भारतीय विज्ञान संस्थान

IISc Annual Report 2025-26

AI: A key research catalyst



IISc
Leadership 2025-26

INDIAN INSTITUTE OF SCIENCE

VISITOR
THE PRESIDENT OF INDIA

PRESIDENT OF THE COURT
N CHANDRASEKARAN

CHAIR OF THE COUNCIL
SENAPATHY 'KRIS' GOPALAKRISHNAN

DIRECTOR
G RANGARAJAN

DEANS
SCIENCE: S ASOKAN
ENGINEERING: JAYANT M MODAK
UG PROGRAMME: PRABAL K MAITI

REGISTRAR
CAPT SRIDHAR WARRIER (RETD)



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Foreword

I am honoured to present the 2025-26 Annual Report of the Indian Institute of Science (IISc).

In May 2025, the Institute turned 116. It has remained a leading institution for original research and higher education while staying true to its mandate to "provide for advanced instruction and to conduct original investigations in all branches of knowledge as are likely to promote the material and industrial welfare of India."

The Institute's faculty members and students won many laurels in the past year, with Arkaprava Basu (CSA) winning the Vigyan Yuva-SSB award. Balasubramanian Gopal (MBU) and Ambarish Ghosh (CeNSE) won the Tata Transformation prize 2025, while two Honorary Professors earned international laurels: Ajay Sood was selected as Member of the American Association for the Advancement of Science (AAAS), USA, and Sriram Ramaswamy was named Fellow of the National Academy of Sciences (NAS), USA. Additionally, three NASI Fellows, four INAE Fellows, six INAE Associate Fellows, six INSA Fellows, and seven IASc Fellows were inducted from our faculty this past year. A team of undergraduate students also won a gold medal at the international Genetically Engineered Machines (iGEM) competition.

IISc has continued to push the boundaries of knowledge with rigorous research across departments. Some highlights from the past year include using liquid marbles to enhance pesticide deposition on leaves, detecting a quantum fluid of electrons in exceptionally clean graphene, and pinpointing a fungal source for the rich red pigment produced by the lac insect. In the areas of sustainability and energy, researchers have developed a method to recycle plastic from fishing nets and automotive waste to create durable nylon, as well as a novel multiport DC converter to rapidly charge EVs. Researchers have also devised a terbium-based paper sensor to detect biomarkers linked to liver cancer, and a technique to use bacteria to fix cracks in bricks to build habitats in space. These are only a few examples of cutting-edge research happening at IISc.

The Institute has also embarked on several large-scale research initiatives with potential for enormous social impact. An AI Centre of Excellence called Translational AI for Networked Universal Healthcare (TANUH) was established by the Ministry of Education to design AI-driven tools for early detection, risk prediction, monitoring, and personalised solutions for oral and breast cancer, retinal diseases, diabetes, and mental health. Another milestone is the launch of a "moonshot" project supported by the Pratiksha Trust, which seeks to develop implantable as well as non-invasive brain co-processors to enhance or restore brain functions such as memory, attention, vision, and motor skills, with a focus on cognitive rehabilitation of stroke survivors.

The Institute received numerous accolades this year for its continued excellence. Yet again, IISc has received the top rank in the university and research categories of the National Institutional Ranking Framework (NIRF) rankings, while occupying the second spot in the overall category. IISc also ranked the highest among Indian institutions in the Nature Index 2025.

IISc has continued to build strong partnerships with leaders in industry and education. To aid our country's armed forces, researchers have joined hands with Fibroheal Private Limited to develop Fibroplug – a novel silk-based material to help control bleeding due to injuries and accidents. We have partnered with StrideAide, an AI health tech firm, to set up a digital podiatry clinic at the IISc Health Centre. We also signed a MoU with Tufts University to establish the Interdisciplinary Centre for Nutrition Science and Medicine (ICNSM), and another with L&T semiconductor technologies for setting up a national 2D innovation hub for semiconductors and quantum technologies. In addition, we are collaborating with the Henry Royce Institute for cutting-edge research on 3D bioprinting, biofabrication, and materials science.

With support from the Ministry of Tribal Affairs, IISc is in the process of setting up a training fab to enhance capacity building in semiconductor technology, and providing 48,000 hours of training and 2,100 NQDF-certified courses for tribal students. We have also entered into an academic partnership with IIT Gandhinagar to enable students from there to join IISc directly for a Master's programme after completing the third year of their BTech. This is in addition to joint research projects, workshops, and access to infrastructure and lab facilities in both institutions.

From the coming academic year, IISc will also be offering new BTech programmes in Aerospace Engineering, Materials Science and Engineering, and Mechanics and Computing.

On the infrastructure front, faculty quarters, new hostels for men and women students and postdocs, and an International Visitors House have been completed. Construction of the UG Complex and the Tata IISc Medical School and Bagchi Parthasarathy hospital is progressing well. An NTPC Centre for Advanced Neurosurgery and the CIPLA Foundation Centre for Pulmonary Medicine are also being established as part of the Tata IISc Medical School.

In an interesting development, we partnered with Amar Chitra Katha to bring out a comic on the rich history of IISc. Titled The Crucible of Indian Science, the comic has been published in English, Kannada, and Hindi to spread awareness about the Institute's legacy and contributions.

While support and funding from the government have been critical for IISc's operations, support from non-government sources has also proven beneficial for the Institute's advancement in the last few years. Endowments and grants from generous donors and alumni have enabled the Institute to modernise and provide enhanced support for its students and help our faculty members pursue groundbreaking research.

In the years to come, we will continue to persist in our pursuit of excellence and contribute to nation-building activities.

On behalf of IISc, I thank the Ministry of Education, and Chair and members of the Council for their continued support and guidance in all our endeavours.



G Rangarajan
Director, IISc
September 2026

2025-26
IISc at a Glance

Academic Structure

Division of Biological Sciences

BC	Biochemistry
CAF	Central Animal Facility
CES	Centre for Ecological Sciences
CIDR	Centre for Infectious Disease Research
CNS	Centre for Neuroscience
DBG	Developmental Biology and Genetics
MCB	Microbiology and Cell Biology
MBU	Molecular Biophysics Unit

Division of Chemical Sciences

IPC	Inorganic and Physical Chemistry
MRC	Materials Research Centre
OC	Organic Chemistry
SSCU	Solid State and Structural Chemistry Unit

Division of Electrical, Electronics, and Computer Sciences

CSA	Computer Science and Automation
ECE	Electrical Communication Engineering
EE	Electrical Engineering
ESE	Electronic Systems Engineering

Division of Interdisciplinary Sciences

BE	Bioengineering
CSP	Centre for Society and Policy
CDS	Computational and Data Sciences
CeNSE	Centre for Nano Science and Engineering
CiSTUP	Centre for infrastructure, Sustainable Transportation and Urban Planning
ICER	Interdisciplinary Centre for Energy Research
ICWaR	Interdisciplinary Centre for Water Research
MS	Management Studies
RBCCPS	Robert Bosch Centre for Cyber-Physical Systems
SERC	Supercomputer Education and Research Centre

Division of Mechanical Sciences

AE	Aerospace Engineering
CAOS	Centre for Atmospheric and Oceanic Sciences
CEaS	Centre for Earth Sciences
CE	Chemical Engineering
CiE	Civil Engineering
DM	Design and Manufacturing
CST	Centre for Sustainable Technologies
DCCC	Divecha Centre for Climate Change
MT	Materials Engineering
ME	Mechanical Engineering

Division of Physical and Mathematical Sciences

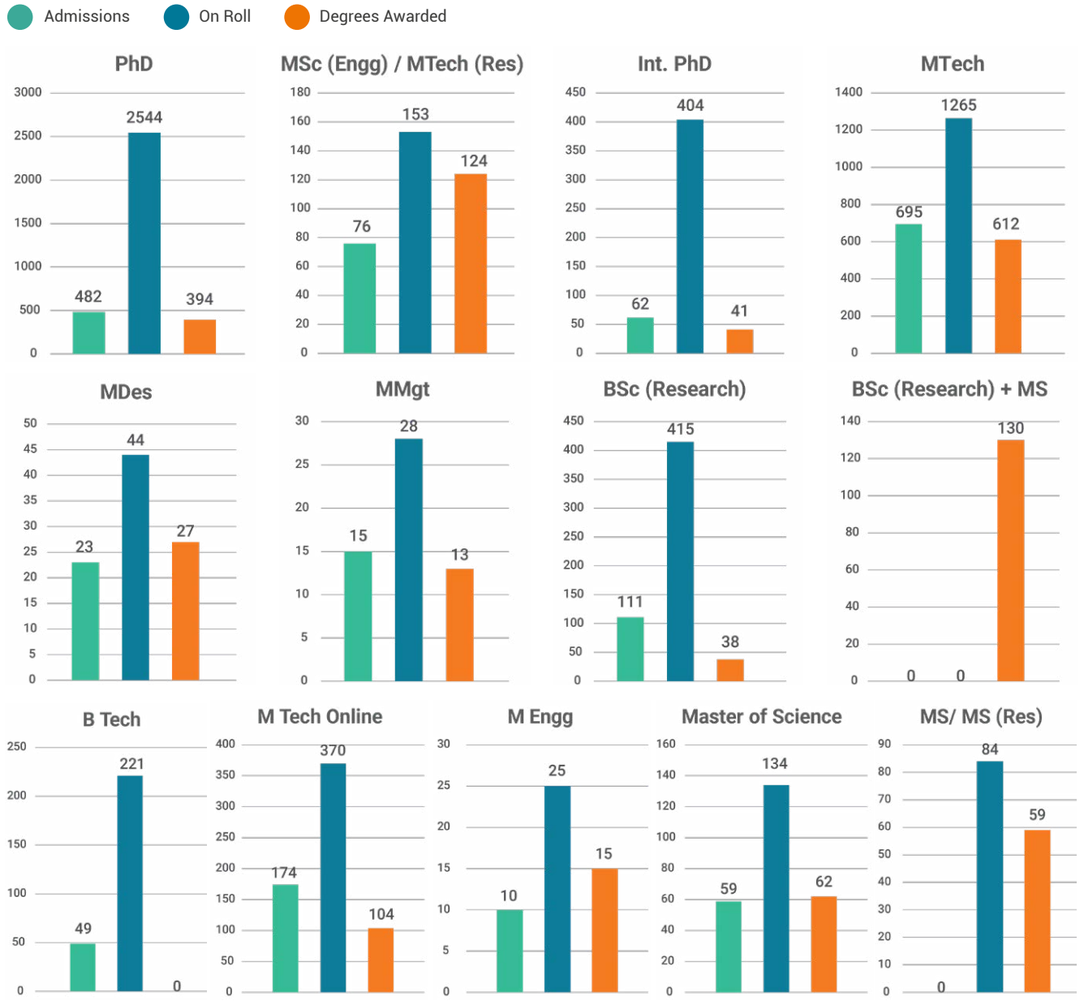
CCT	Centre for Cryogenic Technology
CHEP	Centre for High Energy Physics
IAP	Instrumentation and Applied Physics
MA	Mathematics
PHY	Physics

Centres under the Director & Autonomous Centres

LIB	JRD Tata Memorial Library
OoC	Office of Communications
OIR	Office of International Relations
CCE	Centre for Continuing Education
ODAA	Office of Development and Alumni Affairs
IPTeL	Office of Intellectual Property and Technology Licensing
CC	Challakere Campus
CSIC	Centre for Scientific and Industrial Consultancy
DIGITS	Digital Campus and IT Services Office
ORG	Office of Research Grants
OCCaP	Office of Career Counselling and Placement
FSID	Foundation for Science, Innovation and Development
CBR	Centre for Brain Research
KSCST	Karnataka State Council for Science and Technology
ARTPARK	AI and Robotics Technology Park
OLSEH	Office of Laboratory Safety and Environmental Health

Students:
Admissions, Conferments, On Roll

Admissions, On Roll & Degrees Awarded 2025-26



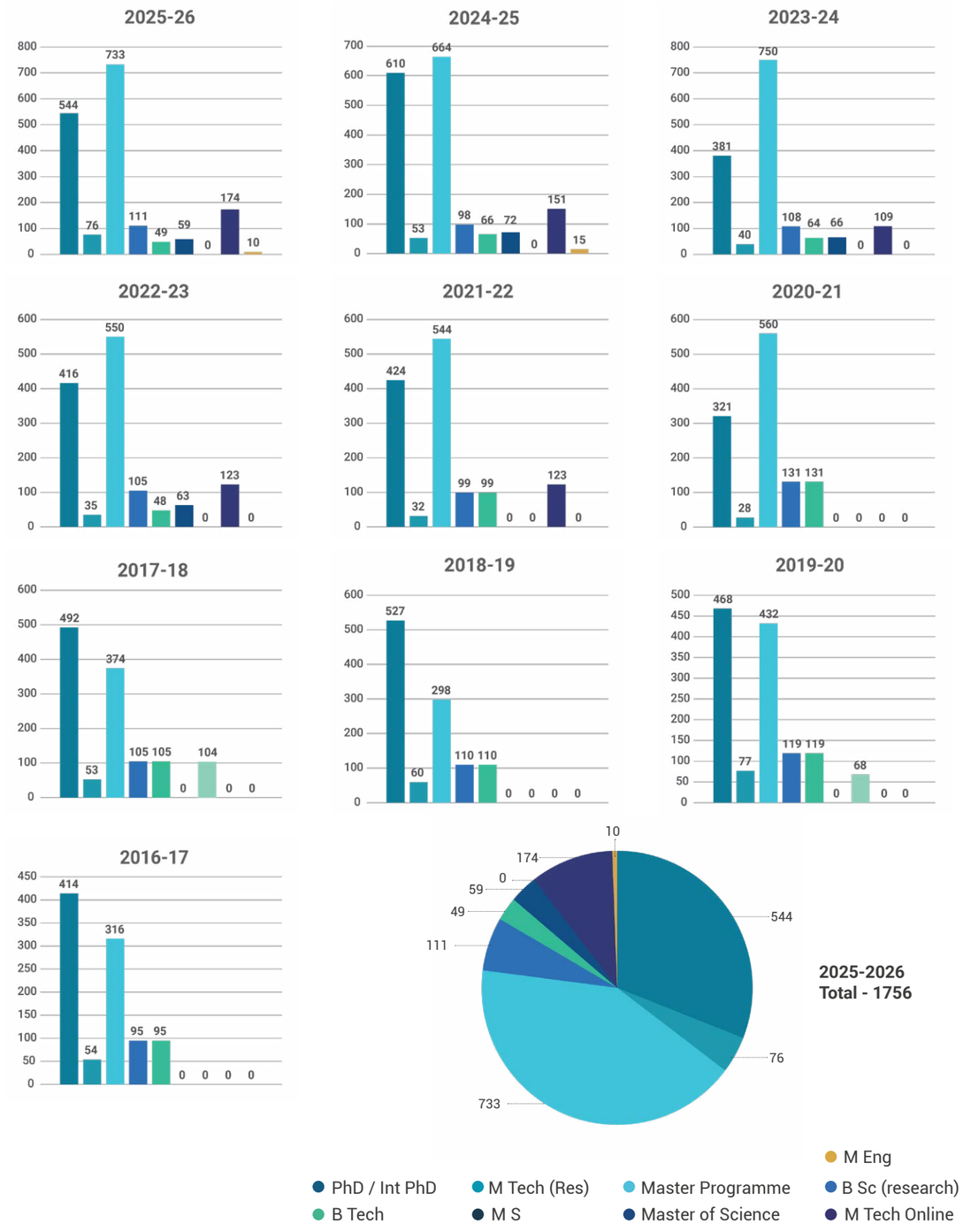
Continuing Education	
National Programme - QIP Degree programme Ph.D	1
Industry Oriented Programmes : CCE Proficience 29 Semester courses	1250 Successfully completed
Industry sponsored short term/full term courses: 58 Self Support Courses	1234 particiapted

Hostels	23
Men	18
Women	5
Messes	5

Scholarships/Fellowships	4168
IISc	3313
Others	855

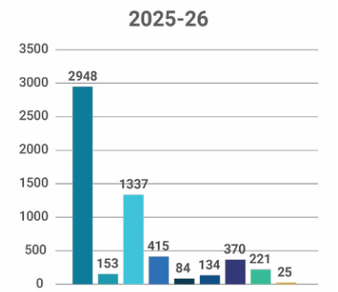
Students:
Admissions, Conferments, On Roll

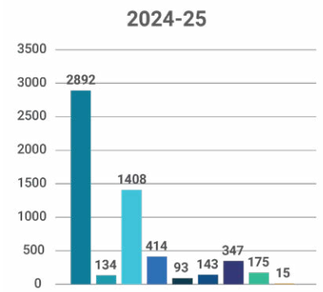
Admissions from 2016-17 to 2025-26

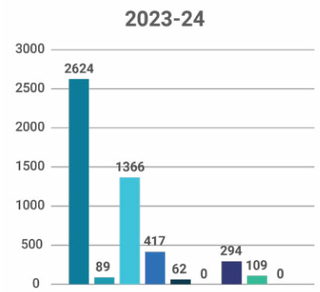


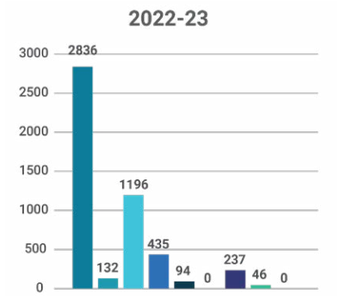
Students:
Admissions, Conferments, On Roll

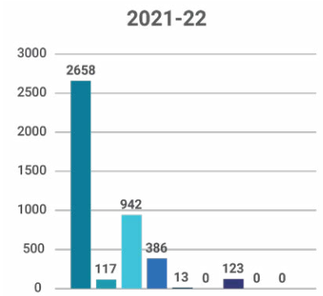
On Roll from 2016-17 to 2025-26

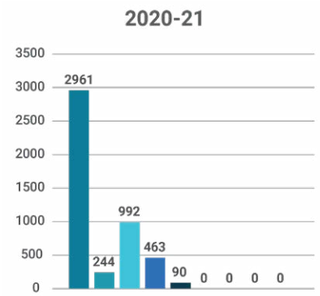


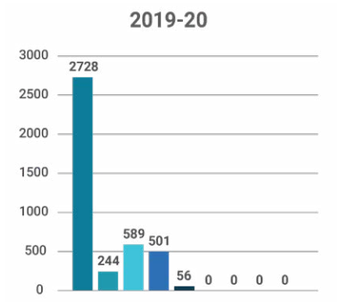


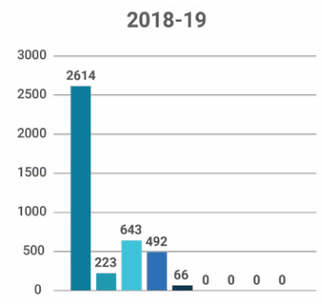


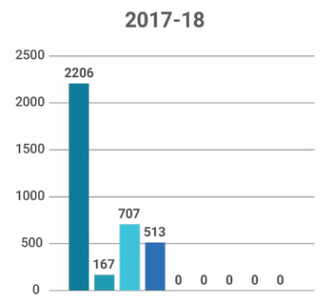


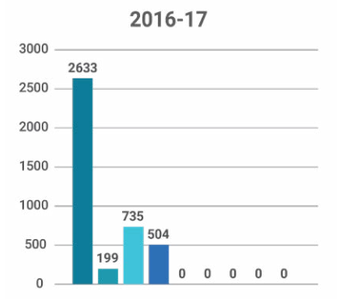


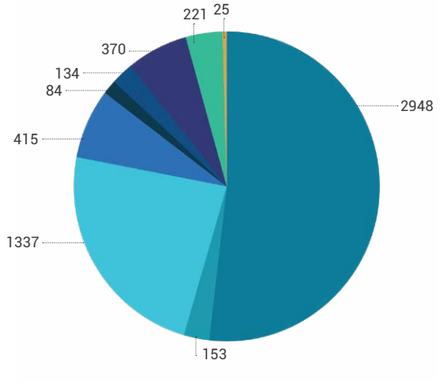






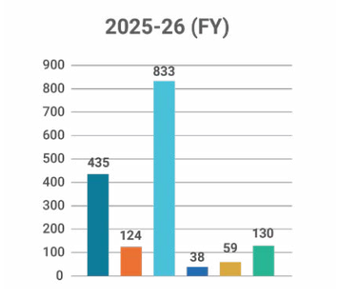


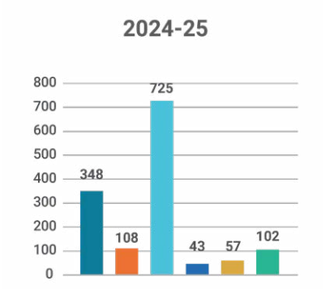


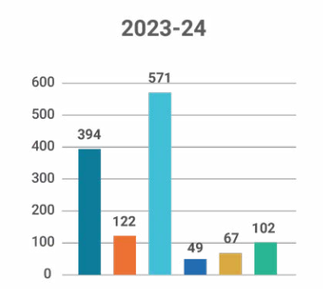


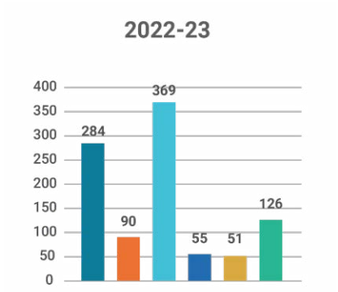
Students:
Admissions, Conferments, On Roll

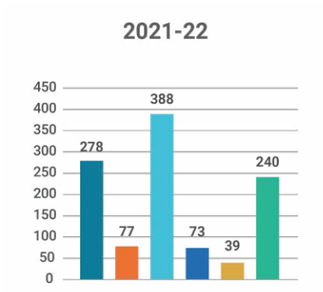
Conferments from 2016-17 to 2025-26

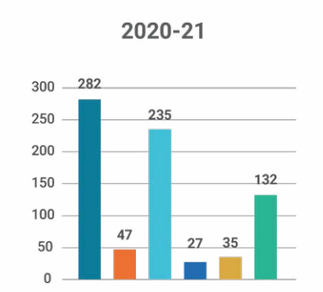


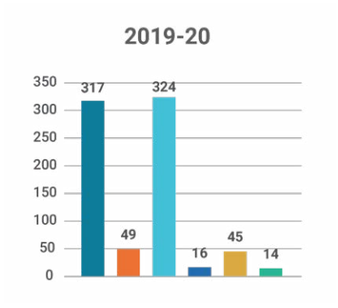


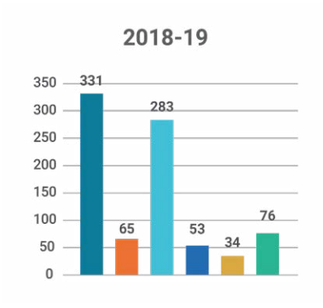


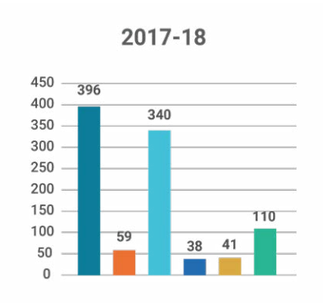


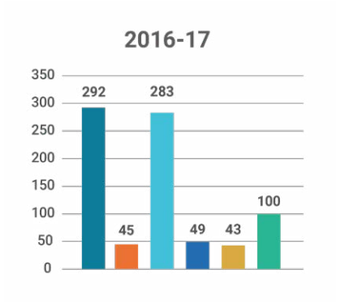


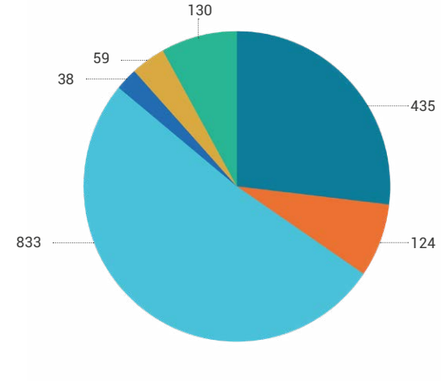












Programmes

Research

PhD · Int PhD · BSc (Research) · MSc

Science	PhD	Int. PhD	BSc (Research)	MSc
Biochemistry	●	●		
Ecological Sciences	●	●		
Microbiology and Cell Biology	●	●		
Molecular Biophysics	●	●		
Developmental Biology and Genetics	●	●		
Neurosciences	●	●		
Inorganic and Physical Chemistry	●	●		
Materials Research	●	●		
Organic Chemistry	●	●		
Solid State and Structural Chemistry	●	●		
Mathematics	●	●		
Physics	●	●		
Astronomy and Astrophysics	●	●		
High Energy Physics	●	●		
Interdisciplinary Programme - IMI	●			
Undergraduate Programme			●	
Life Sciences				●
Chemical Sciences				●

Programmes

Course/ Research

PhD · Mtech (Res) · MTech · MDes · MMgt

Engineering	PhD	M Tech (Res)	M Tech	M Des	M Mgt
Civil Engineering	●	●	●		
Earth Sciences	●	●	●		
Computer Science and Automation	●	●	●		
Electrical Engineering	●	●	●		
Electrical Communication Engineering	●	●	●		
Electronic Systems Engineering	●	●	●		
Aerospace Engineering	●	●	●		
Chemical Engineering	●	●	●		
Mechanical Engineering	●	●	●		
Materials Engineering	●	●	●		
Design and Manufacturing	●	●	●	●	
Atmospheric and Oceanic Sciences	●	●	●		
Instrumentation and Applied Physics	●	●	●		
Computational and Data Science	●	●	●		
Nanoscience and Engineering	●		●		
Energy Research	●				
Management Studies	●				●
BioSystems Science and Engineering	●				
Water Research	●				
Sustainable Technologies	●	●			
Cyber Physical Systems	●				
Climate Change	●				

Programmes

Courses offered 2025-26

Division	Level 100	Level 200	Level 300	Level 400	Level 500	Grand Total
Academic and Research		22	1	1		24
Dean Under-graduate Prgramme	52	56	32	11	10	161
Division of Biological Sciences	3	94	16			113
Division of Chemical Sciences		13	15			28
Division of EECS		139	20			160
Division of Interdisciplinary Sciences		133	31			164
Division of Mechanical Sciences		266	13			279
Division of Physical and Math. Sciences		70	60			130
M.Tech.(Online) Sponsored Degree Programme		32	3			35
Support and Services under the Director		5	3			8
Grand Total	**55**	**831**	**196**	**12**	**10**	**1101**

Faculty

Staff (840)	SC/ST	OBC	GN	EWS
Academic, Scientific & Technical (540)				
Academic	46	23	422	0
Scientific	26	0	21	0
Technical	2	0	0	0
Support (300)				
Officers	8	11	21	0
Administrative	60	30	57	10
Technical	24	18	30	10
Maintenance	5	2	14	0
Others	0	0	0	0

Publications 2025	
Biological Sciences	379
Chemical Sciences	414
Electrical, Electronics, and Computer Sciences	554
Interdisciplinary Research	578
Mechanical Sciences	1229
Physical and Mathematical Sciences	556
Autonomous Society/centre	82
UG Studies	24
Centers under Director	2
Total	**3818**

Academic Divisions: 7 Departments: 43	
Biological Sciences	8
Chemical Sciences	4
Electrical, Electronics, and Computer Sciences	4
Mechanical Sciences	10
Medical Sciences	2
Physical and Mathematical Sciences	5
Interdisciplinary Sciences	10

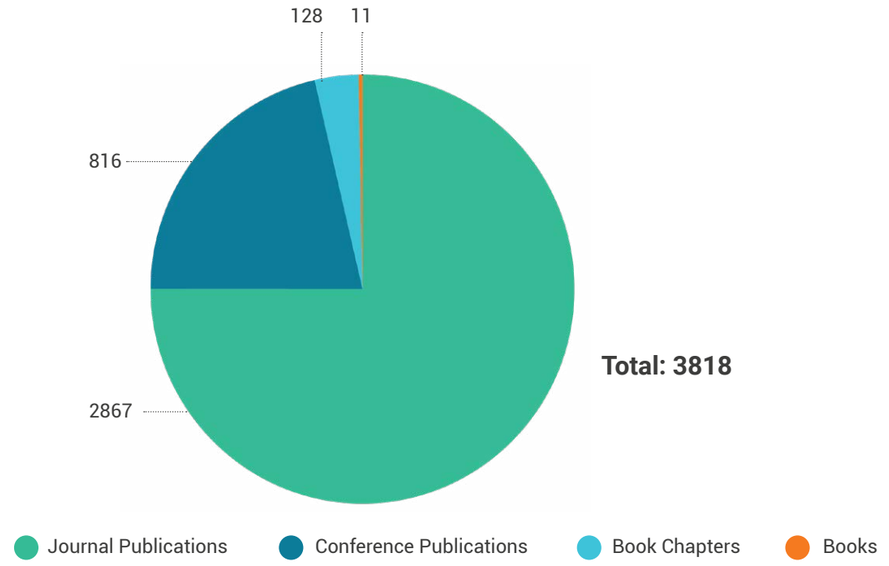
Faculty

Interactions	
On Campus	
Institute Lectures	12
Institute Colloquium	14
International Conferences	40
Visitors - Visits from different Minstries	8
Visitors - Experts from different fields	8
Visitors - School/College	162
Staff	
Visits	453
Conferences	
Lectures delivered	
Assistance in Other Institutions	

As per the Duty/Vacation Leave Approved by HR

Awards and Distinctions	
J C Bose Fellowhsip	7
TWAS	0
Indian Academy of Sciences	7
Indian National Academy of Engineering	4
National Academy of Sciences	3
Indian National Science Academy	6
Shanti Swarup Bhatnagar (SSB) Prize	
Swarna Jayanti	

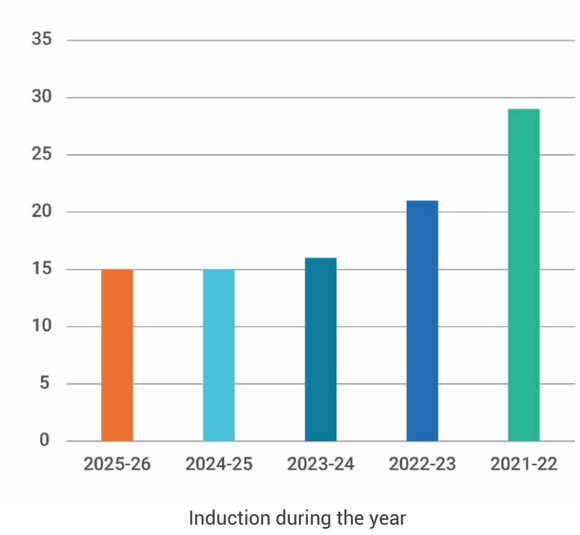
Publications



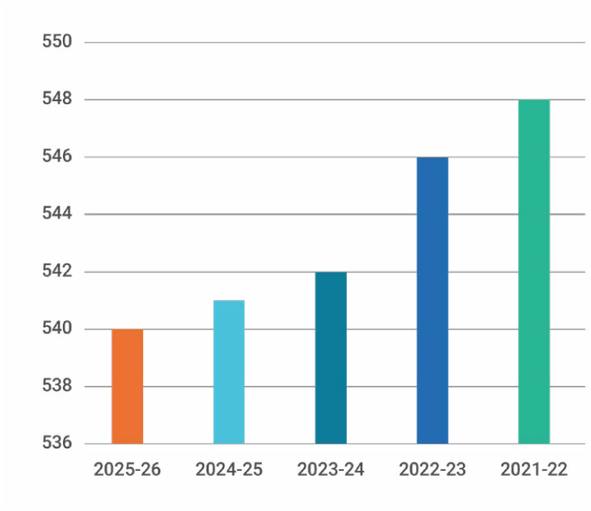
Degrees Awarded 2025-2026 (FY)	
Int PhD	41
MS (Res)	59
PhD	394
MTech	612
MTech (Res)	122
MMgt	13
MDes	27
Four Yr. BSc (Res)	38
BSc (Res) + MS	130
MSc	62
MSc (Engg)	2
MTech (Online)	104
MEngg	15
Total	**1619**

Faculty
Induction, Academic and Technical Staff

New Faculty Inducted during 2021-2026



Academic, Scientific and Technical Staff On Roll from 2021-2026





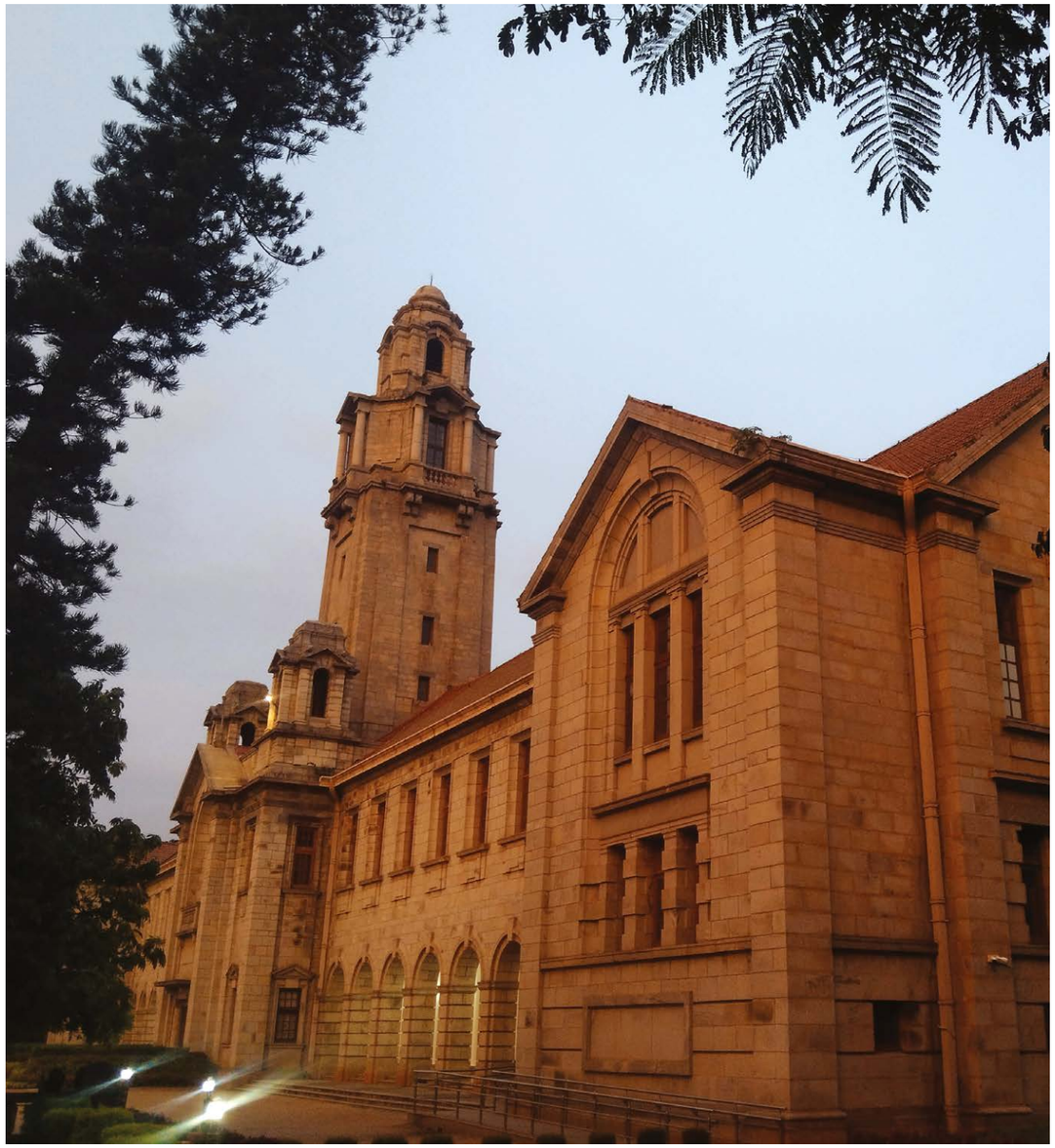


1. *The Institute*

The Indian Institute of Science (IISc) is an institution of higher learning and research established in 1909 under the Charitable Endowments Act 1890. With the establishment of the University Grants Commission in 1956, the Institute came under its purview as a Deemed University. The principal authority governing the Institute is the Council, which is advised by the Court in the formulation of policies. The Director is the Chief Executive of the Institute and is assisted in its management by the Senate and the Faculties of Science and Engineering.

1.1
The Court

The membership of the Court is drawn from different cross-sections of the country such as Industry, Universities, Scientific Institutions, etc. In addition to eminent persons of science, learning and industry, it also contains the nominees of the Government of India, the Government of Karnataka, and the Tata Trusts. The Professors of the Institute and the members of the Council are also ex-officio members of the Court. The following are the members of the Court as on 31.03.2026:



N Chandrasekaran
President of the Court and Chairman, Tata Sons Limited, Mumbai

Shekhar Mande
JC Bose Fellow and Honorary Faculty Scientist, National Centre for Cell Science, Savitribai Phule Pune University, Ganeshkhind, Pune

S Subbiah
HoD, Department of Surgical Oncology, Kilpauk Medical College and Government Royapettah Hospital, Chennai

Krishna M. Ella
Executive Chairman, Bharat Biotech International Limited

Shireesh B. Kedare
Director, Indian Institute of Technology (IIT) Bombay

Tessy Thomas
Vice Chancellor, Noorul Islam Centre for Higher Education, Kanyakumari; Former Director General, Aeronautical Systems, DRDO

N. Manjula
Secretary to Government, Department of Information Technology Biotechnology and Science & Technology (ITBT), Government of Karnataka

KN Vyas
Former Chairman, Atomic Energy Commission

K. Ullas Kamath
Mentor – FICCI Karnataka State Council and Founder, UK & Co

S N Agarwal
Chairman, Bhoruka Power Corporation Ltd

R Mukundan
Past President, Employer's Federation of India; Managing Director and CEO, Tata Chemicals Limited

M. N. Doja
Former Director, Indian Institute of Information Technology (IIIT) Sonipat

Abhay A Pashilkar
Director, CSIR-National Aerospace Laboratories

V. Narayanan
Chairman, ISRO

V Mohan
Chairman, Madras Diabetes Research Foundation

Lt Col G Rajaram (Retd)
President, IISc Alumni Association

Govindan Rangarajan
Director, IISc (Ex-officio)

All members of the Council
(Ex-officio)

Professors of the Institute
(Ex-officio)

Prof. D Nagesh Kumar
Registrar (Secretary) (Ex-officio)

A meeting of the Court was held on 13.03.2026 and an extraordinary meeting of the Court was held on 21.08.2025.

Members of the Council who are not otherwise members of the Court:

Senapathy 'Kris' Gopalakrishnan
Co-Founder, Infosys; Chairman, Axilor Venture Pvt Ltd

Vineet Joshi
Secretary, Department of Higher Education, Ministry of Education

Abhay Karandikar
Secretary, Department of Science and Technology, Ministry of Science and Technology, Government of India

Tushar Giri Nath
Additional Chief Secretary to the Government, Department of Urban Development and Department of Home, Government of Karnataka

Ritesh Kumar Singh
Additional Chief Secretary, Department of Finance, Government of Karnataka

TV Narendran
CEO & Managing Director, Tata Steel Limited

Siddharth Sharma
CEO, Tata Trusts

G Kumar Naik
Hon'ble Member of Parliament (LS)

LS Tejasvi Surya
Hon'ble Member of Parliament (LS)

Sudha Murty
Hon'ble Member of Parliament (RS)

Asokan S
Dean, Faculty of Science

Jayant M Modak
Dean, Faculty of Engineering

Prof. D Nagesh Kumar
Registrar (Ex-officio, Secretary)

1.2
The Council

The Council is the principal governing authority of the Institute and its membership includes the Nominees of the Court, Parliament, Government of India, Government of Karnataka, Tata Trusts, Representatives of Indian Universities, University Grants Commission and scientific bodies. The following are the members of the Council as on 31.03.2026:

Senapathy 'Kris' Gopalakrishnan
Chairman of the Council
Co-Founder, Infosys and Chairman, Axilor Ventures Private Limited

Vineet Joshi
Secretary, Department of Higher Education, Ministry of Education

Abhay Karandikar
Secretary, Department of Science and Technology, Ministry of Science and Technology, Government of India

Tushar Giri Nath
Additional Chief Secretary to the Government, Department of Urban Development and Department of Home, Government of Karnataka

Ritesh Kumar Singh
Additional Chief Secretary, Department of Finance, Government of Karnataka

Siddharth Sharma
CEO, Tata Trusts

TV Narendran
CEO & Managing Director, Tata Steel Limited

G. Kumar Naik
Hon'ble Member of Parliament (LS)

L S Tejasvi Surya
Hon'ble Member of Parliament (LS)

Sudha Murty
Hon'ble Member of Parliament (RS)

V. Mohan
Chairman, Madras Diabetes Research Foundation

V. Narayanan
Chairman, ISRO

M. N. Doja
Former Director, Indian Institute of Information Technology (IIIT) Sonipat

Abhay A. Pashilkar
Director, CSIR-National Aerospace Laboratories

Govindan Rangarajan
Director, IISc (Ex-officio)

Asokan S
Dean, Faculty of Science

Jayant M Modak
Dean, Faculty of Engineering

Prof. D Nagesh Kumar
Registrar (Secretary) (Ex-officio)

Council Meetings were held on 21.06.2025, 20.09.2025, 20.12.2025, and 28.03.2026

1.3
Finance Committee

Senapathy 'Kris' Gopalakrishnan
Chairman of the Council
Co-Founder, Infosys and Chairman, Axilor Ventures Private Limited

Sanjog Kapoor
Joint Secretary & Financial Adviser, Ministry of Education, Government of India

Saumya Gupta
Joint Secretary (TE), Ministry of Education, Government of India

Mohammed Ikramulla Shariff
Joint Secretary (Budget & Resources) Finance Department, Government of Karnataka

Ashish W Deshpande
Secretary & Chief Financial Officer, Sir Ratan Tata Trust, Mumbai

RF Savaksha
Secretary & Chief Financial Officer, Sir Dorabji Tata Trust, Mumbai

V. Mohan
Chairman, Madras Diabetes Research Foundation

Rajiv Kumar Singh
Accountant General (A&E), Bangalore, Karnataka

Govindan Rangarajan
Director (Ex-officio)

Prof. D Nagesh Kumar
Registrar (Secretary) (Ex-officio)

Finance Committee Meetings were held on 20.06.2025, 19.09.2025, 19.12.2025, and 27.03.2026.



1.4
The Senate

The Senate is one of the authorities of the Institute that consists of the Director as the Chair, all Professors and Associate Professors, one elected representative (Assistant Professor) from each of the Faculties, the Librarian, and the Registrar (Secretary). The Senate meets at least once a term.
This principal academic body functions to
(a) plan and coordinate the research activities of the Institute
(b) regulate and organise courses of instruction and study, admission of students, examinations, etc.
(c) formulate conditions for the award of degrees of the Institute
(d) recommend names to the Council for the award of degrees

The Senate recommended the award of various degrees as follows:

Int. Ph. D	41
MS (Res)	59
Ph. D	394
M.Tech	612
M.Tech (Res)	122
M.Mgt	13
M.Des	27
Four Yr. Bsc (Res)	38
BSc + MS	130
M.Sc	62
M.Sc (Engg)	2
M.Tech (Online)	104
M.Engg	15
Total	**1619**

During the AY 2025-26, the Senate met on 22.05.2025, 12.06.2025, 28.08.2025, 28.11.2025, and 09.02.2026.

1.5
Faculties

The faculties act as advisory bodies to the Senate and assist in the discharge of its duties. Each faculty consists of the respective Dean as Chairperson, all Professors, Associate Professors, and Assistant Professors as members, and Chief Research Scientists, Principal Research Scientists, and Senior Scientific Officers as invitees, and the Deputy Registrar as the Secretary.

The joint faculty is headed by the Director, all Professors, Associate Professors, and Assistant Professors as members and Chief Research Scientists, Principal Research Scientists, and Senior Scientific Officers as invitees with Registrar as the Secretary.

The Joint Faculty meetings were held on 14.08.2025 and 30.01.2026. The Science Faculty meeting and Engineering Faculty meeting were held on 29.10.2025.



2. *Staff*

Director
Govindan Rangarajan

Dean (Science)
Asokan S

Dean (Engineering)
Jayant M Modak

Dean (Planning and Infrastructure)
SK Satheesh

Dean (Administration and Finance)
PS Anil Kumar

Dean, Division of Biological Sciences
Usha Vijayraghavan

Dean, Division of Chemical Sciences
G Mugesh

Dean, Division of Electrical, Electronics, and Computer Sciences
Rajesh Sundaresan

Dean, Division of Interdisciplinary Sciences
Navakanta Bhat

Dean, Division of Mechanical Sciences
GK Ananthasuresh – till 08.04.2025
Satyam Suwas – from 09.04.2025

Dean, Division of Medical Sciences
Navakanta Bhat

Dean, Division of Physical & Mathematical Sciences
Kaushal Verma

Dean, UG Programme
Prabal K Maiti

Associate Dean, UG Programme (BSc (Research))
Dipshikha Chakravortty

Associate Dean, UG Programme (BTech)
Srikanth Krishnan Iyer

Registrar
Capt Sridhar Warrier (Retd), MBA – till 21.03.2026
Nagesh Kumar D, PhD – from 22.03.2026

Financial Controller
Indumati Srinivasan, PGDPPM – till 06.08.2025
Wg Cdr Venkata Rao Pilaka (Retd), MBA – from 07.08.2025

Joint Registrars
MC Jayaprakash, MBA
Veeranna Kammar, MSc – from 27.06.2025

Deputy Registrar
Anoop S, MA
Aparna Kandi, MBA
Ramanathan K, MCom
Veeranna Kammar, MSc – till 26.06.2025

Assistant Registrars
Anil Kumar Angadi, MA
Anoop Yadav, MBA
Ashwathaman ML, PGDPM&IR
Gopi Konkipudi, MTech
Jayaraj K, MBA
Krishna Kant Kumar, MA
Mahesh Kumar TM, PhD
Michealraj S, MBA
Mithun Nair, MBA
Nithya R G, MBA
Nitin Anand A, MBA
Raghavendra G, M Com
Sathish Kumar S, MSc
Senthil Kumar M, MBA
Manish Pokhriyal, MTech
Sreedhar BN, MBA
Vasanthan AA, MBA

Administrative Officer (Challakere Campus)
Munti Madugu Mudassar, MTech

Hindi Officer
Bhushan Balkrishna Mule, MA

Internal Auditor
Ravikumar U, MA

JRD TATA MEMORIAL LIBRARY

Librarian
Umeshareddy Kacherki, PhD

Deputy Librarian
Ashish Kumar Ahirwal, MLISc – from 27.11.2025
Suresh B Balutagi, PhD

Assistant Librarians
Ashish Kumar Ahirwal, MLISc – till 26.11.2025
Pradeep P Kavi, AISc

HEALTH CENTRE

Chief Medical Officer
Satish Rao C, MBBS

Senior Medical Officer
Nirmala R, MBBS

Principal Medical Officer
Aditya Malladi, MBBS

Medical Officer
Neethi Raveendran, MBBS

CAMPUS MANAGEMENT AND DEVELOPMENT

Project Engineer-cum-Estate Officer
Lt Col Navneet Lobana (Retd), MTech

Deputy Project Engineer
Lenin Ram K, MTech

Sr. Assistant Executive Engineer
G Lohithesh Kumar, MTech

Assistant Project Engineers
Amruth Appachu K, MTech
Karthik P, MTech
Radhika Muthukumar, BE

Gymkhana President
Ambedkar Dukkipati, PhD (IISc)

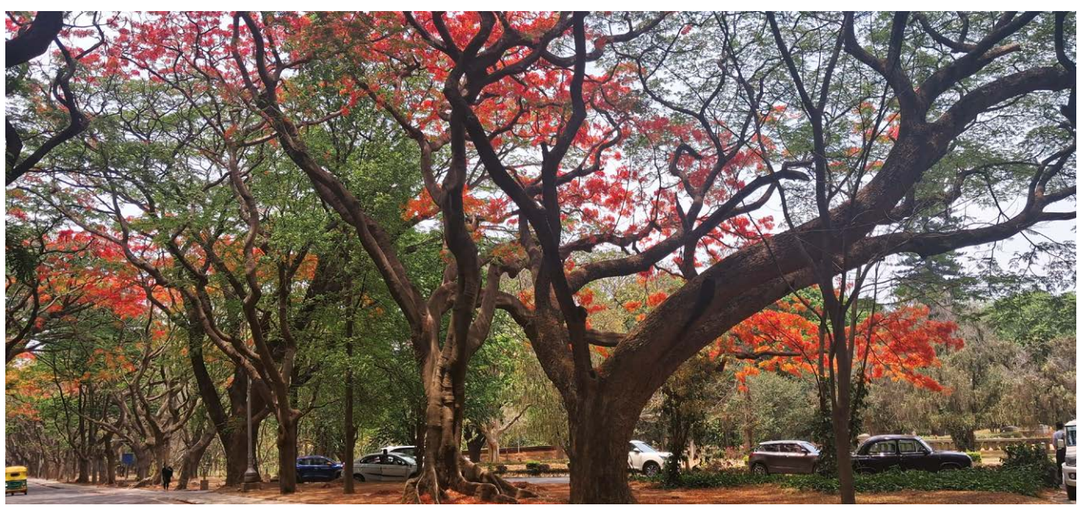
STUDENT AFFAIRS

Chair, Council of Hostel Wardens
Asha Bhardwaj, IAP

Wardens
Jayanth GR, IAP
Manoj Varma, CeNSE
Vishal Singh, DM
Geetharani K, IPC
Jyothsna Komaragiri, CHEP
Subinoy Rana, MRC
Naga Phani Aetukuri, SSCU
Sarasij Das, EE
Sheetal Jain, SSCU
Sreedhara M B, SSCU
Anoop Thomas, IPC
Sujit Das, MRC
Sanhita Sinharay, BE
Shovamayee Maharana, MCB
K Ramanathan, DR
Nithya RG, AR

Student Advisors
MS Bobji
Chair & Advisor

Student Counsellors
Ambedkar Dukkipati, CSA
Annapoorni Rangarajan, MRDG
Abha Misra, IAP
Partha Pratim Mondal, IAP
Viswesha Guttal, CES
Harish Seshadri, MA
Digbijoy Nath, CeNSE
Deepakash Das, DBG
Nitin Anand, Academics-II







3.1 *Division of Biological Sciences*

The Division of Biological Sciences forges important links between basic science and innovative research. It is committed to enhancing frontline studies in almost all aspects of modern biology: Neuroscience in health and disease, Infectious Disease, Structural Biology, Oncology, DNA Repair and Genomic Stability, Systems Biology and Bioinformatics, Immunology, Enzymology, Reproductive and Developmental Biology, Ecological Studies and more.

Themes

Investigators in the Division focus on numerous processes central to the understanding of life, emphasising on areas with considerable translational potential, namely, cognition and neuronal reprogramming, infectious diseases, drug and molecular design, diagnostics and therapeutics in cancer, gene targeting, genetic disorders and genetic diversity.

Departments | Centres | Units

- Department of Biochemistry
- Central Animal Facility
- Centre for Ecological Sciences
- Centre for Infectious Disease Research
- Centre for Neuroscience
- Department of Developmental Biology and Genetics
- Department of Microbiology and Cell Biology
- Molecular Biophysics Unit

A fungal origin for coveted lac pigment

Lac pigment is a rich red colour that is greatly valued for its various applications in food colouring, textiles, and dyes, and also in handicrafts and folk art. Scientists at the Department of Developmental Biology and Genetics (DBG) have found that this colourful pigment, extracted from the lac insect, may be produced by a symbiotic yeast-like organism living inside the insect. By sequencing the insect microbiome, the team found that only the yeast-like organisms harbour the genes required to produce the key ingredients in the pigment synthesis pathway. This discovery highlights the crucial role of fungal symbionts in insect evolution and pigment production.

Reference:
Vaishally, Pal S, Thyagarajan KR, Shukla SP, An endosymbiotic origin of the crimson pigment from the lac insect, Proceedings of the National Academy of Sciences (2025).

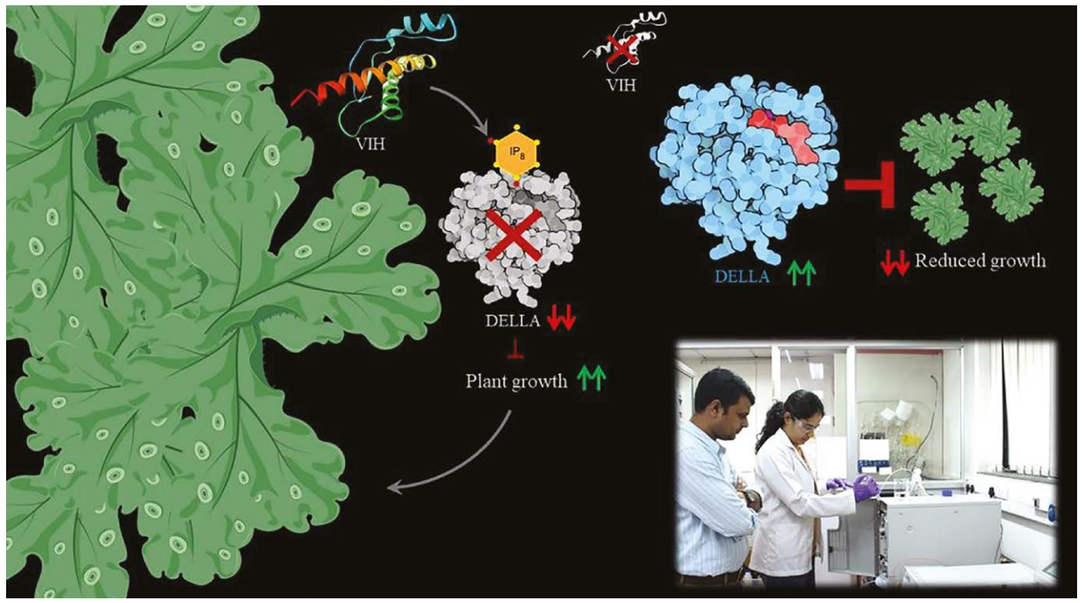


Research Snapshots
2025-26

Uncovering an ancient mechanism of growth and development in land plants

Bryophytes were the first plants to colonise land around half a billion years ago but lacked the receptor for the phytohormone they produce. Using the liverwort *Marchantia polymorpha* as a model system, researchers at the Department of Biochemistry found that the plants recruit an enzyme called MpVIH, which produces the inositol pyrophosphate (InsP8) to dismantle the growth suppressing protein DELLA. The researchers used CRISPR-Cas9 gene editing experiments to confirm that plants lacking functional MpVIH showed severe developmental defects, while suppression of DELLA restored normal growth. Since this mechanism appears conserved across all land plants, the findings could help to develop future higher-yielding crop varieties.

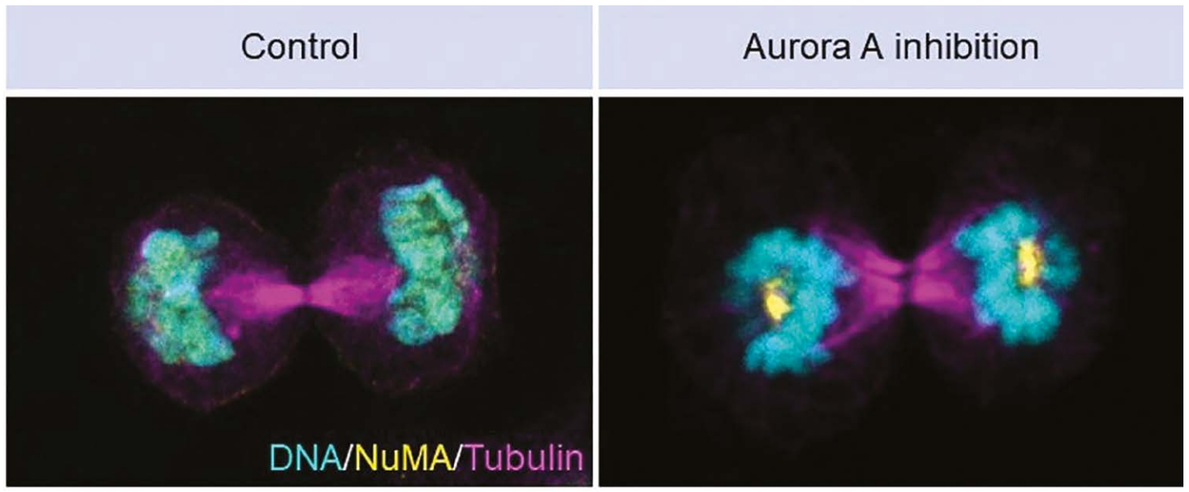
Reference:
Rana P, Edathil Kadangonan A, Koley P, Ghosh R, Pullagurla NJ, Naik HC, Mondal P, Gayen S, Laha D, GA-independent DELLA regulation by inositol pyrophosphate in a nonvascular land plant, Nature Chemical Biology (2025).



How key enzyme shapes nucleus formation in cell division

Eukaryotic cell division involves duplicating and dividing their genetic material equally and then rebuilding the nuclear envelope around the separated halves. If any of this process fails, the resulting nuclei can be misshapen or disorganised, linked to cancer and ageing-related diseases. Researchers at the Department of Microbiology and Cell Biology (MCB) have found that an enzyme, Aurora A, plays a critical role in ensuring proper nucleus formation after cell division. They have also developed a novel genetic tool to selectively remove it only at the later stages of cell division. These findings present new possibilities for targeting protein states for therapeutic applications.

Reference:
Rajeevan A, Olakkal V, Balakrishnan M, Chakrabarty D, Charon F, Noordermeer D, Kotak S, Aurora A regulates the material property of spindle poles to orchestrate nuclear organization at mitotic exit, EMBO Journal (2025).



Research Snapshots
2025-26

Anthropogenic changes threaten survival of Eastern Himalayan birds

Habitat changes threaten the survival of understorey insectivorous birds found in the Eastern Himalayas. Researchers at the Centre for Ecological Sciences (CES) studied the impact of selective logging on bird populations in the Eaglenest Wildlife Sanctuary, Arunachal Pradesh, over 10 years (2011-2021). They tagged birds with lightweight aluminium rings and tracked their survival and changes in body mass. The researchers found that logged forests expose birds to stressful fluctuations due to the loss of the forest canopy. The findings also highlight the significance of understanding why certain species of birds are declining after logging, and how microclimatic niches in disturbed habitats influence population dynamics.

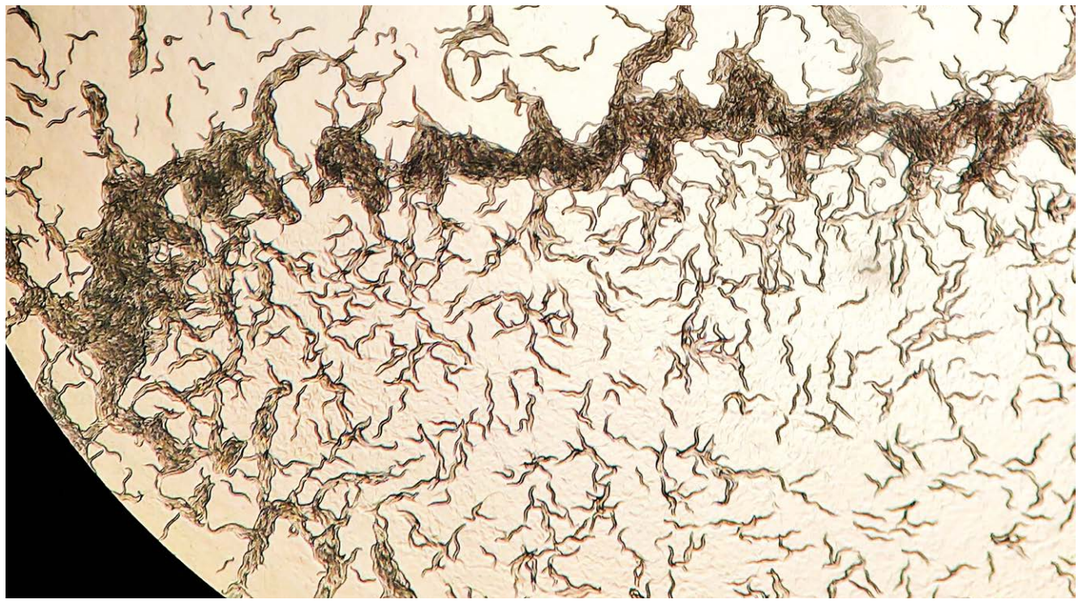
Reference:
Bharadwaj A, Chanda R, Biswakarma A, Tamang B, Munda B, Pradhan DK, Rai M, Rai S, Srinivasan U, Microclimatic niche shifts predict long-term survival and body mass declines in a warmer and more degraded world, Journal of Applied Ecology (2025).



Worming out molecular secrets behind collective behaviour

Studying social behaviour is essential for understanding how certain neuromodulatory pathways, such as the serotonin pathway, influence mood and social interactions. Scientists at the Centre for Neuroscience (CNS) have been investigating these signalling mechanisms using the worm *Caenorhabditis elegans*. The researchers report that the disruption of a single conserved synaptic gene alters the signalling of a specific neuropeptide, causing the worms to exhibit an unusual type of swarming behaviour. This swarming resembles serotonin-driven swarming described in other species, such as desert locusts, suggesting that the neuromodulatory control of social behaviour might be evolutionarily conserved.

Reference:
Shahi N, Kumari N, Khapre S, Dahiya D, Saritekin E, Kocabaş A, Babu K, Neuromodulation of swarming behavior in C. elegans: Insights into the conserved role of calsyntenins, Proceedings of the National Academy of Sciences (2026).

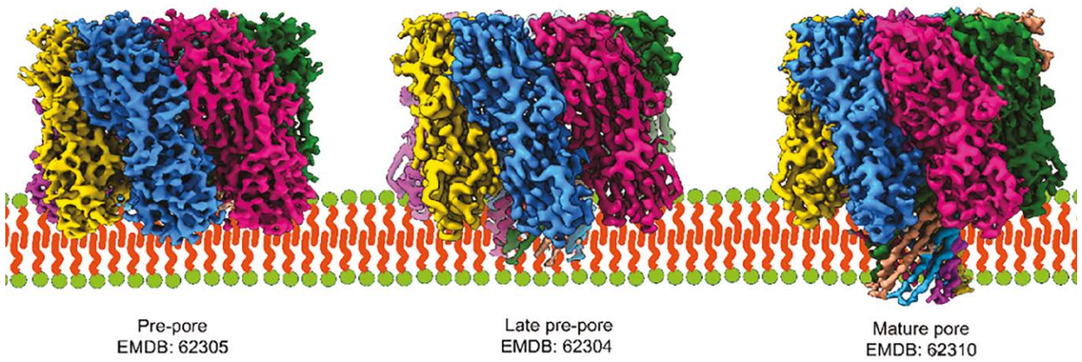


Research Snapshots
2025-26

How bacterial toxins punch holes in membranes

The rise of multi-drug-resistant *Staphylococcus aureus* has become a global health concern due to a toxin known as alpha-haemolysin (α-HL), which plays a central role in the bacterium's ability to cause disease. Scientists at the Molecular Biophysics Unit (MBU) have uncovered how bacterial toxins assemble to punch holes in human cell membranes. The researchers have demonstrated how lipid composition directly influences the assembly and function of a pore-forming toxin under near-physiological conditions. The findings provide a detailed view of how bacterial toxins attack host cells and could aid the development of drugs or vaccines that block this process.

Reference:
Chatterjee A, Roy A, Satheesh T, Das PP, Mondal B, Kishore P, Ganji M, Dutta S, Structural insights into pre-pore intermediates of alpha-hemolysin in the lipidic environment, Nature Communications (2025).



3.1.1
Biochemistry

The Department of Biochemistry, established at IISc in 1921, has been carrying out basic and translational research in diverse areas of biochemistry and molecular biology. The year 2021 was a new milestone in the history of the Department as it completed 100 years of existence. At present, there are 16 faculty members, two Emeritus scientists, 81 PhD students, 15 PDF/DST Young Scientists/UGC Kothari Fellows, one administrative staff, one technical assistant, one permanent helper, and 25 temporary staff in the Department.

FACT FILE

Established: 1921
Phone: +91-80-2293 2473
Fax: +91-80-2360 0814
Email: office.bc@iisc.ac.in
URL: biochem.iisc.ac.in
Degree programmes offered:
PhD and Int PhD

IN NUMBERS

16 Academic staff
65 PhD students
16 Int PhD students
75 Publications
10 PhD conferments

Chair: Utpal S Tatu



Current Research

Proteins – Structure and Function

(i) Transcriptional and post-transcriptional regulation of carbon metabolism of *Pichia pastoris*

(ii) Mitochondrial protein translocation, biogenesis and turnover with regard to various pathophysiological conditions

(iii) Studying neglected infectious diseases such as rabies and Lumpy Skin disease to improve diagnosis and treatment strategies

(iv) The enzymes involved in the restriction-modification system in *Heliobacter pylori* and the mismatch repair system from *Neisseria gonorrhoea*

Genome Biology

(i) The molecular mechanisms underlying chromosome synapsis, homologous recombination, DNA repair and genomic stability

(ii) Studies on RAD51 paralogs in mammalian DNA damage responses, genome stability and tumour suppression

(iii) The roles of the Structural Maintenance of Chromosomes (SMC) complexes that mediate higher-order chromatin organisation

(iv) The roles of RAG proteins in genomic instability, understanding mechanism of non-homologous end joining (NHEJ) and identification of compounds with anti-cancer properties

(v) The basis of mRNA fate decisions with a specific focus on translation and mRNA decay

(vi) Mechanism and physiological significance of stop codon readthrough in mammalian systems

(vii) Macromolecular interactions that help in 3D genome organisation using single-molecule and super-resolution imaging technologies

(viii) Understanding mechanisms of transpliciing based expression of HSp 90 in *Giardia lamblia*

Systems Biology, Bioinformatics and Metabolic Engineering

(i) Mathematical and computational models of biological systems to understand control structures in biochemical pathways, metabolic and regulatory networks, insights from which are being used to understand key perturbations in disease and for biomarker and drug discovery as well as precision medicine

(ii) Secondary metabolites with anti-cancer as well as anti-thrombotic activity from endophytic fungi of *Datura metel, Casia fistula, Catharanthus roseus and Mapia foetida*

Cell Biology and Immunology

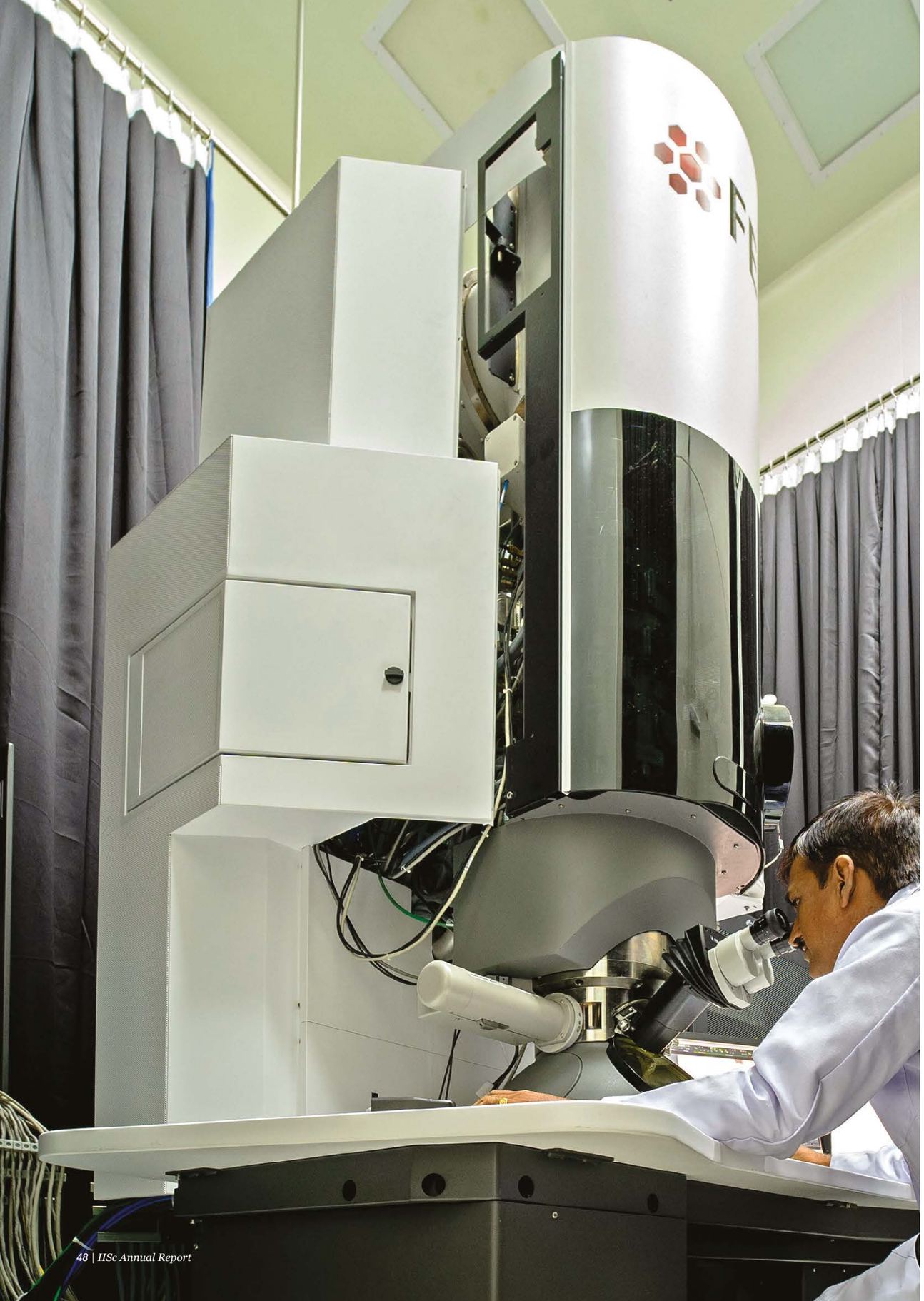
(i) Thymic atrophy and sepsis – key aspects of host response – during infections

(ii) Host response to tuberculosis using an integrated systems biology approach

(iii) Cytoskeletal forces generated through actomyosin ring machinery during cell division

(iv) Signalling role of inositol phosphates in plants

(v) Role of intracellular RNA sensing mechanisms in inflammatory cell death



Faculty & Staff

P N RANGARAJAN
PhD (IISc), Professor

UTPAL S TATU
PhD (IISc), Professor

DIPANKAR NANDI
PhD (California-Berkeley), Professor

PATRICK D'SILVA
PhD (IIT Bombay), Professor

SATHEES C RAGHAVAN
PhD (BHU), Professor

NAGASUMA CHANDRA
PhD (Bristol), Professor

SHIKHA LALORAYA
PhD (Wisconsin), Professor

GANESH NAGARAJU
PhD (IISc), Professor

SANDEEP M ESWARAPPA
PhD (IISc), Associate Professor

PURUSHARTH RAJYAGURU
PhD (CCMB), Associate Professor

SARAVANAN PALANI
PhD (Heidelberg), Assistant Professor

DEBABRATA LAHA
PhD (Tubingen), Assistant Professor

KESAVARDANA SANNULA
PhD (IISc), Assistant Professor

MAHIPAL GANJI
PhD (TU Delft), Assistant Professor

PAYEL ROY
PhD (JNU New Delhi), Assistant Professor

SHANMUGHA RAJAN
PhD (Bar Ilan, Israel), Assistant Professor

Emeritus Professors

G PADMANABAN
PhD (IISc)

K MUNIYAPPA
PhD (IISc)

3.1.2
Central Animal Facility

The Central Animal Facility (CAF) at the Indian Institute of Science was established in 1971 to cater to the needs of investigators from various departments with research interests in areas like biochemistry, microbiology, reproductive biology, cell biology, immunology, virology, neuroscience, cancer biology, interdisciplinary science, and engineering to accomplish animal research objectives.

FACT FILE

Established: 1971
Phone: +91-80-22932734/ 22932457
Email: office.caf@iisc.ac.in

Chair: Sathees C Raghavan



Current Research

The experimental animals are provided to several investigators from around 100 IISc labs who are using laboratory animals for research activities in the Division of Biological Sciences (Biochemistry, Microbiology and Cell Biology, Developmental Biology and Genetics, Molecular Biophysics Unit, Centre for Neuroscience and other Departments such as Mechanical Engineering, Materials Research Centre, Materials Engineering, Inorganic and Physical Chemistry, Department of Bioengineering and Centre for Nano Science and Engineering. Researchers from outside IISc also benefit from CAF in various ways.

The CAF is registered with the Committee for Control and Supervision of Experiments on Animals (CCSEA), Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, New Delhi (Registration number: 48/GO/ReRcBiBt-S/ ReBi-L/1999/ CCSEA). All activities related to laboratory animal breeding and research at the Indian Institute of Science are performed as per the specified guidelines of CCSEA, New Delhi, as well as in-house institutional guidelines under the direct supervision of Institutional Animal Ethics Committee (IAEC).

New Central Animal Facility (NEW CAF):
A new building for CAF has been established to create a full-fledged National Facility for Laboratory Animal Experimentation. This facility has 36,000 sq ft area and is operational for active laboratory animal research. The facility aims to provide and maintain Specific Pathogen Free (SPF) rodent research models to investigators within IISc and other institutions/ universities from all over India, and investigators from private industries. The new CAF is establishing a transgenic mouse facility to provide services on generating genetically modified mouse models along with cryopreservation and re-derivation of the precious strains generated and imported.

Research

Pharmacognosy: Identification of medicinal plants or their active constituents in the context of phytotherapy approach at various levels and management for their medicinal and therapeutic potentiality.

Food Biotechnology: Focused on metabolic and systems-based biochemical processes in food-related biological systems to produce and improve foods, food ingredients, and functional foods at the processing stage.

Cryobiology: Development and validation of optimised cryopreservation protocols for gametes and embryos and their assessment of biological viability following post-thaw (in vitro) in terms of pregnancy outcome and wellbeing of progeny.

Stress Biology: Antistress consequences of generally employed drugs or phytoconstituents to compare for their protective effects in restrained stress.

Additive facilities

1. Imaging Facility
2. Cell Culture Facility
3. Transgenic Facility
4. Histopathology Facility
5. Molecular Biology
6. Behavioural Facility
7. FACS Facility



Associated Scientific Staff

SATHEES C RAGHAVAN
PhD (BHU), Professor

RAMACHANDRA S G
PhD (KVAFSU), Chief Research Scientist

RAVINDRANATH H ALADAKATTI
PhD (Karnatak University), Principal Research Scientist

Staff Members

DEEKSHA PANDIT
Junior Research Scientist I

LINA MATHEW
Junior Research Scientist I

CHARITHA
Junior Research Scientist I

AJIN S KUMAR
Junior Research Scientist I

KALYANI MOHAN
Junior Research Scientist I

ARYA SIDHARTHAN
Junior Research Scientist I

MANJUNATH J
Senior Research Technologist

SHRUTHI P
Senior Project Associate I

MONIKA H M
Project Associate II

VISHAHARINI
Senior Project Associate I

JANANI
Project Associate I

DHANYA
Project Associate II

ADITYA
Project Associate I

SURAVI CHATTOPADHYA
Project Associate I

AANCHAL KASHYAP
Project Associate I

AAYUSH SANWLE
Project Associate I

JEEVAN
Project Associate I

SREELAKSHMI
Project Associate I

HILTER HMANGTE KOM
Project Associate I

BHAGYA
Senior Admin

HARSHITHA N
Admin

SARIKA H P
Admin

3.1.3
Centre for Ecological Sciences

The Centre for Ecological Sciences (CES) conducts cutting-edge research in diverse areas of ecology, evolution, behaviour and conservation. We study a range of terrestrial and marine taxa from invertebrates, like insects and molluscs to vertebrates, including fish, herpetofauna, birds and mammals. We employ diverse tools from field-based research, and laboratory experiments to molecular ecology and mathematical modelling.

FACT FILE

Established: 1983
Phone: +91-80-2293 2506, 2360 0985
Email: office.ces@iisc.ac.in
URL: ces.iisc.ac.in
Degree programmes offered: PhD, Int PhD and MSc

IN NUMBERS

11 Academic Staff
1 Scientific Staff
67 PhD students
13 MSc students
75 Publications
3 PhD student conferment
2 Honorary Professors

Chair: Kartik Shanker



Core Research

CES carries out research in animal behaviour, behavioural ecology, bioacoustics, biogeochemistry, biogeography, chemical ecology, climate change, community ecology, ecosystem ecology, forest and grassland dynamics, macroecology, marine ecology, mathematical ecology and modelling, movement ecology, molecular ecology, phylogenetics, phylogeography, plant–animal interactions, population ecology, predator–prey interactions, sensory ecology, stress physiology and venom evolution.



Current Research

We study the interplay between diversity and survival with an emphasis on small populations. We use cutting-edge technology to study evolution in small populations and how they survive. We have been monitoring eastern Himalayan birds in primary and degraded forest for 16 years. Our results show that, in response to microclimatic niche shifts in degraded forest, survival rates and body masses are declining for several species. Our work also shows that bamboo harbours distinct specialist bird communities and year-round mixed-species flocks of bamboo species with highly specialised bill morphologies.

We advanced precision snakebite science by showing that Russell's viper venom variation across India is shaped by climate and geography, enabling predictive venom-risk maps. We demonstrated that varespladib and marimastat can neutralise diverse Russell's viper toxicities in preclinical models, supporting early-intervention small-molecule therapies. The team also revealed toxin synergy in Russell's viper venom, where SVMPs and PLA_{2S} jointly amplify damage.

For the high-altitude grasslands of Spiti, standardised bioinformatic pipelines were developed to identify soil microbes with 16S DNA amplicons, as well as whole-metagenome sequences. Here we also developed and standardised pipelines to quantify the abundance of key genes involved with soil nitrogen cycling. In the mega-cities of Delhi and Bangalore, we quantified the abundance and distribution of antibiotic-resistant bacteria.

Our work in nutritional ecology and animal cognition showed for the first time that reptiles can access uncertainty in resource availability and that they forage in the wild in ways that tightly maintain intake targets.

We also find that stress modulates nutritional retention and not intake patterns. We also show how physiology integrates with colour and behaviour to influence communication outcomes in colourful reptiles. In a global analysis of wild carnivores, we find that canid and felids differ in their reliance on known routeways.

In a modelling work, we demonstrate that a novel "halting interaction" — where individuals stop moving when encountering opposite-facing neighbours — can surprisingly generate robust collective order in large populations.

We investigate the evolutionary ecology of life history strategies in the mosquito *Aedes aegypti*. Through controlled experiments, we show that the short-lived pupal stage, which has largely been ignored, shows striking flexible anti-predator strategies. Despite the complexities of metamorphosis, pupae use information gathered as larvae to modify their antipredator behaviour. In other work, we show that adult females display complex responses to predators of their offspring when laying eggs.

We conducted a global meta-analysis of the impacts of human activities, lethal and non-lethal, on animal behaviour. We continued our decade long monitoring of sea turtles, sharks and rays across the coast of India. In particular, we examined the genetics of commonly caught sharks, the drivers of elasmobranch fisheries and assessed the levels of microplastics across trophic levels. Our satellite telemetry study of leatherback turtles in the Andaman Islands reveals migrations to Western Australia and the coasts of Madagascar and Mozambique.

Our work on tarantulas demonstrates that climate-driven genetic and demographic responses in this group were probably shaped by latitude.

In a semi-arid grassland system, we find that while native perennial plants are underrepresented where grazing is high, they are still well represented in the soil seed bank, which contributes to the resilience of an unmanaged grassland. In another study, we find that the plant-herbivore-parasitoid food webs associated with the plant family Rutaceae under cultivation differ from those in the forest understory.





Faculty & Staff

SUMANTA BAGCHI
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JANAKI BALAKRISHNAN
PhD (New Delhi), Visiting Professor

ROHINI BALAKRISHNAN
PhD (TIFR), Professor

RENEE M BORGES
PhD (Miami), FASc, FNA, Visiting Professor

RAGHAVENDRA GADAGKAR
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VISHWESHA GUTTAL
PhD (Ohio), Professor

KAVITA ISVARAN
PhD (Florida), Professor

PRAVEEN KARANTH
PhD (SUNY, Albany), Professor

ANUBHAB KHAN
PhD (NCBS, Bangalore), Assistant Professor

T V RAMACHANDRA
PhD (IISc), Scientific Officer

KARTIK SHANKER
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PhD (NCBS), Associate Professor

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PhD (Portugal), Associate Professor

MARIA THAKER
PhD (Indiana State), Professor

SASKYA VAN NOUHUYS
PhD (Cornell), Associate Professor

3.1.4

Centre for Infectious Disease Research

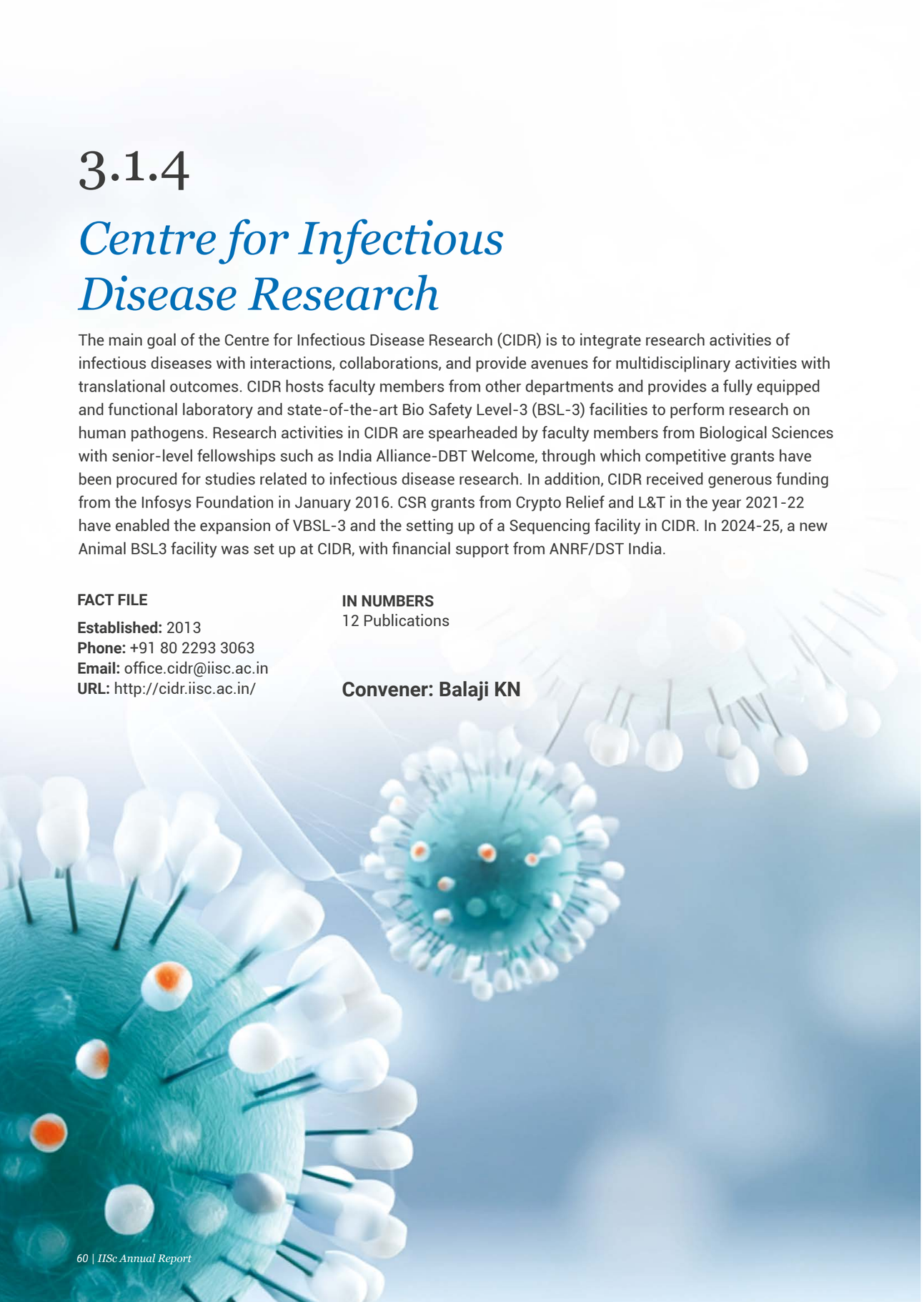
The main goal of the Centre for Infectious Disease Research (CIDR) is to integrate research activities of infectious diseases with interactions, collaborations, and provide avenues for multidisciplinary activities with translational outcomes. CIDR hosts faculty members from other departments and provides a fully equipped and functional laboratory and state-of-the-art Bio Safety Level-3 (BSL-3) facilities to perform research on human pathogens. Research activities in CIDR are spearheaded by faculty members from Biological Sciences with senior-level fellowships such as India Alliance-DBT Welcome, through which competitive grants have been procured for studies related to infectious disease research. In addition, CIDR received generous funding from the Infosys Foundation in January 2016. CSR grants from Crypto Relief and L&T in the year 2021-22 have enabled the expansion of VBSL-3 and the setting up of a Sequencing facility in CIDR. In 2024-25, a new Animal BSL3 facility was set up at CIDR, with financial support from ANRF/DST India.

FACT FILE

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IN NUMBERS
12 Publications

Convener: Balaji KN



Core Research

Ongoing work is directed towards understanding and targeting drug tolerance in *Mycobacterium tuberculosis* and application of network biology to identify new drug combinations. Another area of research is focused on the principal immune mechanisms that contribute to reactivation of tuberculosis in the context of HIV infection. Another newly developed area of research is virus-host interactions of emerging RNA viral pathogens including SARS-CoV-2, and viruses that cause influenza and dengue. The overall aim is to understand the molecular basis of viral pathogenesis and translate the knowledge to novel antivirals and improved vaccine candidates.



Current Research

Amit Singh
In a recent study from our laboratory, we discovered that Mtb develops antibiotic tolerance largely through its ability to infect macrophages, its primary host cells, in specific metabolic states. Our work revealed that macrophages are metabolically heterogeneous: a subset provides a protective niche that shields Mtb from antibiotics, while others render the bacteria more susceptible. Importantly, we identified meclizine, a safe and widely available FDA-approved anti-nausea drug, as a metabolic modulator that reprogrammes macrophages to create an environment where Mtb can no longer tolerate antibiotics.

Shashank Tripathi
We continued our research on SARS-CoV-2 host interactions and antiviral development, which led to following publications. Furthermore, we intensified our efforts in Influenza and Flaviviruses research, to understand conserved and strains-specific virus-host interaction and development of novel vaccine and antiviral strategies.

Vidya Mangala Prasad
Our lab works with pathogenic, enveloped RNA viruses, such as Dengue virus, Zika virus, Japanese encephalitis virus and influenza viruses. The lab also works with viral proteins from HIV-1, influenza, SARS-CoV-2, etc. Our focus is on structurally characterising the viral immune landscape to identify quaternary epitopes as well as the virus infection machinery to delineate protein and membrane conformational changes that occur during virus infection.



Associate Faculty

USHA VIJAYARAGHAVAN
PhD, Dean, Professor

BALAJI K N
PhD, Professor

DIPANKAR NANDI
PhD, Professor

BALASUBRAMANIAN GOPAL
PhD, Professor

DIPSHIKHA CHAKRAVORTTY
PhD, Professor

NAGASUMA CHANDRA
PhD, Professor

DEEPAK K SAINI
PhD, Professor

AMIT SINGH
PhD, Professor

SHASHANK TRIPATHI
PhD, Associate Professor

VIDYA MANGALA PRASAD
PhD, Assistant Professor

3.1.5
Centre for Neuroscience

Understanding the structure, function, and development of the brain in health and disease requires studying the brain across different levels of organisation using molecular, cellular, systems, cognitive, and computational approaches. These are the focus areas of the Centre for Neuroscience (CNS). It recruits faculty across wide-ranging disciplines to establish a strong programme in basic neuroscience and builds links to existing expertise in IISc as well as with clinical centres to develop translational research. The department currently has eleven faculty members.

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Degree Programmes offered:
PhD and Int PhD

IN NUMBERS
11 Academic Staff
54 PhD students
21 Publications
5 Int PhD Students
1 PhD Conferments

Chair: Supratim Ray



Core Research

Visual perception and recognition, molecular neurobiology and genetics, molecular mechanisms of pain and itch, cognitive neuroscience and AI, motor learning and neural basis of complex behaviours, neurobiology of learning and memory, movement and cognitive control, molecular organisation of synapse, emotion and reward processing, neural oscillations and high-level cognition, neuronal regulation of energy balance.



Current Research

S P Arun

In the last year, we have uncovered several fundamental insights into visual perception and its neural basis. We have investigated a famous visual-auditory association called the Bouba-Kiki effect, wherein humans associate words like bouba/kiki to round/angular shapes. How does the Bouba-Kiki effect work for natural words and shapes that contain a mixture of features? If the effect is holistic, the effect for a composite stimulus would not be explainable using the parts.

If the effect is compositional, it will be. We found that the Bouba–Kiki effect strength for composite shapes/words was predicted remarkably well as a linear sum of the contributions of the constituent parts. Some ongoing work includes understanding how physical properties of objects are integrated into visual representations, understanding the neural basis of real-world vision, etc. Finally, in the last year, we received funding from the EkStep foundation to study the cognitive predictors of reading in children.

Kavita Babu

Over the last couple of years, we have studied aspects of *C. elegans* behaviour and found interesting phenotypes involving foraging behaviours, swarming behaviours (Shahi et al., 2026) as well as memory related behaviours in *C. elegans.* Apart from this our lab also works on claudins in *C. elegans* neurons and we have shown that the claudin-like gene in *C. elegans,* CLC-3 is required to maintain cholinergic signalling at the neuromuscular junction.

We are in the process of further studying claudins in neurons and the mechanism behind swarming behaviours.

Arnab Barik

Since joining CNS in 2020, I have investigated the circuit mechanisms underlying pain and itch. We identified a novel circuit responsible for stress-induced analgesia, molecularly characterising and functionally validating a descending pathway from the septum to the hypothalamus that operates in an opioid-dependent manner to respond to stress and modulate pain. In follow-up work, we discovered a previously unknown ascending pathway to the hypothalamus that plays a critical role in chronic pain-induced stress and anxiety.

In a separate study, we are examining licking as a coping behaviour in response to painful stimuli. Using viral genetics and transgenic mouse strains, we show that a circuit centred on the parafascicular thalamic area is instrumental in driving pain-induced licking behaviours.

Sridharan Devarajan

Our lab seeks to understand the neural bases of attention, to develop neurofeedback BMIs to enhance attention control, and to understand how attention works in AI models. This work is supported by funding from the DST SwarnaJayanti Fellowship, a Google research grant, a Renault-Nissan research partnership and a Gore Subraya Bhat Chair Associate Professorship in Digital Health. In one study, we proposed SASHA, which treats whole-slide histopathology analysis as a sequential attention problem: a lightweight attention-based MIL model identifies informative regions, and reinforcement learning selectively allocates high-resolution sampling to only 10–20% of patches, preserving diagnostic performance while reducing computational cost. In another study, we show that transfer learning should preserve learned feature attention priors rather than enforce domain alignment, introducing a source-free semi-supervised framework (CRAFT) that improves regression under domain shift by retaining useful internal attention structure and recalibrating outputs. In a third study, we demonstrate that attention selectively protects working memory, with attended representations resisting distraction and unattended representations remaining more vulnerable, revealing attention-dependent gating of memory representations. This year also marks the commencement of the IISc Moonshot project, AMRIT–AI–guided Movement Recovery through Indigenous Neurotechnologies.

Ashesh Dhawale

The overarching goal of my research programme is to investigate the neural mechanisms of learning. While the neurobiology of learning has been previously studied using simple tasks that require subjects to choose between just two options, little is known about how the brain learns in real-world situations where there usually are many more options. In the past year, we have investigated these questions in both humans and experimentally tractable rodent models. We found that humans rapidly adapt many aspects of their trial-and-error learning strategies, including their ability to generalise from familiar to unfamiliar options based on the latent structure of the learning environment (manuscript in preparation). In comparison, we found that rats' learning strategies are relatively inflexible.

Balaji J

Memories of life events are encoding in the brain, and these memories shape our behaviour. Our laboratory's research interest lies in understanding how these memories are formed, encoded in the brain and elicit novel behaviour. While our previous research has shown that memories over time transform and how they can lead to adaptive behaviour in the previous year, our efforts have been focused on i) substantiating our understanding of confabulation ii) discovering and establishing the existence of hitherto unknown novel inhibitory projection from CA1 to CA2 region iii) establishing its role in social context memory iv) identifying and establishing the nature of cognitive deficits following chemotherapy both in breast cancer mice model and in human patients. Apart from this we have substantiated our fNIRS based wearable wireless device development for monitoring and measuring cognitive efficiency. We have now filed for an Indian patent.

We have also been able to consolidate and submit for publication our effort to develop a wearable head band for ease of monitoring neuronal activity. Additionally, in collaboration with Prof Sathees Raghavan's laboratory, we have found that the commonly used pesticide endosulfan affects the brain and causes cognitive deficits across generations in mice models.

Aditya Murthy

Using novel measures of online control, we showed how the selective implementation of a leading joint in task space and a lagging joint in null space can enable the control of multi-jointed movements and attenuate the problem of joint redundancy. To our knowledge this is amongst the first studies to show that



planning and control of joints are not only solely in the service of endpoint but also include joint trajectories. We also published work from a joint collaboration between Asokan's group and our lab that involved using a first of its kind wearable mechanical eye tracker for non-invasive monitoring of saccade eye movements that can be used to study eye movement during REM stages of sleep to better understand the nature of sleep disorders as a consequence of brain dysfunction that is known to occur in neurodegenerative diseases.

Deepak Nair

The Nanoorganization Group is dedicated to understanding the fundamental principles that govern brain function, with a particular focus on the molecular organisation and regulation of excitatory synapses. Our aim is to uncover how key synaptic molecules drive the formation, function, and plasticity of synapses, thereby shaping brain development and contributing to neurological disorders across the lifespan, from early neurodevelopmental conditions to neurodegenerative diseases such as Alzheimer's disease. By integrating concepts and methodologies from multiple disciplines, we seek to build quantitative, data-driven models of synaptic organisation and dynamics that span both spatial and temporal scales from nanometre-scale molecular interactions to network-level organisation, and from millisecond events to changes

that evolve over hours and longer. A major component of our research involves the development and application of advanced imaging technologies, including super-resolution microscopy, expansion microscopy, and AI-enabled approaches for molecular probe and protein design, to visualise synaptic architecture with unprecedented precision. Our current work also investigates how the amyloidogenic machinery perturbs normal synaptic nanoorganisation during Alzheimer's disease pathogenesis.

Srikanth Padmala

In the last year, our research primarily focused on investigating the interactions between reward and emotion in the human brain using behavioural and functional brain imaging techniques. In a functional MRI (fMRI) study, we investigated the impact of negative emotion on reward motivation. We observed that negative emotion counteracts the reward-driven enhancements in visual perception. In a separate behavioural study, we found that the contingency between a successful response and reward outcome plays a crucial role in driving the impact of appetitive and aversive motivation on negative emotional distraction.

Supratim Ray

We studied the effect of healthy ageing on stimulus-induced gamma sources and found that they reduce in power but not in spatial extent in human EEG. We also studied fractal dimension on EEG data and found that changes in Higuchi fractal dimension across age in healthy human EEG are anti-correlated with changes in oscillatory power and 1/f slope. We made a toolbox to find oscillatory bursts in brain signals using compressive sensing techniques. We also built a model in which delayed accumulation and dissipation of inhibition compared to excitation was used to explain variation in gamma peak frequency with changing contras.

Debasish Roy

Adaptation to changing metabolic demands is essential for survival. Peripheral neurons (the somatosensory DRG neurons) connecting multiple organ systems enable the body to respond to major physiological changes by sensing and relaying information to the brain. Our lab is interested in deciphering the structural and functional complexity of the peripheral sensory neurons in metabolic tissues like adipose tissue with an overarching goal to comprehensively address not only as to how these neurons form an integral component of the brain-to-periphery bidirectional interoceptive communication system but also to identify their role in tissue development, and function. Since joining CNS (late February 2026) our immediate focus is to understand how DRG sensory neurons control fasting induced lipolysis in adipose tissue, and to discover spinal cord injury responsive subtypes of DRGs.





Faculty

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PhD (Johns Hopkins), Professor

KAVITA BABU
PhD (IMCB, Singapore), Professor

ARNAB BARIK
PhD (Medical College of Georgia), Assistant Professor

SRIDHARAN DEVARAJAN
PhD (Stanford), Associate Professor

ASHESH DHAWALE
PhD (NCBS, Bangalore), Assistant Professor

BALAJI JAYAPRAKASH
PhD (TIFR), Associate Professor

ADITYA MURTHY
PhD (Pittsburgh), Professor

DEEPAK NAIR
PhD (Leibniz Institute for Neurobiology), Professor

SRIKANTH PADMALA
PhD (Maryland), Associate Professor

SUPRATIM RAY
PhD (Johns Hopkins), Professor

DEBASISH ROY
PhD (VIT, Vellore), Assistant Professor

Adjunct Faculty

ANINDYA SINHA
PhD (TIFR, Mumbai), Professor, National Institute of Advanced Studies (NIAS), Bangalore

SANJAYA VISWAMITRA
Head of Radiology, Sri Sathya Sai Institute of Higher Medical Sciences, Bangalore

3.1.6

Developmental Biology and Genetics

Research in the Department of Developmental Biology and Genetics (DBG) is diverse and ranges from molecular to organismal scales. Groups within the department conduct research in bacterial and human genetics, signal transduction, mammalian reproduction, endocrinology, cell and developmental biology, ageing and metabolic disease, cancer, stem cells, longevity, and cryo-electron microscopic analysis of large macromolecular complexes.

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Degree Programmes offered: PhD and Int PhD

IN NUMBERS

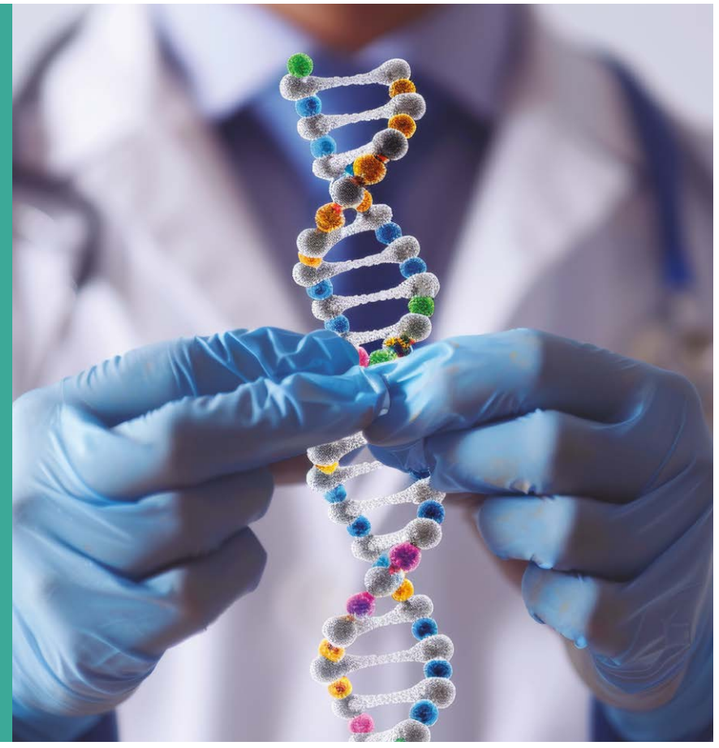
11 Academic Staff
63 PhD students
13 Master's Students
18 Int PhD Students
211 Publications (last 5 years)

Chair: Annapoorni Rangarajan



Core Research

Research in the Department of Developmental Biology and Genetics (DBG) ranges from bacterial and human genetics to signal transduction, developmental biology, cancer, diabetes and stem cell biology. The underlying theme is the molecular-level studies of cellular functioning in normal and pathological conditions. We approach this in a variety of ways, using model systems such as *Drosophila*, transgenic, knockout and humanised mouse models and even direct human population studies.



Current Research

Signal transduction, infection, and transgenic mouse models to study gastrointestinal function

A novel transgenic mouse has been characterised, harbouring an activating mutation in receptor guanylyl cyclase C that appears to mimic some of the features seen in patients with familial diarrheal syndrome. These changes include an altered gut microbiome and increase fecal water content, and gut transit. The role of a universal stress protein in modulating biofilm formation in *Mycobacterium smegmatis* has been shown and we have characterised the role of a novel phosphodiesterase in mycobacteria that has profound effects in cell physiology and membrane properties. Identified a novel protein in *Mycobacteria* that condenses DNA and binds RNA. Investigated the consequences of expression of hyperactive receptor guanylyl cyclase C in the gut and identified changes that include alterations in the microbiome and intestinal gene expression.

Cellular signalling and inflammation

Towards understanding ageing and inflammation, research is focused on a class of receptors known as G protein-coupled receptors (GPCRs) and their roles in the cascade of events, which occur when cells grow old aka 'aged.' Research is keenly being pursued on the mechanisms by which GPCRs and receptors of other classes, cross paths, a phenomenon known as 'cross-talk'. Like 'eukaryotic cells,' 'prokaryotic' bacterial cells also possess an extensive internal network of connections that direct specific responses to specific stimuli. In this area, studies are carried out on two-component signalling (TCS) cascades and we recently reported the presence of intricate networking amongst TCS systems in Mtb. A Raman Spectroscopy based bacterial identification and viability assessment platform has been developed.

Ageing and longevity research in the Indian setting

Understanding ageing biology in the Indian population can help extend health span and improve the quality of life as we age.

Through groundbreaking science, community partnerships, and innovative policies, we're building a future where all Indians can age healthier. Our discoveries will contribute to the global mission of improving human longevity. To do this, we are collecting signatures from the Indian population through the BHARAT Study (Biomarkers of Healthy Aging, Resilience, Adversity, and Transitions), a comprehensive population study investigating biomarkers of ageing in the Indian population. Through multi-omics and multi-modal analyses, we aim to identify patterns and markers that can predict ageing-related conditions and develop interventions to improve health span. There is also an effort to understand organ-specific biomarkers and compare them with novel organotypic senescent models we build to design interventions that delay ageing.

Structural biology of translation
Eukaryotic translation initiation occurs in two different modes: cap-dependent and cap-independent. Canonical protein synthesis is cap-dependent where 43S ribosomal pre-initiation complex (PIC) recruits to 5'end of capped mRNA, mediated by eukaryotic initiation factor (eIF) 4F complex. Alternatively, several positive strand RNA viruses use Internal Ribosome Entry Sites (IRESs), which are internal cis-acting sequences present in 5′ UTR of mRNA that drive the assembly of translation initiation complex without the requirement of 7-methylguanosine cap (cap-independent). Encephalomyocarditis virus (EMCV) employs Type 2 IRESs present in its 5'UTR and requires 43S PIC, the central domain of eIF4G, eIF4A, and an essential ITAF (IRES trans-acting factor)-polypyrimidine tract binding protein 1 (PTB1) to form 48S PIC. We used cryo-electron microscopy (cryo-EM) to determine the structure of EMCV IRES-bound mammalian 48S PIC in a scanning-arrested closed state at the start codon. The EMCV-IRES-48S structure shows that the EMCV IRES domains contacts initiator tRNA (tRNAi) and 40S head at the inter-subunit interface, which reveals an altogether unique mechanism used by viruses to capture host translational machinery for its protein synthesis. The tRNAi is held away from the 40S body in contrast to canonical cap-dependent translation while the domain I apical region of EMCV IRES mimics 28S rRNA of 60S to interact with 40S ribosomal head proteins: uS13 and uS19. The structural analysis accounts for numerous biochemical studies on Type 2 IRES and shows how Type 2 IRES interacts with 43S PIC to form 48S PIC.

Host-microbe interaction
To understand how sensing/perception in a complex environment shapes adaptation





in prokaryotes and eukaryotes, ensuring their survival. A genetically tractable eukaryotic model, *Caenorhabditis elegans,* has been utilised to understand how sensory neurons and G-protein coupled receptors allow sensing of microbes in the environment leading to adaptation in the worm's behaviour or its physiology, to optimise its survival. It was found that *C. elegans* uses olfaction as the means to distinguish between some species of bacteria. Volatiles that are perceived as threat allow worms to run away (flight response), lay their eggs far away from threat cues and allow them to mount a defensive physiological response. Also, *Pseudomonas aeruginosa,* a Gram-negative bacterium, has been utilised to understand how its large genomic repertoire of two-component sensors and response regulators (136 genes) regulates quorum-dependent processes, namely swarming motility, and biofilm formation. Identification of 18 two component systems in *Pseudomonas aeruginosa* as regulator of biofilm formation on endotracheal tubes. This sheds lights on genes which affect disease pathology in patients suffering from ventilator associated pneumonia.

Microbiome-mediated insect adaptation
Microbiomes constitute important components of animal health, development, and adaptation. In insects, microorganisms can form extreme and highly intricate symbiotic associations. The emergence and maintenance of such symbiotic interactions is an important but understudied and underappreciated aspect of adaptation. Using insects such as scale insects that are pests on many important crops and scarab beetles that are important agents of nutrient recycling in terrestrial landscapes, symbiotic associations between insects, bacteria and fungi are being studied. Current research focuses on acquisition and transmission of primary and secondary symbionts, their metabolic integration with host physiology, their role in digestion and detoxification, host adaptation and evolution.

Epigenetic regulation during mammalian embryogenesis and stem cell differentiation
Epigenetic regulation plays an important role in development. Often, dysregulation of epigenetic regulation is associated with diseases. How epigenome and epitranscriptome regulate the gene expression to drive lineage specification during pre-implantation development and gastrulation remains poorly understood. Recently, we have discovered that m6A RNA

methylation plays an important role in setting up three early embryonic lineages (Embryonic stem cells, Trophoblast stem cells and extra-embryonic endoderm stem cells) during preimplantation development. Currently, we are exploring crosstalk between epigenome and epitranscriptome during the early embryonic lineage specification. On the other hand, many X-linked genes have been implicated to contribute to early embryogenesis. Recently we have shown that two X-chromosome in female cells coordinate each other to fine tune the X-linked gene expression dosage relative to autosomal dosage during early embryogenesis. We are now exploring the underlying mechanisms involved in transcriptional coordination between two X-chromosomes during the early embryogenesis.

Climate change and maternal child health

Growing evidence suggests that deteriorating global warming conditions will adversely affect pregnant women who undergo vast metabolic and physiological adaptations. To address this issue, especially in India where pregnant mothers are exposed to prolonged summer heat (>40°C), we created a mouse model system resembling human pregnancy adversities, including frequent pregnancy loss, low neonatal birthweight and mortality. Transcriptomic investigation revealed embryonic defects starting post-implantation, mainly contributed by dysregulated placental development. Further, we are investigating how heat-humidity stress perturbs the healthy microbiome and epigenome, thereby disrupting maternal-child health.

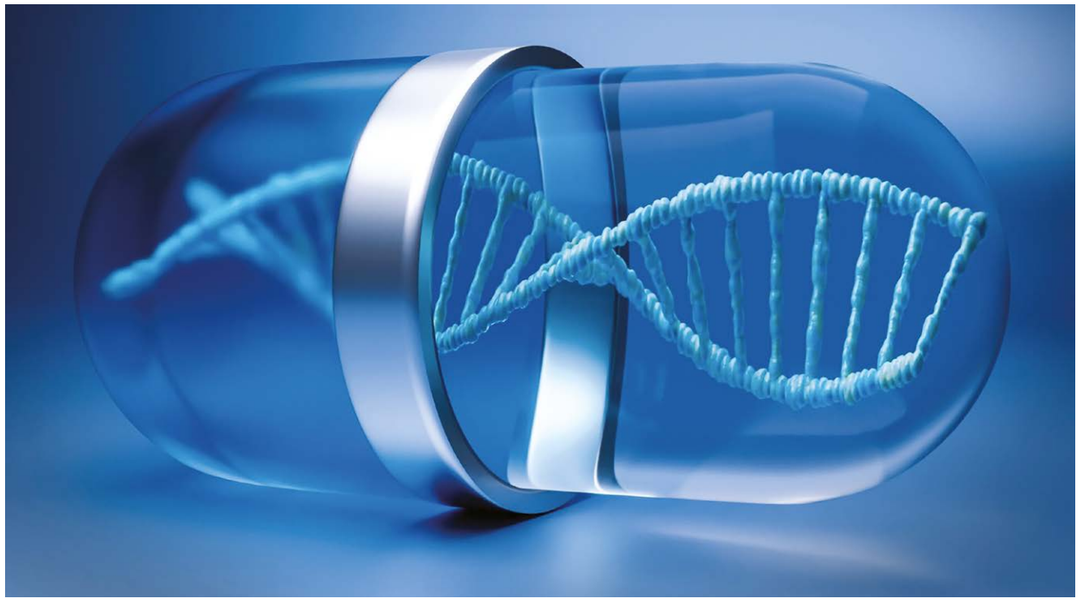
Muscle development

LIM domain, constituted by two tandem C2H2 zinc finger motif proteins regulate several biological processes. They are usually found associated with various functional domains like Homeodomain, kinase domain, and other protein binding domains. LIM proteins that are devoid of other domains are called LIM only proteins (LMO). A novel role for LIM only protein Beadex (LMO2) has been identified in the development of Crystal cell blood formation in *Drosophila melanogaster.*

It is shown that the *Drosophila* gene CG9650 is involved in muscle patterning through regulation of Notch and Wingless pathways (Saraoj Jawkar PhD thesis). It was also shown that Croton tiglium L. which has been used in Ayurvedic and Chinese herbal medicinal formulations from ancient times can cause genotoxicity.

Molecular reprograming of adipose tissue and metabolic disease

Adipose tissue is categorised into white adipose tissue (WAT) and brown adipose tissue (BAT).



While WAT expands massively during obesity and ageing with lipid overload, brown fat, a distinct tissue, dissipates energy as heat through uncoupled respiration, increasing energy expenditure and insulin sensitivity. Thus, increasing the activity of brown adipose tissue (BAT) is considered an attractive therapeutic strategy to help reduce insulin resistance, obesity, and associated metabolic diseases. Recently, we identified a small molecule, sesaminol, as an inducer of brown adipose function. Besides, sesaminol holds the promising capacity to combat diet-induced obesity and metabolic dysfunction–associated fatty liver disease (MAFLD). Unlike genetic manipulation, small molecules that can induce BAT function are safer and more attractive therapeutic targets for developing anti-obesity regimens. Our research interest also centres on the impact of brown and/or beige fat function on age-related obesity and insulin resistance. Our recent study reveals that ageing and β3-adrenergic stimulation affect the physicochemical properties of mitochondrial membrane and brown fat function.

Islet environment and hormone secretion during type-2 diabetes

Patients with diabetes have high blood glucose levels either because their pancreas does not produce sufficient insulin, or their body cells do not respond to signals from insulin that tell them to use up glucose. Current treatments, therefore, rely on supplying insulin bolus to such patients. However, recent studies have shown fluctuations in the levels of other hormones.

To understand these changes, we focus on the islet environment where glucagon, somatostatin, exosomes, and glucose transporters maintain glucose homeostasis which is affected during diabetes. We have been able to discover that there is a decrease in somatostatin secretion, glucagon and exosome secretion during type-2 diabetes. Some of these ER stress-related effects can be decreased by treatment of islet cells with a chlorophyll-derived compound called Pheophorbide A. Pheophorbide A increases glucose transport in beta cells, which is compromised during type-2 diabetes.

Omics-based biomarkers have the potential to revolutionise personalised health monitoring by predicting biological age (BA) and resilience; no validated systems currently exist that can accurately assess the biological age of an organ like pancreas. Establishing a framework for integrating these data across genomic, proteomic, and metabolic domains to assess overall health and predict the onset of metabolic diseases like diabetes would provide insights into the determinants of ageing and metabolic dysregulation leading to type 2 diabetes. This work is done in collaboration with the Longevity India initiative.

MicroRNAs in oral cancer

MiRNAs play a critical role in the progression of various diseases, including oral squamous cell



carcinoma (OSCC). The aim of our study is to identify novel tumour suppressor miRNAs, which are silenced by DNA methylation and investigate their roles in OSCC pathogenesis. We have treated OSCC cells with 5-Azacytidine to reactivate tumour suppressor miRNA genes silenced/downregulated due to DNA methylation. At 5-day post-treatment, total RNA was isolated from 5-Azacytidine and vehicle control treated cells and subjected to microRNA microarray analysis, using Agilent human miRNA microarray chips with 2,459 miRNAs. Of the 50 miRNAs which were found to be upregulated following the treatment, we have explored the role of miR-6741-3p in detail. The results indicated that miR-6741-3p directly targets the oncogene *SRSF3.* The tumour-suppressive role of miR-6741-3p was established by various *in vitro* assays and *in vivo* study in NU/J athymic nude mice. Based on our observations, we have proposed that miR-6741-3p may serve as a potential biological target in tumour diagnostics, prognostic evaluation, and treatment of OSCC and perhaps other malignancies.

Cancer Stem Cells

Cancer Stem Cells (CSCs) are a subpopulation of cancer cells with stem cell-like properties that play a crucial role in drug resistance and metastasis. Metastasis, the spread of tumours from primary sites to distant organs, is the major cause of cancer-associated deaths. Two key processes that aid in this are 1) the epithelial to mesenchymal transformation that enables cancer cells to become more migratory and invasive, and 2) anoikis resistance which enables cancer cells to death triggered by matrix-detachment. Work done so far has identified a key role for the cellular energy sensor, AMP-activated protein kinase (AMPK), in both these processes, thereby linking cancer stemness, EMT and anoikis resistance. Further, AMPK activation causes metabolic re-wiring by activating catabolic and inhibiting anabolic processes.

Hypoxia is a hallmark of solid tumour microenvironment and contributes to tumour progression and therapy failure. The developmentally important Notch pathway is implicated in the maintenance of cancer stem/progenitor cells in tumour hypoxia. Yet, the mechanisms that lead to notch activation under hypoxia are not fully understood. Hypoxia is also a stimulus for AMP-activated protein kinase (AMPK), a major cellular energy sensor. In one study, we show that pharmacological as well as hypoxia-triggered AMPK activation led to stabilisation of intracellular Notch1 via Fyn kinase. AMPK inhibition under hypoxia affected self-renewal and drug resistance adversely, suggesting that hypoxia-induced AMPK activation might potentiate breast cancer aggressiveness through the Notch pathway. We are currently focused on developing novel AMPK-inhibitors to test their potential against curbing metastasis.

Cancer glycobiology

The relationship between cancer (breast and ovarian) cells and their tissue microenvironments in the context of invasion and metastasis is being investigated using approaches including experimentation and computation to understand how changes in glycans that contribute to cell and tissue structure and are aberrantly regulated and in turn impact affect cancer cell phenotypes.

The group has strived to uncover the role of glycans at distinct scales: evolutionarily shaping the primary structure of a protein by evolving residue neighbourhoods distinct from disordered stretches and conferring negative charge through sialic acids to the local ECM neighbourhoods around cancer cells with implications both for immune cell interactions and theragnostic applications.

Small RNA mediated epigenetic regulation of host-pathogen interaction.

RNA interference (RNAi) is a conserved pathway across all eukaryotic species. Even though proteins involved in the RNAi pathway are well conserved, there is a degree of plasticity introduced by the presence of multiple homologs of DICER or AGOs depending on the presence of different types of sRNAs and their functions in different species. However, there are exceptions to this conservation, with unicellular protozoa like *Plasmodium falciparum*, among others, lacking the RNAi pathway altogether. A common feature of the RNAi pathway in these organisms is the lack of canonical RNAi factors. Both DICER and AGO in most of these protozoa lack conservation of various conserved domains, including the helicase and dsRNA binding domains in DICER or the conserved PAZ or MID domains involved in sRNA binding in AGOs. Despite their discovery, how sRNAs are produced using these atypical RNAi factors in vivo and their function in these neglected protozoan parasites are yet to be investigated. The group is using *Toxoplasma gondii* as model to address i) How are small RNAs synthesised using minimal and atypical RNAi machinery? ii) What is the role of the small RNA pathway in the life cycle of parasites? iii) How do small RNAs regulate host-pathogen interaction?

From the host perspective, we have set up the model for studying ocular toxoplasmosis, which is an understudied model. Our group has identified candidate host miRNA molecules that get mis-regulated upon *Toxoplasma* infection and impact on host transcriptome in the ocular cell model using RPE-1 cells. We are now validating the role of these mis-regulated miRNAs as host-determinant of infection.



Telomere integrity and Molecular Oncology

Progressive telomere shortening causes heightened DDR machinery recruitment to unprotected chromosome ends driving senescence. Genomic instability allows bypassing senescence checkpoint leading to crisis with critically short telomeres. Cells must either re-express telomerase (TEL+) or use ALT+ pathway to attain replicative immortality and become cancerous. Of all cancers, 5-10% are ALT+; an increased incidence is seen in mesenchymal tissue-derived paediatric tumours including osteosarcomas, liposarcomas, and neuroepithelial tumours. Despite overall improvements in targeted cancer therapies, childhood cancers still rely heavily on non-targeted chemotherapies with debilitating side-effects: hampered development, fertility problems and childhood trauma, amongst many others. A translationally driven genomic stability and telomere biology research aims to identify, understand and exploit therapeutic vulnerabilities in biomarker-defined (ALT+) subsets of childhood cancers to improve both the prognosis and quality of life. Active efforts are taken to bridge the gap between discovery and application via a series of interdisciplinary projects with clinicians, chemists and bioinformaticians.



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SANDHYA S VISWESWARIAH
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3.1.7

Microbiology and Cell Biology

The Department of Microbiology and Cell Biology (MCB) is 82 years old, and its origins go back to the Pharmacology and Fermentation Technology Laboratory started in 1941. The department has demonstrated commendable research performance over the past year, with notable publications, securing competitive research grants, and initiating national and international collaborations.

FACT FILE

Established: 1941
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Degree Programmes offered: PhD, Integrated PhD, BS (Research), and MSc (Life Sciences)

IN NUMBERS

15 Academic staff
1 Scientific staff
95 PhD students
27 Int PhD students
14 PhD conferments
1 Office Staff
1 Technical Staff

Chair: Saumitra Das



Core Research

At MCB, the researchers explore how cells work: from fighting infections and chronic diseases to unlocking the secrets of growth and development. Their research spans four core areas: cancer and chronic diseases, microbiology and immunology, molecular and cellular biology, and plant developmental biology, with a common goal of better understanding life science for a healthier, more sustainable future.



Current Research

Saumitra Das's group has been studying the biology and pathogenesis of RNA viruses. They have successfully deciphered the role of miR22 in Coxsackievirus B3 (CVB3) virus replication and pathogenesis; results will help in developing an effective antiviral target against CVB3. Thus, they demonstrated how host protein PSPC1 (an important component of paraspeckles) is exploited by HCV to regulate ribosome assembly during translation of viral RNA. More importantly, their effort in developing a VLP-based HCV vaccine has moved one step forward towards human trial. The preclinical studies in the pig model showed promising results with the VLP immunogenicity and safety; the candidate vaccine is now up for testing in the non-human primate model at Emory Vaccine Research Centre in collaboration.

Shashank Tripathi's group focuses on the development of broadly protective vaccines against respiratory RNA viruses (Influenza and SARS-CoV-2) and development of broad-spectrum antivirals against respiratory and mosquito-borne RNA viruses. They also work on elucidation of novel forms of mammalian antiviral innate immunity and viral evasion of the same.

Sudha Kumari's group focuses on several aspects of immunotherapy. Healthy immunity relies on active immunosurveillance. They use a highly interdisciplinary approach to investigate immunosurveillance by lymphocytes, and how they are dysregulated in diseases to eventually inform immunotherapies from a very fundamental cell biology standpoint. The broad areas of their research are:
1) Investigating signalling at immunological synapse and
2) Immunosurveillance in ovarian cancer.

Dipshikha Chakravortty group is investigating *Salmonella* division within host-derived vacuoles. They are exploring quorum sensing in compartmentalised bacteria. Assessing effects of polyamines and SCFAs on virulence. Examining bile acid stress and persistent carrier state. They are also studying antimicrobial resistance and alternative treatments. Unravelling mechanisms of extraintestinal infections.

Analysing membrane remodelling in virulence/resistance and investigating *Salmonella*-gut microbiome interactions.

Samay Pande's group focuses on antimicrobial resistance, antimicrobial strategies, experimental evolution, bacterial interactions, bacterial predation, evolution of lifecycles and multicellularity. They have explored how bacterial interactions (predation, starvation-induced lysis, and population bottlenecks) shape antimicrobial resistance. Predation history constrained resistance evolution in *E. coli,* while lytic events enriched resistant soil isolates. Bottleneck experiments in *M. xanthus* revealed distinct evolutionary outcomes across cooperative traits, highlighting ecological and demographic drivers of resistance.

Umesh Varshney's group focuses on the role of MutTl in two-component signaling (TCS) mediated regulation of gene expression, nucleotide homeostasis, and survival fitness of *Mycobacterium tuberculosis.* Global initiation of translation with a non-methionine amino acid in *Escherichia coli.* They showed that, (1) Mycobacterial MutT1 Nudix hydrolase domain functions as protein phosphatase and regulates nucleoside diphosphate kinase function. (2) The two isoforms of initiator tRNAs in *Escherichia coli* have functional significance. (3) Lamotrigine mediated rescue of RsgA deficient *E. coli* reveals a new role of IF2 in ribosome biogenesis.

G Subba Rao's group studies vesicular transport between the organelles. Organelle contacts, biogenesis, and associated pathogenesis. They illustrated the localisation and function of Arf-like GTPase 15 (Arl15) in mammalian cells. They have shown that Arl15-GFP localises primarily to Golgi and a cohort to the cell surface. Molecularly, they demonstrated that Arl15 functions in the cargo transport from Golgi to the cell surface and regulates cell adhesion.

Sachin Kotak's group focuses on the mechanism of cell division, mitosis, nuclear and chromatin organisation. During cell division in animal cells, once chromosomes are segregated, a cleavage furrow forms to partition the genome and cytoplasmic contents. This process is driven by an equatorially localised RhoA-regulated actomyosin network. However, how this machinery is spatially confined to the equatorial cortex remains poorly understood. Interestingly, they recently uncovered a key role for the polar membrane-localised LIN-5/GPR-1/2 complex in ensuring proper cleavage furrow formation and successful cytokinesis.

Shovamayee Maharana's group focuses on RNA metabolism, RNA-RNA binding protein phase separation. They are investigating the role of cellular RNA in the function and formation of RBP condensates in the cells. Understanding the phase behaviour of prion-like RBPs in ageing. Mapping RNA metabolism during cellular stress. Understanding phase behaviour of prion-like RBPs with pathogenic RNA. Delineating role of RNA properties in prion-like RBPs aggregation.

Naresh Loudya's group focuses on chloroplast biogenesis and chloroplast-to-nucleus communication. Chloroplasts are semi-autonomous organelles that carry out photosynthesis, which sustains life on Earth. Chloroplast development and function require the import of thousands of nucleus-encoded cytosolic proteins. Using a genetic screen, they have identified a negative regulator whose loss-of-function improves chloroplast development in the protein import mutant. Additionally, they are investigating the role of a TPR protein during early chloroplast development.





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PhD (Lucknow), PRS

3.1.8

Molecular Biophysics Unit

The Molecular Biophysics Unit (MBU) is engaged in frontline research in contemporary areas of biophysics, structural biology, and physiology. Research activities in the unit focus on the structure, conformation and interactions of biomolecules and their functions, with the main objective of understanding biological activity in molecular terms.

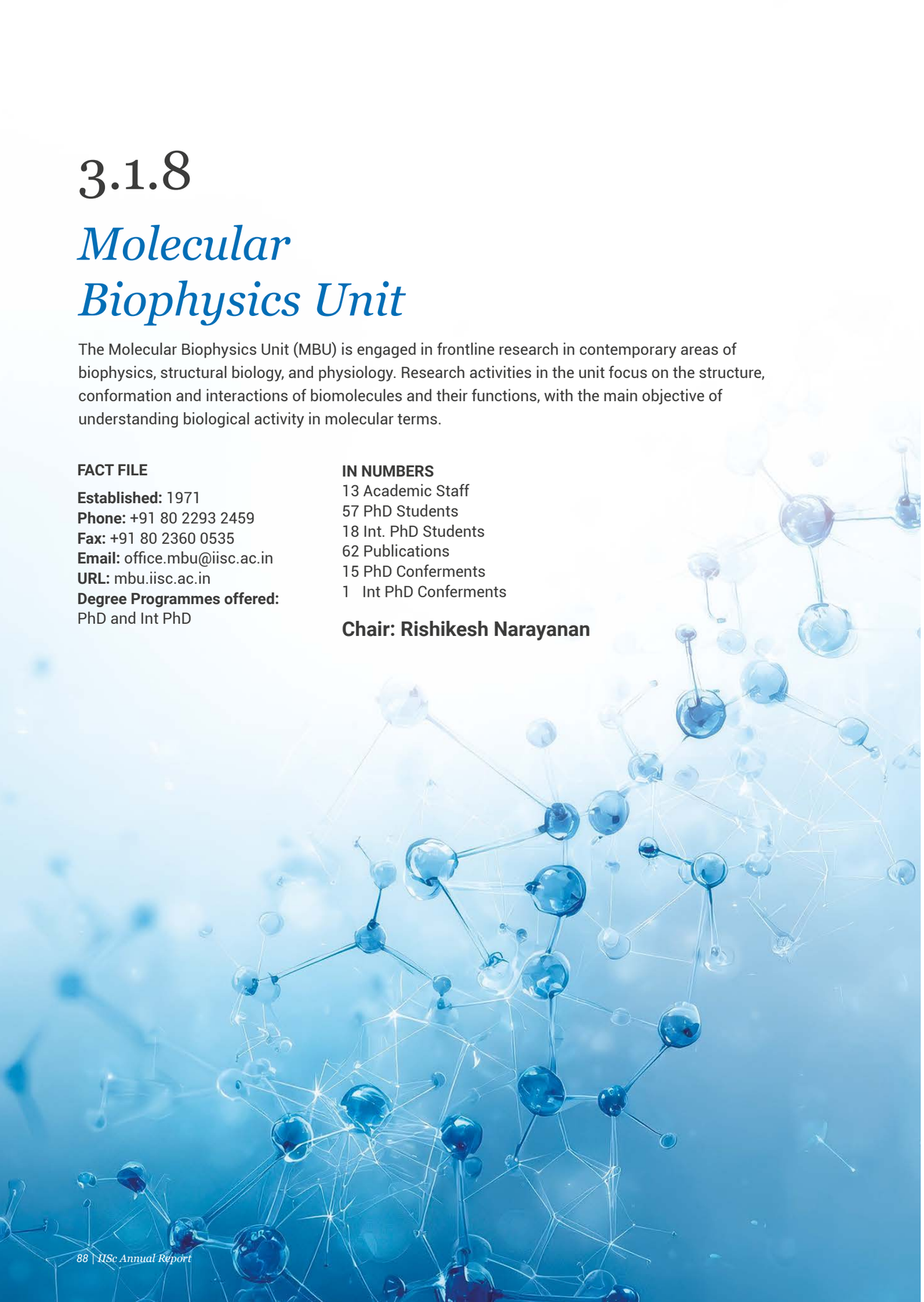
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Degree Programmes offered:
PhD and Int PhD

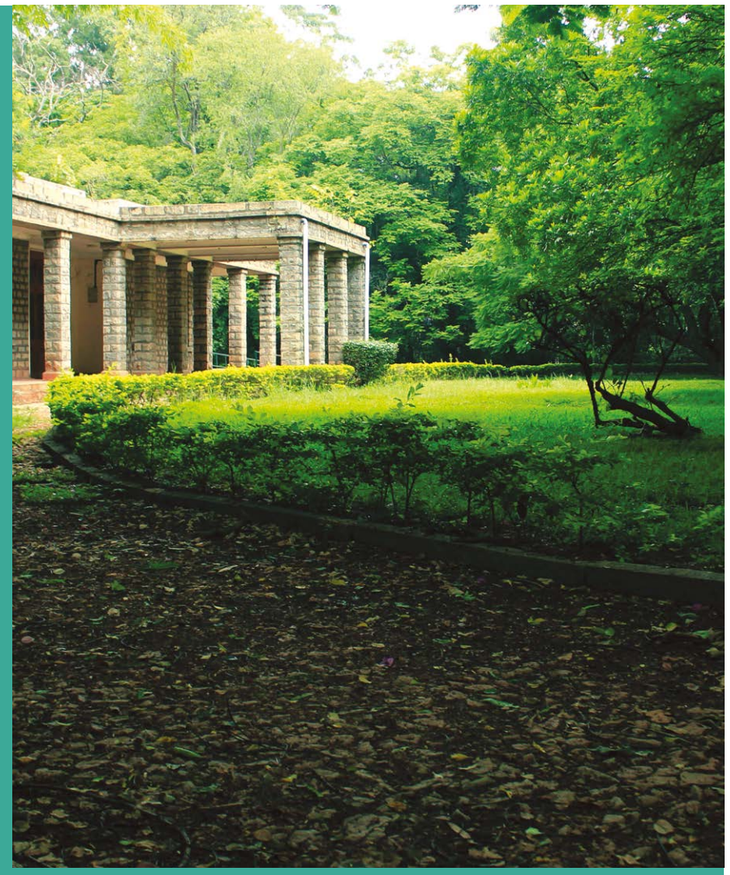
IN NUMBERS

13 Academic Staff
57 PhD Students
18 Int. PhD Students
62 Publications
15 PhD Conferments
1 Int PhD Conferments

Chair: Rishikesh Narayanan



Core Research



AI/ML in biophysics and drug discovery — combinatorial biology, macromolecular design, and synthetic biology; bacterial-bacterial interactions; cellular imaging of macromolecular complexes; computational biology and genomics; computational neuroscience and NeuroAI; host-pathogen interactions; integrative multiscale biophysics — modelling and experiments; intrinsically disordered proteins; macromolecular structure determination by X-ray crystallography, cryo-electron microscopy, and NMR spectroscopy; membrane biophysics; neurological disorders; neurophysiology — patch-clamp electrophysiology, ion-channels; peptide chemical biology; peptides — synthesis, design, and conformational studies; phase separation in biology; proteins — chemistry, conformational analysis, structure, design, folding, and dynamics; protein-protein and protein-DNA/RNA interactions; spectroscopy and physico-chemical studies of biomolecules; statistical thermodynamics and biomolecules; structural virology.

Current Research

Amit Baidya
Our lab works on bacterial nanotubes that serve as a conduit for inter-cellular exchange of cytoplasmic material, e.g., amino acids, toxins, antibiotic resistance markers and plasmids among different species (bacterial-bacterial interaction), including human host cells (host-pathogen interaction). i) Identification of components of the nanotube apparatus ii) Understanding the genetic regulation and structure-function relationships of the components of nanotubes iii) Elucidation of the cellular circuitry that determines the assembly of these nanotubes iv) Understanding of the underlying mechanisms of intra- and inter-kingdom crosstalk v) Mechanism of nanotube mediated antibiotic resistance spread in microbial community.

Aravind Penmatsa
The laboratory seeks to understand the molecular machinery involved in the transport of neurotransmitters and antibacterial compounds using X-ray crystallography and electron cryomicroscopy,

antibody development and other biophysical tools. i) Gating mechanism, substrate and inhibitor interactions were studied for the GABA reuptake transporter isoforms (GATs) in the neural synapse and glial cell membranes ii) Insights into the inhibition specificities of natural toxins on norepinephrine reuptake transporters iii) The architecture of a newly discovered bacterial antiporter YcgO was resolved to facilitate understanding the interplay of phosphorelay pathways and K+ efflux in bacterial cells.

Ashok Sekhar
Our lab is involved in the experimental characterisation of biomolecular dynamics and its relation to function and malfunction using NMR spectroscopy. i) Deciphering the function of intrinsically disordered DNA binding domain of the cytidine repressor ii) Pinpointing the different modes of dynamic regulation of the mammalian circadian clock iii) Elucidating the mechanism of interconversion between the two folded conformations of metamorphic proteins iv) Developing and applying new NMR methods for characterising molecular dynamics in glycans v) Understanding dynamics from an evolutionary perspective – how natural selection moulds free energy landscapes and assigns functions to promiscuous conformations.

Anand Srivastava
Our lab is involved in theoretical and computational biophysics research. It focuses on developing statistical mechanics and molecular simulations tools to understand the behaviour of complex biophysical systems. i) Uncovering the principles that govern lateral organisation in membranes ii) Modelling the various protein-mediated vesicular transport pathways iii) Exploring processes that regulate membrane composition and cell-organelles size iv) Exploring the sub-cellular organisation principles in terms of "membrane-less organelles", which are cellular coacervates rich in RNA and intrinsically disordered proteins.

Balasubramanian Gopal
Our lab studies the formation, function and regulation of the bacterial RNA degradosome, a biomolecular liquid condensate. It is an active area of investigation due its crucial role in modulating the cellular phenotype and associated pathology. i) Recent studies have focussed on *Staphylococcus aureus* RNA degradosome involving RNases, PNPase and a helicase, CshA, to understand their role in regulating cellular transcript levels ii) Understanding the phenotypic switch between the persistent and the virulent states of *Staphylococcus aureus*.

Giriraj Sahu
The primary focus of our lab is to elucidate the structural and functional association of neuronal ion channel multiprotein complexes in the regulation of neuronal excitability in brain physiology and pathophysiology. i) Factors contributing to adrenergic and cholinergic neuromodulation of principal pyramidal brain neurons ii) Role of ER-PM junctional proteins in the modulation of neuronal intrinsic excitability in physiology and pathophysiology such as, epilepsy and ageing iii) Development of novel antiepileptic drug targets to restrict the increase of excitatory drive in acquired epilepsy iv) Physiological modulation of neuronal voltage gated calcium channels.

Jayanta Chatterjee
The focus of our lab is mechanism-driven design of peptide and macrocyclic therapeutics through integration of conformational preorganisation, stereo electronic control (CH–π, n π* interactions), and backbone engineering (thioamidation). Development of α-helical miniproteins and helix–hairpin assemblies (<40 aa) with engineered loop dynamics and multivalent architectures for targeting protein–protein interactions and antibody-mediated assemblies. Implementation of quantitative high-resolution lipidomics using advanced mass spectrometry to characterise membrane remodelling in drug-resistant pathogens and identify lipid-driven vulnerabilities for next-generation therapeutics.

Mahavir Singh
The focus of our group is on studying the protein-nucleic acid interactions that govern chromatin remodelling, telomere DNA maintenance and bacterial toxin-antitoxin (TA) systems that regulate persistence during antibiotic stress. i) Role of hnRNPA1 in recognition and unfolding of telomere DNA and RNA G-quadruplex structures has been studied ii) Structure, functions, and mechanism of action of diseases-associated telomere helicase RTEL1 iii) Structure and function of type II and type III bacterial TA systems and their mechanism of assembly have been elucidated.

Rishikesh Narayanan
We study the impact of neural-circuit heterogeneities on learning, memory, and information processing in rodents. We demonstrate a diversity of impact of neural-circuit heterogeneities, depending on several internal and external attributes. Our analyses present degeneracy, the ability of disparate structural components to yield similar functional outcomes, as a fundamental organising principle of brain function. These findings argue for a theoretical formalism involving the brain as a complex adaptive system.

Raghavan Varadarajan
Our lab probes protein stability and gene function using deep mutational scanning and applies this to the design of immunogens for viral vaccines. Vaccine formulations for influenza and COVID-19 have been developed in collaboration with the Bangalore-based startup, Mynvax. The influenza vaccine formulation has successfully completed a Phase I clinical trial in Australia. A combined Phase I/II clinical trial in India will be initiated later this year. Other broadly protective and pandemic

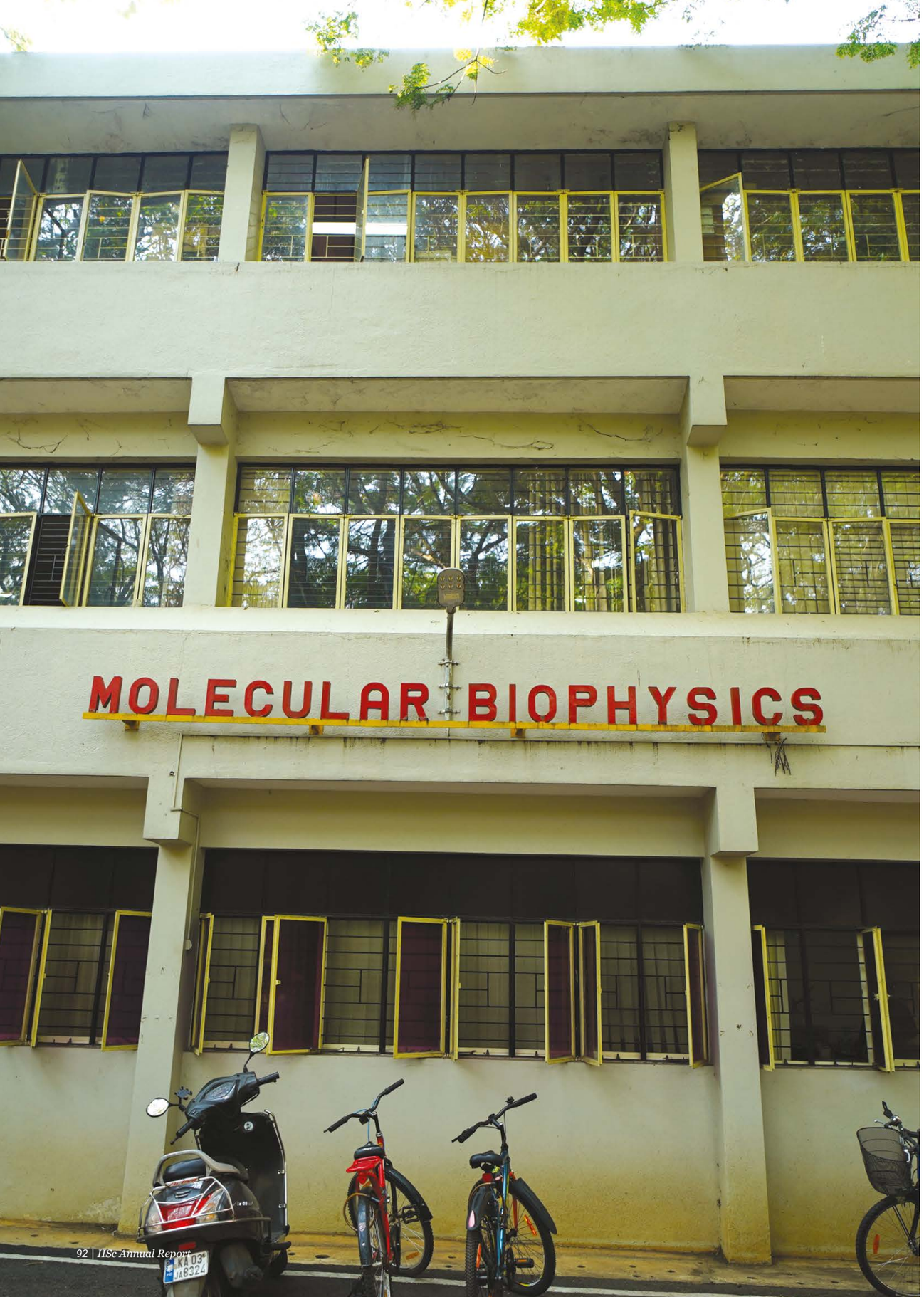


influenza vaccine formulations are also being developed.

Siddhartha P Sarma
Our lab is involved in the characterisation of protein and peptide structure, function, protein-ligand interactions and dynamics using NMR spectroscopy. Structure and function studies of novel neurotoxic disulfide rich toxins from animal venom. Development of new NMR methods to establish disulphide linkages in peptides.

Somnath Dutta
My group focuses on the structural and mechanistic studies of bacterial toxins, bacterial effector proteins, and multidrug efflux pumps using single-particle cryo-electron microscopy (cryo-EM) integrated with biochemical and biophysical approaches. We aim to elucidate the dynamic molecular mechanisms underlying bacterial infection and antimicrobial resistance through high-resolution structural biology. Characterising the structural basis of pore formation by bacterial toxins from *Staphylococcus aureus* in lipid membranes and cellular environments, providing insights into membrane disruption, oligomerisation, host-pathogen interactions, and membrane repair. Understanding the mechanisms of virulence factor translocation through secretion systems in *Mycobacterium tuberculosis,* advancing the understanding of bacterial pathogenicity at the molecular level. Structural and functional properties of multidrug efflux pump systems in *Escherichia coli,* contributing to the understanding of antibiotic resistance mechanisms.

Vidya Mangala Prasad
Our lab is interested in understanding the structural mechanisms of enveloped virus entry using methods such as cryo-electron tomography, single particle cryo-EM and sub-tomogram averaging. Elucidating the physical mechanisms and structural intermediates formed during cellular entry by enveloped viruses like dengue and Zika viruses. Understanding the structural basis of interaction between flaviviruses and cellular factors. Identifying epitopes involved in antibody recognition of pathogenic RNA viruses. Using AI-based deep learning methods for protein-derived antiviral interventions.



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Emeritus Faculty

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Dr MedSci (Kyushu), FASc, Professor



3.2 *Division of Chemical Sciences*

The Division of Chemical Sciences has consistently maintained its position among the top 50 chemistry departments in world rankings over the past decade. It is a globally competitive Division with clear focus on top quality research in specific current areas such as bio-inorganic chemistry and chemical biology of drugs with a particular aim towards disease control and cure, ultrafast spectroscopy and dynamics of molecules.

Themes

Faculty members of the division work on all contemporary topics in chemistry, including chemical synthesis, drug design, chemical biology, materials chemistry, surface and interface science, nanochemistry, molecular spectroscopy, ultrafast chemical dynamics, computational and theoretical chemistry, solid state chemistry and nuclear magnetic resonance spectroscopy.

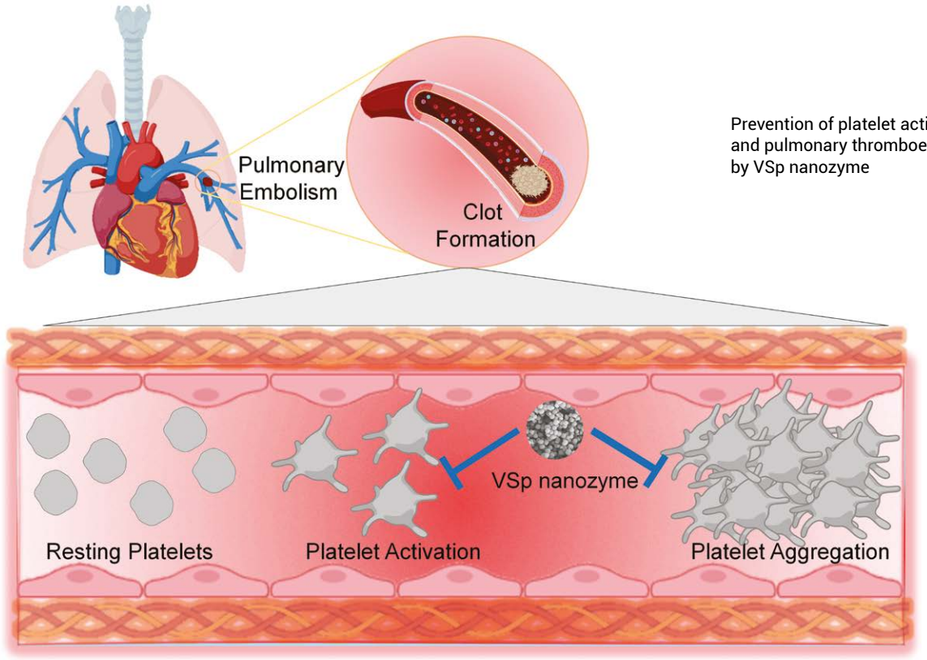
Departments | Centres | Units

- Department of Inorganic and Physical Chemistry
- Materials Research Centre
- Department of Organic Chemistry
- Solid State and Structural Chemistry Unit

Novel nanozyme prevents excess clotting

When a blood vessel is injured, specialised blood cells called platelets get activated and cluster together around the vessel to form protective blood clots. However, in conditions like PTE or diseases like COVID-19, oxidative stress and levels of toxic Reactive Oxygen Species (ROS) increase, leading to over-activation of platelets. This triggers the formation of excess clots in the blood vessel, contributing to thrombosis. Researchers at the Department of Inorganic and Physical Chemistry have developed an artificial metal-based nanozyme that can potentially be used to clamp down on abnormal blood clotting caused by conditions like pulmonary thromboembolism (PTE). These "nanozymes" work by controlling ROS levels, thereby preventing the over-activation of platelets that leads to excess clot formation or thrombosis.

Reference:
Sherin GR, SharathBabu BN, Manikanta K, Girish KS, Mugesh G, Vanadia nanozymes inhibit platelet aggregation, modulate signaling pathways and prevent pulmonary embolism in mice, Angewandte Chemie (2025).

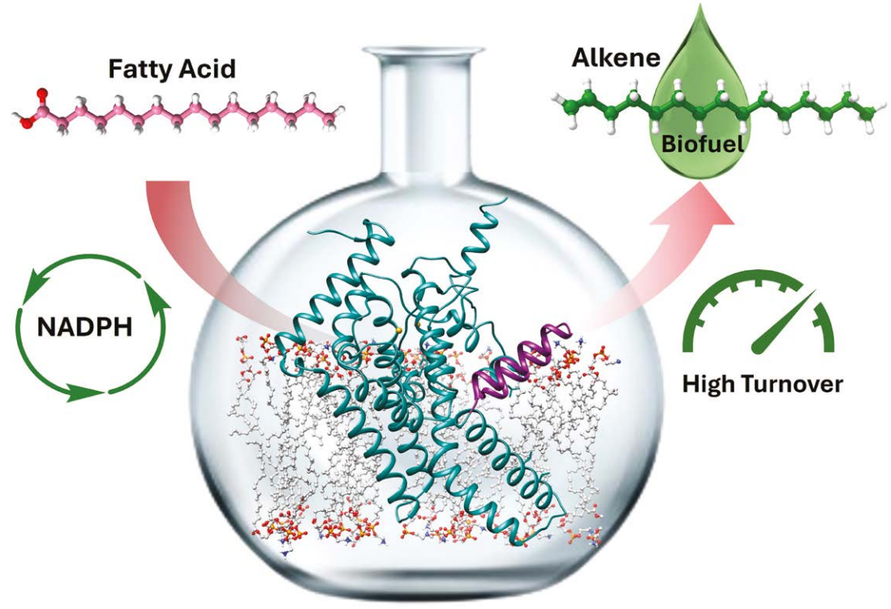


Prevention of platelet activation and pulmonary thromboembolism by VSp nanozyme

A high-performance biocatalytic platform for green hydrocarbon production

Researchers at the Department of Inorganic and Physical Chemistry (IPC) have developed a highly efficient cell-free enzyme system that converts fatty acids into 1-alkenes – versatile hydrocarbons that can serve as "drop-in" biofuels, polymer feedstocks, or pharmaceutical precursors. The team leveraged a membrane-bound bacterial enzyme called UndB and improved its performance using enzyme engineering, co-substrate recycling, and molecular simulation-guided redesign. By decoupling from cellular constraints, the team achieved a remarkable 262-fold increase in the enzyme's turnover number (a measure of catalytic performance), and a ~13-fold increase over the previous whole-cell system. The team's biocatalytic platform provides an alternative to synthesis from petrochemicals. The team has been granted a patent for this technology and is exploring industrial collaborations for large-scale production.

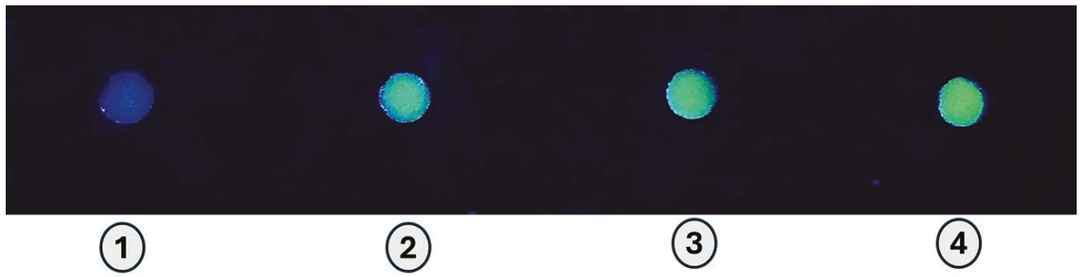
Reference:
Iqbal T, Murugan S, Karupusamy J, Sirohiwal A, Das D, Engineering of integral membrane metalloenzyme UndB and designing of a cell-free biocatalytic platform enabled efficient 1 alkene production, ACS Central Science (2025).



Terbium's green glow: A simple sensor for liver cancer

β-glucuronidase is an evolutionarily conserved enzyme found across life forms – from microbes to plants and animals. Its core function is to break down a sugar acid called glucuronic acid. Beyond its biological omnipresence, the enzyme also doubles as a critical biomarker for liver cancer. Researchers at the Department of Organic Chemistry have developed a unique luminescent probe that uses terbium, a rare earth metal, to sense the presence of β-glucuronidase, which can potentially aid in the detection of liver cancer. With liver cancer claiming more lives each year, such a technological advance is both timely and promising. Given the wide clinical relevance of β-glucuronidase as a biomarker in different types of cancers, neonatal jaundice, and NSAID-induced toxicity, this sensor offers a potentially powerful screening tool.

Reference:
Sakthivel S, Biswas A, Maitra U, Turn-on luminescent detection of liver cancer biomarker β-glucuronidase using a terbium-based paper sensor, Chemistry (2025).

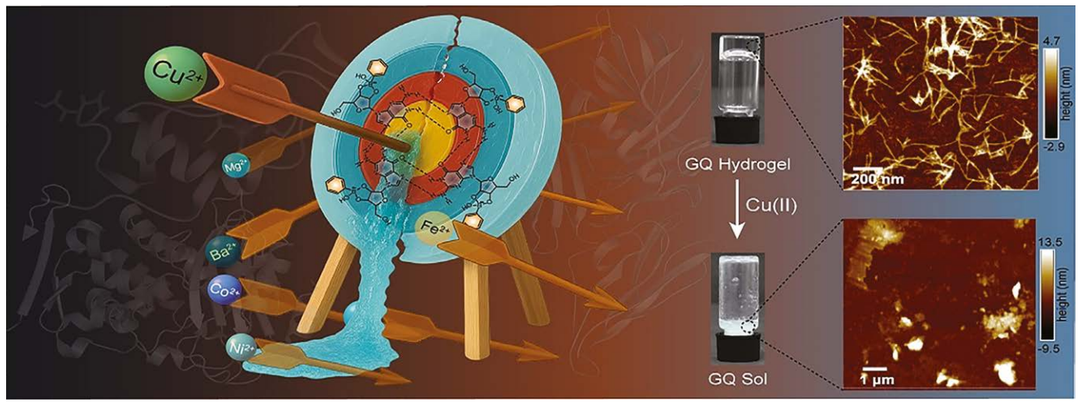


Research Snapshots
2025-26

Copper-sensitive hydrogel for targeted drug delivery

Scientists at the Materials Research Centre (MRC) have engineered a hydrogel that rapidly transitions from the gel to solution stage (gel-to-sol) upon exposure to copper [Cu(II)] ions. As the gel is highly sensitive to the levels of copper ions, it can aid in diagnosing some neurodegenerative disorders such as Parkinson's and Alzheimer's. Upon exposure to relatively higher levels of Cu(II), the hydrogel could also release L-dopa (used in Parkinson's treatment) in a controlled and sustained manner. Such an innovative approach paves the way for the development of responsive biomaterials capable of specific drug delivery, marking a significant step forward in the design of biomimetic materials for targeted drug delivery.

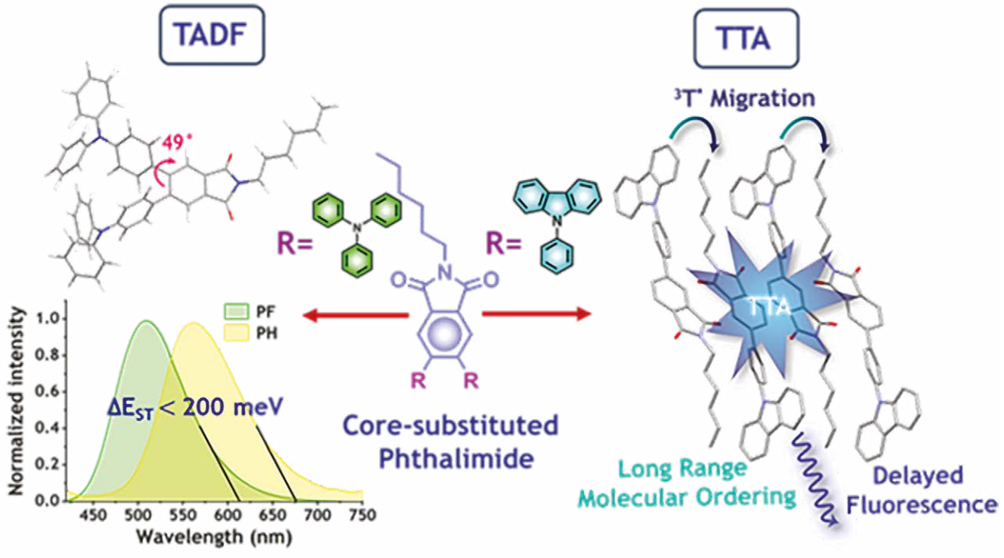
Reference:
Srivastava A, Gupta K, Solra M, Jindal G, Rana S, Exclusive cupric ion specificity of gel sol transition enables efficient sensing and therapeutic delivery, Small (2025).



Modulation of delayed fluorescence pathways via rational molecular engineering

Organic light-emitting diodes (OLEDs) have attracted immense attention in display and illumination technologies due to their flexible device structures and multicolour emission. However, one of the key challenges in developing efficient OLEDs is overcoming the loss channel of triplet excitons, which are long-lived with very low radiative efficiencies and are primarily unutilised, which limits the overall efficiency of OLEDs. In a recent study, researchers from the Solid State and Structural Chemistry Unit (SSCU) have introduced a donor-acceptor chromophore design that enables both thermally activated delayed fluorescence (TADF) and triplet-triplet annihilation (TTA) in thin films of organic semiconductors. This work serves as a proof-of-concept, showing how different emission mechanisms can be harnessed from a single donor-acceptor system through strategic donor selection.

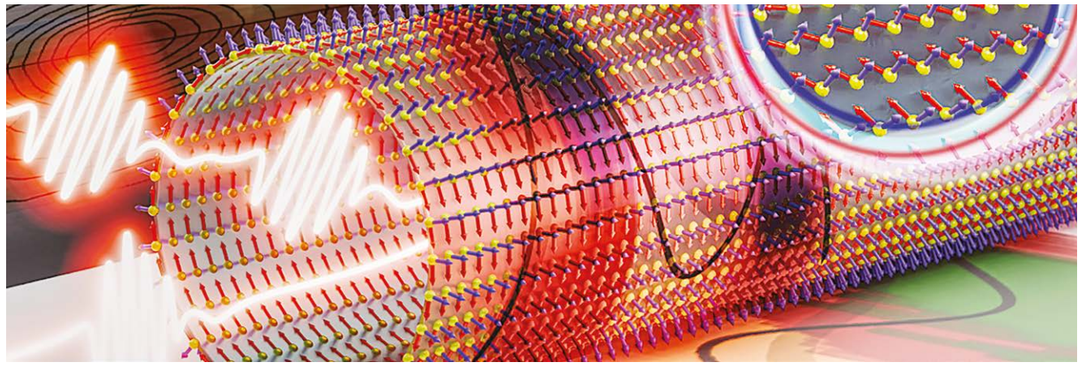
Reference:
Debnath S, Ramkissoon P, Salzner U, Hall CR, Panjwani NA, Kim W, Smith TA, Patil S, Modulation of delayed fluorescence pathways via rational molecular engineering, Nature Communications (2025).



Decoding quantum transport in disordered systems

A new study from researchers at the Solid State and Structural Chemistry Unit (SSCU) addresses a central question in quantum transport. In highly ordered molecular nanotubes, excitons can travel over extended distances even at room temperature. But disordered systems like natural photosynthesis can transport excitons over hundreds of nanometers lengthscales and on picosecond (10-12 seconds) timescales with near unity quantum efficiency. In the study, the researchers used porphyrin nanotubes to mimic natural photosynthesis in the lab. They experimentally built and refined advanced optical instrumentation – a femtosecond 2D spectrometer with >300 nm spectral coverage and ~10 fs temporal resolution – to map excitation versus detection energy with ultrafast precision. Understanding these phenomena could also help us design more efficient solar cells and artificial light-harvesting systems that work reliably in real world conditions.

Reference:
Thomas AS, Roy C, Roy I, Bhat VN, Ghosh S, Tiwari V, Disordered light-harvesting aggregates can host functional vibronic couplings at room temperature, Nature Communications (2026).



3.2.1

Inorganic and Physical Chemistry

Established more than a century ago in 1909, when the Institute was founded, the Department of Inorganic and Physical Chemistry (IPC), has demonstrated scientific excellence in both basic and applied research.

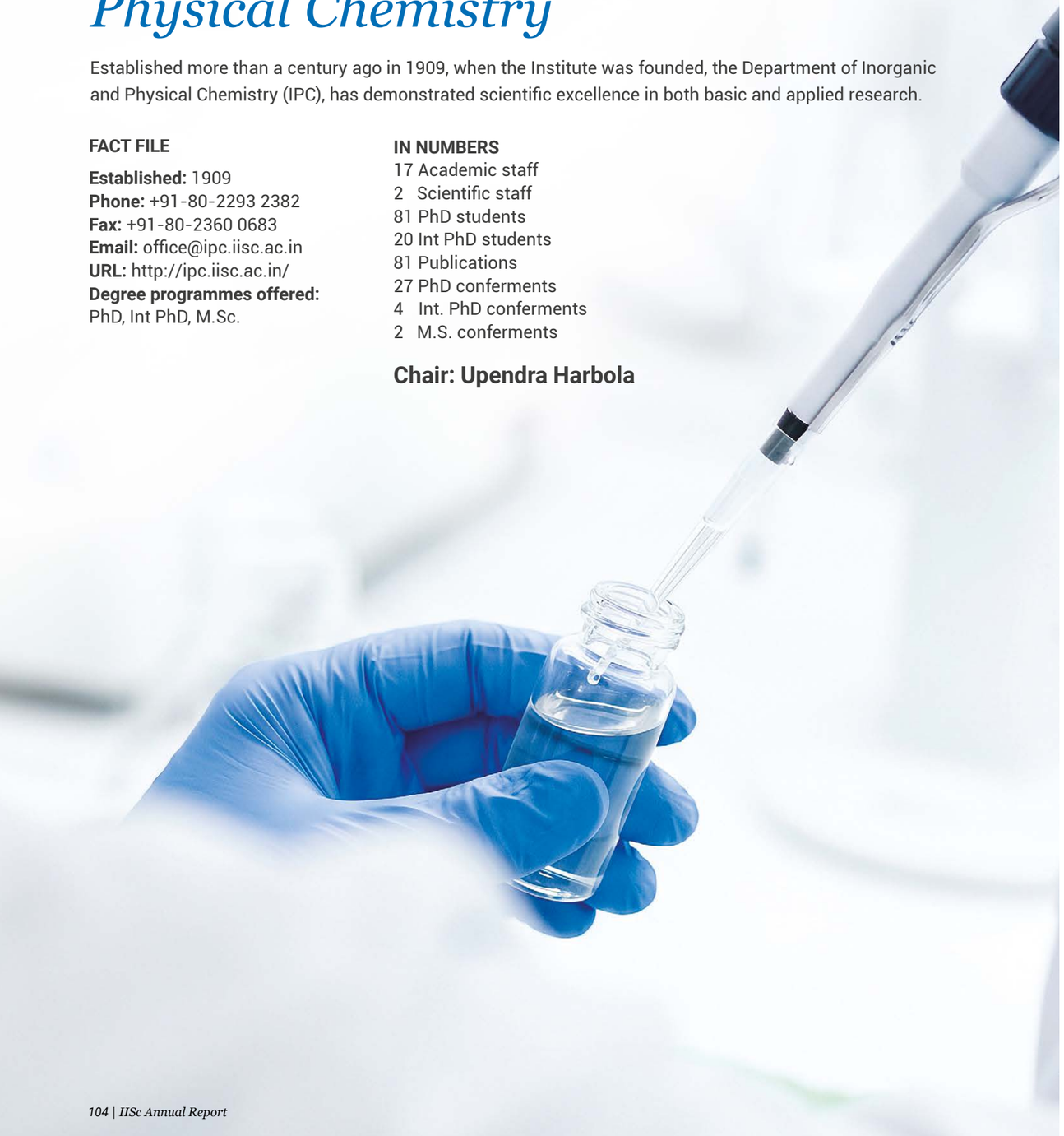
FACT FILE

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URL: http://ipc.iisc.ac.in/
Degree programmes offered:
PhD, Int PhD, M.Sc.

IN NUMBERS

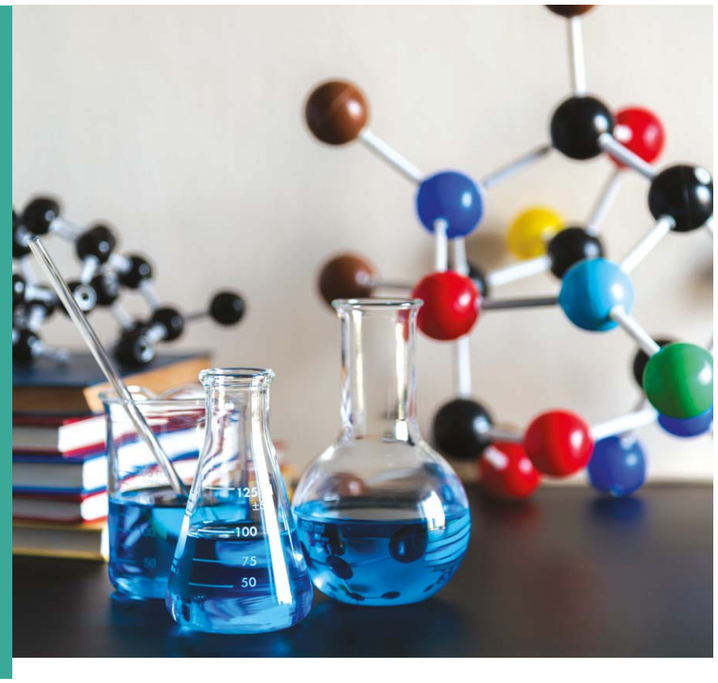
17 Academic staff
2 Scientific staff
81 PhD students
20 Int PhD students
81 Publications
27 PhD conferments
4 Int. PhD conferments
2 M.S. conferments

Chair: Upendra Harbola



Core Research

Currently, the department has 17 faculty members working in rich and diverse areas of chemistry including molecular spectroscopy, magnetic resonance spectroscopy, chemical dynamics, bio photonics, molecular electronics and spintronics, analytical and computational theory, electrochemistry, polymer chemistry, transition metal and non-metal chemistry, bio-inorganic and biophysical chemistry, chemical biology, and functional materials.



Current Research

Bio and Medicinal Inorganic Chemistry

IPC is actively working on developing novel enzymes and phyotochemicals for biocatalysis and therapeutic biology. The reaction mechanism, activity, and kinetics of membrane-bound metalloenzymes that are responsible for biosynthesis of 1-alkanes in bacteria have been established. Novel glycoside hydrolase enzymes have been identified that exhibits excellent activity against biofilms of pathogenic bacteria. This may lead to the development of first-in-kind enzyme therapy against the biofilm-associated microbial infections. A tri-terpenoid phytochemical compound, squalene has been isolated from plant which exhibit anti-inflammatory properties as well as metalloenzyme down regulation.

Chemical Dynamics and Spectroscopy

Using a home-built pulsed nozzle Fourier transform microwave spectrometer, rotational spectra of the first complexes of 1-fluoronapaphtahlene-(H2O)1,2 have been recorded. Initial results indicate that the complex with two water molecules may have the water in two different sites, which is rather uncommon. In another work, a combination of Raman spectroscopy and artificial intelligence has been employed for the quick identification of bacterial pathogens. This has the potential to translate into an efficient, cost-effective solution for accurate identifications of causative bacteria.

Collaborative efforts on quantum light-matter interaction in department have demonstrated that vibrational strong coupling significantly enhances the electrical conductance of undoped intrinsically insulating, amorphous polymers such as polystyrene, poly (benzyl mecthacrylate) and various other polystyrene type polymers. The technique can also be used to enhance the conductance of small aromatic molecules. Based on this, a prototype device has been developed, and an Indian patent application has been filed. In another experiment, we show that the strong coupling of electronic transitions can suppress the ground state intermolecular interactions and thereby modify the photophysics of Chlorophyll derivatives.

In a collaborative effort between IPC, aerospace engineering at IISc and University of Rennes, France, the potential of shock waves in early formation of molecules after the big bang has been shown, leading to important publications in astronomy and astrophysics.

Theoretical and Computational Chemistry

Excited state proton transfer (PT) dynamics were studied using mixed quantum-classical simulations for 2-(oxazol-2-yl)-3-hydroxychromone (OHC) and its 1:1 complexes with water as well as [2,2'-bipyridyl]-3,3'-diamine or BP(NH2)2. OHC shows three low-lying conformers, two of which (OHC-A and B) show intra-chromone ring H-bonding while the third (OHC-C) shows chromone-oxazole inter-ring H-bonding. Various facets of the ultrafast dynamics initiated on the lowest bright (ππ*) state were investigated, including the role of the lowest dark (nπ*) state and detectability of the post-PT product. For the 1:1 complexes, where the water acts as a proton relay molecule, the dynamics are richer with the possibility of donor-first type (OHC to water) or acceptor-first type (water to OHC) of double PT or only one of these two (single PT events). Dynamical features of these types of events were investigated in detail. For BP(NH2)2, our work focussed on interpreting the timescales of the fluorescence bands seen in experiments. Additionally, our results indicate that the dynamical timescale of band II of this molecule arise from twisting of the pyridyl rings after PT, in agreement with a suggestion in an earlier computational study. Nonlinear molecular spectroscopy with entangled-photon field was studied. Entangled photon fields carry nontrivial quantum correlations that defy classical physics and provide new tools for monitoring quantum dynamics in molecules. We recently showed how the signal arising from classical processes can be eliminated when intense entangled-photon beams are used in two-dimensional electronic spectroscopy. We also studied the effect of strong molecule-cavity field coupling on the electron transport properties of single-molecule junctions. A model of a self-interacting finitely extensible Gaussian chain that evolves stochastically under the action of random thermal fluctuations and an external fluid velocity gradient has been developed to understand the response of collapsed polymers to the effects of linear mixed flow. Lastly, the electronic requirements for the formation of borophenes are currently being explored computationally.

Polymer Chemistry

A modular strategy to prepare crosslinked amphiphilic gels using peripherally clickable hyperbranched polymers (HBP) and PEG-diazides was developed, and these were utilised to anchor catalytically active metal species, such as Cu, Pd and Au. The modularity of this approach permits one to easily vary the crosslink density by changing the PEG length, the hydrophobic domain size by varying the nature of hyperbranched polymer, and it also permitted the installation of a molecular jacket around the catalytic site, by co-clicking with a desired mono-azide segment. The nature of the molecular jacket was shown to influence the reaction rate, depending on the compatibility of the reactant with the molecular jacket. Thus, the reactant solutions could be simply stirred in these vials, the product solutions poured out and vials could be rinsed and reused multiple times. Such catalytic glass vials could be very useful for ligating/labelling biological macromolecules using a simple *Stir-Pour-Rinse-Reuse* protocol.

Organometallic and Coordination Chemistry

Single atom Pd on Cu2O has been developed and some preliminary results have been obtained on C-C and C-N cross coupling reactions with ppm level Pd loading under aqueous micellar conditions.

Certain new and novel iridium dinitrogen and dihydrogen complexes bearing pincer ligand have been synthesised and characterised. These complexes were found to show exceptional hydrogenation catalytic activity under mild conditions. An unusual iridium pincer complex with hydride and H2 ligands trans-disposed to one another was found to exhibit dynamical H-atom site exchange between the H2 and the hydride sites through metal-ligand cooperativity mechanism, which is unprecedented.

Development of cost effective, earth abundant, less toxic base metal catalysts or main group



catalysts for the synthesis of organoboranes has been demonstrated. Considerable effort has been committed to the preparation of organoboranes employing cost-effective, earth abundant and less-toxic non-precious metals (Cu, Ni, Fe). Recently, an efficient catalyst system based on Co(II)-NHC complex for the borylation of pyridine derivates and internal alkynes has been developed.

Supramolecular Chemistry/Catalysis

In a recent report, Mukherjee's group has shown that the fate of a chemical can be controlled by the shape of the reaction vessel. In a Pd(II) cage of octahedral shape anthrone undergone oxidative C-C coupling to form di-anthrone, while the same reaction under identical reaction condition in a Pd(II) cage of different shape showed the formation of simple anthraquinone. DFT study was done to corroborate this unusual observation of different fates of a reaction by changing the shape of the reaction vessel. In another project, Mukherjee's group has reported the first example of a water-soluble square orthobicupola architecture. The cage was used as a molecular vessel for photocatalytic oxidation of aryl- and alkyl-thio compounds to their corresponding sulfoxides selectively without formation of any trace of toxic sulfones as byproducts.

In the area of micellar catalysis, a biodegradable surfactant has been developed using cardanol, a biowaste. Preliminary results have shown that its aqueous solution can be used as a green and sustainable alternative to toxic organic solvents.

Nanomaterials and catalysis

Pd-Zn bimetallic nanoparticles capped by hexadecyl amine were obtained via solvated metal atom dispersion and co-digestive ripening. They were found to be highly catalytically active for the semi-hydrogenation of acetylene to ethylene. The selective hydrogenation of pure acetylene takes place at room temperature with greater than 85% selectivity towards ethylene. This is the highest reported ethylene selectivity with substantial conversion, under very mild conditions (room temperature and atmospheric pressure) in comparison to the literature reports wherein the reaction conditions are a lot harsher. Nearly monodisperse Ag and Au nanoparticles were prepared

using digestive ripening in the presence of [C18BIm]Br ionic liquid. This process effectively transformed a polydisperse sample under mild conditions within a brief time frame. Herein, the capping ligand ionic liquid plays a dual role as a stabilising agent, which inhibits the particles against aggregation, and more importantly as a digestive ripening agent.

Main Group Chemistry
The Lewis acidic diboron compounds often display an interesting reactivity and have witnessed significant interest by the unusual reactivity of these compounds. We have developed a protocol to synthesise trifluoromethyl boronates from alkenes by the mutual activation of the Togni II and the bis(catecholato)diboron reagents in the absence of any catalyst and additives. This reaction enables synthesising a series of trifluoromethylated alkyl boronates using unactivated alkenes, including natural products and drug derivatives, in a regioselective manner. Moreover, the synthetic utility of the boronic ester present in the product allows access to a range of trifluoromethyl containing compounds. We have also extended this protocol for the synthesis of α-trifluoromethylated ketones through trifluoromethylation of the corresponding catecholboron enolates of α, β-unsaturated ketones.

Electrochemistry, Surfaces and Interfaces
In the field of CO2 electrocatalysis, operando Raman spectroscopy and online mass spectroscopy have been used to demonstrate the CO2 reduction on Nickel-yttria-stabilised zirconia (Ni-YSZ) cermet surface and the mechanism of catalyst deactivation has been explored. A series of Co-doped copper oxide catalysts with varying Co/Cu ratios supported on Au has been developed which exhibit a remarkable oxygen reduction reaction activity with very low H2O2 selectivity.

As part of instrument development, home built Scanning tunning Microscopy (STM-BJ), mechanically controllable break junction (MCBJ) and EGaIn large area junction setups with unique single/ensemble molecule conductance measurement capabilities has been developed in the department. Employing home built MCBJ setup, several interfacial reactions have been probed.

Protein chemistry, biocatalysis, signal and energy transduction, multiscale simulations, quantum chemistry
The Sirohiwal Research Group works at the intersection of chemistry, biology, and physics, addressing fundamental questions about the molecular mechanisms that drive biological processes. Our focus is on understanding the structural and functional complexity of proteins and how biomolecular events are coordinated across a wide range of time and length scales.

Using a bottom-up approach, we study systems ranging from elementary particles such as electrons and protons to larger biomolecular assemblies, including protein-protein interactions. Our research employs advanced multiscale computational methods, including quantum mechanics/molecular mechanics (QM/MM), non-adiabatic and classical molecular dynamics (MD), computational spectroscopy, and machine learning.





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ANOOP THOMAS
PhD (IISER TVM), Assistant Professor

DEBASIS DAS
PhD (U Michigan), Associate Professor

K GEETHARANI
PhD (IIT Madras), Associate Professor

UPENDRA HARBOLA
PhD (JNU), Professor

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3.2.2

Materials Research Centre

Since its establishment in 1978, the Materials Research Centre (MRC) has served as a vibrant hub for interdisciplinary research, focusing on various domains of materials science and technology, particularly electronic, functional materials and devices. Guided by the inspiring motto, “From basic science to device prototypes," the centre consistently strives to translate fundamental scientific knowledge into tangible advancements, encapsulating its unwavering commitment to pushing the boundaries of research and innovation.

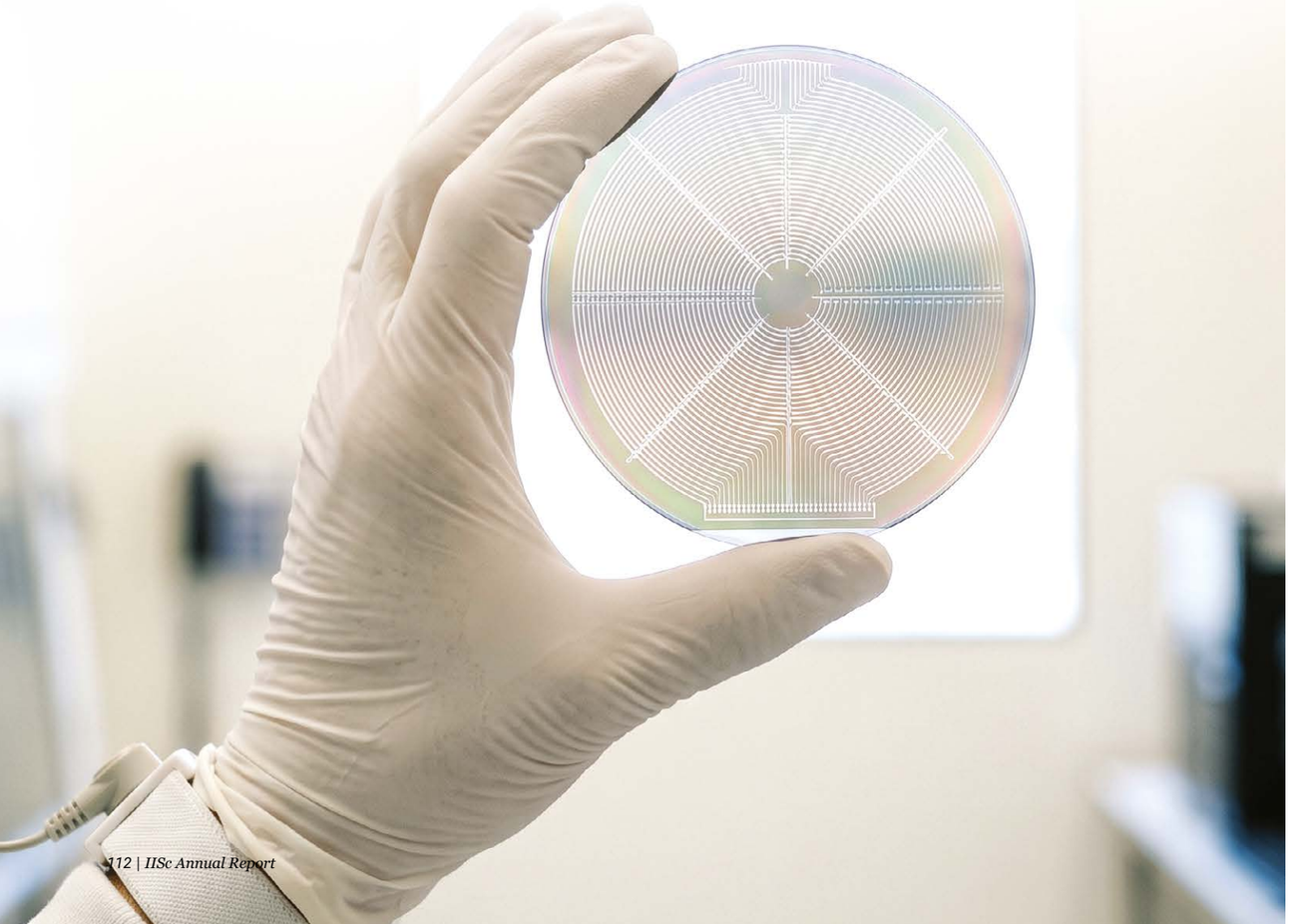
FACT FILE

Materials Research Centre
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URL: http://www.mrc.iisc.ac.in/

IN NUMBERS

9 Faculty
80 Graduate students
60 PhD Students
9 Int PhD Students
190 Publications

Chair: Abhishek K Singh



Core Research

MRC focuses on diverse research areas, including semiconducting materials for OLEDs, gas sensing, and ferroelectric materials, as well as magnetic materials. The centre also explores biomaterials for musculoskeletal applications, catalytic materials for water splitting and purification. The centre also focuses on Li-ion/Na-ion batteries, hydrogen storage, fuel cells, thermoelectrics, and meta-materials.



Current Research

Energy Harvesting Materials
Faculty of the centre are involved in addressing the challenges associated with development of efficient energy harvesting materials using state-of-the-art density functional theory-based methods. An extensive study is in progress to develop guidelines for designing high ZT thermoelectric materials and ambient condition efficient hydrogen and Li storage materials. Nanostructurisation of transition metal silicides is carried out for high temperature thermoelectric application.

2D Materials and Metamaterials
Faculty of the centre are working on 2D materials as they are considered as materials for next generation devices. To use 2D materials as building blocks in electronic, optical, and sensing applications, their electronic properties need to be modified. A focussed effort aiming towards gaining the ability to modify the band gaps of these materials in a controlled and non-invasive way. Meta-structure-based materials for perfect absorbers at IR and microwave frequencies.

Organic light emitting diodes for flexible displays
MRC faculty are also involved in various organic materials development, such as light emitting especially thermally activated delayed fluorescence emitters, hyperfluorescence, dendrimer-based emitters, nano materials-based emitters, electron transporting, and host materials for OLED application and single photon emitters for quantum computing. Focus is on purely organic and solution-processed device fabrication for cost-effective OLED displays and lightings.

Chemistry at the materials biology-interface
Researchers at MRC have a strong focus in exploring chemistry of materials to interface with biology using synthesis, computation and analytical tools. The goal of sustainable healthcare is being targeted through the development of biosensors, enzyme mimetics, biocatalysts, biologics delivery vehicles, and regenerative medicines.

Biomaterials for musculoskeletal reconstruction and regenerative engineering
They are developing next generation implants and bioengineering solutions to address unmet clinical needs

for musculoskeletal, dental, and neurosurgical applications. Encompassing experimental discovery, theoretical predictions, computational analysis, and clinical translational research, a strong foundation has been laid biomaterials science and regenerative engineering; thereby impacting human healthcare.

Nanostructured Materials for Energy and Environment Applications

MRC also involved in designing nanostructured based catalysts for water splitting, water purification, batteries and fuel cells. Few faculties are associated with the development of materials for gas sensing applications at room temperature, infra-red and UV detection.

Ferroic and quantum model materials at atomic scale

Faculty of the centre are working on the ferroelectric, magnetic and quantum materials for being exploring the platform for the devices like rf filter, resonators, broadband, ferroelectric memory, dielectric energy storage and quantum communications. Faculty also working magnetic thin films to bring attention to the industry for room temperature device application as non-volatile memories or into low power nanoelectronics devices.

SIGNIFICANT ADVANCES AND INNOVATIONS

Our department stands at the forefront of technological, scientific, and scholarly advancements, driving groundbreaking developments across multiple fields. With a strong focus on efficient energy harvesting materials, our research efforts have resulted in remarkable breakthroughs. By utilising state-of-the-art density functional theory-based methods, we have effectively tackled the challenges associated with their development. Furthermore, our ongoing extensive study has yielded invaluable guidelines for designing high ZT thermoelectric materials and efficient hydrogen and Li storage materials, even under ambient conditions. In addition, our department has made significant contributions to the field of nanostructurisation techniques, particularly in the areas of transition metal oxides, nitride, and semiconducting thin films, unlocking their immense potential for industrial applications. These achievements reflect our unwavering commitment to advancing scientific knowledge and driving transformative progress in several areas, including the development of new CMOS devices for enhanced transistor performance, high dielectric energy storage, pioneering theoretical approaches for quantum materials and machine learning, the advancement of ferroelectric devices, and the revolutionising of healthcare.





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PRABEER BARPANDA
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3.2.3

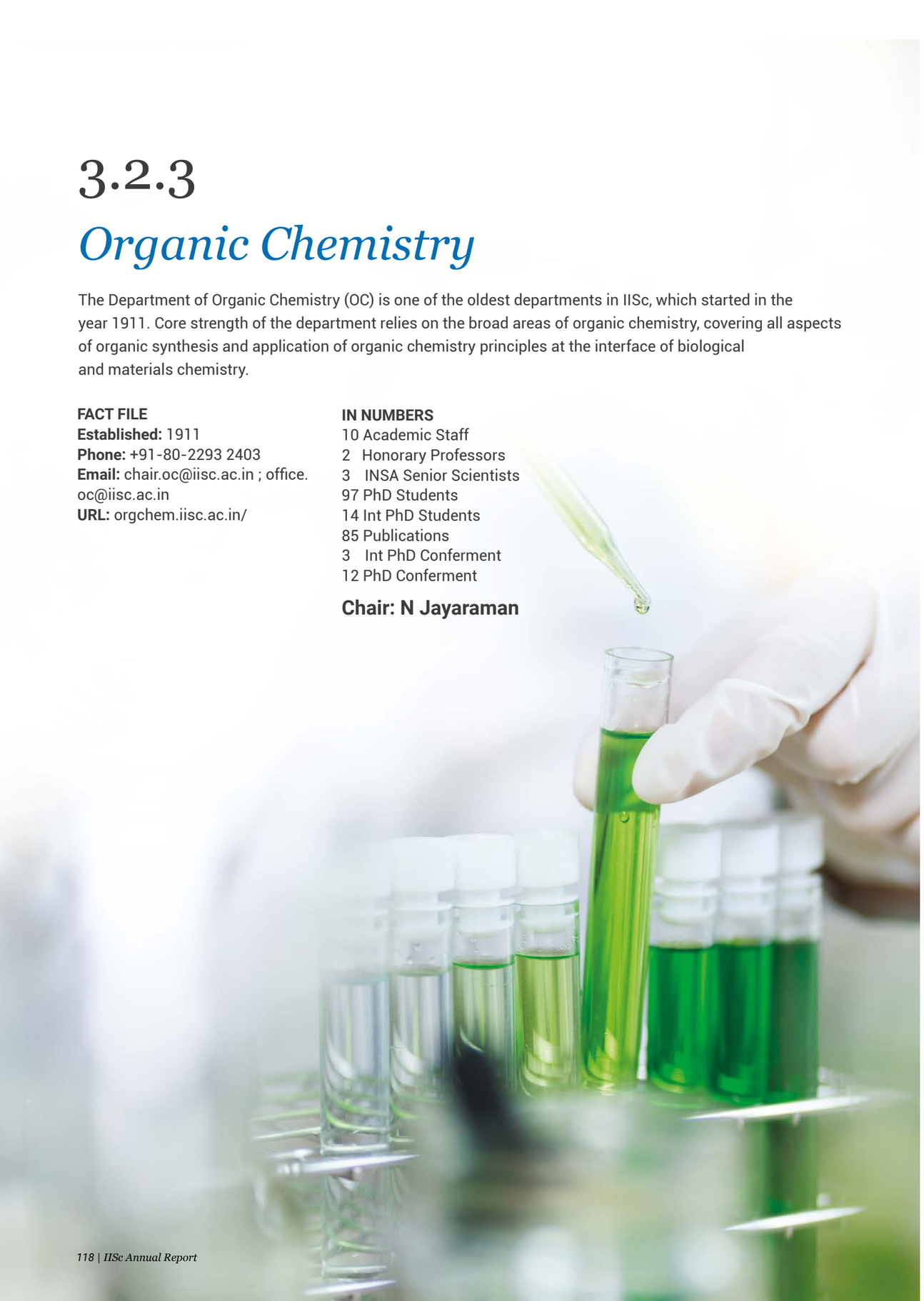
Organic Chemistry

The Department of Organic Chemistry (OC) is one of the oldest departments in IISc, which started in the year 1911. Core strength of the department relies on the broad areas of organic chemistry, covering all aspects of organic synthesis and application of organic chemistry principles at the interface of biological and materials chemistry.

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URL: orgchem.iisc.ac.in/

IN NUMBERS
10 Academic Staff
2 Honorary Professors
3 INSA Senior Scientists
97 PhD Students
14 Int PhD Students
85 Publications
3 Int PhD Conferment
12 PhD Conferment

Chair: N Jayaraman



Core Research

Aryne chemistry; asymmetric catalysis; chemical biology; carbohydrate chemistry; computational chemistry; enzyme sensing; hydrogels; macromolecular chemistry; medicinal chemistry; natural product synthesis; organic materials; organocatalysis; peptides; photocatalysis; supramolecular chemistry; synthetic methodologies; total synthesis; transition metal catalysis.



Current Research

Vignesh Palani
While new method development continues to advance, there is a growing demand for efficient syntheses, particularly those employing unique retrosynthetic logic to streamline drug discovery. A recent trend in this direction involves the design and development of molecular editing methodologies. The group explores editing tools to selectively alter both the periphery and the core framework of the molecule without disrupting other inherent functionalities. The group recently disclosed their first work, in which they developed a decoupling strategy to achieve 1,3-translocation of aroyl groups in saturated carbocyclic frameworks.

Sharvan Kumar
Synthesis of stable, highly electron-deficient/rich organic compounds and their radical ions for the preparation of next-generation optoelectronic devices, conductivity, and magnetism is a major focus. Recently, we isolated C3-symmetric molecules, and we also prepared pyrene-based C2-symmetric compounds. We are planning to conduct photophysical and electronic studies of these compounds along with DFT calculations.

Durga Prasada Hari
The use of [1.1.1]propellane as a carbene mimic to directly incorporate cyclic units into ketone frameworks, providing streamlined access to spirocyclic and methylenecyclobutyl (MCB) ketone derivatives, is pioneered. An unprecedented [2,3]-sigmatropic rearrangement in which [1.1.1]propellane functions as a carbene precursor, enabling rapid synthesis of allenylated and allylated methylenecyclobutanes is revealed. The first strain enabled RPC/annulation method to assemble diverse hetero bicyclo[n.1.1]alkanes were developed. Interrupted Dowd–Beckwith reaction is developed, enabling regioselective deconstructive functionalisation of cyclic ketones using electricity as the sole oxidant. A visible light driven C–Cl activation is demonstrated on polychloroalkanes via triplet carbene insertion.

Garima Jindal
The group investigates the reaction mechanisms of metal- and enzyme-catalysed transformations. The group employs a combination of physical organic tools—including spectroscopic techniques, DFT calculations, and deuterium-labelling studies—to elucidate catalytic cycles and the origins of stereoselectivity. Their research focuses on carbene insertion reactions mediated by cytochrome P450 enzymes and a range of transition metals. The group is currently developing AI/ML-driven approaches to design new Fe-based chiral catalysts for such transformations. Another research involves identifying the true active species in dirhodium catalysis. Leveraging mechanistic insights, the group has designed new Rh catalysts, which are being explored for asymmetric transformations.

Mrinmoy De
Developed synthesis, functionalisation and characterisation of various nanomaterials and their applications in related fields such as antimicrobial activity, sensing, delivery, molecular recognition, catalysis etc. Formulation of various lipids and related nanomaterials such as lipid nanoparticle (LNP), liposomes, coacervate etc. for mRNA, DNA and drug delivery applications is conducted. The surface modifications of various polymorphs of 2D transition metal dichalcogenides such as MoS2 using thiolate ligands is developed. The reported functionalisation method is followed globally. State of the art antibacterial activities against MDR bacterial strains is observed. In vivo specific antibacterial and antibiofilm activities using those newly developed antimicrobial agents are shown.

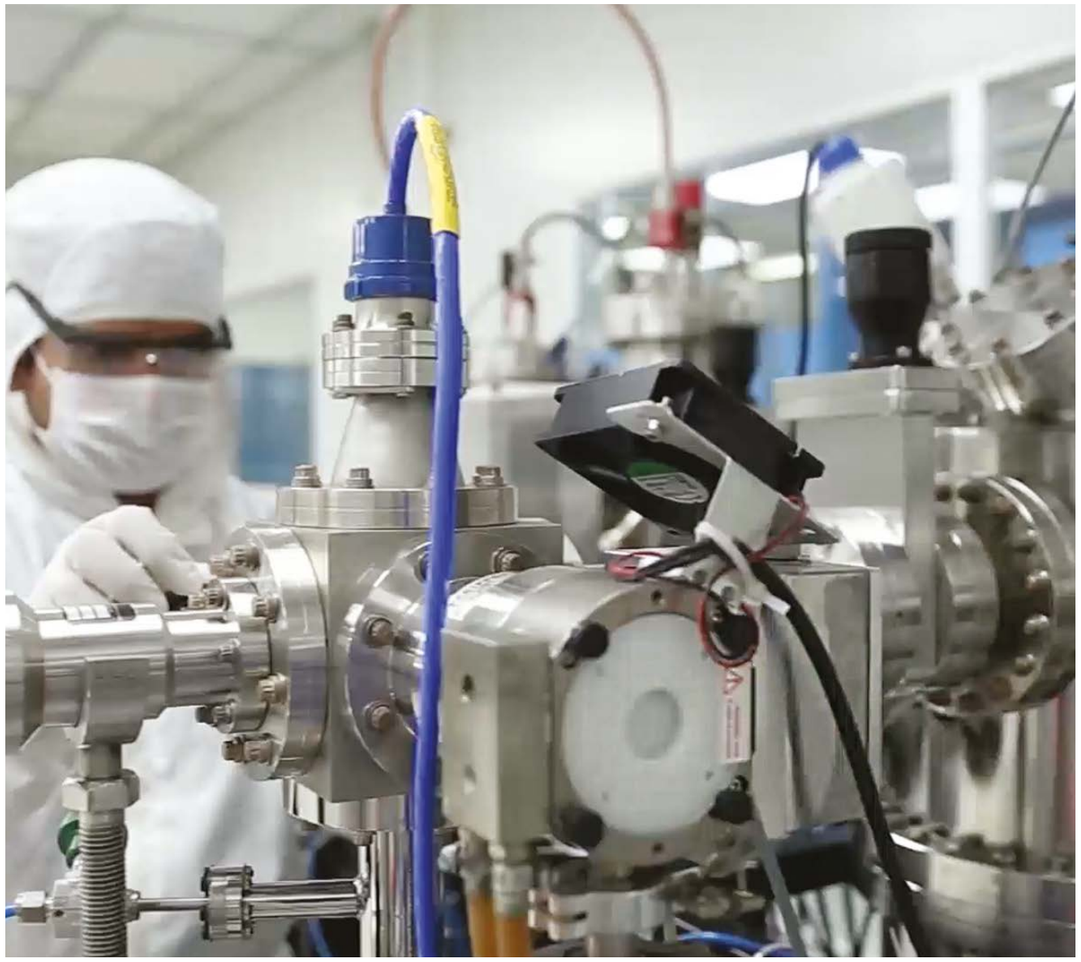
Santanu Mukherjee
We have devised organocatalytic desymmetrisation routes to enantioselective total synthesis of naturally occurring [5]-ladderanoic Acid and an unnatural analogue of [3]-ladderanol, namely benzo-[3]-ladderanol. These approaches not only provide a general solution to these structurally unusual lipids but also reveal their plausible biosynthesis. In addition, we have developed the first Ir-catalysed enantioselective formal meta-allenylation of pyridines using a temporary dearomatisation strategy. Apart from developing reactions and their application, we are interested in devising catalytic strategies. In this direction, we introduced a new form of cooperative catalytic mode, namely divergent cooperative catalysis.

AT Biju
In the area of N-heterocyclic carbene (NHC) catalysis, we have demonstrated the NHC-catalysed enantioselective synthesis of N-acyl cyclic sulfonimidamides via controlling the S(VI)-stereogenic center. Moreover, a DKR approach to C-O axially chiral benzonitriles via NHC-catalysed atroposelective imine umpolung has been established. Additionally, NHC-catalysed (3+3) annulation for the atroposelective synthesis of N–N axially chiral quino(xa) linones has been established. In the domain of strain-release driven reactions of bicyclo[1.1.0] butanes (BCBs), HFIP-mediated simultaneous activation of BCBs and indolyl alcohols for the selective synthesis of indole-fused bicyclo[3.1.1]heptanes and tetracyclic spiroindolenines has been uncovered.

EN Prabhakaran
Development of HBS-constrained α-helicomimics to disrupt critical biomolecular interfaces. By targeting the ERG transcription factor (linked to prostate cancer), GATA-3 and the SARS-CoV-2 spike protein, this work achieved highly selective, nanomolar-range binding affinity, demonstrating the therapeutic potential of artificial transcription factors. Investigated the fundamental biophysics of protein folding, focusing on proline cis/trans isomerism and the helix-coil transition. Using refined peptide models, identified van der Waals and tetrel bonding interactions as key stabilisers of elusive cis-proline conformers and deconvoluted the unconventional thermal folding behaviour of HBS helicomimics. Through a series of studies, mapping of steric handles, Cα-substitutions, and linkers dictate conformational dynamics, solvent polarity effects, and thermal folding are conducted, providing a blueprint for tuneable drug models.

KR Prasad
The core theme of the research is total synthesis of complex natural products of therapeutic significance with an emphasis on development of asymmetric synthetic strategies/methodologies en route to the natural products. Some of the recent investigations include the total synthesis of complex macrolactones, indole alkaloids, pyrrolidine and piperidine containing alkaloids and triquinane natural products. The group is also interested in examining bio-activity profile of the natural products and analogues synthesised, with a particular interest in finding small molecules for the activation of mutant p53 protein; the protein responsible for the control of many cellular processes.

N Jayaraman
3-Thiocresyl-prop-1-enyl (TCP) glycosides are developed as efficient donors in glycosylations. A trivalent tris-(3-N-methyl-N-pyridyl propyl)amine-catalysed site-selective mono-O-acylations of glycopyranoside derivatives is demonstrated. Pyridoneimines, installed at the peripheries of poly(ether imine) (PETIM) dendrimers of generations 1 to 3 show dendrimer generation-dependant-electron delocalisation between the non-aromatic pyridoneimine to an aromatic imidopyridinium resonances. Albumin hitchhiking-mediated lymph node targeting of Tn-DSPE-PEG-2000 glycolipid is studied that show induction of highly specific antibodies for Tn-expressing cancer cells. A study on carbohydrate-biphenyl-carbohydrate bolaamphiphiles shows the formation of chiral supramolecular assemblies in aq. solutions. Carbohydrate-conjugated anthracene carboximides show minimal cytotoxicity, excellent cell permeability and specific lectin binding properties.





Faculty & Staff

AT BIJU
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Honorary professor

S BHATTACHARYA

Honorary professors and INSA senior scientists

TUSHAR KANTI CHAKRABORTY
UDAY MAITRA

INSA senior scientist

S CHANDRASEKARAN

3.2.4

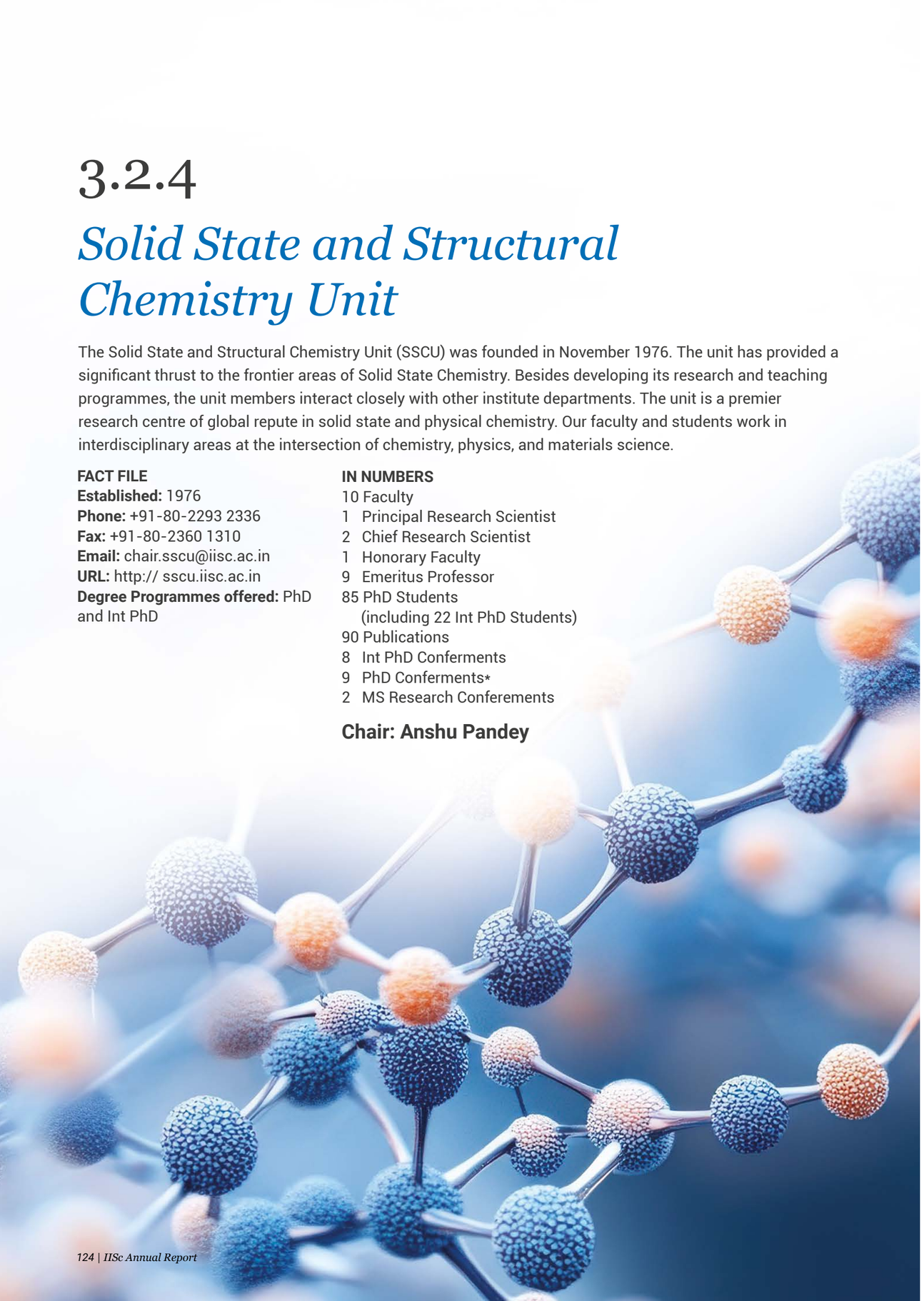
Solid State and Structural Chemistry Unit

The Solid State and Structural Chemistry Unit (SSCU) was founded in November 1976. The unit has provided a significant thrust to the frontier areas of Solid State Chemistry. Besides developing its research and teaching programmes, the unit members interact closely with other institute departments. The unit is a premier research centre of global repute in solid state and physical chemistry. Our faculty and students work in interdisciplinary areas at the intersection of chemistry, physics, and materials science.

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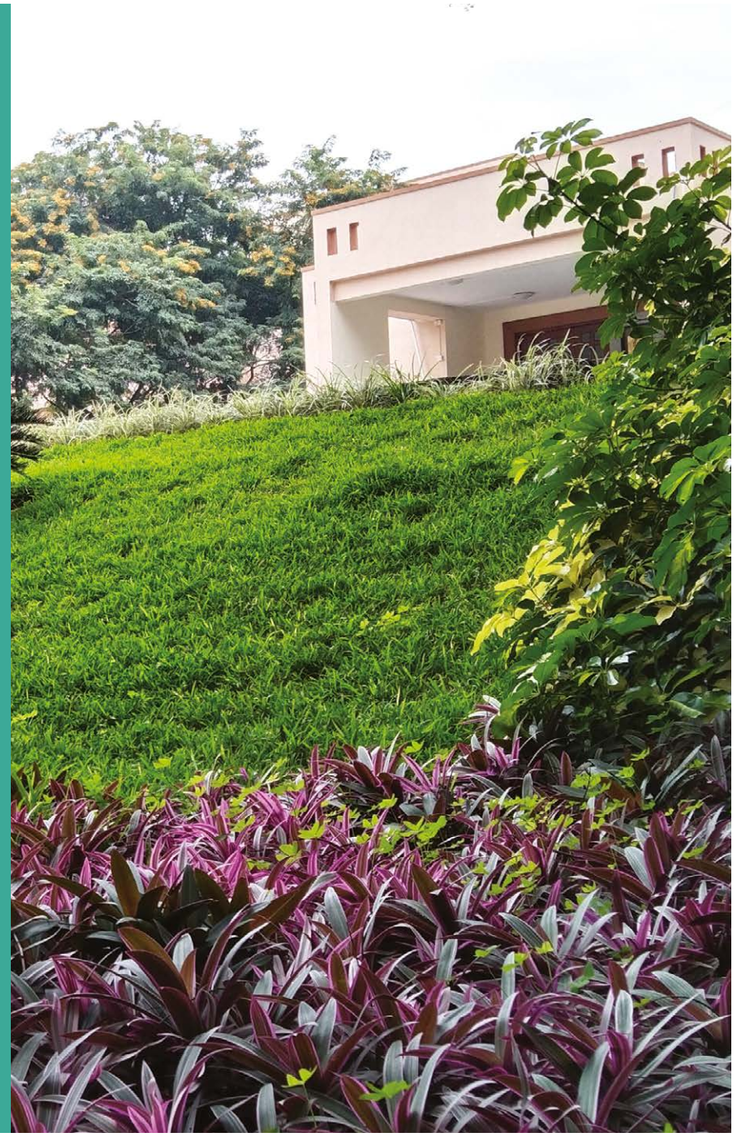
IN NUMBERS
10 Faculty
1 Principal Research Scientist
2 Chief Research Scientist
1 Honorary Faculty
9 Emeritus Professor
85 PhD Students
(including 22 Int PhD Students)
90 Publications
8 Int PhD Conferments
9 PhD Conferments*
2 MS Research Conferements

Chair: Anshu Pandey



Core Research

SSCU is a world-renowned premier centre with highly interdisciplinary research, spanning frontier areas lying at the intersection of chemistry, physics, and materials science. We develop nanomaterials and organic materials for solar cells, light-emitting diodes, photodetectors, batteries, catalysts for fuel cells, molecular magnetic materials, and soft biomaterials. We also specialise in developing novel spectroscopic techniques, such as ultrafast time-resolved and NMR methods, for characterising materials on fundamental and applied levels. To complement this experimental expertise, our faculty also develops theoretical and computational methods spanning areas of biophysics and condensed matter physics. In general, our faculty work at the interface of experiment and theory in a very interdisciplinary setting, as reflected in the composition of the SSCU faculty and students.



Current Research

Research theme at SSCU broadly falls under the verticals:
A) Quantum technologies,
B) sustainable materials and
C) semiconductor materials.
This research theme is summarised in the adjoining figure. Collaborations within SSCU and across departments aim to create synergy between these verticals.

RESEARCH HIGHLIGHTS:
Summaries of key research projects and their potential impacts on academia, society, or industry.

DEVICES AND MATERIALS
Satish Patil and co-workers were able to elucidate the dark triplet pair states in singlet fission in a variety of tailored molecules. Their findings have direct implications for new mechanistic insights into dark states in organic materials.

The brain coordinates activity across billions of neurons through collective oscillations rhythmic patterns that underpin

memory, perception, and learning. While neuromorphic engineering has made great progress mimicking local features like individual neuron spiking and synaptic plasticity, replicating the global oscillations, reminiscent of cognitive capability of brain, in hardware has remained elusive. We reported a new neuromimetic system. What makes our particularly interesting is the scale dependence. And its ability to be reconfigured by external stimuli.

Vanadium dioxide (VO2) is a prototypical correlated oxide with a temperature-dependent metal-to-insulator transition with a concomitant crystal symmetry change. In this work, the authors design and synthesise modulation-doped VO2-based thin film heterostructures that closely emulate a textbook example of filling control in a correlated electron insulator. Abhishek Mondal and co-workers showed how subtle variations in the solvent environment modulate lattice elasticity and, in turn, govern spin-state switching under external stimuli. The system demonstrates a finely balanced interplay between structural flexibility and cooperative interactions, enabling pressure-induced bistability and multi-stimuli responsiveness within a single porous framework.

SPECTROSCOPY
Vivek Tiwari and co-workers have shown that functional vibronic couplings that matter for photosynthetic activity can also survive in disordered environments. Magnetic Resonance Group research is focused on developing new magnetic resonance spectroscopic methods and techniques to elucidate structural and dynamical details of renewable energy materials such as semiconductors for solar energy harvesting, catalysts for biomass energy conversion reactions, and electrolytes.

THEORY
We have proposed a unified tropical geometric framework to study different facets of non-Hermitian systems. We expect that our formalism will stimulate further exploration in different fields of non-Hermitian physics and various topics in modern mathematics through the lens of tropical geometry.

MATERIALS DESIGN
Indian Patent: Granted with patent number 419208 on 25th January 2023.
Title: Hybrid Halide perovskite-derived compounds, materials and method of preparation thereof. Inventors: Debasmita Pariari, Sakshi Mehta, Abhishake Mondal, and D. D. Sarma.
Indian patent: Granted with Patent Number 422547 on 21st February 2023. Title: Substrate-integrated nano-structured nickel-iron ultra-battery. Inventors: Debasish Sarkar, A. K. Shukla, and D. D. Sarma

SPECTROSCOPY
Femtosecond Multidimensional Electronic Spectrometer with sensitivity ~300x higher than conventional approaches, only such experiment in India. Interesting applications in pump-probe imaging of organic semiconductors and biological materials. This work was also selected as Editors' Choice in J. Chem. Phys. Patent granted to Vivek Tiwari, Vivek Nagendra Bhat, Asha Sweety Thomas; WO2024134663 – System and method of variable repetition rate shot-to-shot rapid scan pump-probe and 2D electronic spectroscopy; Application No. 202241074681; Granted on 27.06.2024. PCT/IN2023/050664.

DEVICES
Sanchari Debnath, Satish Patil (2022), Diketopyrrolopyrrole compounds, preparation, and implementation thereof, Indian patent applications no. 202241066076.

Semiconductor nanocrystals, Date of Patent: January 4, 2022 Assignee: Indian Institute of Science, Inventors: Anshu Pandey, Biswajit Bhattacharyya, Guru Pratheep Rajasekar, Amit Kumar Simlandy
Patent on High Fidelity Single Photon Sources Filed (2025): Parna Roy, Parineeta Gogoi, Anshu Pandey (Priority Date: 2024).

Awadhesh Narayan's lab has discovered a van der Waals ferromagnetic low-pass filters with tunable Curie temperature (260 to 380 K) based on wafer-scale iron germanium telluride thin films. This is in collaboration with the experimental group of Prof. Faxian Xiu, Fudan University, China.



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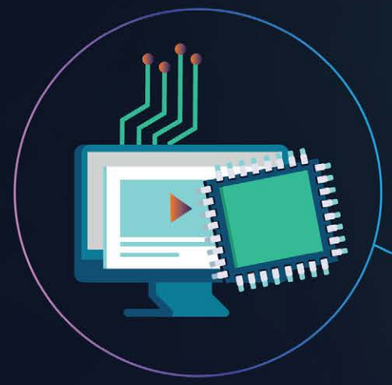
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3·3 *Division of Electrical, Electronics and Computer Sciences*

The Division is assiduously seeking fundamental advances in the following core areas: signal processing, communications, networks, microelectronics and devices, photonics, theoretical computer science, computer systems and software, artificial intelligence and machine learning, control and optimisation, power systems, power electronics and high voltage engineering.



Themes

A feature of the division's R&D activities is its focus on rigorous innovation in contemporary, interdisciplinary themes: cyber physical systems, big data analytics, 5G technologies, devices for healthcare, electronics for strategic sector, network science, cybersecurity, neuromorphic computing, image and video processing, and smart grids. The division is also actively participating in Institute level programmes on smart energy, smart water, smart cities, and devices for healthcare, and electronics for the strategic sector.

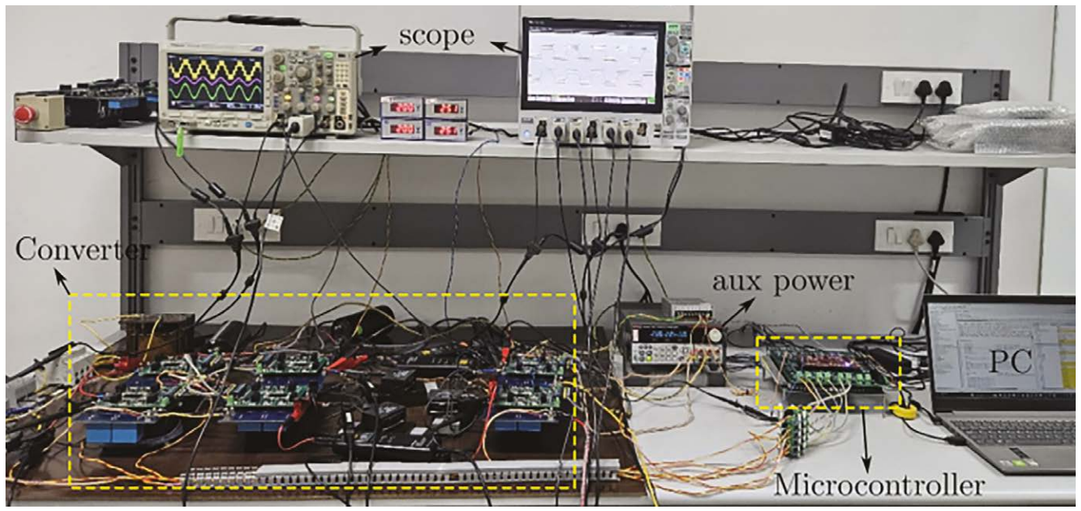
Departments | Centres | Units

- Department of Computer Science and Automation
- Department of Electrical Communication Engineering
- Department of Electrical Engineering
- Department of Electronic Systems Engineering

Novel fast charging solution for electric vehicles

Researchers at the Department of Electrical Engineering (EE) and collaborators have developed a novel cascaded H-bridge (CHB)-based multiport DC converter that directly connects to the medium-voltage AC (MVAC) electricity grid, eliminating the need for large and expensive line frequency transformers. Such converters can help address the growing power demands of fast charging EV stations, crucial for scaling up India's EV infrastructure. Along with power conversion, the technology facilitates a compact bidirectional charging hub that provides key advantages. In addition to powering multiple vehicles, it also enables local storage of charge in batteries, and can easily be hooked up to renewable energy sources like solar panels.

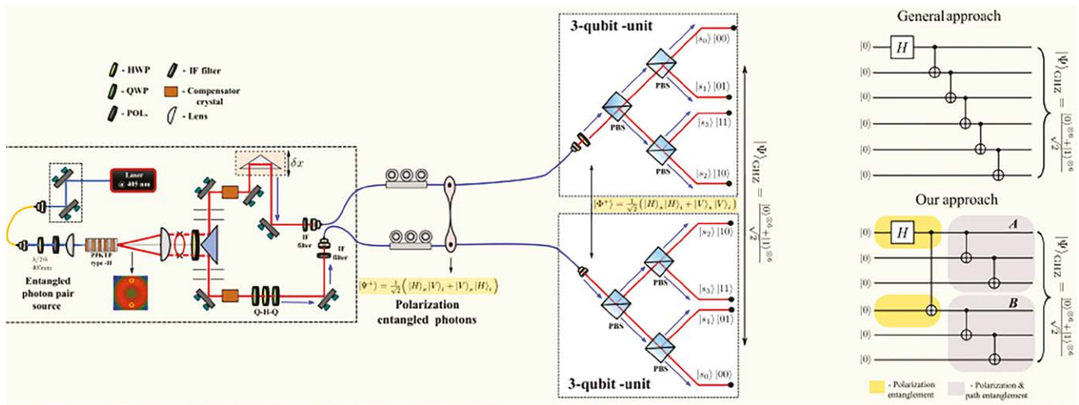
Reference:
Harisyam PV, Saichand K, Surjakanta M, Shashidhar M, Kaushik B, Medium voltage AC to isolated multiport DC converter for electric vehicle fast-charging stations, IEEE Transactions on Industrial Electronics (2025).



Making quantum computers using a packet of light

Like classical computers, quantum computers can use AND, OR, and NOT logic gates, called quantum gates. Researchers at the Department of Electronic Systems Engineering (DESE) have now designed these universal quantum gates by manipulating single photons to function as a set of three qubits. Each photon has two polarisation states, which forms an intrinsic qubit. To encode more qubits, they distributed a single travelling photon into two spatial paths in superposition twice, and recombined the paths. They then used the same setup to entangle the state of two such photons. This effectively created a six-qubit system. The study presents a way to take a leap forward towards the ultimate goal of creating quantum computers.

Reference:
Sengupta K, Dinesh SP, Shafi KM, Asokan S, Chandrashekar CM, Experimental realization of universal quantum gates and a six-qubit entangled state using a photonic quantum walk, Physical Review Applied (2025).



Redefining GaN power devices for adoption in EVs and data centres

Researchers at the Department of Electronic Systems Engineering (DESE) have uncovered fundamental insights into designing gallium nitride (GaN) power transistors, making them safer and easier to utilise in high-value electronics such as electric vehicles and data centres. They showed that the device behaviour depends on whether the p-GaN layer is fully or partially depleted. The team also designed new metal-based gate stacks that can cut gate leakage by up to 10,000 times, while improving threshold stability and reaching gate breakdown voltages up to ~15.5 V. Such advancements can boost the deployment of GaN technology in applications where reliability, robustness, and performance margins are paramount, opening up indigenous opportunities to leapfrog in providing advanced electronic solutions.

Reference:
Malik RR, Joshi V, Chaudhuri RR, Thakare AV, Shrivastava M, Achieving ultrahigh threshold voltage in enhancement-mode AlGaN/GaN HEMTs with an AlxTiyO/p-GaN integrated gate stack—Part II, IEEE Transactions on Electron Devices (2026).
Malik RR, Chaudhuri RR, Joshi V, Karthik SR, Shrivastava M, Physical insights into turn-on mechanisms in p-GaN gate AlGaN/GaN HEMTs—Part I, IEEE Transactions on Electron Devices (2025).

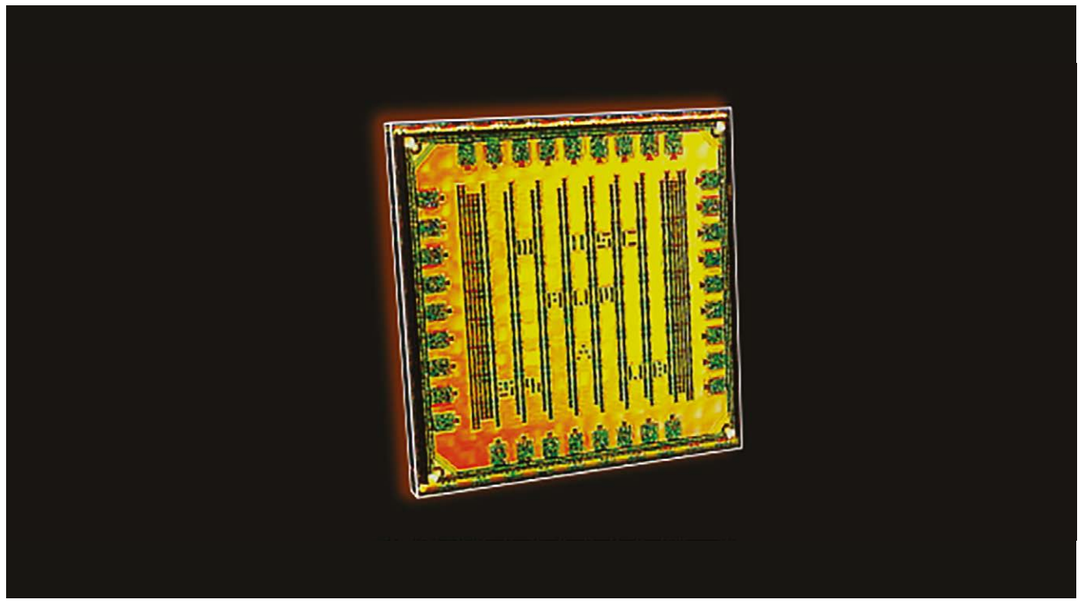


Research Snapshots
2025-26

Efficient quantum-safe crypto chip for IoT security

Researchers at the Department of Electronic Systems Engineering (DESE) have demonstrated a compact and low-power chip implementing quantum-safe cryptography for the Internet of Things (IoT). This is the first custom ASIC (Application-Specific Integrated Circuit) demonstration of hardware-accelerated signature verification for SQIsign, an attractive candidate for securing IoT applications such as secure boot, firmware update, certificate validation, and server authentication. The team's hardware accelerator chip, implemented in 28nm CMOS technology, demonstrates SQIsign-1D uncompressed signature verification with an order of magnitude improvement in performance and energy efficiency compared to state-of-the-art assembly-optimised software. The results show that SQIsign is a promising quantum-safe digital signature candidate for IoT applications.

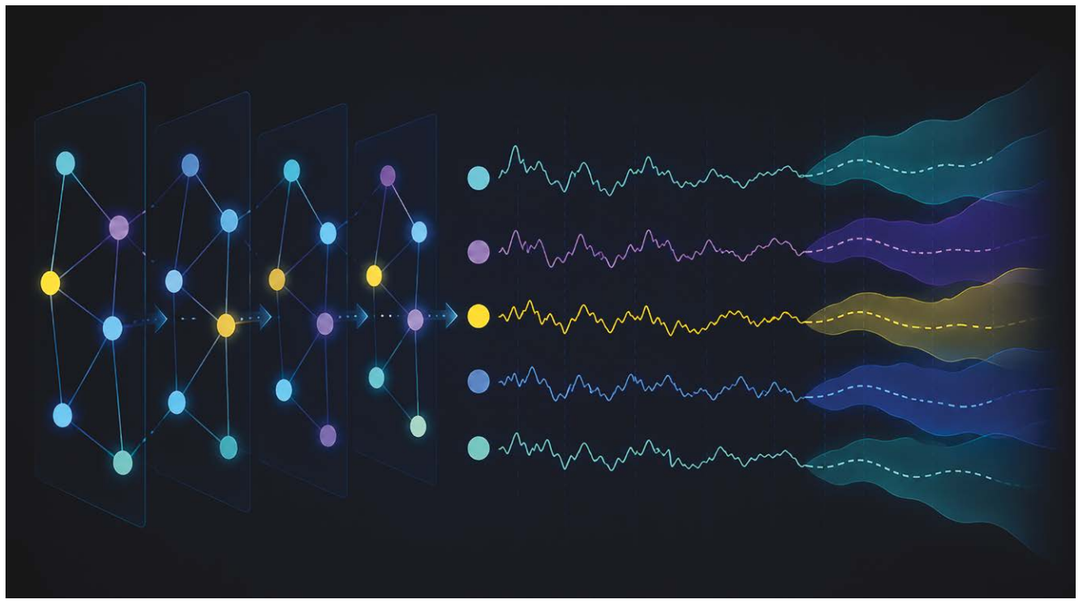
Reference:
Ramapragada KST, Banerjee U, A 0.05mm2 1.19-to-7.34mW SQIsign-1d isogeny-based post-quantum signature verification accelerator for IoT, IEEE International Solid-State Circuits Conference (ISSCC) (2026).



A new framework for predicting graph time series

Researchers at the Department of Electrical Communication Engineering (ECE), with collaborators, have developed a conformal prediction framework for quantifying uncertainty in graph time series, which capture both temporal dynamics and relationships between interconnected nodes. Existing approaches typically address time series and graph structures separately, overlooking either temporal patterns or underlying graph topology. The new sequential prediction framework leverages graph structure to capture pairwise dependencies while providing user-specified coverage guarantees. The team shows that its approach produces exponentially smaller prediction regions than graph-agnostic methods. Tests on real-world datasets show that it maintains the desired empirical coverage while reducing prediction region sizes by up to 80%.

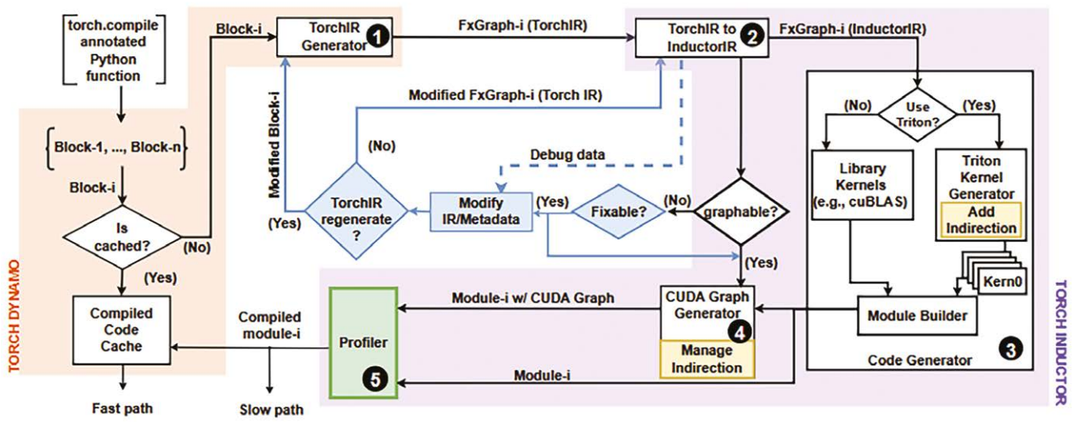
Reference:
Dua S, Mateos G, Chepuri SP, Conformal Inference for Time Series over Graphs, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) (2026).



Systems support for GPU-driven machine learning pipelines

Today, GPUs or graphics processing units, are the workhorses of AI/ML-driven computing. While GPUs often account for the majority of the cost of AI/ML-driven services, they are often underutilised. This, in turn, drives up the cost of AI/ML-based computation. Researchers at the Department of Computer Science and Automation (CSA) find that a growing semantic gap between how GPUs are programmed and the intricate performance features of modern GPUs is to blame. They demonstrated how compilers for popular AL/ML programming frameworks such as PyTorch can be enhanced to bridge this semantic gap. This technique, named GraCE, does not require changes to the already-written software nor to the existing GPU hardware. Through a novel use of a level of indirection, it improves GPU hardware utilisation, lowering the cost of computation.

Reference:
Ghosh A, Nayak A, Panwar A, Basu A, GraCE: Unlocking CUDA Graphs with compiler support for ML workloads, Proceedings of the 20th USENIX Symposium on Operating Systems Design and Implementation (2026).



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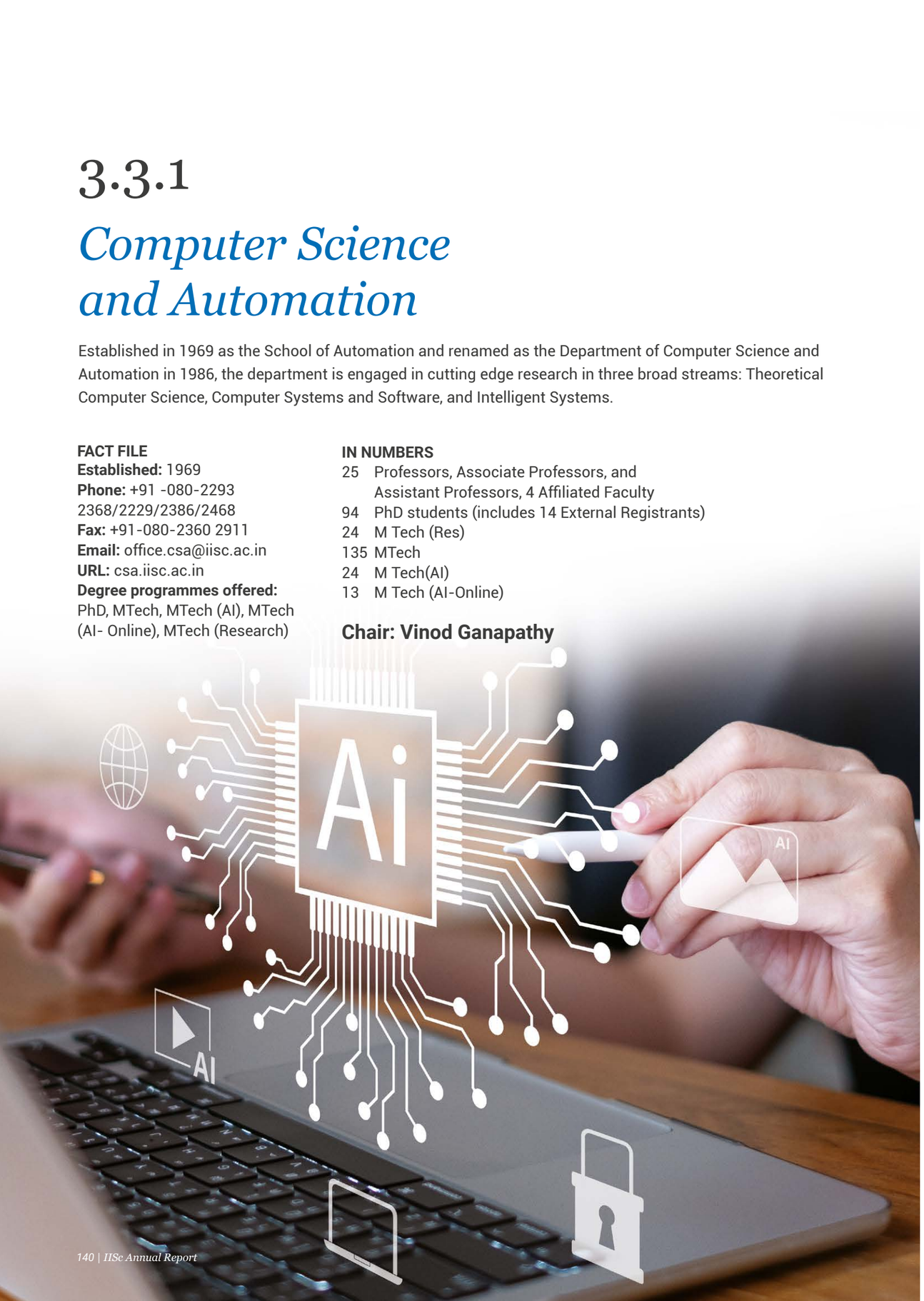
Computer Science and Automation

Established in 1969 as the School of Automation and renamed as the Department of Computer Science and Automation in 1986, the department is engaged in cutting edge research in three broad streams: Theoretical Computer Science, Computer Systems and Software, and Intelligent Systems.

FACT FILE
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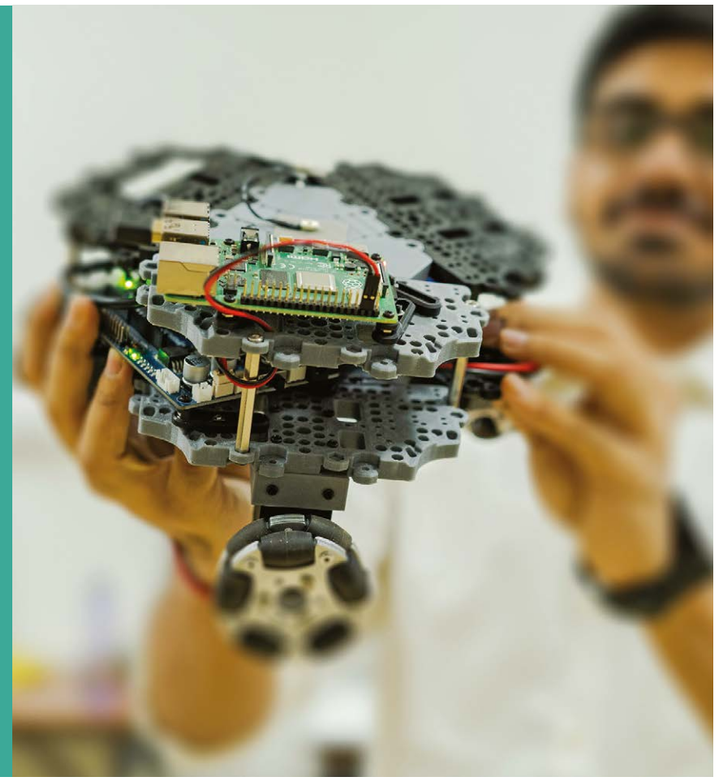
IN NUMBERS
25 Professors, Associate Professors, and Assistant Professors, 4 Affiliated Faculty
94 PhD students (includes 14 External Registrants)
24 M Tech (Res)
135 MTech
24 M Tech(AI)
13 M Tech (AI-Online)

Chair: Vinod Ganapathy



Core Research

Algorithms, Complexity Theory, Geometry, Cryptography, Distributed Computing, Game Theory, Graph Theory, Programming Languages, Software Engineering, High-performance Computing, Compilers, Computer Architecture, Operating Systems, Databases, Systems Security, Scientific Visualisation, Machine Learning, Reinforcement Learning, Mechanism Design, Stochastic Approximation Algorithms, Stochastic Optimisation and Control, Computational Biology, Data Analytics in Computer Systems, Robotic Systems, Data-Driven Safety.



Current Research

CSA faculty made contributions across the entire gamut of computer science, some of which we highlight below:

Constructed a second price (Vickrey) auction protocol (SPA), which does not require any auctioneers and ensures total privacy in the presence of rational parties participating in the auction. In particular, the confidentiality of the highest bid and the identity of the second highest bidder are protected. We model the bidders participating in the second price auction as rational, computationally bounded and privacy-sensitive parties. These are self-interested agents who care about winning the auction more than learning about the private bids of other parties. A rational party does not deviate from the protocol arbitrarily but does so only for its own individual 'advantage' – without any consideration for others. Such an advantage is modelled using suitable utility functions.

Bin packing is a fundamental problem in computer science and optimisation. Best-Fit is a widely used algorithm for bin packing, and it has been studied by many stalwarts (including Turing Award winners such as Ullman, Yao, Karp, etc.) of computer science. Kenyon, in 1996, conjectured that the most practical algorithm for bin packing is to apply Best-Fit into randomly permuted items. This conjecture also initiated a subarea of beyond worst-case analysis called random-order arrival. In their recent SODA paper, Arindam and his students (PhD student KVN Sreenivas and BS student Anish Hebbar) made the first progress on the conjecture after three decades. This is the first instance of a SODA paper co-authored by an IISc UG.

Established the NP-hardness of testing equivalence to depth two arithmetic circuits, also known as sparse polynomials. The result, which is obtained via direct reduction from the 3SAT problem, provides supporting evidence for NP-hardness of the

Minimum Circuit Size Problem (MCSP) for homogeneous depth three arithmetic circuits. Proving the hardness of MCSP for both Boolean and arithmetic circuits is a long-standing open problem in complexity theory. This work has appeared in the proceedings of the 51st EATCS International Colloquium on Automata, Languages and Programming (ICALP 2024).

Addressed fairness in resource allocation and machine learning contexts. Continued to contribute to the interface of Computer Science and Mathematical Economics with a focus on (i) Collective Welfare as Algorithmic Objectives: The goal here is to revisit standard performance metrics (e.g., regret) with a fairness lens. (ii) Fair Division under Constraints: This thread of work addresses the impact of combinatorial constraints on existential and algorithmic fairness guarantees.

Introduced the notion of Continuous Scatterplot Operator (CSP) as a means to query and interactively analyse bivariate fields. Demonstrated their use in the study of electronic transitions in a comprehensive application study. As a follow-up to previous work on computational methods for tracking salinity movement in the ocean, we introduced an advection-based feature definition that represents the movement of high salinity water, developed algorithms to track their evolution over time, and used them to establish observations in the Bay of Bengal. Developed novel algorithms for simplifying the Jacobi set of bivariate fields and for constructing a topological descriptor called the time-varying extremum graph, with applications to tracking features in time-varying scalar fields. Proposed a geometric optimisation criterion for homology cycles that represent holes in topological spaces, and polynomial-time algorithms for computing optimal cycles.

Studied secure multiparty computation in the asynchronous setting with perfect security and optimal resilience (less than one-fourth of the participants are malicious). It has been shown that every function can be computed in this model [Ben-OR, Canetti, and Goldreich, STOC 1993]. Despite 30 years of research, all protocols in the asynchronous setting require communication complexity for computing a circuit with C multiplication gates. In contrast, for nearly 15 years, in the synchronous setting, it has been known how to achieve communication complexity (Beerliova and Hirt; TCC 2008). The techniques for achieving this result in the synchronous setting are not known to be sufficient for obtaining an analogous result in the asynchronous setting. Closed this gap between synchronous and asynchronous secure computation and showed the first asynchronous protocol with communication complexity for a circuit with C multiplication gates.

Focused on the problem of design and analysis of variants of digital signature schemes that are quantum-safe. After some initial investigation in the multivariate quadratic (MQ) setting, we have initiated work in lattice-based signatures. We look at the problem of designing ID-based and other signature schemes with tight security reduction. To that end we revisited some existing generic approaches and identified some critical gaps in the security definition as well as the security reduction. We addressed this gap by rigorous security proofs under the standard security definition. In addition, we are exploring the problem of quantum money where stronger security guarantees are possible based on quantum mechanical principles, as well as various privacy-enhancing protocols, like identification, that can additionally be quantum-safe.

Provided an approximate linear programming formulation for a multi-agent cooperative Markov decision process and provided a numerical scheme for its solution. The approximate LP incorporates function approximation not just on the value function but also on the constraints. In yet another work, we developed families of generalised simultaneous perturbation-based zeroth-order stochastic optimisation algorithms where the number of function measurements used in the estimator decides the level of accuracy of the resulting gradient estimate. In the class of actor-critic algorithms, it has been observed that running a few recursions of the critic update in between two successive updates of the actor results in improved performance. We presented a



hybrid optimisation algorithm that optimises in the continuous space of parameters as well as the discrete space of the number of instants and suggests optimally the number of steps to follow in between two successive critic updates.

Made progress on the following problems:

1. Inference problems on graphical models
2. Model editing
3. Machine learning for quantum physics

(1) The total colouring conjecture (TCC) is a classical problem. A weakened version of TCC was known to be true for graphs of chromatic number at most 4. We extended the result to the case where the chromatic number is at most 5. This was a long-pending case. Also studied the total colouring conjecture, connecting it to Hadwiger's conjecture.

(2) We proved new bounds on the anti-Ramsey numbers of star graphs via maximum edge q-colouring. Erdős introduced this problem in the seventies and there has been renewed interest recently.

(3) Presented a near-linear time algorithm for parcel delivery using drones.

(4) Another applied problem we worked on was the use of graph theory in quantum physics. There was a question raised by the Nobel Prize-winning Anton Zeilinger and his student Mario Krenn. We made some interesting progress on that problem.



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3.3.2

Electrical Communication Engineering

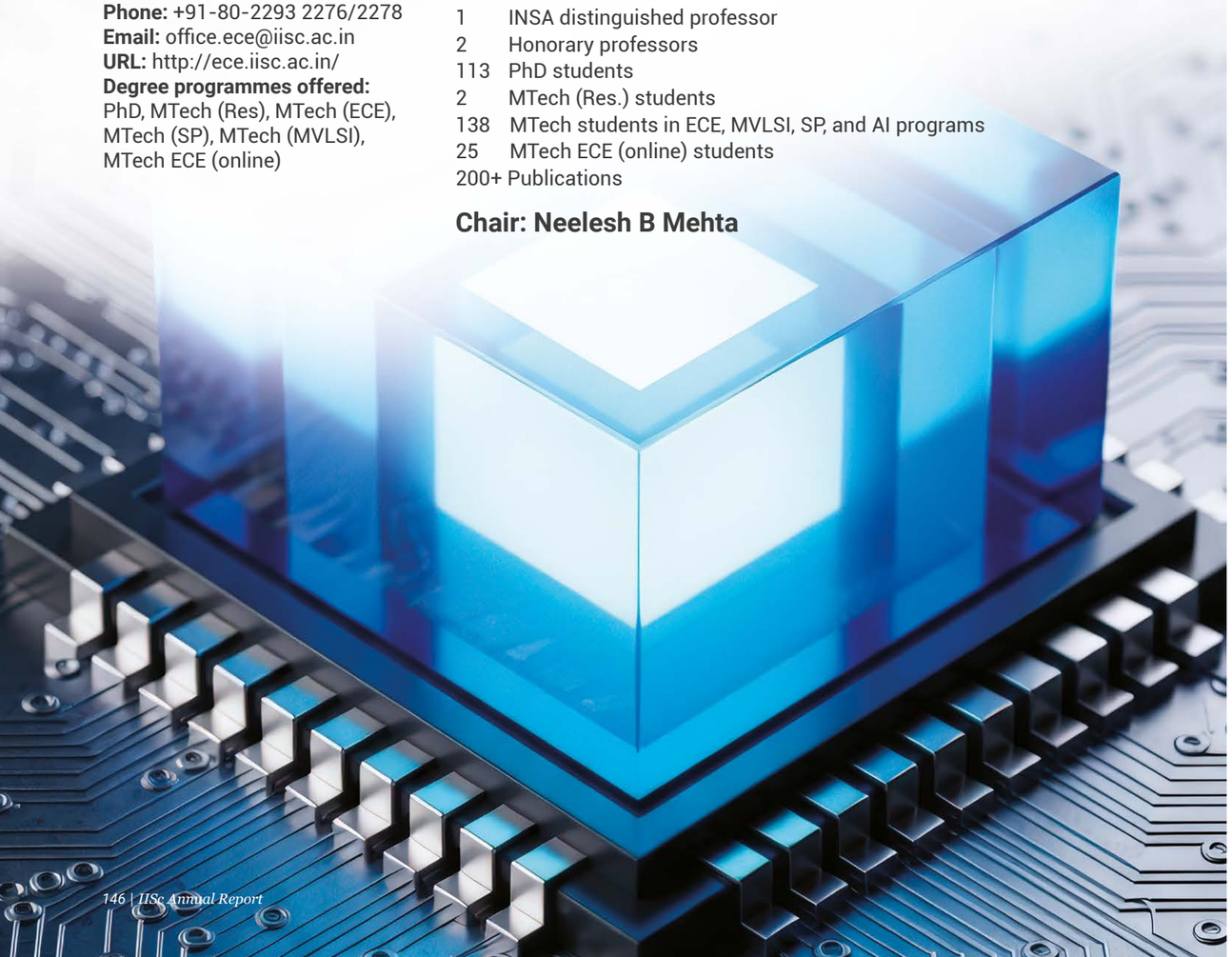
Started modestly as a Communications Laboratory in 1923 in the then Department of Electrical Technology, the ECE Department was made a formal entity in 1947. The department has been conducting cutting-edge research on information theory, coding theory, 5G and beyond wireless communications, networks, signal processing, video analytics, machine learning, quantum communications, nanoelectronic devices, photonics, electromagnetics, quantum communications and devices, and RF sensors. In addition to contributing to the research and development workforce of the country in the above areas, the department has nurtured close engagement with public and private sector industries over many years. The department hosts research talks, webinars, workshops, conferences, and other events on cutting-edge topics of interest to researchers, industry, and the general public.

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Degree programmes offered:
PhD, MTech (Res), MTech (ECE), MTech (SP), MTech (MVLSI), MTech ECE (online)

IN NUMBERS

25 Academic staff
1 INSA distinguished professor
2 Honorary professors
113 PhD students
2 MTech (Res.) students
138 MTech students in ECE, MVLSI, SP, and AI programs
25 MTech ECE (online) students
200+ Publications

Chair: Neelesh B Mehta



Core Research

Wireless communications, Information Theory, Coding theory, Networks, Signal Processing, Machine Learning, Artificial Intelligence, Photonics, Electromagnetics, Nanoelectronic Devices, and Quantum Communications



Current Research

Wireless Communications, Information and Coding Theory, and Signal Processing

The research focused on information theory, coding theory, quantum error correction, and computational genomics, with emphasis on reliable communication and efficient data recovery. Key contributions include new constructions for weakly constrained and Reed–Muller codes, efficient decoding algorithms, fault-tolerant CSS quantum codes, and recoverable systems on lattice models. The work also advances directed information estimation for communications and causality, nanopore signal classification, genome assembly coverage analysis, and substitution-rate estimation from genomic reads. Combining rigorous mathematical foundations with practical applications, the research spans classical and quantum coding, statistical physics, communication systems, and computational biology, emphasising efficient decoding, reliability, scalability, and fault tolerance in modern information-processing systems. Another thread of research focuses on coded caching and efficient content delivery in multi-access, device-to-device and hierarchical networks, with emphasis on privacy, security and robustness. Key contributions include function-correcting codes with data protection, private information retrieval for vehicular networks and coded retrieval from distributed servers. The work also develops combinatorial designs and novel delivery schemes for scalable, low-delay and communication-efficient networked systems. Function-Correcting codes have been designed.

We worked on advanced wireless communication and sensing techniques for 5G/6G systems, particularly RIS/IRS-aided MIMO and mmWave networks. Key contributions include methods to exploit and/or mitigate beam-split and spatial-wideband effects, improve joint channel estimation and data detection, and enhance network energy efficiency. The work also extends to sparse estimation and control of dynamical systems, compressed sensing, federated learning, and signal processing applications in biomedical and underwater acoustic systems. Some innovations have been prototyped and demonstrated at the IISc 5G laboratory.

We focused on the design, modelling, analysis, and optimisation of wireless communication systems, which includes 5G/6G cellular systems and WiFi. We proposed a novel energy-efficient feedback-enhanced successively reordered transmissions scheme that combines distributed multiple access-based ordered channel access, feedback, and quantised payloads. We developed a novel, accurate analysis of the saturation

throughput and average access delay of IEEE 802.11ax's hybrid medium access control protocol. We proposed latent Thompson sampling-based beam selection algorithm for accurate millimetre-wave beam selection and tracking in 5G systems. We analysed the mixed-numerology, multiuser MIMO-OFDM system employed in 5G and developed techniques to mitigate inter-numerology interference. For downlink non-orthogonal multiple access, we developed a new algorithm that jointly adapted the users' modulation and coding schemes and transmit powers to ensure fairness and achieve high spectral efficiency.

We focused on novel view synthesis and perceptual quality assessment. We developed novel regularisation and adaptive densification algorithms for sparse-input neural radiance fields and 3D Gaussian Splatting, significantly improving novel view synthesis from limited input images. For dynamic scenes, we introduced bidirectional flow representations and temporally aware densification strategies to better capture scene motion. We further developed latent diffusion model-based no-reference image and video quality assessment algorithms with strong cross-dataset generalisation. We introduced new subjective datasets and learning-based algorithms for multispectral remote sensing image quality assessment.

Machine learning, Artificial Intelligence, Optimisation, Control, and Networks

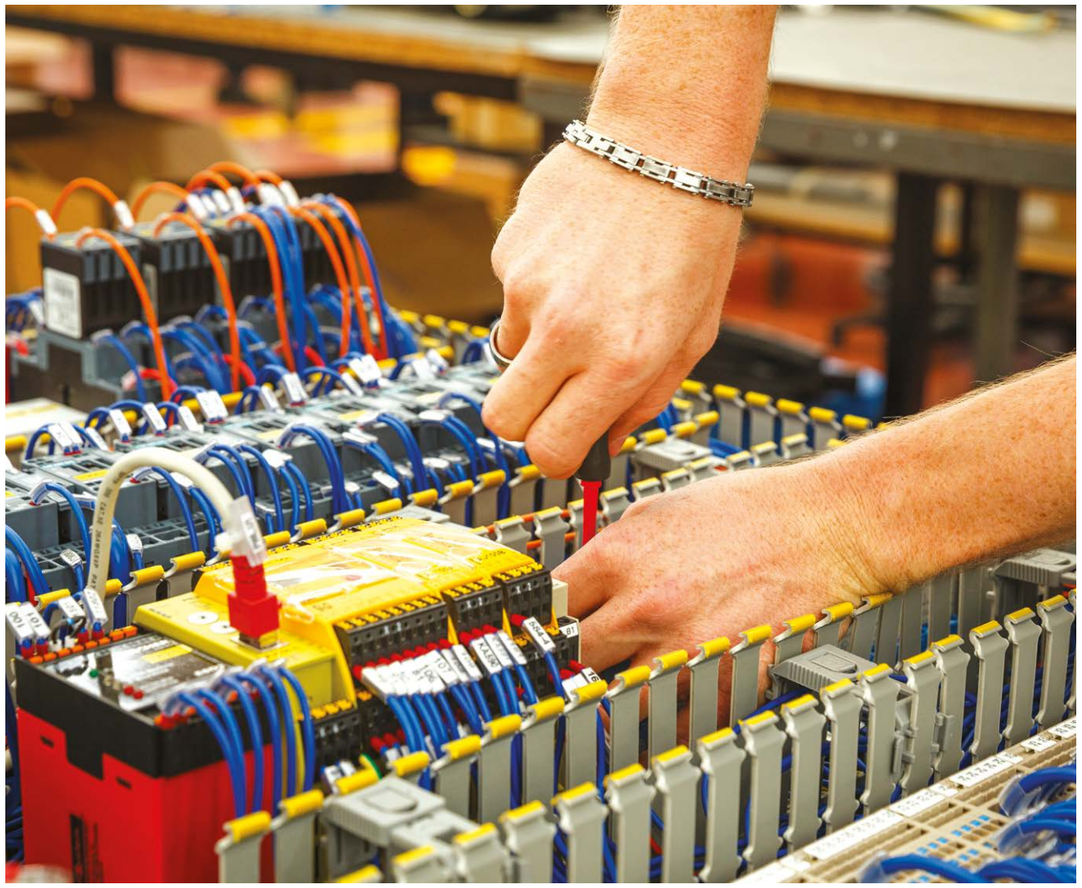
The department enabled research on healthcare data infrastructure in India, by introducing a quality-graded platform (MIDAS) for AI-driven healthcare. The platform employs a hub-and-spoke system for data collection, where each thematic hub works with a set of spokes to collect data for a specific disease or medical condition from primary, secondary, and tertiary health centres. The department was also involved in developing a mobile phone-based, white-light imaging-based edge AI device for oral potentially malignant disorder screening. The tool was recognised at the India Mobile Congress 2025 as the "Best Education Institute Exhibit of the Year".

We studied a security issue in random-walk (RW) based decentralised learning, where a "Pac-Man" attack silently kills random walks at malicious nodes, disrupting the learning process. To defend against this, the proposed Average Crossing (AC) method duplicates random walks to maintain stability and ensures convergence of learning even under attack, supported by both theory and experiments.

We focused on three overarching themes: uncertainty quantification in machine learning systems, temporal graph representation learning, and decentralised constrained learning. In uncertainty quantification, we developed conformal inference methods that exploit graph structure to provide compact uncertainty regions for graph time-series predictions. We also developed topology-aware state-space models for capturing long-range spatial and temporal dependencies in continuously evolving graphs. In decentralised constrained learning, we developed communication-efficient, projection-free methods for collaborative learning in federated and decentralised settings with heterogeneous, non-IID data.

We studied how to efficiently run large language models (LLMs) on distributed systems like PETALS, where model blocks are shared across many low-end GPUs over the internet and proposed optimised methods for assigning model blocks and routing requests to reduce inference time, with proven performance improvements through theory, simulations, and experiments.

We focused on advancing reliable machine learning, with key publications at ICML and ICLR covering symmetry discovery, trustworthy LLM fine-tuning, and data attribution. We also expanded our work in scientific machine learning and medical AI, developing complex-valued neural operators and generative frameworks presented at venues including AAAI and TMLR. This clinical research effort was further supported by an ICMR grant to develop AI-assisted neurosurgical planning tools in collaboration with AIIMS Delhi. On the translational front, our fundamental research into context intelligence saw continued commercial deployment through LatentForce.ai. We contributed to broader



technology governance through a recent appointment to the Government of Karnataka's Committee for Responsible AI.

The department also probed when reinforcement learning and preference-based learning algorithms fail and how to repair them, once we leave the idealised tabular, realisable regime for function approximation and model misspecification. We showed that the widely used DQN algorithm can converge to fixed points that are no better than, and sometimes strictly worse than, the initial policy, even when it sees all states and actions infinitely often. Separately, we showed that the well-known Direct Preference Optimisation (DPO) algorithm is fundamentally a mis-specified statistical estimator prone to preference order reversal, worsening of policy reward, a nd high sensitivity to the input data distribution. We proposed a fix to provably mitigate this issue. Complementing these cautionary results, Reliable and Conservative Policy Iteration (RPI/CRPI) was developed, which retained tabular monotonicity and per-step improvement guarantees under function approximation. We characterised exactly when simple algorithms still recover optimal behaviour despite badly mis-specified value models.

We advanced sequential inference and learning under weak distributional assumptions. We obtained sharp results for power-one sequential tests, including the first second-order characterisation of an optimal sequential mean test, and developed asymptotically optimal testing procedures for Markovian data. Other contributions included regret-tail characterisations for nonparametric bandits, new insights into testing-by-betting, and new betting strategies with tight iterated-logarithmic regret. We also developed new results on stochastic approximation with heavy-tailed Markovian noise and on the general theory of sequential testing.

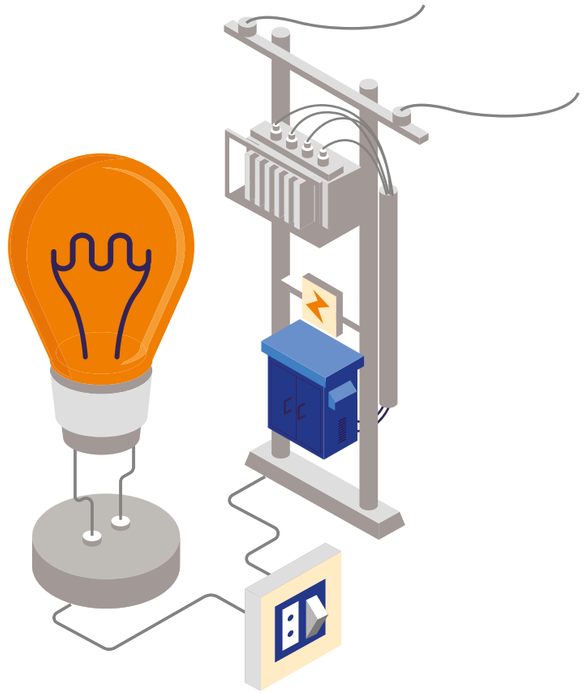
NanoElectronics, RF, Microwaves, Photonics, and Lasers

We demonstrated that conventional unidirectional ring-cavity-based Yb fiber lasers can provide low-noise pump sources for cascaded random Raman fiber lasers and supercontinuum generation in standard telecom fibers. Our RF-resolved noise measurements revealed that mid- and high-frequency pump intensity noise critically governs Raman spectral purity and supercontinuum noise. We established practical design guidelines for realising low-cost, low-noise broadband fiber sources for SWIR imaging, quantum photonics, and sensing applications.

We developed a radar technique to prevent spoofing attacks and false target detection in automotive and indoor radar systems. We proposed a machine learning method to correct aging-induced frequency drift in on-chip clock generators. We designed a radar waveform for accurate Doppler detection without extra synchronisation hardware. We also developed an integrated noise-cancelling low noise amplifier for wideband radar and communication receivers.

In collaboration with UCC, Ireland, we formulated a novel 1D-FDTD framework which introduces a generalised update scheme for interconnected transmission line (TL) junctions and lumped-element resonators using modified Telegrapher's equations and custom boundary conditions (BCs). We developed an active one-bit coded anomalous reflector using PIN diodes, which works as an RIS in the sub-6 GHz band. We developed an automated method for designing pixelated metasurfaces using Particle Swarm Optimisation (PSO) with MATLAB and CST Microwave Studio simulations.

We demonstrated infrared photodetection without using a low-bandgap material by exploiting hot electron valve engineering. This work involved the whole flow from design, developing a hot electron model, fabrication of a heterojunction device, infrared photodetection characterisation, and system-level integration. We developed a novel sub-diffraction limit optical probing technique by using a nano-pillar-induced isotropic strain on a metallic substrate. The technique allowed us to experimentally observe, for the first time, Moiré-trapped biexciton that is nontrivially stabilised inside a single Moiré pocket. We showed through a quantum mechanical model (using a variational principle) that such stabilisation is possible for a triplet state due to a strong attractive exchange interaction, which overcomes the expected repulsive direct Coulomb interaction.





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P VIJAY KUMAR
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Adjunct Faculty

RAMESH HARIRAHARAN
PhD (New York) Adjunct Professor

VIKRAM SRINIVASAN
PhD (UC San Diego), Adjunct Faculty

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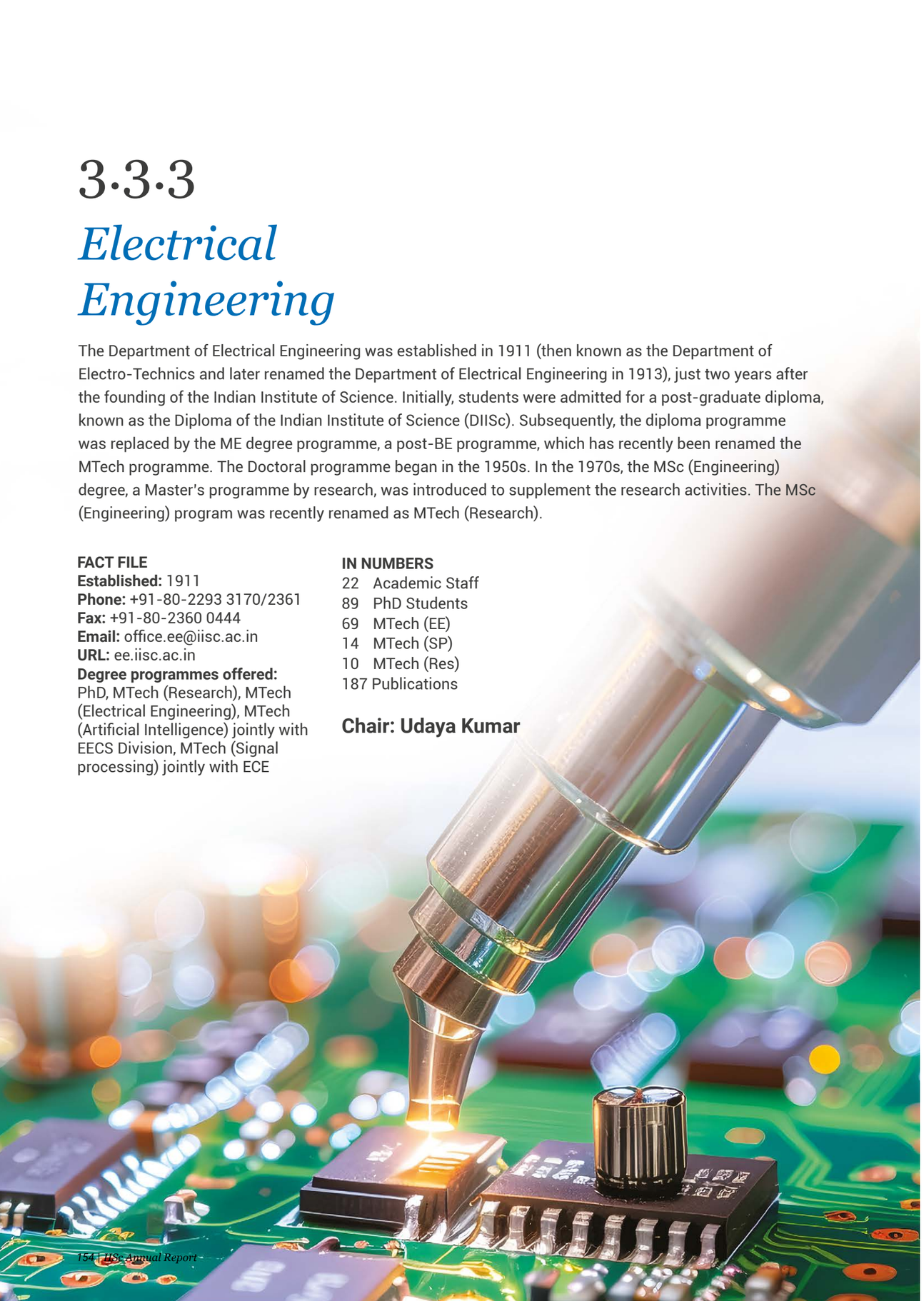
Electrical Engineering

The Department of Electrical Engineering was established in 1911 (then known as the Department of Electro-Technics and later renamed the Department of Electrical Engineering in 1913), just two years after the founding of the Indian Institute of Science. Initially, students were admitted for a post-graduate diploma, known as the Diploma of the Indian Institute of Science (DIISc). Subsequently, the diploma programme was replaced by the ME degree programme, a post-BE programme, which has recently been renamed the MTech programme. The Doctoral programme began in the 1950s. In the 1970s, the MSc (Engineering) degree, a Master's programme by research, was introduced to supplement the research activities. The MSc (Engineering) program was recently renamed as MTech (Research).

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Degree programmes offered: PhD, MTech (Research), MTech (Electrical Engineering), MTech (Artificial Intelligence) jointly with EECS Division, MTech (Signal processing) jointly with ECE

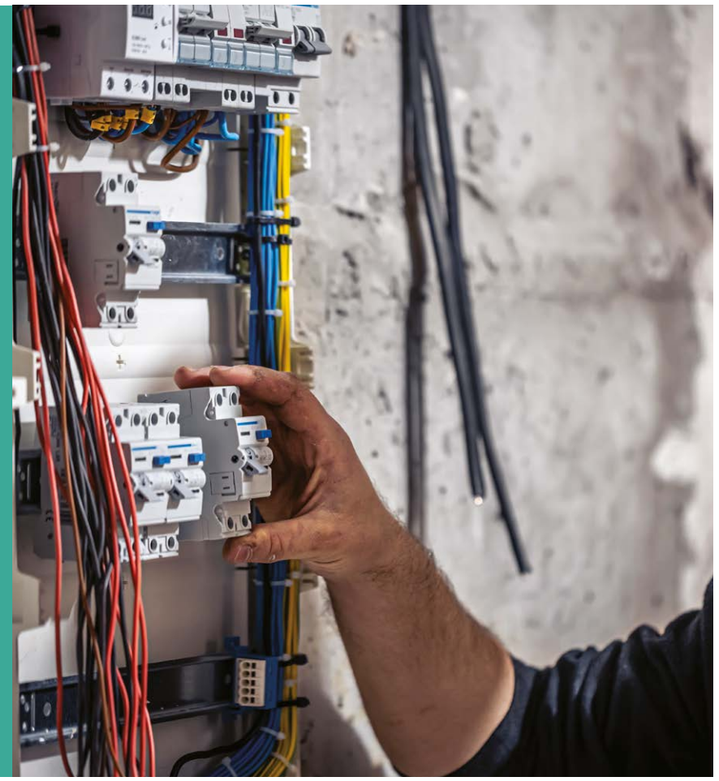
IN NUMBERS
22 Academic Staff
89 PhD Students
69 MTech (EE)
14 MTech (SP)
10 MTech (Res)
187 Publications

Chair: Udaya Kumar



Core Research

The research work of the Department of Electrical Engineering falls into two major fields, namely i) Power and ii) Systems and Signal Processing. The first area includes Power Systems, Power Electronics and High Voltage Engineering. The Systems and Signal Processing research area includes Machine Learning and AI, Large Language Models, Real-Time Systems, Medical Imaging, Image and Video Processing, Digital Health, Speech and Audio Signal Processing, Control and its application to robotics, Networked control and Multi-agent Systems.



Current Research

Power Systems: An open-source, heterogeneous, resource-constrained hardware platform is developed for the application of edge computing in the smart grid using a unique hardware platform called Parallella, which hosts a Zynq SoC (dual-core ARM + FPGA) and a 16-core co-processor called Epiphany. The raw waveform data is sent to a cloud server over a bandwidth-limited communication channel using a custom anomaly-aware data compression algorithm implemented on the ARM. Phasor measurement algorithms are implemented on the FPGA. A parallel power quality measurement algorithm is implemented on the Epiphany.

In the area of power system protection, a simple linear programming algorithm running in the central master controller to coordinate the relays using three different IEEE standard curves has been developed. The most pressing challenges in modern power grids are sustaining stable operation of renewable-heavy, power-electronics-dominated grids, where reduced system inertia and weak-grid conditions threaten resilience against both small- and large-signal disturbances. To address this, dedicated research efforts are made that involve the use of modern control-theoretic frameworks to the problem, combining optimal and robust control methods with machine-learning and neural-network-based data-driven approaches. It is rigorously validated through extensive hardware-in-the-loop (HIL) testing, ensuring solutions are proven against real-world conditions faced by today's power systems.

Power Electronics: Research in power electronics has been at multiple levels, namely, component, subsystem, power converter, common applications, and niche applications. Component-level activities have focused on characterisation and modelling of wide bandgap (WBG) power semiconductor devices,

high-frequency power magnetics, and magnetic materials for high-speed electrical machines, including the development of the required characterisation setups. Subsystems developed include gate drivers, protection circuits, active and passive filters, digital controller hardware, and monitoring systems.

WBG device-based inverters for electric vehicle (EV) motor drives, ac-dc power factor correction converters, power converters for partial power processing, single-stage single- and three-phase ac-dc isolated converters for EV chargers, and reconfigurable EV chargers that can cater to 2, 3, and 4-wheeler segments have been developed successfully.

Development of switched capacitor multilevel inverters for PV applications has been initiated. Power electronic interfaces and fast equaliser circuits for electrochemical storage elements such as Li-ion, hydrogen electrolyzer and ultracapacitors have also been developed. Major achievements include high-voltage power supplies for next-generation x-ray systems, which reduce stray dose and improve image quality, novel high-frequency soft-switching power conversion with high-step-down gain for powering next-generation processors, and compact low-droop pulsed power supplies for ground-based and airborne phased array radar systems. Novel pulse width modulation (PWM) techniques for multi-phase motor drives, current and torque control techniques for switched reluctance motor, output power control techniques for switched reluctance generator, and control of multi-port dc-dc converters are other research highlights.

High Voltage Engineering: Research based on cold plasma techniques has successfully reduced numerous gaseous pollutants through a cascade of plasma and ozone treatments. In a new initiative, the cold plasma is employed to treat the seeds for a better yield. Pollution-induced flashover studies on EHV/UHV transmission insulators, condition monitoring of HV apparatus, corona, HVAC and HVDC studies on multi-stress aging on composite insulators and polymeric housed surge arresters, development of superhydrophobic coatings for polymeric insulators and studies on high-temperature high-current low-sag (HTLS) conductors have been pursued. In the area of high-voltage transformers, closed-form analytical expressions have been derived that correlate the harmonic sum of squares of natural frequencies of a 1-ph, 3-ph, Y- or Delta-transformer winding to its elementary inductances and capacitances for any possible condition of the neutral terminal. A novel model has been developed to simulate lightning attachment to aircraft. Work is initiated towards efficient numerical field simulation of the lightning stroke current and field distribution in aircraft. A computationally efficient scheme has been developed for quantifying the potential developed by the spacecraft due to its interaction with the space plasma.

Systems and Signal Processing: New robustness results have been proved for learning multi-class and multi-label classifiers under label noise. The transfer learning method has been suggested for CNNs using the novel concept of a bank of filter trees. A distributed algorithm for rigid registration of point sets has been designed, and uniqueness results for rigid registration have been observed.

One of the focus areas of research in computer vision is cross-modal matching, i.e., given data from one modality (ex. image-text), the goal is to retrieve semantically meaningful data from another modality (ex. photo-sketch). Work is in progress on challenging problems, including classifying data from unseen classes (zero-shot learning), detecting data from unseen classes (novelty detection), and semantic segmentation of urban scenes to aid autonomous driving.

Recent advances in large language models (LLMs) have enabled a convergence of affective computing and multimodal modelling. The department has focused efforts on understanding and generating human emotions in multimodal data. Emotion modelling has been enhanced through techniques that align high-level linguistic representations with low-level multimodal signals, allowing models to better perceive and respond to emotional cues in conversation. At the same time, efforts in LLMs have also advanced to uncertainty calibration, where we have introduced losses that guide models to express appropriate confidence levels, improving their ability to detect and abstain from incorrect or ambiguous outputs. These uncertainty-aware adaptations are achieved using efficient input-sampling methods, which perturb the input to elicit the local behaviour of the model. Further, a thread of work focusing on fine-tuning strategies of LLMs has found that efficient label encoding in classification tasks allows improved generalisation of these models.

There is active work on developing AI tools for frontline health workers to enable early assessment of depression, anxiety, substance-use disorders and cognitive impairment by fusing questionnaires with spontaneous speech and video, validated in the field against psychiatrist-confirmed diagnoses under privacy-by-design governance.

In the area of digital signal processing, the research work carried out includes speech representation learning, Visual speech recognition, and articulatory modelling. Approaches for acoustic source localisation, new risk minimisation strategies for speech signal denoising, and new and robust techniques for spectro-temporal modelling of the speech signal have been developed. It has been discovered that a new class of signals that can be reconstructed from their magnitude spectrum and established Hilbert integral relations. Advanced techniques for robust extraction of several parameters of the voice box from speech acoustics have been developed.

In the area of image processing and deep learning, the research work includes the development of new wavelet-based reconstruction strategies for unlimited sampling, which is a new sampling strategy that promises to offer an unlimited dynamic range. A new regularisation method has been developed which has the power to eliminate a large amount of noise without suppressing image resolution. Further, a novel type of regularisation for reconstructing images from highly undersampled non-uniform spatial point measurements with application to speeding up confocal microscopy has been developed. A novel type of multicomponent regularisations, that are adaptive to the data that undergo reconstruction, has been developed. Based on these regularisations, numerical studies that confirm their potential to compete with deep learning methods have been performed. Further, a novel type of regularisation for images recorded as a function of time has been developed for fluorescence microscopy images; for the first time in the literature, this regularisation is not blind to the fact that motion characteristics of biological samples vary spatially and temporally.

The topics of information extraction from audio, including recognition of the spoken content, the speaker, and the language/accent, are pursued. Further, healthcare based on acoustic data is explored to identify sleep disorders, neurological disorders like ALS, respiratory disorders like asthma, as well as for viral infections in the respiratory pathway.

In the area of controls, we have developed fundamental design and analysis techniques for resource aware event-triggered control. We have also developed highly scalable, near-optimal, and provably safe algorithms for the coordination of robots' trajectories at intersections in warehouses. We have also developed new models for opinion dynamics of resource aware utility maximising agents in social networks.

We have developed an observer for sensor fault reconstruction of the linear time-invariant systems under resource constraint scenarios. Formation control with collision avoidance has also been developed for multiple quadrotors using adaptive and robust control methodology.



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Electronic Systems Engineering

The Department of Electronic Systems Engineering (ESE) has evolved over more than five decades from the Centre for Electronics Design and Technology (CEDT) into a broad, research-intensive department that connects fundamental science, engineering design and system realisation. Its enduring strength is the ability to work across scales: from materials and devices to circuits, algorithms, networks, prototypes and deployable systems.

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Degree programmes offered:
MTech ESE, MTech Microelectronics and VLSI Design with ECE, PhD, Direct PhD and MTech (Research)

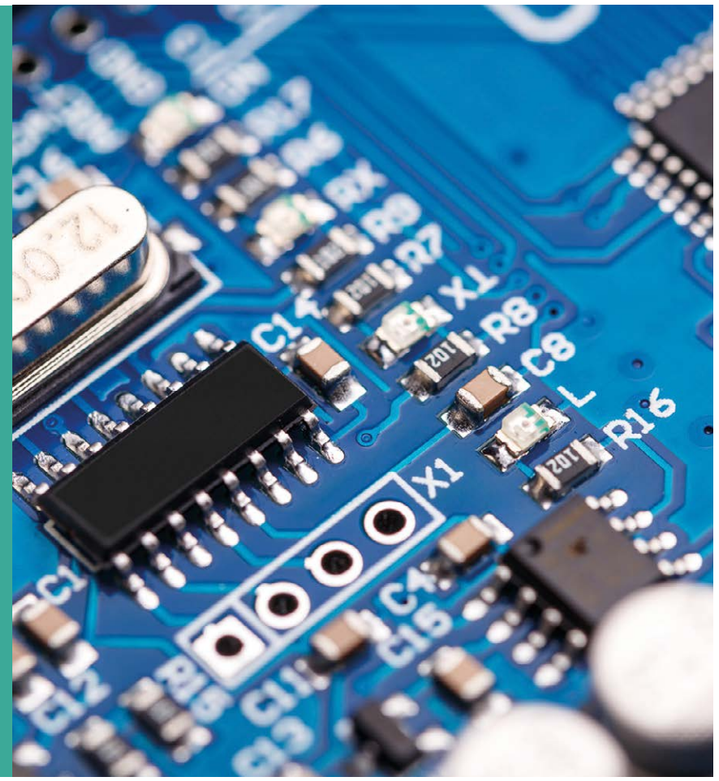
IN NUMBERS
20 Faculty members
100+ PhD students
200+ MTech students

Chair: Mayank Shrivastava



Core Research

Research in the department encompasses a spectrum of areas, including nanoelectronics, signal and information processing, neuromorphic engineering, IC design, reconfigurable computing, hardware security, healthcare technologies, biomedical engineering, networked embedded systems, Internet-of-Things, communication networks, power electronic drives, and renewable energy systems. It hosts and co-hosts very popular MTech programmes in Electronic Systems Engineering, Electronic Product Design, Microelectronics and VLSI, and Artificial Intelligence.



The next phase is not intended to be growth for its own sake. The department is seeking deeper research, stronger shared infrastructure, a larger and more diverse doctoral community, carefully targeted faculty recruitment, and a more visible role in national missions, industry-led technology development and international academic partnerships. The working objective is to build ESE into an internationally respected and nationally consequential department in electronic systems. The CEDT legacy remains an important part of ESE: hands-on engineering, attention to practical constraints, and the discipline of taking ideas beyond analysis into working systems. The department's current ambition is not to reproduce the past, but to carry that ethos into fields that will shape the next several decades, including quantum technologies, future semiconductors, intelligent computing hardware, connected systems and healthcare technologies.

ESE is therefore positioned as more than a collection of individual laboratories. With the support and engagement of the faculty, students and staff, the department is being shaped as a coordinated academic institution with shared research priorities, common platforms, a strong teaching mission and an outward-facing national role. By 2036, ESE aims to be recognised for a small number of attributes that matter: internationally visible research of depth; leadership in nationally important technology programmes; shared facilities that enable research well beyond a single group; doctoral graduates who lead efforts across academia and industry; and a culture in which teaching, research, mentoring, collaboration and institutional contribution reinforce one another.

Current Research

Quantum Technologies

Current platform: The department's existing work spans quantum information, coding and communication, quantum-aware circuits and systems, device-level questions, and emerging links with photonics, electronics and control.

Growth priorities: Integrated quantum photonics and photonic packaging; superconducting and other solid-state quantum hardware; quantum materials and devices with strong device-physics and technology content; cryogenic and control electronics; and quantum-classical interfaces.

Ten-year ambition: Build an end-to-end environment in which foundational theory, devices, hardware, packaging, control and systems can be developed together, while contributing meaningfully to national quantum programmes.

Semiconductors and VLSI

Current platform: ESE has significant strength across semiconductor materials and devices, nanoelectronics, wide-bandgap technologies, mixed-signal and digital circuits, memory, hardware security, neuromorphic systems, reconfigurable computing and prototype development.

Growth priorities: Memory technologies, including non-volatile and emerging memories; advanced packaging and heterogeneous integration; semiconductor process integration and device technology for beyond-silicon platforms; next-generation AI hardware; and foundry-oriented translation.

Ten-year ambition: Create a nationally distinctive "materials-to-systems" semiconductor platform that connects device science, fabrication, circuits, packaging, chip design, validation and product translation.

Intelligent Systems

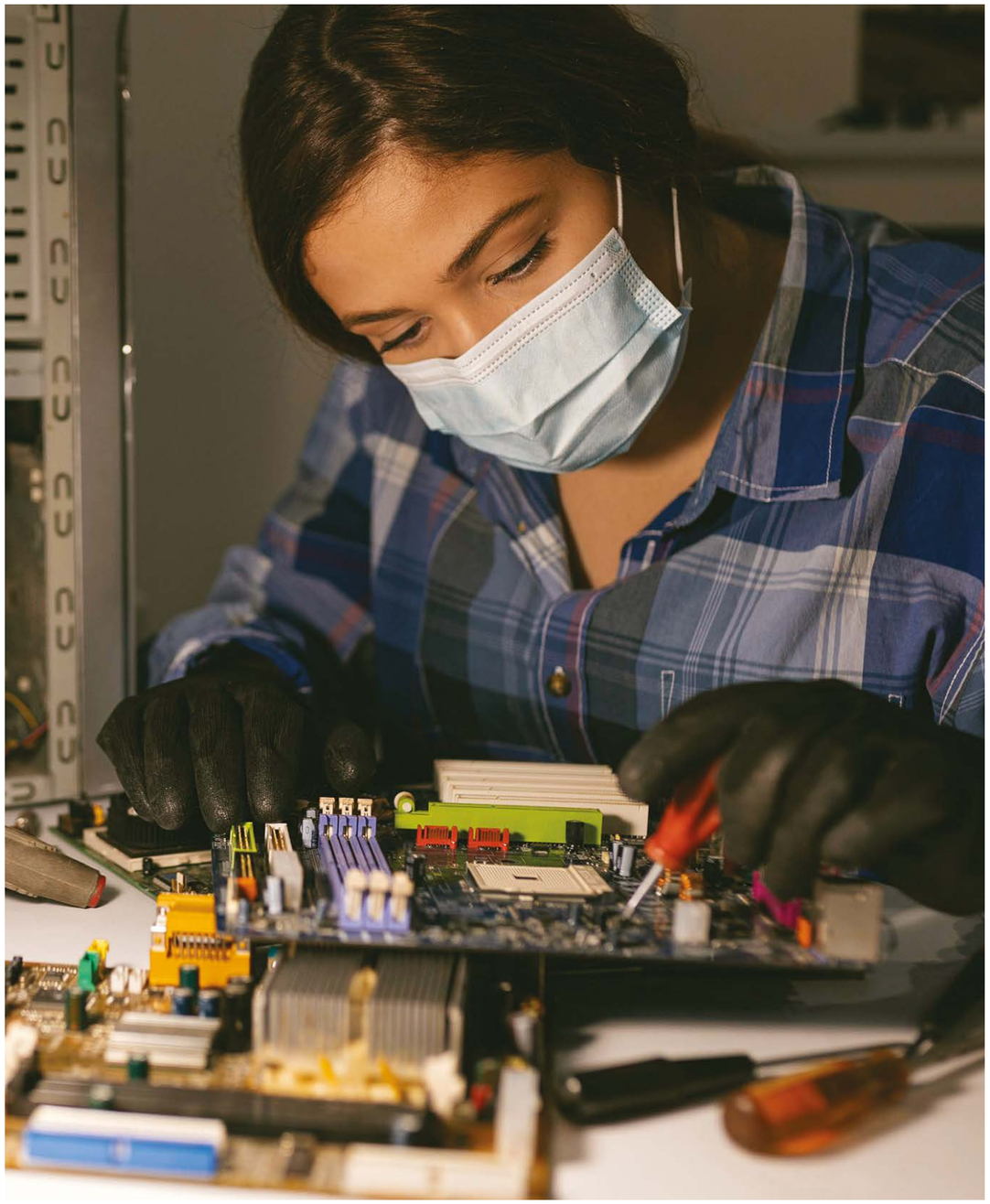
Current platform: The department's intelligent-systems work spans AI and neuromorphic hardware, embedded and cyber-physical systems, communication and networking, secure computing, sensing, healthcare electronics, wearables, human-machine interfaces, and intelligent power and energy systems.

Growth priorities: Next-generation AI hardware; human-centred, wearable and pervasive intelligence; secure edge systems; communication-computing co-design; intelligent healthcare technologies; and dependable autonomous and networked systems.

Ten-year ambition: Develop intelligent systems in which algorithms, hardware, sensing, communication and deployment constraints are co-designed from the outset, with demonstrable impact in industry, healthcare and public infrastructure.

The boundaries between these thrusts are deliberately porous. Quantum devices need advanced materials, packaging and control; semiconductor platforms increasingly depend on AI-driven design and intelligent architectures; and intelligent systems require new devices, secure hardware, communication and sensing. Several of the department's strongest opportunities lie at these interfaces.

Over the past decade, the department has produced well over 750 publications, more than 100 patents and multiple start-ups, while participating in research and infrastructure programmes at the several-hundred-crore scale. Representative outcomes include advanced semiconductor and GaN power-device platforms; mixed-signal, secure and neuromorphic computing systems; RISC-V and FPGA-based architectures; quantum-information and network research; clinically oriented diagnostic and therapeutic



devices; resilient IoT and communication systems; and renewable-energy and electric-mobility technologies to name a few.

The next step is to convert this distributed strength into fewer, larger and more visible institutional programmes. The emphasis will be on work that combines fundamental depth with a credible path to scientific leadership, national capability, industrial adoption, clinical utility, standards, open platforms or venture creation.



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Assistant Professor

V NAGA KRISHNA
Scientific Officer Gr

P RAMACHANDRAN
Scientific Officer Gr

VASANTA K B
Scientific Assistant

GV SATHISHA
Scientific Assistant

KALPANA B V
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GAYATHRI PR
Technical Assistant

SAHID P
Technical Assistant

TANGERALA RAMA ASUTHOSH
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AKSHAY P
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BUSI RAMAKRISHNA REDDY
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PRAKASH BARAMANI
Administrative Assistant

PERUMALLA PRADEEP CHANDRA
Administrative Assistant



3.4 *Division of Interdisciplinary Sciences*

Interdisciplinarity is the characteristic feature of the research carried out in this division. Specific research areas include bioengineering, urban infrastructure and transportation, nanoscale materials, nano devices and systems, economics, finance, human resource management, marketing, optimisation, public policy, energy, water, internet of things, distributed sensing, computer systems, computational science, data sciences and bioinformatics.



Themes

Interdisciplinary research has emerged as a crucial component of the research landscape in recent years. By breaking down departmental barriers, interdisciplinary research facilitates novel breakthroughs that may not be possible within the confines of a particular discipline. The Division of Interdisciplinary Research has a wide range of Departments/ Centres with the common theme of a strong interdisciplinary focus.

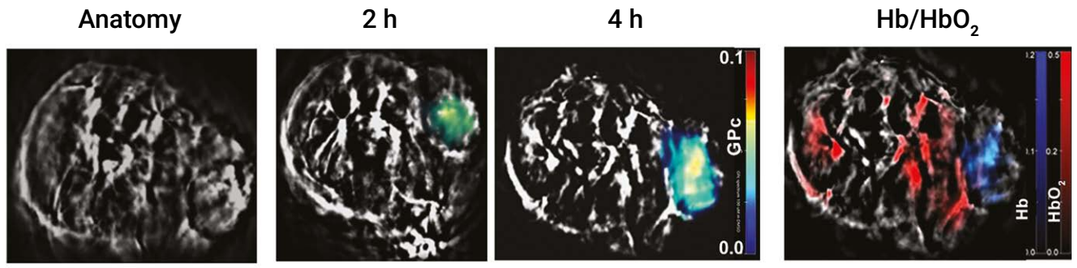
Departments | Centres | Units

- Department of Bioengineering
- Centre for Society and Policy
- Centre for Infrastructure, Sustainable Transportation and Urban Planning
- Centre for Nano Science and Engineering
- Department of Computational and Data Sciences
- Department of Management studies
- Interdisciplinary Centre for Energy Research
- Interdisciplinary Centre for Water Research
- Robert Bosch Centre for Cyber Physical Systems
- Supercomputer Education and Research Centre

Novel photoacoustic contrast agent for visualising tumours

Researchers from the Department of Bioengineering have developed a biocompatible small molecule that can be used as a minimally invasive contrast agent for Photoacoustic (PA) Tomography. In this method, a near-infrared (NIR) laser beam is shined on light-absorbing molecules (chromophores) sent to the target region, which then expand, creating a pressure change. The change can be picked up as an auditory signal, and analysing these signals allows scientists to construct 3D images of the target region. Such molecules can greatly help visualise tumour sites with high metabolic activity non-invasively. The use of such molecules can also circumvent challenges with Positron Emission Tomography (PET), while providing similar functionality at a lower cost, for pinpointing superficial tumours.

Reference:
Patkulkar PA, Arjun SV, Sharma A, Panda SK, Vinay V, Shringi C, Sinharay S, In vivo visualization of tumor metabolic activity with a tetra glucose-conjugated zinc-phthalocyanine photoacoustic contrast, JACS Au (2025).

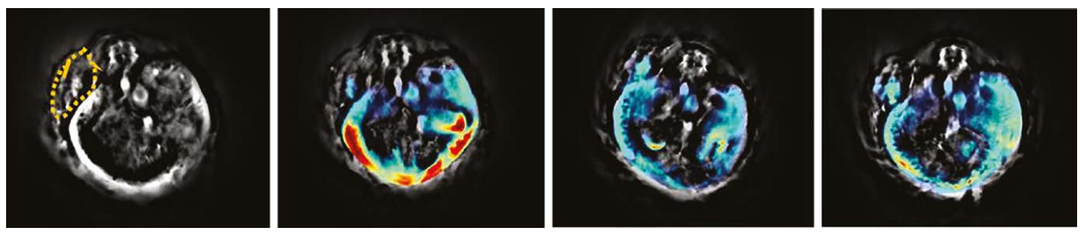


Research Snapshots
2025-26

Vesicle vehicles to pinpoint tumour cells

All cells, just like humans, communicate. They secrete nano-sized vehicles called 'extracellular vesicles' (EVs) that deliver cargo to nearby cells. Researchers at the Department of Bioengineering have now found a novel way to use these delivery systems to visualise tumours. The researchers tagged EVs extracted from normal and cancer cells with a dye named indocyanine green and analysed how much the recipient tumour cells absorbed both types of ICG-tagged EVs. The EV-coupled ICG gave a longer and stronger signal from inside the tumour. The EVs also stayed for much longer inside the target tumour cells, allowing better detection. The findings point to the possibility of using EVs derived from an individual for personalised tumour imaging.

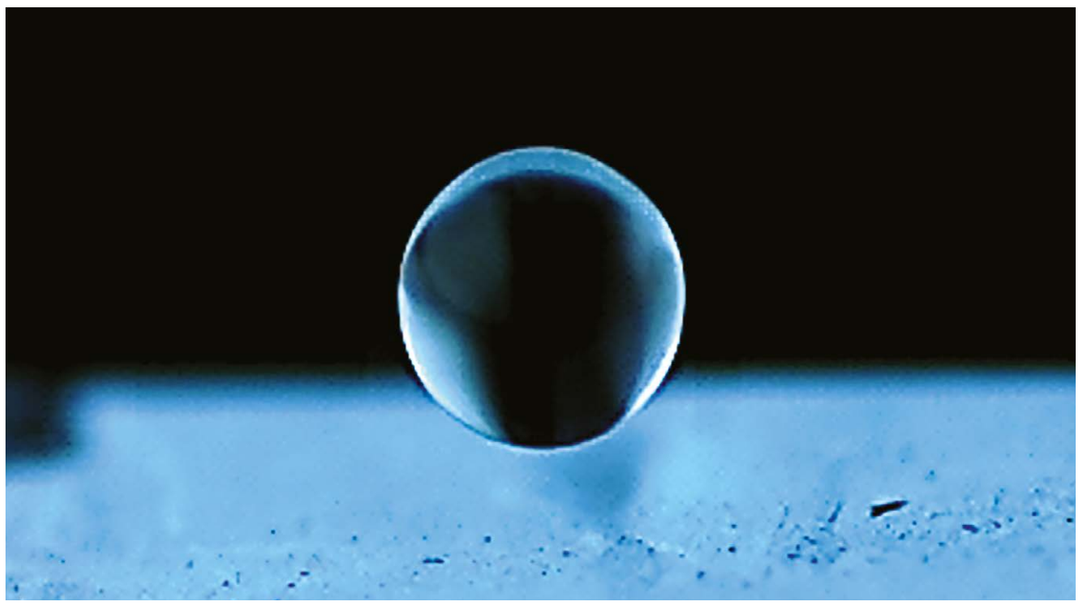
Reference:
Ghoshal B, Patkulkar PA, Bhatt P, Rana S, Sinharay S, Jhunjhunwala S, Neutrophil-derived extracellular vesicles for facile delivery of diagnostic agents to tumor microenvironments, ACS Applied Biomaterials (2025).



A sticky solution for enhanced pesticide deposition

A new approach developed by researchers at the Centre for Nano Science and Engineering (CeNSE) uses Liquid Marbles (LMs) to enhance pesticide deposition on leaf surfaces. The researchers designed a bed of hydrophobic particles and allowed water droplets to roll over them freely. To mimic flexible plant surfaces, the team fabricated cantilevers using stainless steel of different lengths and then applied a coating of Teflon to make the surface hydrophobic. They also designed LMs using organic components like zein (a protein found in corn) and found them to be more efficient than glass beads-based ones. The approach offers a safer alternative to using surfactants, polymers, and oils, which are harmful to the environment.

Reference:
Lathia R, Iyer P, Modak CD, Reddy BS, Sen P, Hydrophobic particle coating for enhanced droplet deposition, Journal of Colloid and Interface Science (2025).

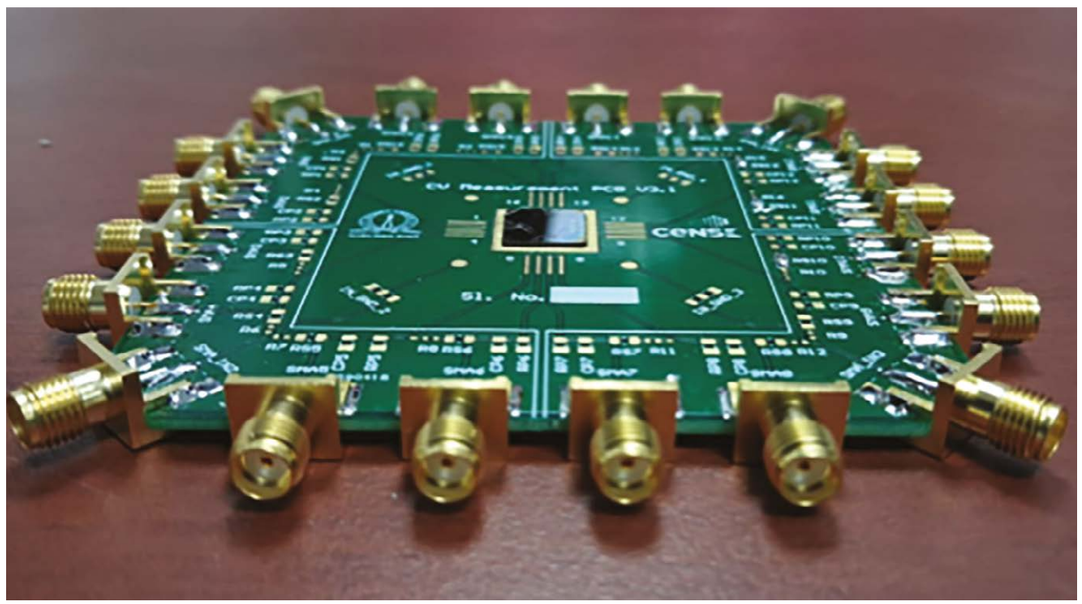


Research Snapshots
2025-26

Encoding adaptive intelligence in molecular matter by design

In a collaboration spanning chemistry, physics, and electrical engineering, researchers at the Centre for Nano Science and Engineering (CeNSE) have created tiny molecular devices that can be tweaked to perform diverse functions. The same device can behave as a memory unit, a logic gate, a selector, an analog processor or an electronic synapse, depending on how it is stimulated. The team synthesised 17 carefully designed ruthenium complexes and analysed how minute variations in molecular geometry and ionic surroundings sculpted electron behaviour. By carefully tweaking the ligands and ions arranged around the ruthenium molecules, the authors showed that the same device can exhibit many types of dynamic behaviour across a wide range of conductance values.

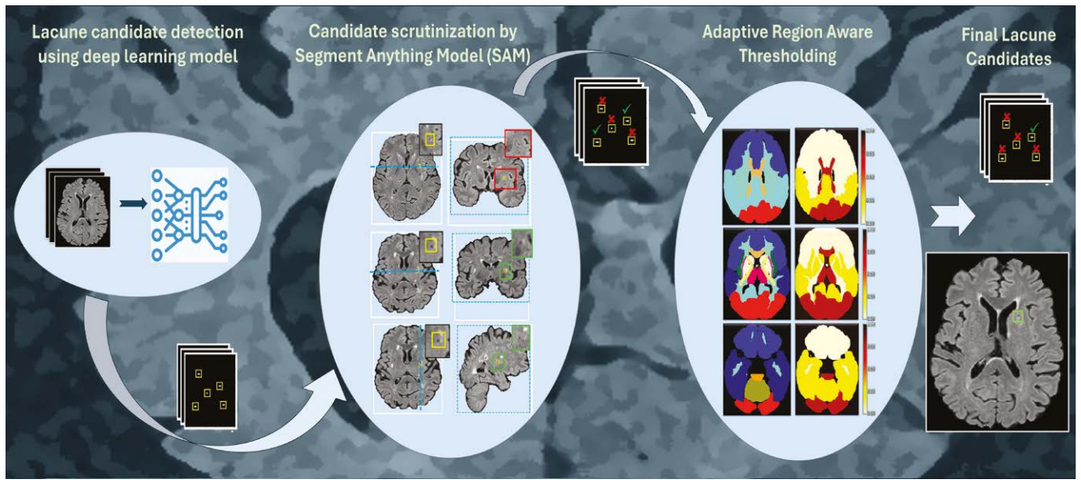
Reference:
Gaur P, Kundu B, Ghosh P, Bhattacharya S, Lohit T, Harivignesh S, Rath SP, Thompson D, Goswami S, Goswami S, Molecularly engineered memristors for reconfigurable neuromorphic functionalities, Advanced Materials (2025).



Segment Anything Model (SAM)-powered spotting of lacunes in the brain

Researchers at the Department of Computational and Data Sciences (CDS) have devised a deep learning-based approach to detect lacunes – small, fluid-filled cavities that serve as biomarkers for cerebral small vessel diseases. It uses Meta AI's Segment Anything Model (SAM) to accurately identify lacunes and distinguish them from mimics. The approach mirrors clinicians' practice of examining lacunes in 3D scans while ensuring regional and morphologically consistent characteristics across all axes, but at a much faster rate. The model was robust at accurately identifying lacunes in MRI scans under varied imaging conditions. It outperformed existing state-of-the-art methods and showed strong performance even in low-data settings through self-distillation, a process where the model learns from its own predictions.

Reference:
Deepika P, Shanker G, Narayanan R, Sundaresan V, Automated detection of lacunes in brain MR images using SAM with robust prompts using self-distillation and anatomy-informed priors, Computers in Biology and Medicine (2025).

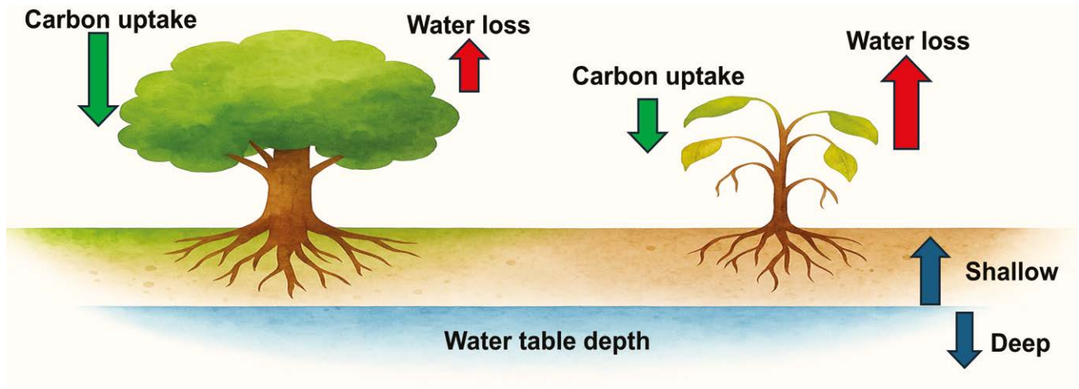


Research Snapshots
2025-26

How groundwater affects the carbon cycle

Researchers at the Interdisciplinary Centre for Water Research analysed the efficiency of ecosystems in storing carbon across India. They calculated water table depth, chemical energy produced by plants, and the amount of water moved by the plants from the soil to the atmosphere. They found that if the water tables are deeper, ecosystems' efficiency and plants' productivity are lower in most regions. However, during the monsoon in wetter regions of the country, where the water table lies close to the surface, the soil becomes easily waterlogged, leaving plants' roots deprived of oxygen. Such insights can help policymakers identify regions with higher environmental degradation due to overexploitation of groundwater, and tailor strategies for sustainable water use in these regions.

Reference:
Chakraborty A, Sekhar M, Bhanja SN, Rao L, Linking groundwater variability to ecosystem carbon and water use efficiencies across India, Ecological Informatics (2025).



3.4.1 *Bioenginering*

The Department of Bioengineering (BE) at the Indian Institute of Science was founded on June 4, 2015. BE undertakes research and training in the broad multi-disciplinary area of biological systems with equal emphasis on science and engineering by bringing together biologists, engineers, and those who are trained as bioengineers.

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Degree programmes offered:
PhD, UG Minor, MTech

Chair: Kaushik Chatterjee



Core Research

The primary research areas of BE include computational systems biology, mathematical biology, drug delivery, biomaterials, quantitative cell biology, biophysics, molecular imaging, medical imaging instrumentation, medical image analysis, cancer and stem cell mechanobiology and immunoengineering.



Current Research

Systems Biology of Cancer
Metastasis and therapy resistance remain two unsolved clinical challenges. A key property enabling cancer cell fitness during metastasis and therapy resistance is phenotypic plasticity – the ability of cancer cells to reversibly switch to another cell-state during stress and the consequent co-existence of multiple phenotypes in a genetically identical population. Our work has decoded the design principles of cellular networks underlying phenotypic heterogeneity in multiple cancers, including in the highly aggressive small cell lung cancer which has an abysmal five-year survival rate of 7% and no molecular targeted therapy yet. Similarly, our analysis for melanoma, lung cancer and ER+ breast cancer has demonstrated how underlying regulatory networks can enable multiple cell-states and how cells can switch among them when exposed to drug, i.e., drug-induced state-switching. Importantly, across these multiple cancers, we have shown how drug-induced adaptation can make a subpopulation of cancer cells more aggressive, thus paving a way for rational identification of combination therapies that can help prevent metastatic spread and delay tumour relapse.

Drug Delivery
Micro- and nano-carriers have emerged as a promising solution for the targeted delivery of active drugs. Use of particles for delivery offers several advantages. Biologics are protected from the harsh external environment present (immune clearance and enzymatic degradation) during their voyage and increases their bioavailability at the target site. Particles can be designed to target specific sites including organ, cells, and intra-cellular targets. We are interested in applying biomaterial and nano- and microcarrier-based techniques to bridge the gap between basic biology and clinical therapies by designing polymeric particle-based vehicles to effectively deliver cargo to their target sites. The major focus is to utilise particle technologies to develop engineering platforms for targeted and efficient delivery of therapeutics for treatment of chronic inflammatory diseases such as osteoarthritis and persistent antibiotic resistant bacterial infections such as in case of tuberculosis.

Molecular Imaging
Study of cellular or molecular events outside the body, through in vitro or ex vivo experiments often oversimplifies the complex biological scenario in living subjects. The field of molecular imaging can potentially help to resolve this caveat as it aims to study these molecular or cellular processes within intact living body, in a longitudinal

non-invasive manner. Our research focuses on the development of molecular imaging tracers (MRI, photoacoustic, and PET) and molecular imaging methods to monitor various molecular targets/biomarkers that could potentially relate to early diagnosis of cancer or early assessment of treatment responses. The ability to image/monitor processes such as gene/protein/enzyme function, protein-protein interactions, changes in tumour microenvironment (TME), metabolic pathways, immune cell function or profiling of signal transduction pathways within an in vivo disease model, in a non-invasive longitudinal manner in real-time can eventually improve medical management of subjects and provide breakthroughs in current diagnostic or theranostic practices in the clinic.

Immunoengineering

Research in this area is directed towards the development of drug delivery systems and biomedical implants that have the capacity to modulate inflammatory immune responses with the goal of treating specific diseases. Our current focus is on developing strategies to treat complications that arise from type-2 diabetes.

Cancer mechanobiology and stem cell bioengineering

The research in cancer mechanobiology focuses on studying and recapitulating the submicron-scale architecture of cancerous tissues using custom-made microfluidic/biomaterial platforms. Recently the field has learned that cancer cells are vulnerable to mechanical forces and undergo apoptosis when subjected to physiologically relevant mechanical stresses. Thus, our next goal is to investigate the effect of mechanical forces on cancer cells grown on the platforms mimicking in vivo microenvironment. The insight gained will be used to optimise mechanical forces to maximise cancer cell killing and the development of therapeutic strategies for clinical treatment. In particular, our research focuses particularly in oral cancer, the second most common cancer in India. The research in stem cell mechanobiology focuses on studying the effect of mechanical forces on stem cell differentiation. Such studies will guide the systematic optimisation of mechanical forces to maximise the yield of differentiated cells towards a desired tissue lineage and to develop stem cell-based therapies for clinical treatment.

Epithelial mechanobiology

Our research focuses on developing innovative, animal-free disease models that can be used to study disease mechanisms and support drug discovery. Recently, we have created organotypic models from lung and mammary epithelial cells, replicating complex tissue architecture to better understand how cancer originates in these tissues. In addition, we are investigating the spatio-temporal dynamics of epithelial tissues to identify biophysical signatures that are disrupted during disease progression. Through this work, we aim to address a fundamental question in epithelial biology: how do changes in tissue mechanics contribute to the onset of disease? To this end, we are specifically focused on cancer and use 2D and 3D organotypic model systems to identify fundamental mechanisms of cellular competition and cooperation that drive diseased states in epithelium.

Medical Imaging Instrumentation and Medical Image Analysis

Relying exclusively on high-end imaging modalities confined to specialised hospitals often restricts the accessibility of critical diagnostics for the broader population. The field of medical imaging instrumentation can potentially resolve this caveat as it aims to bring advanced, real-time diagnostic capabilities directly to the patient at the point of care. Our research focuses on the development and clinical translation of accessible imaging instrumentation, specifically ultrasound and Optical Coherence Tomography (OCT), with a strong emphasis on cost-effective hardware design. By seamlessly integrating these systems with advanced artificial intelligence, including deep learning and physics-informed data analysis, we aim to automate complex medical signal and image interpretation for reliable use by non-experts. The ability to deploy these AI-assisted, highly portable diagnostic devices in resource-constrained environments can eventually democratise healthcare access, allowing for earlier disease detection and providing breakthroughs in how clinical management is delivered at the grassroots level.

Biomaterials for Medical Implants and Tissue Engineering

Biomaterials research is a major effort in our department toward engineering the next generation of medical devices and scaffolds for tissue engineering. Metallic biomaterials such as titanium alloys and stainless steel are utilised for orthopedic devices. Our efforts in 3D printing of these alloys are enabling the fabrication of personalised orthopedic and maxillofacial devices. Cell-laden biodegradable hydrogels are being 3D-bioprinted to prepare tissue scaffolds for the regeneration of tissues, as well as to prepare disease models for drug screening.





Faculty & Staff

SIDDHARTH JHUNJHUNWALA
PhD (Pittsburgh), Associate Professor

RACHIT AGARWAL
PhD (Texas), Associate Professor

MOHIT KUMAR JOLLY
PhD (Rice), Associate Professor

SANHITA SINHARAY
PhD (Arizona), Assistant Professor

MEDHAVI VISHWAKARMA
PhD (EPFL), Assistant Professor

AJAY TIJORE
PhD (NTU, Singapore), Assistant Professor

BHASKARA RAO CHINTADA
PhD (ETH Zürich), Assistant Professor

KAUSHIK CHATTERJEE
PhD (Penn State), Professor

Associate Faculty

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(Massachusetts Amherst), Associate Professor

RAHUL ROY
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NARENDRA DIXIT
PhD (Illinois), Professor

RAMRAY BHAT
PhD (New York Medical College), Associate Professor

SP ARUN
PhD (Johns Hopkins), Professor

PRERNA SHARMA
(TIFR), Associate Professor

NAGASUMA CHANDRA
PhD (Bristol), Professor

S SWAMINATHAN
MD (PGIMER, Chandigarh), Professor

VISHWESHA GUTTAL
(Ohio State), Associate Professor

PROSENJIT SEN
(California), Associate Professor

DEEPAK KUMAR SAINI
PhD (AIIMS), Professor

PRABHDEEP KAUR
MAE (SCTIMST), Professor

3.4.2

Centre for Society and Policy

The Centre for Society and Policy is a policy research centre, established in November 2018. As an interdisciplinary centre for science and technology policy, the centre explores interactions between science, technology, society, and development. The research and discussions at the centre aim to expand the social compact, that is, honour the implicit agreement between science and society to work together for sustainability, and mutual benefit. The centre organises seminars, lectures, and outreach through workshops and training programmes. It has a vibrant visiting faculty programme to attract leading scientists and researchers in the field of science and technology policy.

FACT FILE
Established: November 2018
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URL: https://csp.iisc.ac.in/

IN NUMBERS
6 Associate Faculty
2 Research Faculty
2 Visiting Professor
2 Visiting Scholar
3 Post Doctoral Fellows
20 Research Staff

Chair: TA Abinandanan



Core Research

The aim of the centre is to forge meaningful interactions between science, technology, society and policy through research and dialogue in diverse areas like information technology, infrastructure, health and genomics, S&T for development, sustainable futures, biotechnology, and natural resource and biodiversity.

The DST-Centre for Policy Research at the Indian Institute of Science (DST-CPR, IISc), hosted at CSP, is a project funded by the Department of Science and Technology (DST), Government of India. The research at DST-CPR spans three interconnected domains: scientometrics, research evaluation, and open science. In scientometrics and research evaluation, the Centre has developed a systematic and empirically grounded understanding of India's research landscape: examining publication trends, institutional performance, citation impact, research quality, industry–academia collaboration, and the alignment between research priorities and societal need. Alongside this, the Centre has critically examined India's metric-driven research evaluation culture, including the informal use of journal impact factors, publication counts, and institutional pedigree in fellowship and hiring decisions, and has contributed to international debates on responsible research assessment, including through active engagement with DORA and the Coalition for Advancing Research Assessment (CoARA). In open science, the Centre has produced policy-relevant analyses of India's open access landscape, the science, technology and innovation policy frameworks that govern it, and the conditions under which open science can be meaningfully implemented in resource-constrained settings.

Current Research

Some of the research conducted during the year 2023-2024 includes policy agendas including sustainable futures, food security and health policy, and data economics. Specifically, the research includes developing a regulatory and monitoring ecosystem for the data platform, a market-based framework for data economics, and investigating regulatory guidelines and privacy options for data security. Further, standards, protocol, cyber safety and readiness are explored for power organizations. CSP has collaborated with the Keio University, Japan, to provide a dynamic platform for fostering collaboration and exchanging knowledge in the domains of science, technology, and innovation.

List of events and publications

Event/Policy Dialogue

13 June 2025: Rémi Quirion, Interactive session on the evolving role of EarlyCareer Researchers (ECRs) in science-policy interfaces.

16 September 2025: Eugene Garfield Birth Centenary Celebration Lecture by two distinguished experts Mike Thelwall (University of Sheffield, UK) and Ton (Anthony) F.J.van Raan (Leiden University, Netherlands).

7 November 2025: India-France AI policy roundtables is a series of high-level Track 1.5 AI policy dialogues on India's AI policy priorities. Third India–France AI Policy Roundtable held on 7 November 2025 at IISc Bengaluru as a pre-summit dialogue for the AI Impact Summit 2026.

24-25 February 2026: Workshop in collaboration with the Engineering Biology Research Consortium (EBRC), convened leaders from the industry, government, and academia to explore the current landscape of nucleic acid synthesis in India.

16-17 March 2026: Workshop conducted by Maresi Nerad in collaboration with ANRF PAIR Programme and DST-Centre for Policy Research, IISc, title "Becoming an Effective Doctoral Supervisor."



Associate Faculty

ABINANDANAN T A
PhD (Carnegie Mellon), Professor

SARASIJ DAS
PhD (University of Western Ontario, Canada), Assistant Professor

ANJULA GURTOO
PhD (IIM Ahmedabad), Professor

SHASHI JAIN
PhD (CWI, Amsterdam), Associate Professor

MOHIT KUMAR JOLLY
PhD (Houston, Texas), Assistant Professor

VISHAL SINGH
PhD (University of Sydney), Associate Professor

Research Faculty

CHAGUN BASHA
PhD (University of Rennes 1), Research Associate Professor

INDER S GOPAL
PhD (Columbia University, NY), Research Professor

3·4·3

Centre for Infrastructure, Sustainable Transportation and Urban Planning

Centre for infrastructure, Sustainable Transportation and Urban Planning (CiSTUP) conducts interdisciplinary research on understanding, planning, design, operation, and control of transportation systems. Development of state-of-the-art transportation modelling and analysis tools for safe, efficient, and sustainable mobility and city planning is a focus area. CiSTUP advises transportation agencies, civic authorities, and policy makers on scientific approaches to designing, planning, and operation of transportation systems.

FACT FILE
Established: 2009
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URL: http://cistup.iisc.ac.in/
Degree programmes offered:
A new MTech programme in *Smart Mobility and Logistics Systems* began in August 2025.

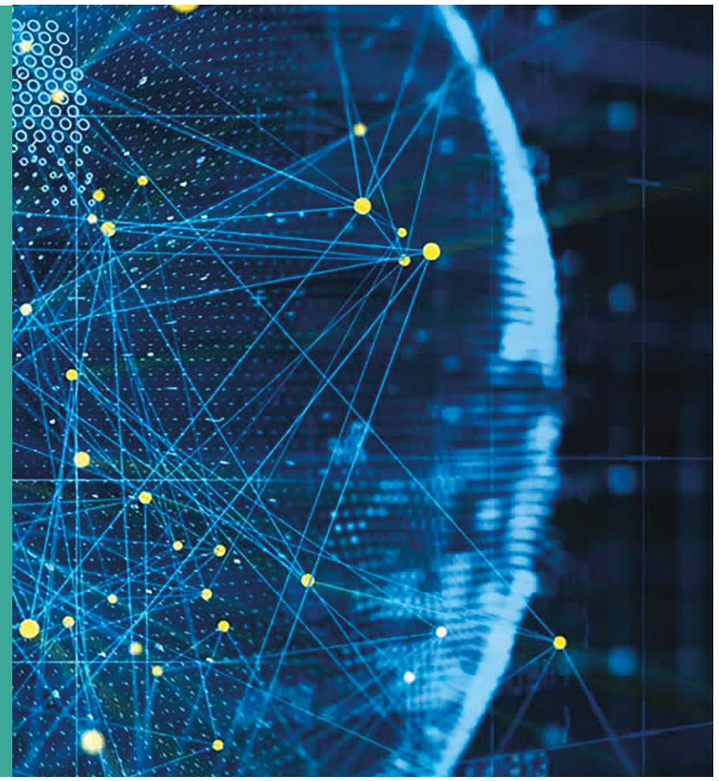
IN NUMBERS
Recent strength of CiSTUP was 101 (excluding about 25 interns advised), comprising the following:
- 3 faculty + 2 associate faculty + 1 research faculty + 3 visiting faculty (Total 9 faculty)
- 9 post-doctoral researchers
- 36 research staff
- 15 MTech students
- 30 students of other departments guided by CiSTUP faculty
- 2 admin staff

Chair: Abdul Rawoof Pinjari



Core Research

Integrated and multimodal mobility systems, transportation planning, transportation engineering, travel demand modelling, traffic operations and control, transportation networks, operations research in transportation, travel behaviour, public transportation operations and planning, shared mobility, artificial intelligence (AI) for mobility, intelligent transportation systems (ITS), emerging mobility technologies (electric, connected, automated vehicles, urban air mobility), spatio-temporal data analytics, urban sensing, freight and logistics.



Current Research

City-scale, multimodal mobility demand modelling to forecast spatio-temporal and modal distribution of travel demand – to aid transportation planning in Indian cities.

Research under the theme *"AI for Mobility (AIM) @IISc"* for urban traffic measurement, inference, and control using AI techniques such as computer vision and graph neural networks.

Decision-support tools for public transit agencies – ridership forecasting models, transit routing algorithms, and transit assignment tools to predict crowding.

Electric vehicle logistics – (1) joint optimisation of electric vehicle scheduling and routing decisions, and (2) electric bus fleet scheduling and solar charging algorithms.

Urban air mobility and logistics – Algorithms to coordinate the scheduling and routing of drones and metro systems for optimising parcel deliveries.

Development and applications of traffic simulators for heavy vehicles (to enhance benefits of advanced driver assistance systems), cars (to reduce parking search in congested urban areas), and bicycles (to evaluate the benefits of bicycling lanes).

Optimising the potential of drive-by sensing for city-scale monitoring of driving behaviour, traffic, and other urban parameters.

Learning from multi-sensory, unlabelled, streaming data in autonomous systems, with applications in cyber-security of vehicles, vehicle collision detection, etc.

Investigation of non-uniformity in understanding of road rules among various road users (motorised and non-motorised) to improve driver education and safety.

Autonomous collection of traffic crash data using drones applying multi-drone energy-aware scheduling, path planning, and autonomous flying.

Faculty & Staff

ABDUL RAWOOF PINJARI
PhD (Univ. of Texas), Professor

TARUN RAMBHA
PhD (Univ. of Texas), Associate Professor

PUNIT RATHORE
PhD (Univ. of Melbourne), Assistant Professor

VIJAY GOPAL KOVVALI
PhD (Texas A&M Univ.), Research Professor

PANDARASAMY ARJUNAN
PhD (IIIT-Delhi), Assistant Professor

SATYAVATI KOMARAGIRI
PhD (Univ. of Texas), Assistant Professor

CHANDRA BHAT
PhD (Northwestern Univ.), Satish Dhawan Visiting Chair Professor

NAGARAJAN NATARAJAN
PhD (Univ. of Texas), Visiting Associate Professor

RAGHURAM KRISHNAPURAM
PhD (Carnegie Mellon University) Visiting Professor

3.4.4

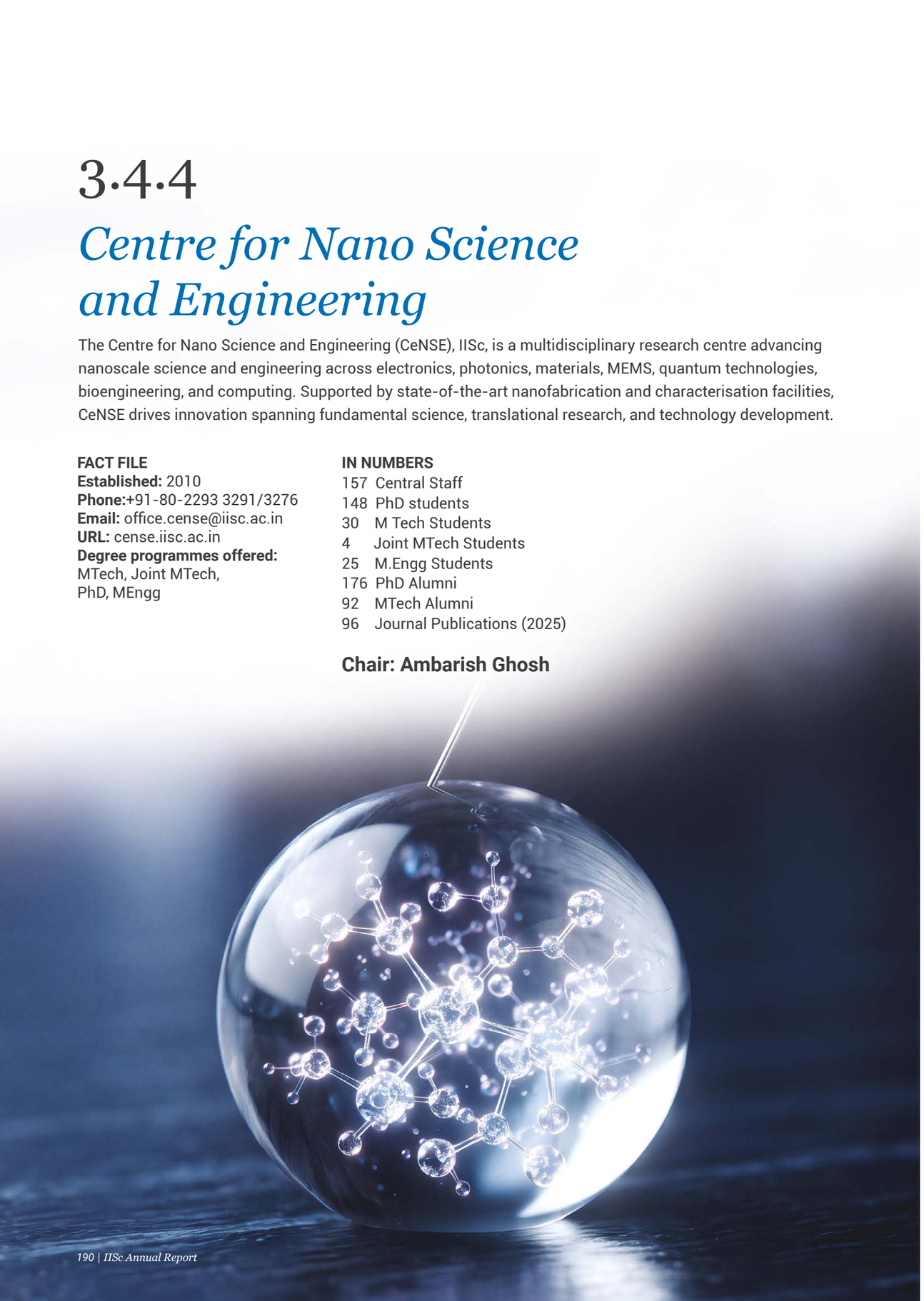
Centre for Nano Science and Engineering

The Centre for Nano Science and Engineering (CeNSE), IISc, is a multidisciplinary research centre advancing nanoscale science and engineering across electronics, photonics, materials, MEMS, quantum technologies, bioengineering, and computing. Supported by state-of-the-art nanofabrication and characterisation facilities, CeNSE drives innovation spanning fundamental science, translational research, and technology development.

FACT FILE
Established: 2010
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Degree programmes offered:
MTech, Joint MTech,
PhD, MEngg

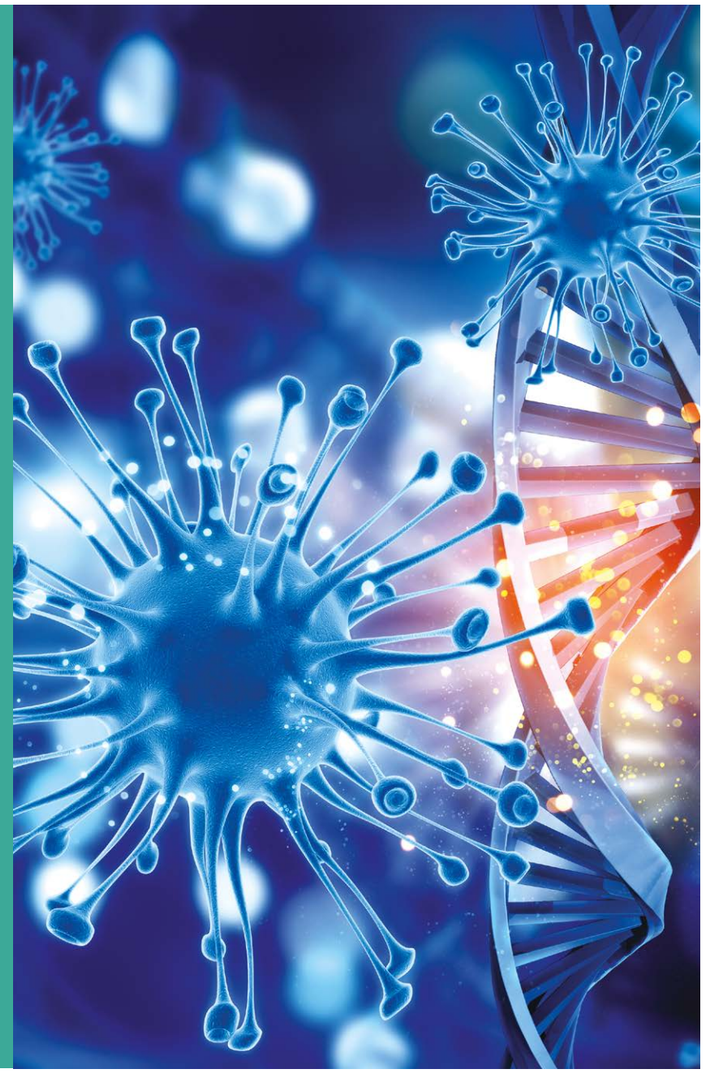
IN NUMBERS
157 Central Staff
148 PhD students
30 M Tech Students
4 Joint MTech Students
25 M.Engg Students
176 PhD Alumni
92 MTech Alumni
96 Journal Publications (2025)

Chair: Ambarish Ghosh



Core Research

Electronics: power electronics, memory devices, gas, bio and pressure sensors; Optoelectronics - thin-film solar cells, spectroscopy. **Quantum science and technology:** topological insulators, superconductors, van der waal heterostructures, quantum sensing, quantum fluids, electron hydrodynamics. **Bio-medical interface:** nanopore sensing and sequencing, lab-on-chip, electrochemical biosensors, neural interfaces, neural tissue engineering. **MEMS, NEMS, Systems, Packaging and Microfluidics:** nonlinear dynamics, nanorobotics, piezoelectricity, droplets, wafer scale packaging. **Photonics and Lasers:** silicon photonic integrated circuits, fibre lasers, ultrafast lasers, signal processing. **Materials and electronics devices:** thin films, bulk crystals, wide band-gap devices, ferroic oxides, heterojunctions. **Brain-inspired computing:** artificial intelligence, neuromorphic computing, chaos.



Current Research

CeNSE continues to strengthen its position as a national leader in nanoscience, semiconductor technologies, quantum systems, photonics, nano-bio engineering, and next-generation computing. By combining fundamental science with translational engineering, the centre addresses critical challenges spanning healthcare, energy, communication, computing, and advanced manufacturing. Supported by world-class nanofabrication and characterisation infrastructure, CeNSE fosters a deeply interdisciplinary ecosystem where materials scientists, engineers, physicists, chemists, and biologists work together to develop technologies of national and global relevance.

Semiconductor Devices and Power Electronics: CeNSE is advancing next-generation semiconductor technologies through research on wide-bandgap materials such as GaN and Ga_2O_3 for high-power, high-frequency, and energy-efficient electronics. Faculty are developing advanced transistors, RF devices, infrared photodetectors, and integrated sensor systems for applications in communication, electric mobility, aerospace, healthcare,

and energy systems. Research also includes emerging memory devices, flexible electronics, and novel architectures aimed at enabling future computing and sensing technologies.

Advanced Materials and Functional Thin Films

Research at CeNSE spans the synthesis, characterisation, and integration of functional materials for electronic, photonic, and quantum applications. Investigations include oxide thin films, perovskites, piezoelectric materials, van der Waals heterostructures, and ferroic systems. Researchers are engineering material interfaces to enable enhanced electronic transport, optical response, energy conversion, and memory functionalities. Significant efforts are directed toward stable perovskite optoelectronics, sustainable material systems, and scalable thin-film technologies compatible with semiconductor manufacturing.

Quantum Materials and Quantum Technologies

CeNSE is actively building capabilities in quantum materials, devices, and sensing technologies. Research focuses on superconducting systems, low-dimensional materials, topological phases, quantum transport, correlated electron systems, and quantum fluids. Faculty are exploring emergent phenomena in engineered heterostructures and cryogenic devices while developing platforms for quantum sensing and nanoscale measurements. Work on NV-centre-based sensing, ultra-sensitive magnetometry, and quantum-enabled instrumentation is contributing toward the development of next-generation quantum technologies.

Photonics and Integrated Optical Systems

Photonics research at CeNSE spans integrated photonic circuits, nonlinear optics, fibre lasers, plasmonics, and quantum photonics. Researchers are developing silicon photonic systems for communication, sensing, and signal processing, alongside high-power laser systems and wavelength-engineered optical platforms. Work on low-loss photonic devices, frequency combs, optical modulators, and integrated photodetectors are enabling scalable photonic technologies for future communication and computing systems. Research in plasmonics and quantum emitters is further advancing nanoscale optical sensing and single-photon technologies.

Nano-bio Engineering and Med Tech

At the interface of nanotechnology and biology, CeNSE is developing innovative healthcare technologies with strong translational potential. Research includes electrochemical biosensors, nanopore-based molecular sensing, neural interfaces, organ-on-chip systems, and microfluidic platforms for diagnostics and therapeutic applications. Faculty are also developing intelligent magnetic nanorobots for targeted drug delivery and minimally invasive therapeutic interventions. These efforts are supported by collaborations with clinicians, hospitals, startups, and industry partners, enabling translation of research into deployable healthcare solutions.

MEMS, NEMS and Microfluidics

CeNSE continues to advance research in micro- and nano-electromechanical systems through work on resonators, sensors, acoustic devices, nonlinear dynamics, and microfluidic systems. Researchers are investigating miniaturised resonant systems, fluid-structure interactions, active matter, and microscale transport phenomena. Technology development includes high-performance pressure sensors, gyroscopes, acoustic signal processors, and droplet-based microfluidic systems. Wafer-scale packaging and scalable MEMS integration are also emerging focus areas.

Neuromorphic and Brain-Inspired Computing

To address the growing energy demands of artificial intelligence and edge computing, CeNSE researchers are developing neuromorphic hardware inspired by biological intelligence. Research includes analog AI hardware, photonic computing, spiking neural networks, and adaptive computing systems using novel electronic and photonic materials. These efforts aim to create ultra-efficient computing platforms capable of parallel processing, learning, and decision-making for future AI applications.





Core Faculty

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AMBARISH GHOSH
PhD (Brown), Professor

CHANDAN KUMAR
PhD (IISc), Assistant Professor

DIGBIJOY N NATH
PhD (Ohio State), Associate Professor

DHAVALA SURI
PhD (BITS-Pilani, Goa), Assistant Professor

GAYATHRI PILLAI
PhD (National Tsing Hua), Assistant Professor

MANOJ VARMA
PhD (Purdue), Professor

NAVAKANTA BHAT
PhD (Stanford), Professor

PAVAN NUKALA
PhD (U. Penn), Associate Professor

PROSENJIT SEN
PhD (UCLA), Associate Professor

RUDRA PRATAP
PhD (Cornell), Professor

SAURABH CHANDORKAR
PhD (Stanford), Associate Professor

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SRINIVASAN RAGHAVAN
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SUPRADEEPA V R
PhD (Purdue), Associate Professor

SUSHOBHAN AVASTHI
PhD (Princeton), Associate Professor

VINI GAUTAM
PhD (JNCASR), Assistant Professor

3·4·5

Computational and Data Sciences

The department focuses on interdisciplinary programmes driven by computation and data-intensive methods, systems and applications. The research is aligned with computational science and computer & data systems. The former explores computational methods and applications to scientific domains, while the latter is into design, implementation and evaluation of high-performance hardware and software systems.

FACT FILE

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Degree programmes offered:
MTech and PhD

IN NUMBERS
18 Faculty Members
00 Visiting/Adjunct Faculty Members
01 Administrative Staff
01 Technical Assistance
02 Postdoctoral Students
61 PhD students
18 MTech Research students
78 MTech students
27 Students graduated in 2024 from DSBA (Online MTech)
75 Current students (MTech Online DSBA program; joined in 2025)
30 Project Associates
Conferments: 09 PhD, 07 MTech Research; 25 MTech CDS

Chair: R Venkatesh Babu



Core Research

Computational science research deals with mathematical modeling, numerical analysis, computational aspects of numerical methods to solve complex problems, and implementation of efficient and robust algorithms on massively parallel heterogeneous architectures. The research finds applications in climate modelling, electromagnetics, fluid mechanics, internet of Things, materials-physics, quantum computing, optics, knowledge harvesting, medical imaging, photonics, structural biology, systems biology, etc.

Computer and data systems research aims to design architectures and platforms for big data, cloud and edge computing, quantum computing, internet of things, databases, accelerators, reconfigurable architectures, scalable methods for AI/ML applications, as well as scalable methods and algorithms for graph analytics, computer vision, machine learning, natural language processing, fault tolerance for HPC applications, bioinformatics, acceleration strategies for ocean modeling application.

Current Research

In the area of computational sciences, very important research successes were observed this year.

Medical Imaging Group (MIG): In this year, the group advanced efficient, trustworthy AI for medical imaging. The group developed lightweight deep learning models for resource-constrained clinical settings. This included introducing parameter-efficient rolling convolution filters for cross-modality imaging. They also created MNSeg-Net for real-time median nerve segmentation in ultrasound videos. To handle variable patient data, the group designed an unsupervised test-time adaptation framework using information geometry. In image reconstruction, the group improved MRI quantitative susceptibility mapping using an iteration-specific denoising network. The group also built a framework to synthesize contrast-phase-specific virtual monochromatic images directly from single-energy CT scans. To improve clinical reliability, the group introduced inference-time correction methods based on uncertainty metrics. The group also developed a robust defense mechanism to detect "deep fake" brain MRIs. Finally, the group successfully translated their medical computer vision techniques into material sciences. They created an unsupervised machine learning framework to automatically stage carbon steel corrosion severity from optical microscopy images.

Computational & Statistical Physics lab (CSPL): Our proposed method for efficient, fast, and approximate matrix multiplication was demonstrated on Large-Language-Model (LLM) inference applications which can save billions of dollars in power consumption annually. We also proposed a randomised linear solver for ill-conditioned linear systems that perform better than the known methods. We continue to work on generalising/extending our methods such as NSMC (N-Sphere-Monte Carlo) that was originally proposed for high-D integration problems, to any sampling task in high-D where the number of parameters is large. A few other works are also in progress which may be described at a future point.

QUEST Lab: In 2025, the QUEST Lab pushed the boundaries of scientific AI and physics-informed learning. The group's research achievements spanned neural operator theory, generative forecasting models, remote sensing, and ocean-climate sciences, as well as innovations in language learning technology.

A significant methodological breakthrough was the introduction of PINTO (Physics-Informed Transformer Neural Operator), which utilises iterative kernel integral units and cross-attention mechanisms. This framework allows for efficient generalisation across various boundary and initial conditions without the need for retraining, using purely physics-based losses. When tested on Navier-Stokes, Burgers', and advection equations, PINTO reduced relative errors to nearly a third of existing physics-informed methods and demonstrated a unique capability to extrapolate to unseen time steps. This physics-informed trajectory was further applied to fluid dynamics through a new neural network for turbulent wind turbine wakes. By integrating k–turbulence closure and actuator disk methods, the lab eliminated the requirement for high-fidelity training data, providing a fast alternative to RANS solvers with a fivefold acceleration in training via transfer learning.

In the area of generative modelling, the lab developed CN-Diff, which incorporates nonlinear data transformations into the diffusion process to capture intricate temporal patterns in time series forecasting.

For remote sensing, the group developed DNOD, a Deformable Neural Operator-based framework designed for small-object detection in Synthetic Aperture Radar (SAR) imagery, achieving a 2.23 mAP improvement on the SARDet-100k benchmark.

In climate science, the lab introduced deep learning architectures for the bias correction of CMIP6 projections, significantly improving the precision of Bay of Bengal sea surface temperature forecasts. Additionally, high-resolution ocean simulations characterised the lifecycle of a 140-km rain plume linked to cyclone Komen, revealing detailed submesoscale activity.

Finally, the EvalYaks project successfully fine-tuned Mistral-7B models for automated CEFR B2 English assessments. These models achieved 96 percent accuracy, performing competitively with frontier AI systems and offering a scalable path for language proficiency evaluation.

FLAME lab: In the area of computational flow modelling, research areas focused on the acceleration of reacting flow solvers and investigation of hydrogen-fuelled combustion phenomena for clean energy. A novel scalable asynchronous discontinuous-Galerkin method for partial differential equations arising in flow modelling was developed. The method was implemented into a widely used open-source finite element library and was demonstrated to provide excellent scalability at extreme scales on IISc's Param Pravega supercomputer. The performance of hydrogen fuel was studied for different load conditions in a longitudinally staged combustion system often used in power generation. In addition, a new machine learning-based reduced-order model has been developed to accelerate chemical kinetics computations in massively parallel reacting flow simulations.

Materials-physics & Algorithmic Techniques Research In eXtreme-computing (MATRIX) Lab: In AY2025-2026, MATRIX lab focused on developing mathematical techniques, scalable computational methods, hardware-aware algorithmic implementations, and data-driven approaches that are aimed at pushing the boundaries of the current predictive capabilities of the design of materials.

The lab developed finite-element-based methods for fully relativistic pseudopotential density functional theory (DFT) incorporating noncollinear magnetism and spin-orbit coupling, including a unified mathematical framework to compute atomic forces and unit-cell stresses. This method achieved 8×–11× minimum wall-time speedups over plane-wave implementations with demonstrated GPU scalability up to 20,000 electrons.

The lab proposed a crystal structure prediction (CSP) framework employing derivative-free structural search with a supervised GNN as the energy evaluator, introducing a model selection framework to address weight initialisation sensitivity and demonstrating that the lightweight CGCNN architecture achieves performance comparable to far more expensive models.



In another contribution, two complementary real-space methods for applying external potential bias within finite-element DFT were developed — a constant electric field approach and a constrained electrostatic potential method — offering a scalable alternative to plane-wave approaches for modelling surfaces and interfaces under external bias.

The lab developed a new eigensolver R-ChFSI, a residual-based reformulation of a Chebyshev filtered subspace iteration (ChFSI) that is tolerant to inexact matrix-vector products (MVPs), with rigorously derived convergence guarantees.

The lab developed hardware-aware parallel algorithms for finite-element DFT calculations that are scalable to tens of thousands of GPUs. Leveraging R-ChFSI's tolerance to inexact matrix-vector products, we developed GPU-aware implementation procedures incorporating approximate overlap matrix inverses, mixed-precision computation, matrix-free methods to accelerate FE discretised operator action on multivectors, block floating-point compressed domain-decomposition communication, blocked computation-communication overlap, and an efficient band-partitioning algorithm.

Algorithmic Techniques for Computational Genomics (ATCG): In AY2025-2026, the ATCG Lab focused on algorithms and systems for genome analysis. The work emphasised pangenome methods, long-read sequencing methods, and rare disease genomics.

The lab developed a faster approach for sequence to graph alignment and whole-genome comparison. This method improved both speed and accuracy on large genomic datasets.

The lab also developed a method that enables scientists to study structural variation and repeat-rich regions of human genomes. The new method improved variant detection which are otherwise challenging to detect using standard genome sequencing techniques.

The lab also contributed methods for *de novo* genome assembly. The contributions include read error correction and

phasing by using rigorous combinatorial optimisation techniques.

In collaboration with experts in population genetics and genomics, the lab is leading the development of scalable methods for working with large pangenome graphs and its downstream applications, e.g., gathering novel biological insights from national sequencing survey data such as the GenomeIndia project.

In rare disease genomics, the group has developed a machine learning model for variant prioritisation. This work is in collaboration with Strand Life Sciences Private Limited. The lab is also working on quantifying the impact of long-read sequencing to improve diagnosis in a cohort of rare disease patients.

Across various projects, the lab released several open-source software. Overall, the work improved the computational foundations for genome analysis and supported applications in genomics and precision medicine.

Biomedical Image Analysis (BioMedIA) Lab:
BioMedIA Lab advanced AI methods for neuroimaging biomarkers and trustworthy medical image analysis. We developed anatomy-guided foundation model approaches for detecting lacunes, cerebral microbleeds and enlarged perivascular spaces, and proposed a weakly supervised framework for intracerebral haemorrhage segmentation in low-data non-contrast CT.

We further introduced physics-informed simulation for robust semi-supervised lesion detection and quantitative radiomics methods for neuroimaging. Our multimodal clinico-radiomics framework for acute ischemic stroke outperformed several unimodal models.

The group received several international recognitions during the year. Our MICCAI 2025 paper on semi-/self-supervised biomarker detection received a Spotlight presentation and Travel Award, and our method ranked among the top six teams in the MICCAI 2025 Traumatic Brain Injury Lesion Detection Challenge. A group from the lab also won the Novelty Track Prize at the Google Research MedGemma Impact Challenge for developing an innovative application of medical foundation models for healthcare. We additionally filed an Indian patent on a two-stage adaptive structured pruning framework for federated medical image segmentation, supporting scalable and privacy-preserving collaborative AI for medical image analysis.

Biomolecular Computation Lab:
The lab made significant progress at the interface of biomedical data science, cancer systems biology, and RNA biophysics. The MIDAS (Medical Imaging and Information Datasets for India) effort was expanded with more stakeholders joining the platform. In precision oncology, studies on gingivobuccal oral squamous cell carcinoma integrated somatic mutation profiling with gene-expression analysis led to identification of nuclear speckle-associated enhancement of stemness under DNA damage response. It further showed that post-translational regulation of stemness contributes to relapse and progression, thereby providing mechanistic insight into therapeutic resistance and potential biomarkers for aggressive disease. In RNA biophysics, rCGMM, a coarse-grained force field embedded with an elastic network model was developed for simulating the dynamics of small noncoding RNAs. This allows efficient exploration of RNA conformational landscapes while preserving key structural constraints relevant to function. Collectively, these studies contributed to building national-scale biomedical data ecosystems, decoding molecular mechanisms of cancer progression, and advancing computational methods for RNA structural dynamics, with clear translational relevance to precision medicine, AI-enabled healthcare, and next-generation molecular modelling.

In the domain of Computer and Data Systems, several advancements were achieved this year.

Database Systems Lab: Advances in GPU technology have frequently driven innovations in database query processing. The recent incorporation of native support for ray tracing (RT) in modern GPUs has spurred interest in its application to relational database workloads -- in particular; RT has been advocated for column indexing. We have examined this premise and conversely argued that it is the classical rasterisation pipeline, rather than RT, which is to be preferred for such applications. The rationale is that rasterisation uses arithmetic value comparisons, instead of the computationally heavy ray-triangle geometric intersections of RT, for data search. To substantiate this claim, we designed RasterScan, a purely rasterisation-based indexing approach, that adheres to the data model employed by RT-based methods. A detailed evaluation demonstrates that RasterScan consistently outperforms its RT counterparts, often achieving order-of-magnitude speedups for both index build and search times.

Vision and AI Lab (VAL):
Developed novel benchmarks and evaluation frameworks for responsible generative AI, including GeoDiv for measuring geographical diversity in text-to-image models and methods for leveraging diffusion-generated synthetic data to improve fairness in image classification.

Advanced the state of the art in controllable image generation and editing, introducing Compass Control for multi-object orientation control and zero-shot depth-aware image editing techniques for diffusion models.

Pioneered methods for improving the physical realism of generative models, including MirrorVerse, which enables diffusion models to generate realistic reflections and mirror-consistent scenes.

Made significant contributions to 3D vision and scene understanding, proposing MonoPlace3D for 3D-aware object placement in monocular detection and UniC-Lift for unified 3D instance segmentation through contrastive learning.

Introduced new machine learning paradigms through Discovering a Zero, uncovering the existence and implications of a previously unexplored zero-vector class in machine learning models.

Contributed to AI safety and trustworthy foundation models, including a detailed investigation of safety pretraining and model abliteration in large language models, while also advancing expressive and compositional object generation in collaboration with industry research labs.

Visual Computing Lab: In this academic year, the members of the VCL continued their research in federated learning, domain adaptation, and multimodal foundational models. In one of our works [WACV'26] we proposed FedSCAI, a federated learning framework for Federated Source-Free Domain Adaptation (FFreeDA), where only a pre-trained source model and unlabelled client data are available. The proposed Server-Client Alignment (SCAI) mechanism reduces client drift caused by severe domain heterogeneity by aligning client and server predictions, leading to more reliable pseudo-labels and improved adaptation. Experimental results on benchmark datasets demonstrate consistent performance gains over existing state-of-the-art methods.

In another well-received work, we proposed PEP-FedPT, a federated prompt tuning framework for Vision Transformers that addresses the trade-off between global generalisation and client-specific personalisation under heterogeneous data distributions. The framework introduces Class-Contextualised Mixed Prompts (CCMP), which can be interpreted as the MMSE estimator of the latent class-specific prompt, leveraging global class prototypes and client class priors. This principled Bayesian formulation enables per-sample prompt personalisation without requiring client-specific trainable parameters, resulting in an efficient and scalable federated learning framework.

In a collaborative work (with DREAM: Lab and Accenture), we developed an optimised federated learning framework for privacy-preserving power-demand forecasting in microgrids, addressing data heterogeneity and scalability across thousands of IoT clients. The proposed optimisations, including an exponentially weighted training loss, improve forecasting accuracy while reducing computational overhead.

Beyond these, we started to pursue another timely research direction towards examining and improving visual reasoning capability of modern multimodal LLMs. In one of our works [AAAI'26], we developed O3SLM, an open-weight, open vocabulary



sketch-language model that extends Large Vision-Language Models to comprehend and reason over hand-drawn sketches. To overcome the scarcity of multimodal sketch data, we introduced a large-scale dataset of image-sketch-instruction triplets for pretraining and instruction tuning. By jointly modeling images, sketches, and natural language, O3SLM learns a unified multimodal representation, enabling SOTA performance on sketch-based object localisation, counting, image retrieval and visual question answering.

I was also a part of an interdisciplinary team of researchers at AIM@IISc that developed one of the largest and most challenging urban traffic dataset and vehicle detection benchmark (BMD-45) to date and the first of its kind across the global south. Accurate vehicle detection in real-world urban environments remains challenging, particularly in developing cities where traffic patterns, camera viewpoints, vehicle types and environmental conditions can differ significantly from those represented in existing benchmarks. BMD-45 was created to help address this gap by providing a large-scale dataset built from operational city-wide CCTV infrastructure.

NLP group:
In AY 2025-26, the NLP pursued a bold research agenda and made several contributions spanning developing new methods, designing evaluation frameworks, curating datasets and benchmarks, and evaluating AI models. Overall, the work can be categorised into three key thrusts:

Evaluating AI Capabilities: Conversations around AI advances are filled with both genuine excitement and, at the same time, hype. Our work in this space aspires to offer clarity and transparency into AI capabilities by rigorously evaluating popular and consequential claims made about AI models. For instance, several recent studies claim that autonomous research agents can generate novel research ideas. Amidst the prevailing optimism, our work exposed a critical concern that a considerable fraction of such research documents are plagiarised and therefore cannot be considered novel. Our work also shows, through controlled experiments, that automated plagiarism detectors are inadequate at catching AI-plagiarised ideas. Another evaluation effort from our group focused on evaluating techniques that enable models to abstain from inappropriate requests. Furthermore, we recently audited the content moderation practices of Twitch, a video streaming platform. Our audit revealed a large fraction of hateful messages, up to 94%, bypass moderation.

AI Text Detection: One of the biggest concerns about large language models is that they would be abused to create large-scale misinformation or spam and generally flood the internet with low-quality content (colloquially called “AI slop”). We are developing detectors that can detect AI-generated content, by training large models to capture clues of AI writing, including specific AI vocabulary (e.g., “delve”, “imperative”), capturing stylistic trends (using bullets and highlights), and overall structure (e.g., negative parallelism – “not only X, but Y”). In a recent study, we evaluated the efficacy of existing state-of-the-art AI text detectors on flagging AI-generated and AI-assisted peer reviews, which is a topic of much debate. Our resulting ICML publication shows that commonplace policies permitting LLM use for polishing reviews cannot be currently enforced. This work informed the ICML 2026 AI-use for reviewing policy and is informing ICLR 2027 guidelines.

Improving Geographical Representativeness of AI: A body of my work characterises and improves the geographical representativeness of AI models. For AI systems to be broadly useful, it is important that they are geographically inclusive—that is, they encode information about, and are sensitive to, different cultures and countries around the globe. Recognising that often standard benchmarks are Western-centric, we have developed new design methodologies to evaluate the representation and fairness of LLM outputs for the Indian context. Towards this goal, we created INDIC-BIAS, a comprehensive benchmark evaluating 14 popular LLMs across 85 distinct Indian identity groups (spanning castes, religions, and tribes). Our evaluation of popular LLMs on these tasks revealed strong negative biases against marginalised identities, with models frequently reinforcing common stereotypes. Building on this, we recently introduced TALES, a taxonomy and an evaluation of cultural misrepresentations of stories generated through LLMs.

DREAM Lab: The DREAM Lab continued its research on distributed systems for cloud, edge and intelligent computing, with key contributions in federated learning, graph neural networks, edge intelligence, hybrid cloud–quantum platforms, and autonomous systems. During the year, the lab extended the Flotilla federated learning framework to investigate power-aware and time-series federated learning, scheduling on edge accelerators, advanced scalable graph analytics through streaming graph partitioning and incremental GNN inferencing and explored adaptive scheduling of DNN workloads for UAV fleets. The group also made contributions to hybrid cloud and quantum computing through orchestration and profiling of quantum-classical workflows (QCE), while expanding research on serverless and agentic computing platforms (TPDS, ICWS, CCGRID). Close collaborations with Microsoft Research, IBM Research, NPCI, and urban mobility initiatives enabled translational research in cloud databases (PVLDB), fintech analytics (ICDE), smart grids, and intelligent transportation systems (CVPR Findings, IEEE SCALE Challenge winner).

Middleware and Runtime Systems Lab: The middleware and runtime systems lab continued its research in the topics of fault tolerance of HPC (High Performance Computing) applications and HPC for AI. In the area of fault tolerance for HPC parallel applications, the lab developed a novel replication-based framework combining checkpointing and fault tolerance. The lab developed adaptive partial replication method to improve application efficiency in the presence of failures. A novel derivation for optimal checkpointing interval in terms of accuracy of failure predictors and replication degree was developed. The lab also developed methods for fault tolerance in MPI I/O applications and developed chunk-level fault tolerance for execution in the presence of failures and sharing of I/O operations by replicas under failure-free conditions. All these strategies yielded significant benefits over baseline executions.

In the area of HPC for AI, the lab developed a novel framework for hybrid CPU-GPU executions to accelerate large-scale LLMs. The framework performed delayed updates for maximising utilisation of CPU and GPU resources and filtered certain layers for updates.



Faculty & Staff

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PHANEENDRA YALAVARTHY
PhD (Dartmouth College), Professor

3.4.6

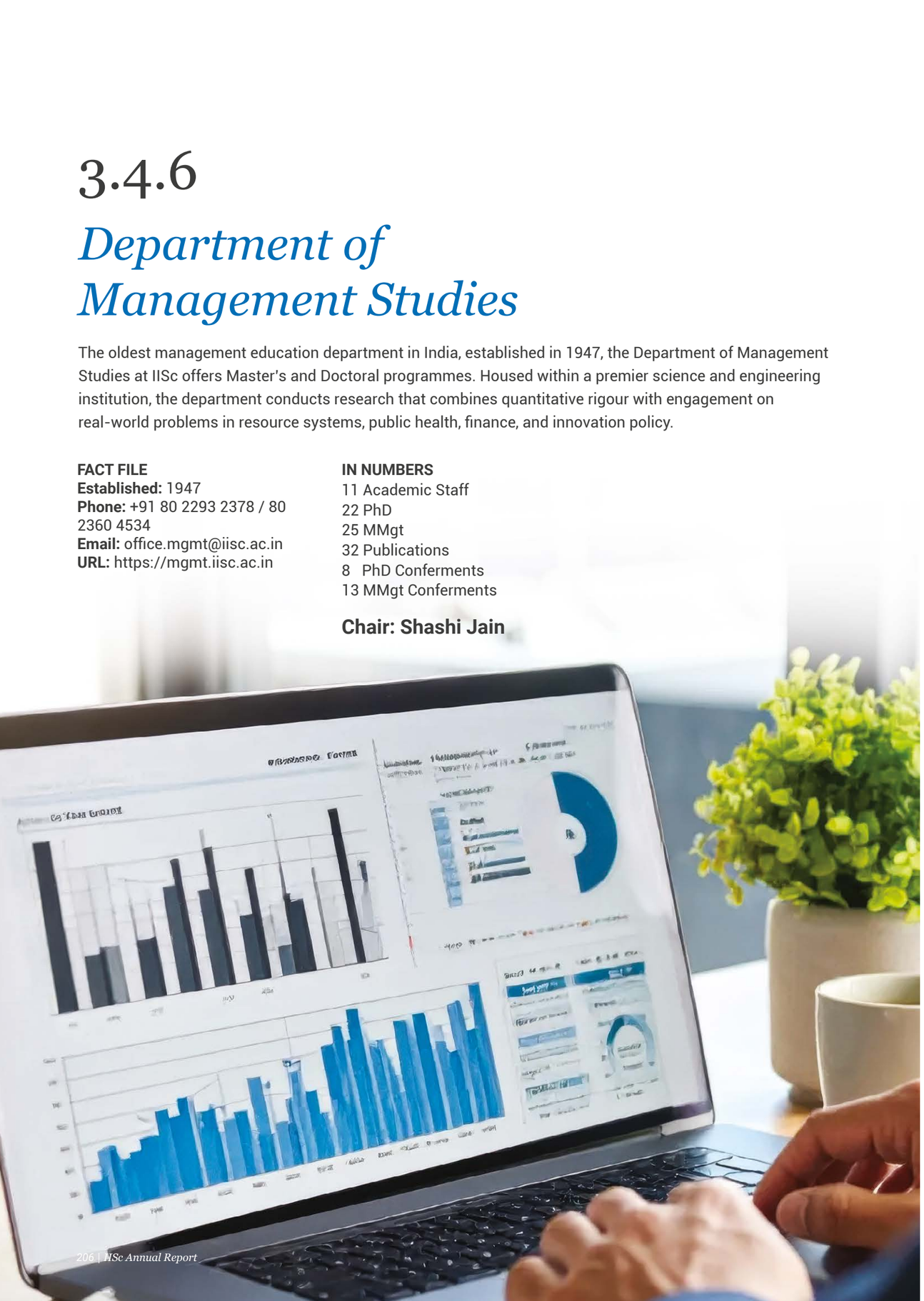
Department of Management Studies

The oldest management education department in India, established in 1947, the Department of Management Studies at IISc offers Master's and Doctoral programmes. Housed within a premier science and engineering institution, the department conducts research that combines quantitative rigour with engagement on real-world problems in resource systems, public health, finance, and innovation policy.

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IN NUMBERS
11 Academic Staff
22 PhD
25 MMgt
32 Publications
8 PhD Conferments
13 MMgt Conferments

Chair: Shashi Jain



Core Research

Innovation and enterprise: Entrepreneurship, innovation ecosystems, start-ups, industrial economics.

Energy and sustainability: Energy access, renewable transitions, energy policy, sustainability transitions.

Public policy and urban systems: Environmental systems, urban and informal systems, public policy.

Health and society: Public health, socio-technical interventions, AI for social good.

Finance and risk: Financial engineering, risk analytics, quantitative finance.

Operations and systems: Supply chain, optimisation, operations research.

Current Research

Entrepreneurship and Innovation Ecosystems: We study the trajectories of returnee and domestic entrepreneurs within emerging startup hubs such as Bangalore, focusing on opportunity recognition, innovation capacity, and venture growth. This work informs policy frameworks aimed at strengthening entrepreneurial ecosystems in emerging markets.

Energy Systems and Sustainability Transitions: Our work addresses India's transition toward low-carbon energy systems, with emphasis on renewable integration and rural energy access. We develop analytical models for demand-side management, variable renewable integration, and energy infrastructure resilience, supporting India's clean energy transition.

Sustainability and Public Policy: This work examines the intersection of sustainability and policy in urban and industrial contexts, including lean production systems, sustainability enablers for SMEs, and incentive-driven behavioural change, with the aim of informing sustainable urban and industrial practice.

Health, Public Policy, and Socio-technical Innovation: Our work in health applies AI and socio-technical methods to public health outcomes, including AI-assisted oral cancer screening, behavioural strategies for sickle cell anaemia elimination, and economic evaluation of emerging medical technologies — aligned with national priorities around health equity and access.

Technology, Intellectual Property, and Informal Systems: We study how intellectual property management, cybersecurity frameworks, and informal urban systems shape technology adoption and innovation, including patent lifecycle valuation, the role of IP in sustainability transitions, and incentive mechanisms for technology readiness.

Financial Engineering and Risk Analytics: In collaboration with banking partners, we apply data envelopment analysis and machine learning to evaluate technical efficiency of rural banks and to model credit risk — estimating default probabilities and loss given default to support regulatory compliance and risk management.

Operations Research and Smart Logistics: This stream develops optimisation models and heuristic algorithms for practical logistics problems, including manufacturing scheduling, drone-truck integrated last-mile delivery, and urban bus allocation, alongside lean production optimisation for SMEs.

Quantitative Finance and Risk Management: We use mathematical and statistical models for portfolio optimisation, hedging, and derivative pricing, including model-free hedging via martingale optimal transport, non-parametric modelling of multidimensional Hawkes processes, and hybrid factor models combining PCA and MLE.



Faculty

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MADHU NAYAKKANKUPPAM
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3.4.7

Interdisciplinary Centre for Energy Research

The Interdisciplinary Centre for Energy Research (ICER) was launched in 2012 with a focus on renewables and energy conversion and storage technologies. The department now has six core faculty, and several affiliate faculty leading efforts in three verticals: materials and chemical, thermal and mechanical, and power and electrical systems.

FACT FILE
The Centre offers PhD and M.Tech. Research programs in the area of Energy.
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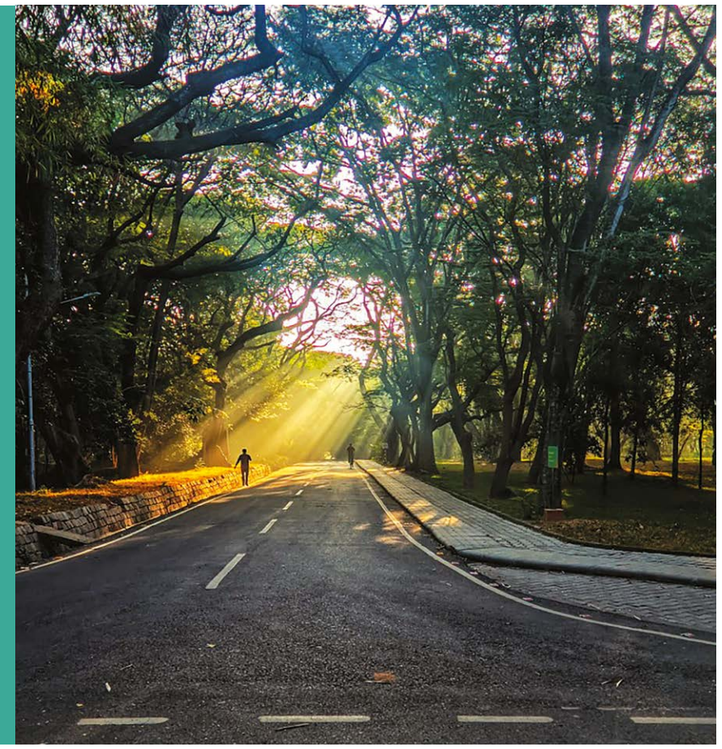
IN NUMBERS
41 PhD
15 MTech Researchers

Chair: Pramod Kumar



Core Research

Supercritical-CO_2 power and cooling cycles, printed circuit heat exchangers, turbomachinery, biomass conversion, green hydrogen production and storage, data centre thermal management, solar thermal energy, solar PV, biomass conversion, energy efficient brine concentration and resource recovery, fuel cells and electrolysers, battery technologies, electrochemical carbon capture, passive radiative cooling coatings, polymer electrolytes, and energy harvesting and sensing.



Current Research

- Design and development of super critical CO_2 (sCO_2) power packs and trans critical CO_2 (tCO_2) heat pumps
- Turbomachine design for sCO_2 systems
- Natural refrigerant-based cooling and heating for reduced environmental impact
- Development of compact heat exchangers for supercritical carbon dioxide Brayton power plant for CSP applications
- Advanced bio-fuels generation from thermochemical conversion of biomass - Research, Demonstration and Analysis
- Polymer-hybrid solid electrolytes for next-generation high-performance Na-based batteries (Na-ion, Na-metal)
- High-energy density sulphur batteries for EV and space applications
- Hybrid evaporative cooling systems
- Multivalent aqueous batteries for India-specific stationary energy storage solutions
- Electrochemical carbon capture and electrosynthesis of high-value chemicals
- Solar PV waste heat-driven water purification
- Fuel cell systems optimal design
- Design and optimisation of thermochemical energy storage systems



Faculty

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PRAMOD KUMAR
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FARSA RAM
PhD (Academy of Scientific and Innovative Research), Assistant Professor

3.4.8

Interdisciplinary Centre for Water Research

Reaching across traditional disciplinary boundaries, ICWaR aims to provide a comprehensive understanding of how complex environmental factors affect water science and technology, and to offer efficient and effective engineering solutions to environmental problems. Students in ICWaR receive education across diverse areas and conduct interdisciplinary research that addresses major water-related science and engineering challenges of modern society.

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IN NUMBERS
33 PhD students
200+ Journal Publications
60+ Conference Publications

Chair: Praveen C Ramamurthy



Core Research

- **Water Resources Management and Systems:** Focuses on river basins, groundwater and urban water systems, regional hydrology, water budgeting, data assimilation, and alternative management strategies.
- **Water Quality, One Health and Sustainable Treatment:** Addresses waterborne disease control and neglected infectious diseases through a One Health framework integrating human, animal, and environmental health. This domain encompasses advanced omics and molecular diagnostics, nanotechnology for water treatment, quality monitoring, groundwater remediation, and sustainable environmental remediation via membrane separation, adsorption, and resource recovery from waste streams.
- **Climate Change and Hydrology:** Explores climate impacts on Indian rivers, monsoon and climate change modelling, glacier hydrology, isotope-based climate change detection, earth system responses to various forcings, and the modelling of hydrometeorological extremes.
- **Earth System Science and Technology:** Integrates geodetic sensors, geodesy, earth system modelling, hydrologic flux retrieval and validation, isotope

Current Research

During the 2025 to 2026 period, the Interdisciplinary Centre for Water Research (ICWaR) continued to pioneer integrated solutions for complex water challenges by bridging fundamental earth science, climate modelling, advanced engineering, and planetary health. The Centre's highly interdisciplinary research has driven significant advancements in predicting hydroclimatic extremes, unravelling deep-time climate shifts, engineering next-generation water treatment technologies, and safeguarding the critical zone. A critical institutional anchor is the Centre for Cauvery River Basin Management and Studies (cCauvery). Established as a collaborative knowledge partner with the National River Conservation Directorate (NRCD) and national technical institutes, cCauvery operationalises a multidisciplinary framework that bridges scientific data collection, hydrologic monitoring, and strategic policy support, positioning itself as a national model for integrated, evidence-based river basin management.

In the domain of Water Resources Management and Systems, research addresses the dynamics of managed human-natural systems. Focus areas include incorporating region-specific irrigation practices into ecohydrological models to evaluate environmental flows and developing automated nested landscape discretisation algorithms and transferable decision trees for direct calibration in data-scarce regions. Additionally, researchers are integrating 2D groundwater-flow modules into large-scale frameworks, such as the Variable Infiltration Capacity (VIC) model, to capture bidirectional surface-groundwater interactions. They are coupling them with physically based downscaling of satellite observations to enable quality-controlled assessments of groundwater drought across India. Within Water Quality and Sustainable Treatment, the Centre merges green materials science, plasma engineering, and microbial biotechnology

to pioneer circular-economy solutions. Innovations include green-synthesised nanoparticles, bio-aerogels, and metal-organic framework (MOF) nanocomposites that extract toxic heavy metals and persistent organic pollutants. This is paired with the design of biomimetic, enzyme-based point-of-care electrochemical tools for real-time detection of micro-and nanoplastics and PFAS. The group is also translating cold plasma processes for hydrocarbon reforming, generating plasma-activated water (PAW) for green fertilisers, and exploiting electric-field-assisted liquid metal dispersions for membrane-free wastewater recycling. Furthermore, aligning with a One Health framework, the Centre leverages advanced omics to investigate pathogen biology, driving the development of translational molecular diagnostics for neglected water-borne infectious diseases.

Focusing on Climate Change and Hydrology, ICWaR investigates the predictability and risk structures of hydroclimatic extremes. Advanced tracking algorithms and high-resolution Earth system models are being used to isolate how regional topography dictates Monsoon Low Pressure Systems (LPS), which drive most extreme rainfall over central India. Researchers are advancing sub-seasonal-to-seasonal (S2S) forecasting to achieve up to 3 months of lead time for droughts, heatwaves, and floods, supported by process-informed machine learning and stochastic rainfall generators. This domain also pioneers research into Earth system boundaries, recently quantifying safe regional aerosol boundaries for the South Asian monsoon, evaluating tipping points in ocean-atmosphere circulations, and formalising risk-risk analysis paths for solar radiation modification. In Earth System Science and Technology, the Centre leverages space-geodetic sensors and advanced isotope geochemistry. Coarse GRACE satellite observations are being downscaled to generate high-resolution Terrestrial Water Storage (TWS) products. At the same time, high-altitude glaciological monitoring networks in Ladakh measure heterogeneous glacier mass loss, utilising Double Gamma Distribution methods to correct for bias. Multi-proxy isotope geochemistry, applying radiogenic and metal-stable isotopes of strontium, calcium, and silicon, is tracing submarine groundwater discharge and salinity intrusion in vulnerable coastal deltas. Additionally, triple oxygen and clumped carbonate isotopes are being used to develop novel paleoclimate proxies, such as archaeological silica phytoliths to reconstruct ancient humidity and Antarctic ice cores to analyse deep-time snow accumulation. Ultimately, this sophisticated convergence of process-based hydrology, space-borne Earth observations, and molecular engineering allows ICWaR to successfully address the dual challenges of climate-induced water scarcity and hydrometeorological extremes. By establishing the water-carbon nexus, pioneering membrane-free purification technologies, and setting safe regional planetary boundaries, the Centre delivers actionable, data-driven intelligence and robust infrastructure frameworks essential to securing national and global water resilience amid accelerating climate change.

Ongoing Research Activities

Centre for Cauvery River Basin Management and Studies (cCauvery)

The Centre for Cauvery River Basin Management and Studies (cCauvery), established in 2024, is hosted by the Interdisciplinary Centre for Water Research (ICWaR) at the Indian Institute of Science (IISc), Bengaluru. It is a collaborative initiative between IISc Bengaluru and NIT Tiruchirappalli, guided by cGanga at IIT Kanpur, and functions as the knowledge partner of the National River Conservation Directorate (NRCD), Ministry of Jal Shakti. cCauvery is dedicated to the restoration, conservation, and sustainable management of the Cauvery River Basin, which is one of India's most vital and contested water systems. The river sustains millions across southern India and plays a critical role in agriculture, ecology, and regional heritage.

The Centre adopts a multidisciplinary framework involving:

- **Data Collection and Dissemination:** Building knowledge on river health and basin dynamics.
- **Scientific Research:** Advancing studies in hydrology, water quality, climate resilience, and ecosystem restoration.
- **Strategic Planning and Policy Support:** Enabling evidence-based water governance.
- **Monitoring and Assessment:** Tracking water quality, flows, and ecological health.
- **Education and Capacity Building:** Training stakeholders through academic programs and outreach.
- **Stakeholder Engagement:** Bridging government, academia, industry, and communities.



By combining science, policy, and collaboration, cCauvery aims to be a national model for integrated river basin management, ensuring the sustainable future of the Cauvery River and its people.

Rajarshi Das Bhowmik

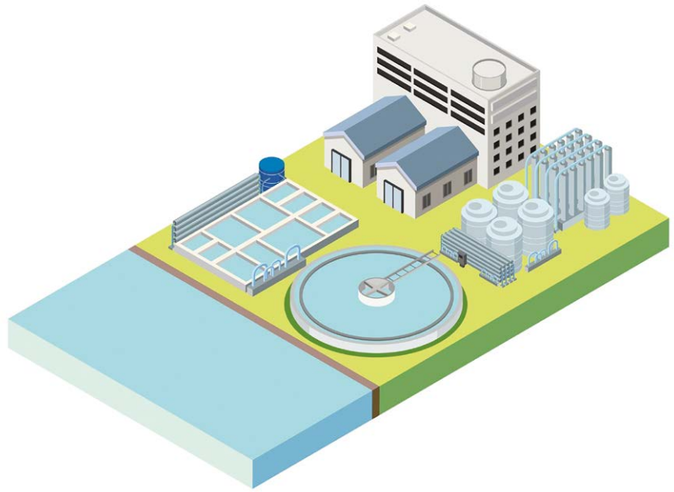
His research group focuses on advancing understanding of hydroclimate extremes, subseasonal-to-seasonal (S2S) forecasting, and process-based hydrology to address multi-scale risks under a changing climate. A core strength of the group lies in developing stochastic rainfall generators capable of simulating unprecedented extreme events for climate-resilient design, alongside creating uncertainty-aware hydrologic models that accurately estimate extreme rainfall return levels and revise flood return periods by accounting for co-occurring

hydrometeorological drivers. Over the past year, the team made significant strides in integrating process-informed machine learning with traditional hydrology, developing AI-based post-processing frameworks to improve crowd-sourced rainfall estimates and hybrid models that enhance computational efficiency and interpretability. Key applied accomplishments include expanding a coupled, high-resolution urban flood forecasting system for Bengaluru toward broader operational deployment, as well as improving S2S predictive skills, achieving up to three months of lead time for forecasting floods, concurrent droughts, and heatwaves. Furthermore, recent studies have illuminated critical complex hydrologic drivers, demonstrating how global teleconnections dictate the spatio-temporal variability of snow cover in the Western Himalayas and drive the spatial synchronisation of river floods across peninsular India, while also uncovering new insights into the feedback mechanisms between forest fires and hydrologic anomalies.

Bramha Dutt Vishwakarma
His research leads the Geodesy for Earth System Science (GESS) group, focusing on the interface of hydrology, remote sensing, climate change, sea level, and the cryosphere. Utilising geodetic sensors and satellite missions, predominantly GRACE, ASTER, and MODIS, his fundamental work tracks large-scale changes in the hydrosphere, evaluates drivers of the water cycle, and separates signals associated with various hydrological processes to distinguish the impacts of climate change from human intervention. Over the past year, significant advancements were made in satellite hydrology and statistical modelling, including the generation of a novel downscaled GRACE Terrestrial Water Storage (TWS) product for India using mascon-wise mass conservation and the improvement of coastal altimetry accuracy via a dynamic search-radius algorithm. Furthermore, his group discovered a new exponential relationship between specific yield and average groundwater levels. It demonstrated the necessity of implicitly incorporating changes in water storage into the traditional Budyko framework for robust hydrological modelling. In cryospheric research, his team established a comprehensive glaciological monitoring site in Ladakh to measure glacier mass, energy balance, and meteorology continuously. Recent regional-scale analyses from this site revealed that Western Ladakh glaciers are experiencing higher mass loss than their eastern counterparts, while also validating the use of Double Gamma Distribution for bias-correcting climate projections in vulnerable high-altitude regions.

Praveen C Ramamurthy
His research focuses on the intersection of environmental nanotechnology, sustainable materials, and water quality monitoring, particularly addressing the severe environmental and epidemiological risks posed by persistent chemical pollutants, including heavy metals, microplastics, and agricultural pesticides. To mitigate these threats, his laboratory engineers advanced materials, including green-synthesised nanoparticles, biogenic adsorbents, and novel metal-organic framework (MOF) nanocomposites, that exhibit high, regenerable adsorption capacities for toxic contaminants like lead, arsenic, and chromium while producing non-toxic byproducts. Concurrently, his group develops specific microbial agents for the biodegradation of persistent herbicides such as atrazine, alongside engineering cutting-edge point-of-care electrochemical and biomimetic sensors to enable affordable, decentralised water quality monitoring. Over the past year, his team has made significant advancements in sensor technology and contaminant remediation. This includes the development of biomimetic, i ron-doped polydopamine sensors for the selective detection of polystyrene nanoplastics, as well as comprehensive evaluations of PFAS detection techniques. Furthermore, building on his foundational expertise in materials and organic electronics, his group actively investigates the physics of degradation in perovskite solar cells and organic electronics. It has recently expanded a decade-long outdoor reliability testbed to utilise artificial intelligence for predictive energy yield and reliability forecasting under Indian climatic conditions.

Govindasamy Bala
As an internationally acclaimed climate and carbon cycle scientist, he conducts interdisciplinary research on modelling global climate change, climate feedback, the carbon and water cycles, solar geoengineering, and monsoon dynamics. A core component of his work involves in-depth investigations into the climatology of Monsoon Low Pressure Systems (LPS), which drive most extreme precipitation across central India. By developing advanced LPS tracking algorithms and utilising high-resolution models such as the NCAR Community Earth System Model (CESM), his group evaluates the profound influence of regional topography, including the Himalayas, Western Ghats, and Southeast Asian mountains, on monsoon characteristics, providing vital information for historical and future flood risk assessments. Pioneering the use of supercomputing for idealised simulations, his research evaluates decadal-to-millennial climate responses to external forcings, including greenhouse gases, aerosols, and land-cover changes. Reflecting his leadership in the IPCC and the Earth Commission, his recent major milestones include setting the safe global aerosol planetary boundary and, over the past year, quantifying the safe regional aerosol boundary for the South Asian monsoon. Furthermore, his latest work continues to advance understanding of Earth's critical thresholds by evaluating robust shifts in tropical circulation



under a warming climate, analysing tipping points in ocean-atmosphere circulations, and developing practical risk-risk analyses for solar radiation modification strategies.

Sekhar M
His research group advances interdisciplinary hydrology with a strong emphasis on groundwater systems, agro-hydrology, satellite hydrology, and critical zone processes. Utilising long-term field observatories such as the Kabini Critical Zone Observatory and the Berambadi watershed, his fundamental work characterises complex groundwater connectivity in crystalline-rock aquifers. It integrates lateral groundwater flow into large-scale hydrological models to better capture bi-directional surface-groundwater exchanges. Building upon this foundation, his group has recently expanded into the emerging water-carbon nexus, establishing a major research frontier by linking groundwater variability to ecosystem carbon and water-use efficiencies across India to understand ecosystem productivity and climate resilience better. Over the past year, his team made significant advancements in remote sensing and Earth system science, developing methodologies to derive clear-sky soil moisture indices from ECOSTRESS data and to estimate surface soil moisture using multi-polarisation NISAR-like SAR data. Furthermore, field-based studies yielded critical insights into agricultural sustainability and hydro-geochemistry, notably tracking the dissipation of agricultural insecticides using compound-specific isotope analysis, mapping the agroecological reuse of reservoir sediments in croplands, and conducting comprehensive multi-index appraisals of groundwater quality and its implications for human health.

Srinivas VV
His research focuses on the modelling, characterisation, and risk assessment of complex hydrometeorological and climate extremes. A primary thrust involves developing quantitative frameworks to analyse flash droughts, using innovative aridity index methodologies to assess their rapid onset, triggers, and spatiotemporal trends across major river basins. In coastal environments, his work investigates the compounding risks of concurrent sea-level rise, storm surge, and extreme rainfall events, specifically evaluating how large-scale climate phenomena such as ENSO and the Indian Ocean Dipole drive spatial disparities along coastlines. Additionally, his research advances statistical methodologies for extreme weather predictability and uncertainty quantification, establishing robust models to evaluate multi-source uncertainties in probable maximum precipitation via imprecise probability, and creating frameworks to estimate probable maximum tropical cyclone parameters for ocean basins with sparse historical records.

Prosenjit Ghosh
His research group leverages advanced stable isotope geochemistry, utilising carbon, oxygen, and nitrogen isotopes, carbonate clumped isotopes, and triple oxygen isotopes to investigate a broad spectrum of Earth system processes, ranging from mantle evolution and palaeoclimate reconstruction to modern anthropogenic impacts and urban greenhouse gas dynamics. Core initiatives encompass isotope fingerprinting of the Indian Summer Monsoon, Southern Ocean biogeochemistry, long-term monitoring of seasonal fossil-fuel emissions over urban centres such as Bengaluru, and tracing wildfire activity across fragile ecosystems. Significant recent contributions to palaeoclimatology include the development of a novel triple-oxygen-isotope proxy using rice-grain amorphous-silica phytoliths from archaeological sites to reconstruct ancient relative humidity, and empirical modelling of East Antarctic ice cores that demonstrated a strong linkage between temperature and ice accumulation rates over the past 800 kiloyears. Over the past year, his team expanded its scope to include emerging environmental contaminants and advanced sensor engineering, delivering comprehensive evaluations of the occurrence, toxicity, and remediation of per- and polyfluoroalkyl substances (PFAS), while also designing novel polymer-assisted electrochemical sensors and molecularly engineered fluorophores for the targeted detection of mercury ions.

Ramananda Chakrabarti
His research applies major-element and trace-element geochemistry, alongside radiogenic and metal-stable isotope geochemistry, to investigate complex water-rock interactions and aquatic geochemistry spanning from terrestrial basins to coastal environments. A primary focus is on analysing the chemical dynamics of major Indian river networks, including the Brahmaputra, Ganga, Godavari, and Mahanadi, to elucidate the impacts of silicate weathering, anthropogenic inputs, and seasonal variability in solute exchange. In vulnerable coastal and deltaic regions such as the Sundarbans, his work examines depth-dependent solute interactions, electrical resistivity, and salinity intrusions among surface water, groundwater, and seawater to assess risks to drinking water quality. Over the past year, his group significantly advanced the understanding of land-ocean elemental fluxes by employing stable strontium ((_^(88/86))"Sr"), calcium ((_^(44/40))"Ca"), and silicon (δ^{30} "Si") isotopes to trace submarine groundwater discharge along the Indian coastline. This recent work demonstrated how isotope fractionation within coastal aquifers profoundly modifies chemical signatures before ocean entry, directly impacting global marine budgets for dissolved cations and silica. Furthermore, his team utilised stable carbon isotopes to unravel seasonal carbon dynamics in the Godavari estuary, revealing how monsoonal hydrological shifts dictate dissolved inorganic carbon (DIC) fluxes from tropical estuaries to the coastal ocean.

Utpal S Tatu
His research centres on advancing the One Health approach, integrating human, animal, and environmental health to address neglected infectious diseases of global importance. Utilising advanced genomics, proteomics, and metabolomics, his laboratory investigates pathogen biology and host-pathogen interactions to uncover molecular vulnerabilities in protozoan parasites and emerging infectious threats. Beyond foundational molecular biology, his group is deeply invested in translational medicine, leveraging advanced omics technologies to develop actionable molecular diagnostics and biotherapeutics for disease detection and control. This translational focus led to the founding of Equine Biotech to pioneer affordable diagnostic solutions for animal health, as well as the rapid development of an ICMR-approved RT-PCR kit during the COVID-19 pandemic to support national response efforts. Recently, his work has expanded into the broader domain of sustainable and planetary health, driving initiatives that monitor interconnected health indicators across human, livestock, and environmental ecosystems in rural communities, while continuing to advise national frameworks like the Malaria Elimination Research Alliance under the Indian Council of Medical Research to strengthen global biotechnology innovation.



Sanjiv Sambandan
His research focuses on semiconductor physics, flexible electronics, and the development of novel devices for smart surfaces and sustainability. Establishing the Flexible Electronics Lab, he advances device physics through critical inventions such as the Adaptive Dielectric Thin Film Transistor, the Speckled Gate Thin Film Transistor, and the Tunable Threshold Thin Film Transistor. A major thrust of his group involves the design of self-healing circuits, utilising specialised fluidic dispersions that automatically align under open-circuit conditions to bridge structural cracks, thereby significantly extending the lifespan of wearable devices and mitigating electronic waste. Recently, his team demonstrated the use of electric-field-assisted liquid-metal dispersions to create highly reliable micro-relays and smart switches in collaboration with ISRO, while also exploring frontier concepts such as digestible electronics. Beyond semiconductor innovation, his research places heavy emphasis on technology translation in the water sector. By leveraging electric fields to polarise and aggregate minute impurities without membranes or synthetic chemicals, his group developed a highly efficient, low-power wastewater treatment and recycling technology that has been successfully spun out to provide scalable, decentralised clean water solutions.

Lakshminarayana Rao
His research centres on developing sustainable technologies for water and wastewater treatment, aiming to address critical infrastructure gaps and align resource management with circular economy principles. A major focus over the past year has been the large-scale recycling of secondary-treated wastewater for indirect groundwater recharge, with a comprehensive assessment of its impacts on agroecosystem health, water quality, and long-term sustainability in semi-arid rural districts. To enhance treatment efficiency, his group uses computational fluid dynamics (CFD) modelling to optimise membrane bioreactors and evaluates novel experimental approaches, such as microbial biofilm growth on textile media. Beyond traditional water treatment, his lab tackles broader interdisciplinary challenges, including coastal saline land

reclamation, tracking the fate of microplastics in aquatic systems, and the thermochemical and biological conversion of municipal solid waste into bio-hydrogen, liquid fuels, and compost. Recently, his research has expanded into advanced plasma-based resource conversion, utilising cold plasma for hydrocarbon reforming and plasma-activated water (PAW) for antimicrobial applications and decentralised green fertilisers, alongside the pioneering integration of artificial intelligence and machine learning frameworks to predict groundwater quality and optimise complex waste-to-energy and smart city infrastructures.

Thejna Tharammal
Her research focuses on the hydrologic cycle and the effects of climate change on monsoons across paleoclimate and future scenarios. She conducts numerical experiments with Earth system models to explore shifts in the hydrologic cycle and water vapour sources across different geological time periods, aiming to advance the fundamental understanding of monsoon mechanics and better anticipate future evolution. Her work also covers critical sectors, including the effects of anthropogenic and regional aerosols on the Indian monsoon and the identification of potential tipping points in the Earth system under climate change. She is an active contributing member of the Earth Commission of Future Earth, which is dedicated to defining evidence-based boundaries for Earth system safety and resilience, and has been awarded the ANRF-Prime Minister Early Career Research Grant for her investigations into monsoon perturbations.

Maya Raghunath Suryawanshi
Her research focuses on hydrology, groundwater modelling, and satellite remote sensing, with a focus on understanding variability in terrestrial water storage and improving regional water resources assessment. Her methodology integrates satellite observations, hydrological modelling, data assimilation, and statistical techniques to investigate hydrological processes across multiple spatial scales. Her current research highlights include developing high-resolution terrestrial water storage products from Gravity Recovery And Climate Experiment (GRACE) observations through physically based downscaling, improving hydrological simulations by assimilating satellite-derived runoff into hydrological models, and developing robust groundwater drought assessment methodologies using long-term groundwater observations and GRACE products. These efforts contribute directly to enhanced drought monitoring, groundwater asset assessment, and water security. Supported by the DST INSPIRE Faculty Fellowship, she aims to advance Earth observation-based methods for monitoring terrestrial water storage and groundwater variability to foster sustainable water resources management.

Soumi Dutta
Her research focuses on developing sustainable, circular technologies for water and wastewater treatment that leverage advanced functional materials, membrane technologies, and resource recovery approaches. Her current initiatives address emerging contaminants, including nanoplastics and microplastics, PFAS, pharmaceuticals, and antibiotic-resistant hazards, by developing bio-based adsorbents, bio-aerogels, advanced membrane systems, and sustainable treatment configurations. Her investigations also encompass contaminant interactions, greywater recycling, hospital wastewater treatment, agricultural runoff management, and circular economy pathways for water reuse and resource recovery. She also serves as a professional member of the Indian Membrane Society (IMS) and the International Water Association Young Water Professionals (IWA-YWP) network.

Manikanta Velpuri
His research focuses on advancing hydrological modelling, prediction in ungauged basins, ensemble streamflow forecasting, reservoir optimisation, and compound extreme-event analysis. His work emphasises developing structural modelling frameworks that represent multi-scale hydrological variability and integrate model outputs with remote sensing and reanalysis products to improve monitoring and forecasting. He has developed novel stochastic



algorithms based on pattern mapping for the temporal disaggregation of daily weather variables into sub-daily and hourly scales, as well as automated nested landscape discretisation algorithms to optimise the spatial representativeness of conceptual physical models. In the domain of surface water hydrology, his work introduces innovative multi-model frameworks to evaluate forecast translation at interior ungauged points, as well as transferable decision trees and symbolic regression architectures for calibration with sparse data. This research further assesses the multi-faceted impacts of climate change, specifically mapping the hotspots of spatio-temporally connected compound extremes and quantifying their critical duration thresholds and risk on crop yields across changing climate scenarios. Currently, he is developing transfer function models to reliably correct globally available reanalysis and Land Surface Model fluxes, establishing a process-oriented, data-driven framework to facilitate direct model calibration in data-scarce regions worldwide.

Jisha Joseph
Her research focuses on groundwater sustainability in coupled human-natural systems under the influence of climate change and increasing anthropogenic pressures. Her work integrates hydrological and ecohydrological modelling, remote sensing, and climate data to investigate groundwater-surface water interactions, groundwater fed irrigation dynamics, environmental flow requirements, and sustainable water management across agricultural landscapes. She has contributed significantly to the development of process-based hydrological models by incorporating groundwater abstraction modules and region-specific irrigation practices to improve the representation of managed hydrological systems. Her current research aims to understand the feedback loops between human activities and hydrological processes, identify sustainable groundwater and irrigation management strategies, and evaluate the environmental impacts, trade-offs, and co-benefits of climate adaptation and nature-based solutions for water-stressed regions.



Faculty & Staff

Chair: PRAVEEN C RAMAMURTHY
PhD (University of Clemson),
Professor

Core Faculty

RAJARSHI DAS BHOWMIK
PhD (North Carolina State University, USA), Assistant Professor

BRAMHA DUTT VISHWAKARMA
PhD (University of Stuttgart, Germany), Assistant Professor

Associate Faculty

GOVINDASAMY BALA
PhD (McGill University), Professor

RAMANANDA CHAKRABARTI
PhD (University of Rochester), Professor

SRINIVAS VV
PhD (Indian Institute of Technology Madras), Professor

PROSENJIT GHOSH
PhD (Physical Research Laboratory), Professor

SEKHAR M
PhD (IISc), Professor

UTPAL S TATU
PhD (IISc), Professor

SANJIV SAMBANDAN
PhD (University of Waterloo), Professor

LAKSHMINARAYANA RAO
PhD (McGill University), Associate Professor

Honorary Consultant

MOHAN KUMAR MS
PhD (IISc), Professor (Retd.)

DST Inspire Faculty

THEJNA THARAMMAL
PhD (University of Bremen)

MAYA RAGHUNATH SURYAWANSHI
PhD (SAC, ISRO and Gujarat University)

SOUMI DUTTA
PhD (Indian Institute of Technology Kharagpur)

MANIKANTA VELPURI
PhD (National Institute of Technology Warangal)

JISHA JOSEPH
PhD (Indian Institute of Technology Bombay)

3.4.9

Robert Bosch Centre for Cyber Physical Systems

The Robert Bosch Centre for Cyber-Physical Systems (RBCCPS) at IISc is a centre under the Division of Interdisciplinary Sciences at the Indian Institute of Science. The centre brings together expertise from multiple departments to promote interdisciplinary research and teaching in various fundamental and applied aspects of cyber-physical systems (CPS).

FACT FILE
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IN NUMBERS
Journals and Publications – 149
Students:
MTech - 91 (55 MTech RAS + 36 MTech AI)
MTech Res - 7
PhD - 61
Degree Awarded:
MTech (Res) - 4
PhD - 10
MTech – 74 (MTech RAS + MTech AI)

Chair: Suresh Sundaram



Core Research

Robotics; AI and machine learning, decision and control; security and privacy in CPS; connected autonomous systems like drones and 5G-enabled autonomous vehicles; and Socio-Technical systems like urban transportation systems and Smart Cities.



Current Research

The centre focuses on foundational and applied research to solve cutting edge problems in Robotics involving advanced machine learning techniques, Connected Autonomous Systems like drones and 5G-enabled autonomous vehicles, and Socio-Technical Systems like urban transportation systems and Smart Cities. Specific topics include formal techniques for data driven control systems, legged motion, multi-modal learning, CPS security, data science for smart-X systems, multi-agent robotic systems, advanced drone technologies, social robotics, human-robot interfaces, stochastic control for robotic systems etc.

The centre has core faculty as well as joint faculty and associate faculty drawn from various departments in the divisions of EECS and Mechanical Sciences. In addition, it has a strong visiting faculty programme, who complement the teaching and research. The centre also hosts post-doctoral researchers as well as visiting scientists and professors from academia and industry.

The centre created a new section-8 company, I-Hub for Robotics and Autonomous systems Innovation Foundation (ARTPARK) to focus on translational R&D leading to creation of new ventures.

RBCCPS has also established strong collaborations with many major technology companies and engages with many start-ups. It also works closely with government bodies and participates in specific standardisation activities.

Pushpak Jagtap
Area of Research:
- Learning based Control
- Robotics
- Formal Methods
- Control Theory

Pavankumar Tallapragada
Event-triggered parametrised control for highly resource constrained control. Developed theory and experiments on multi-robot systems. Algorithms for learning near-optimal, computationally efficient and highly scalable policies for computationally difficult multi robot planning problems such as traffic management and routing. Also conducted proof of concept real-time traffic management with up to 12 real robots at a time. Opinion dynamics in social networks for constrained resource allocation like problems. Contributions include mathematical modelling from a game-theoretic perspective and development of theory and analysis.

Vaibhav Katewa
We study the problems of computing approximate stability radius and stochastic minimum energy control in a data-driven

setting where the system model is unknown, but data from the system is available. We develop transfer learning-based policy/controller for Regional Pole Placement and Multi-Armed Bandits with Thompson Sampling. The policy uses data from a source system to develop controllers for an unknown similar target system. We developed a vulnerability assessment tool that identifies weaknesses and potential attack paths in a substation of a power grid. We developed an Intrusion Detection System for automotive vehicles which analyses the traffic in the CAN bus and Ethernet in a vehicle and detects any potential attacks. We developed a prototype unified display for aircrafts using which different domains like passenger services, entertainment etc. can be controlled securely.

Bharadwaj Amrutur
Multi-Modal fusion for Real-time Perception: Real-Time Perception by fusing Information streams from sensors from all robots and infrastructure sensors (like security cameras). Explore techniques like 3DGaussian Splatting for information representation, applications like Collaborative SLAM, Digital Twins, Navigation, Safety Alerts etc and new sensing modalities like RF sensing based on OFDM Radar, RF Radiance fields etc.

Semantic Interactions for Robots: Learn semantic maps and navigate to semantic goals (e.g. “Go to Kitchen”), active object detection/search (e.g. “Where is Asimov's book?”, “Find out where the student has left their backpack in the library”), use LLM for robust task planning and Sematic Interactions.

Bi-Arm robot manipulation: Data driven learning for coordinated bi-arm manipulation (e.g. manipulating test tubes, beakers, instruments etc for a chemistry lab experiment)

Suresh Sundaram
Area of Research:

- Intelligent flight control system
- Autonomous Systems
- Applied Game Theory
- Computer Vision and Robotics
- Machine learning and AI

Shishir N Y
Research spans across various domains, ranging from hardware development to the creation of controllers utilising optimal controls, learning-based controls, and safety-critical controls.

Abdul Rawoof Pinjari
Transportation planning, travel demand modelling and forecasting: Multimodal transportation planning and modelling; activity-based and micro-simulation approaches to urban travel demand modeling; long-distance/Inter-regional travel analysis; public transit ridership estimation and service planning; consumer adoption and travel demand impacts of emerging travel modes and technology (shared mobility, connected and automated vehicles); model transferability; Uncertainty in travel demand forecasts.

Choice Modelling and Econometric Analysis of User Behaviour in Urban Systems: Discrete choice models; discrete-continuous econometric systems; multidimensional choice systems; Kuhn-Tucker Demand Systems; Copula models; duration models; alternative estimation methods; mathematical modelling of psychological constructs of choice (attitudes, beliefs, etc.).

Travel behaviour Analysis: Travel behaviour analysis for sustainable transport planning and policy formulation; Activity, and time, use based travel analysis; behaviour-centric mobility analytics using ubiquitous data sources.

Freight mobility, trade and logistics: Freight planning and demand analysis at national, statewide, megaregional, and regional levels; logistics-led economic development; interactions between maritime and surface freight transportation.

Land-use and transportation interactions: Urban form and travel behaviour; residential self-selection effects; integrated land-use and travel demand models.

Sustainability issues in transportation: Household vehicle ownership and usage; bicycle and pedestrian travel; elderly mobility; residential and transport-related energy consumption; human exposures to traffic pollutants and related inequities.

Transportation surveys and data collection: Activity-travel surveys and methods; stated preference studies; data fusion to augment conventional data sources.



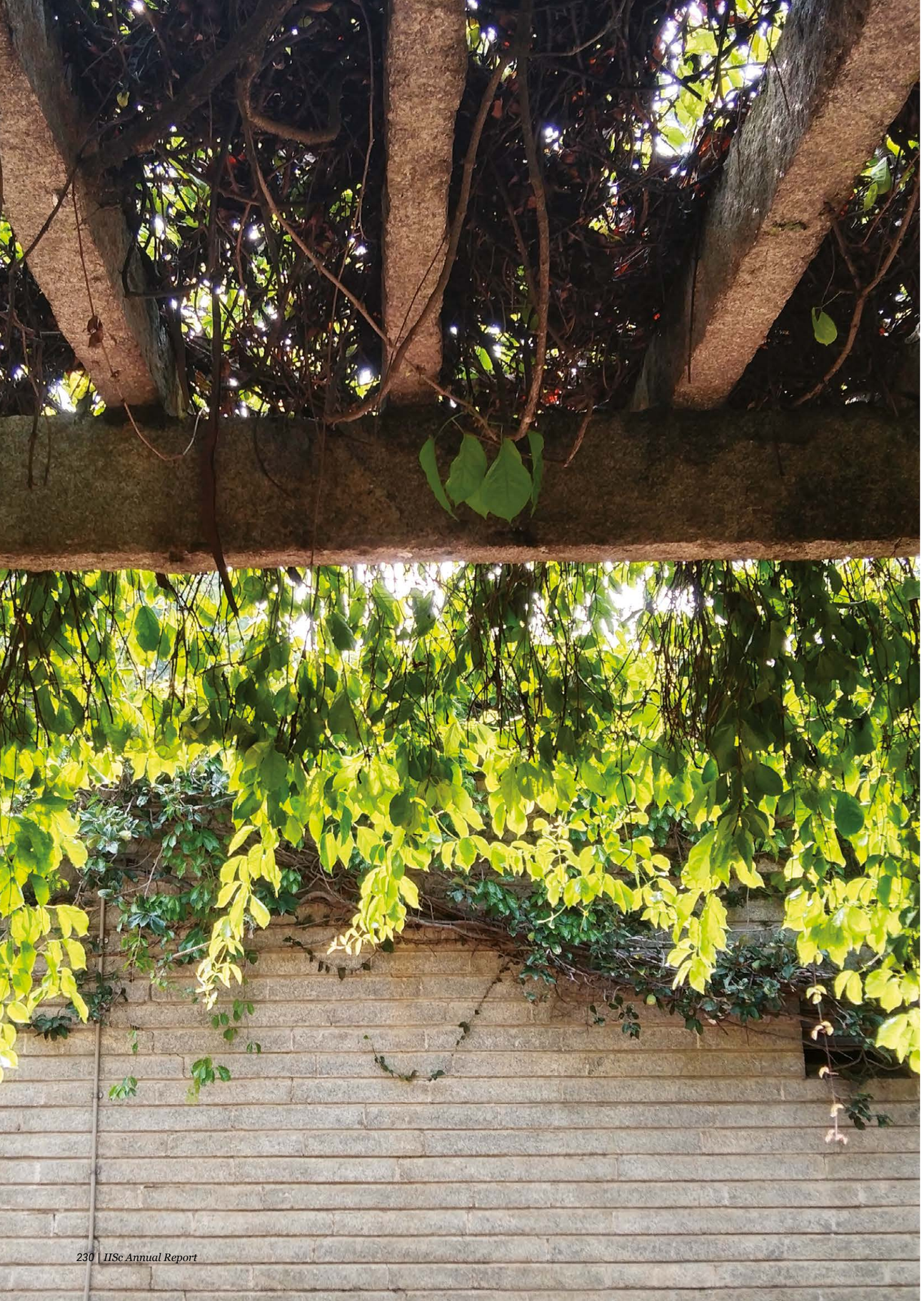
Transportation safety: statistical analysis of traffic crash exposure, occurrence, and occupant injury severity.

Tarun Rambha
Research interests are on the themes of public transportation, electric mobility, logistics, and smart parking systems. Our group has been working on transit problems related to multi-criteria routing algorithms, transit route assignment (ridership prediction), multimodal network equilibria, vehicle scheduling, and electric bus fleet management. In the area of logistics, we are currently looking at eco-routing for electric trucks and optimisation models for drone-assisted deliveries. For smart parking systems, we are currently designing parking lots using mixed integer programs and driving simulator experiments to understand driver behaviour during parking search

Punit Rathore
Big data analytics, Un/Semi/Self-supervised learning, visual analytics using deep learning, explainable AI/ML, data-driven analytics for autonomous systems and transportation, Spatio-temporal data mining, and streaming data analytics. Interested area also includes ML and AI applications to solve complex real-world problems in areas such as transportation, agriculture, healthcare, infrastructure, robotics, and vision.

Pandarasamy Arjunan
Research interests lie in the intersection of Cyber-Physical Systems and data science and their applications pertaining to smart built environments and energy sustainability. Specifically, with focus on developing systems and techniques for energy monitoring, benchmarking, prediction, anomaly detection, and fault detection and diagnosis by leveraging smart meter time series and other opportunistic data sources. He has recently started investigating how to leverage Infrared Thermography (IRT) for city-scale building diagnostics and energy auditing.

Ravi Prakash
Research interests lie at the intersection of robotics, machine learning and human-robot interaction - with a focus on robot manipulation for real world applications i.e., healthcare, retail, space robots etc. The central principle is to enable humans with different levels of robotic expertise to transfer their knowledge and experience about skills and tasks to the robot to explore and execute the tasks in unstructured novel scenarios.



Core & Joint Faculty

BHARADWAJ AMRUTUR
PhD (Stanford), FNAE, Professor

SHISHIR N Y KOLATHAYA
PhD (Georgia Institute of Technology), Assistant Professor

VAIBHAV KATEWA
PhD (University of Notre Dame), Assistant Professor

PUNIT RATHORE
PhD (University of Melbourne), Assistant Professor

PUSHPAK JAGTAP
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PAVAN TALLAPRAGADA
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TARUN RAMBHA
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Associate Faculty

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Visiting Faculty

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DARSHAK VASAVADA
MS (IISc), Guest Faculty

PRASANT MISRA
PhD (University of New South Wales, Sydney, Australia)

KAUSHIK SAMPATH

ASHISH JOGLEKAR

AJAY SETHI

3.4.10

Supercomputer Education and Research Centre

The Supercomputing Education and Research Centre (SERC), at IISc provides the state-of-the-art computing environment catering to the ever-increasing demands of high-performance computing for scientific and engineering research. The Centre hosts 24/7 supercomputing facilities and services including supercomputers of Petaflop capacities for traditional HPC (High-performance computing), deep learning and AI based applications, HPC software and about 2 Petabytes of storage.

Our supercomputer systems have served about 25 departments, 100 research groups and 375 users of the Institute in various fields including aerospace, brain research, chemistry, climate modelling, computational and data sciences, computer science, earth sciences, electronics system engineering, inorganic and physical chemistry, materials research, mechanical engineering, microbiology and cell biology, molecular biophysics, physics etc. SERC resources are also being used by researchers from academic organisations, government-funded R&D laboratories and industry.

FACT FILE

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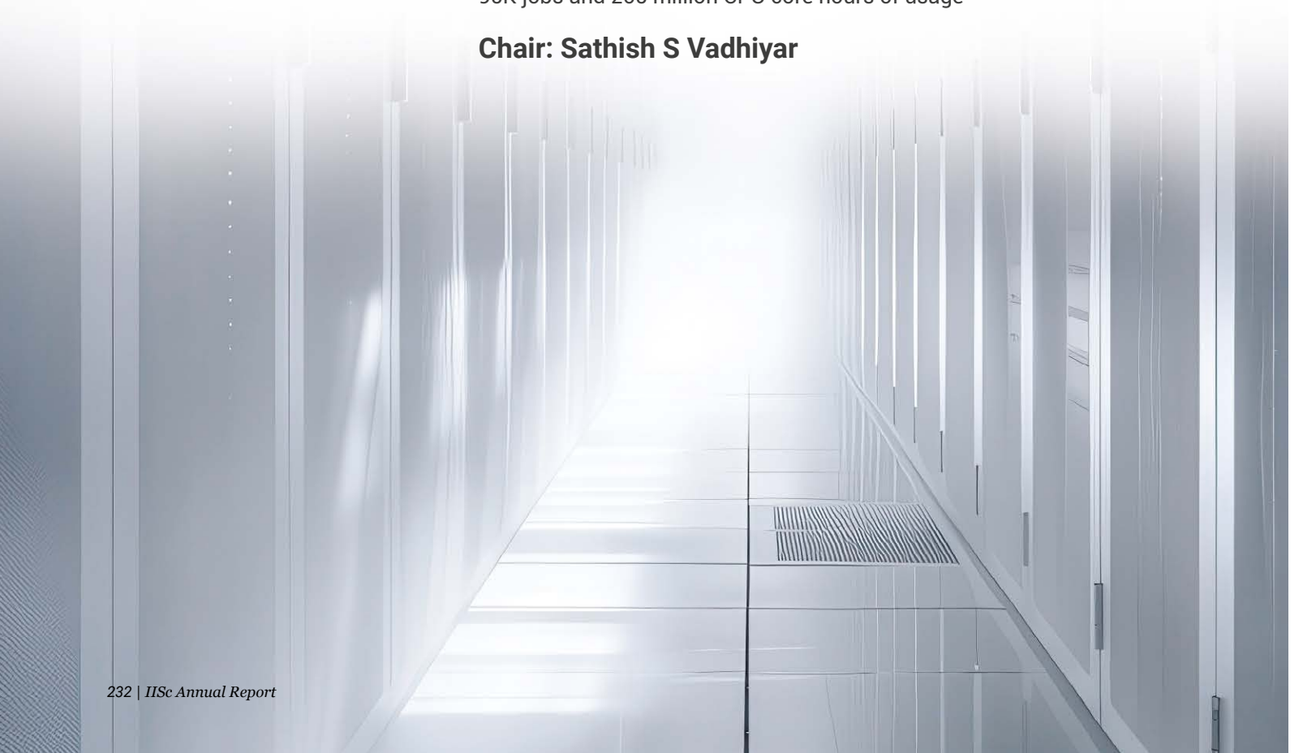
IN NUMBERS

HPC services to 23 departments, 100 research groups and 375 students at the Institute

80 publications, including about 65 publications across the Institute based on supercomputing usage

95K jobs and 205 million CPU core hours of usage

Chair: Sathish S Vadhiyar



Core Research

Supercomputing systems, applications and statistics, Cloud Systems, System Virtualization, Cloud Middleware, Operating Systems, Networking, Digital library, Information Retrieval, Machine Learning, Information security, Computational Electromagnetics, Parallel Programming.



National Supercomputing Mission (NSM) and SERC: SERC continues to play active role in NSM. SERC had created a vision document for R&D for and with extreme-scale computing. SERC has also initiated projects related to indigenous supercomputing hardware development.

Current Research

Faculty conducted research on cloud systems with research students from Computational and Data Sciences in the “Cloud Systems Lab". This year the lab worked in the following areas.

Research Areas: Serverless Platform Architecture, Distributed Application Service Resilience, Isolates for FaaS, Agentic Frameworks for Fault Management

Current research is on evaluating the use of Generative AI tools for responsive system fault management.

Publications: Computational Electromagnetics group research involves the development of fast, scalable, and accurate 3D electromagnetic solvers. These solvers scale to O(N) and O(NlogN) memory and solve time complexity. They can also be applied to complex inhomogeneous geometries to solve electromagnetic radiation and scattering problems. The solution to very large problems is limited by the serial nature of the code, which can be overcome by effectively parallelising the code. The solvers are parallelized for heterogeneous High-Performance Computing (HPC) architecture and ported to SERC supercomputers. Solving significant size problems leads to high solution times due to the ill-conditioning of the system matrix. The group also works on developing efficient and fast preconditioners to reduce the solver's overall solution time. The group is developing a fast direct solver to solve electromagnetic radiation and scattering problems. The solver retains the (N*log*N) matrix factorisation time complexity and (*N*) solution time complexity. The group is also working on parallelising the developed numerical solver for homogeneous and heterogeneous HPC clusters.

Digital Library group continued to study the technological development in the areas of Digital Libraries (DL) for better organise and retrieve data from Digital Library. The group hosts Digital Repository of Theses and Dissertations (https://etd.iisc.ac.in/) of Indian Institute of Science on cloud platform and carried study about usage of the repository. The group studies about user job and usage accounting data analytics for Supercomputers to aid in user policies and capacity planning.



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ABHIK CHAUDHURY
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Honorary Professors

N BALAKRISHNAN
PhD (IISc), Honorary Professor



3.5 *Division of Mechanical Sciences*

Research in the Division spans diverse areas including Geotechnical Engineering, Civil and Aerospace Structures, Transportation, Water Resources, Environmental Engineering and Sustainable Habitat, Climate, Structural and Functional Materials, Manufacturing, Design Theory and Methodology, Geochemistry, Tectonics, Planetary Evolution, Remote Sensing and GIS Applications, Aerodynamics, Combustion, Navigation and Guidance, Solid Mechanics, Fluid Mechanics, Thermal Sciences, Acoustics, Robotics, Dynamics, Biomolecular Engineering, Catalysis, Colloids and Interfacial Science, Nanotechnology, Thermodynamics and Simulations across length scales.



Themes

Among the focus areas include seismology and climate change – modelling as well as paleo studies – which lead naturally to work on environmentally sustainable materials and design and on waste management. The work on materials includes study and modelling of biomaterials, polymers and photovoltaics. Fluid dynamics, including shock waves and other phenomena at hypersonic speeds, is another key area of study that cuts across the various departments in this Division. Researchers in this Division also work on identifying novel drug and vaccine targets for viral infections such as HIV, hepatitis C, and dengue.

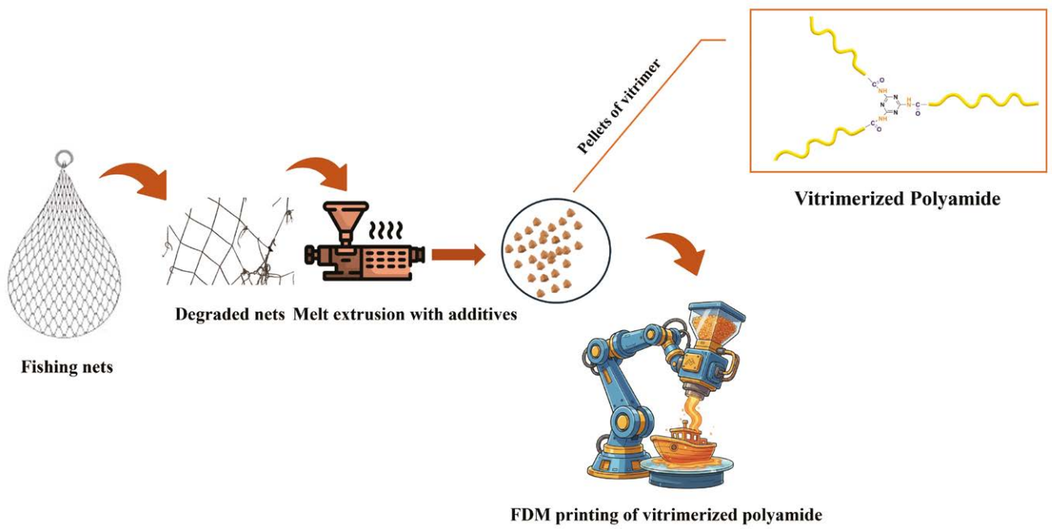
Departments | Centres | Units

- Department of Aerospace Engineering
- Centre for Atmospheric and Oceanic Sciences
- Centre for Earth Sciences
- Department of Chemical Engineering
- Department of Civil Engineering
- Department of Design and Manufacturing
- Centre for Sustainable Technologies
- Divecha Centre for Climate Change
- Department of Materials Engineering
- Department of Mechanical Engineering

New process to recycle plastic waste

Humans produce over 430 million tonnes of plastic annually, according to the UN Environmental Programme. Material waste from fishing is one of the deadliest forms of such waste, threatening the lives of countless marine animals. Scientists at the Department of Materials Engineering used a novel chemical process to recycle waste from fishing nets and automotive parts made of a polymer called PA-66 (Polyamide 66, commonly called Nylon 66), which is challenging to reprocess. The process involves introducing a chemical cross-linker named melamine into the melted waste containing PA-66 in the presence of a catalyst. Improved recycling processes for polymers like PA-66 can give used plastic a new lease of life, while also incentivising waste collection.

Reference:
Kumar SV, Deeraj BDS, Rege SS, Reddy AM, Prasanth SR, Islam SS, Dey I, Samanta K, Misra A, Bose S, From ocean to opportunity: Upcycling fishing net waste into high-performance, reprocessable nylons, Chemical Engineering Journal (2025).

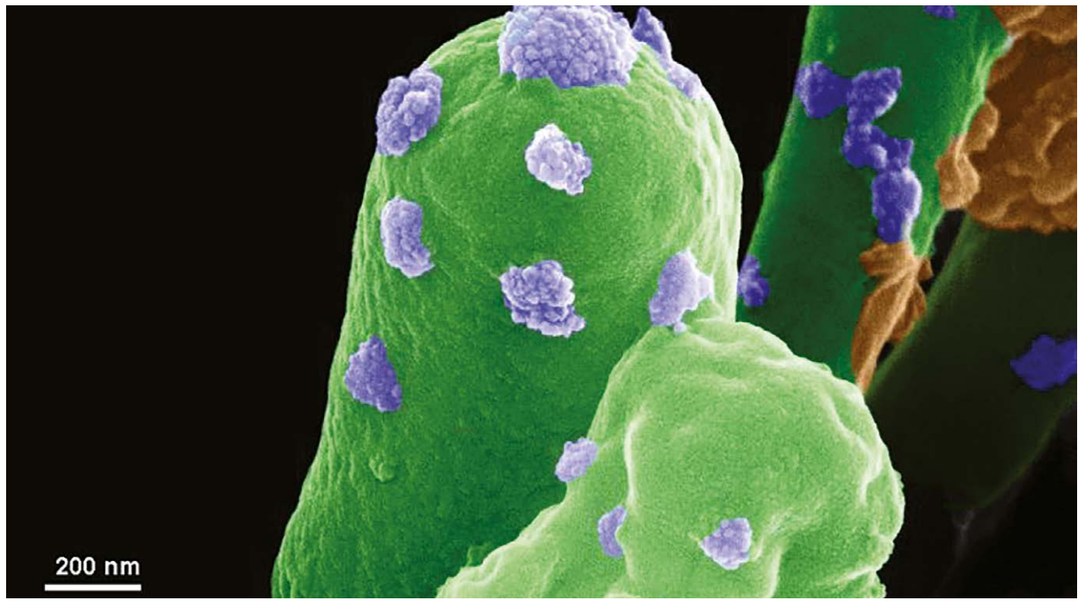


Research Snapshots
2025-26

How brick-building bacteria react to toxic chemical in Martian soil

Bacteria that thrive on Earth may struggle to survive on Mars due to challenges like toxic perchlorate found in Martian soil. Researchers at the Department of Mechanical Engineering have developed a method using the bacterium *Sporosarcina pasteurii,* guar gum, and lunar soil simulant to repair bricks for lunar habitats. The bacterium produces calcium carbonate and biopolymers, which restore the brick's strength and extend the lifespan of built structures. The researchers aim to create a sustainable building strategy that reduces reliance on carbon-intensive cement, benefiting both Earth and future Mars missions by improving infrastructure like roads and landing sites.

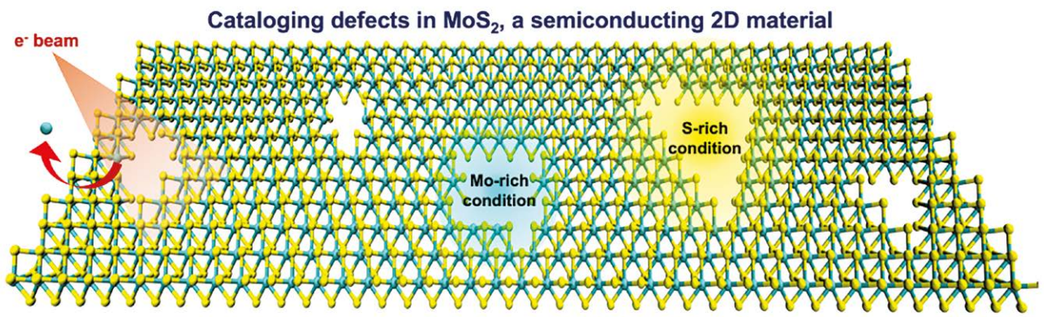
Reference:
Dubey S, Shukla S, Gupta N, Dixit R, Bhadury P, Kumar A, Effect of perchlorate on biocementation capable bacteria and Martian bricks, PLOS One (2026).



Tuning nanopore shapes in 2D materials via the chemical environment

2D materials have advanced nanotechnology due to their mechanical strength, electronic tunability, and atomic thinness. Molybdenum disulphide (MoS_2), for example, is notable for its semiconducting properties. Researchers from the Department of Chemical Engineering have developed a new computational framework to model nanopore formation and evolution in 2D MoS_2. Using a novel atomic fingerprinting scheme that labels undercoordinated atoms, this technique aids density-functional theory calculations and kinetic Monte Carlo (KMC) simulations for modelling pore growth. The findings suggest that adjusting sulphur allows for fine control over pore shape and growth rate, with potential applications in desalination, DNA sequencing, gas separation, and nanoelectronics.

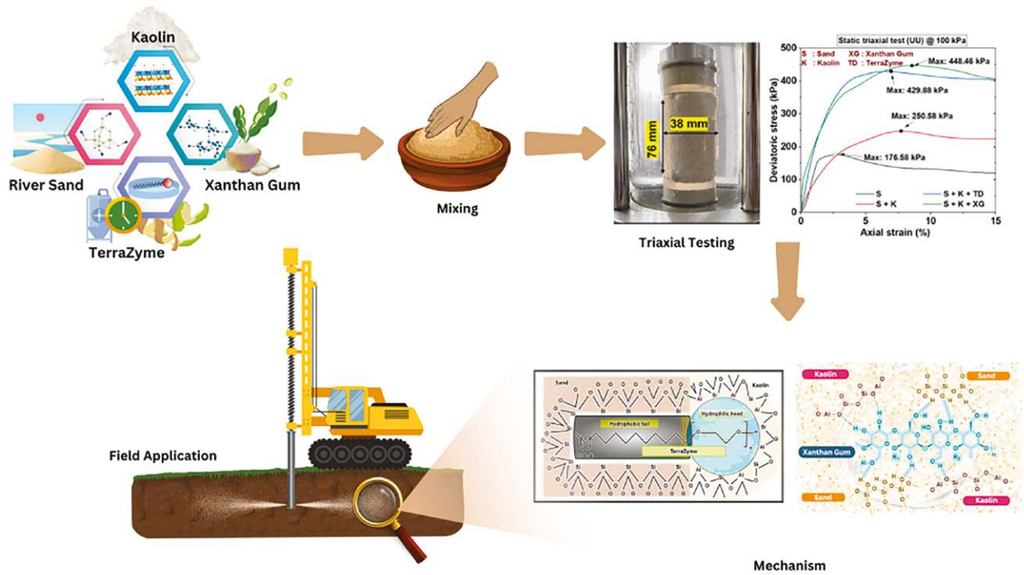
Reference:
Bhowmik S, Govind Rajan A, Size and chemical environment control nanopore geometry in 2d (MoS_2): From irregular to triangular defects, Small (2025).



Strengthening soils sustainably with bio-based stabilisers

Cement industries are significant contributors to CO2 emissions. Researchers from the Department of Civil Engineering and Centre for Sustainable Technologies explored eco-friendly alternatives by mixing sand with 15% kaolin clay and bio-additives like TerraZyme (bioenzyme) and Xanthan gum (biopolymer). After 30 days of curing, tests revealed that both additives increased soil shear strength by up to 2.5 times. While TerraZyme enhanced compaction and bonding, Xanthan gum improved cohesion. This study demonstrates that biopolymers and bioenzymes can significantly enhance soil stability, with TerraZyme successfully used in road construction under the PMGSY scheme.

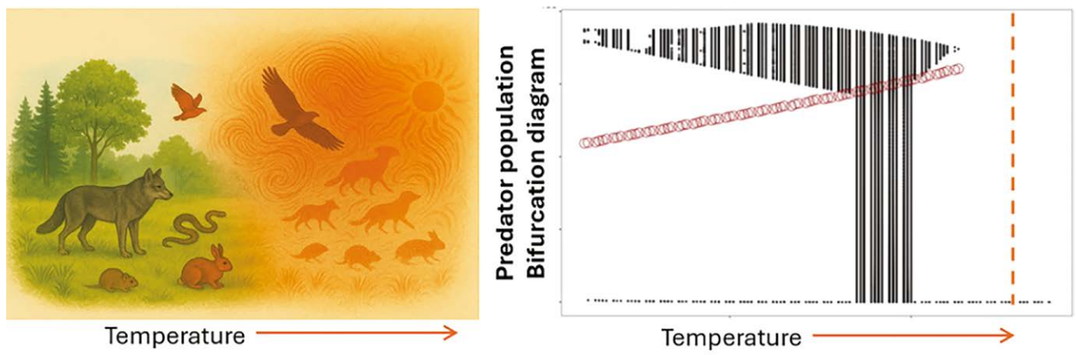
Reference:
Thomas G, Nayak RR, Gupta NK, Latha GM, Strength and microstructural behaviour of sand Kaolin mixtures stabilized with terrazyme and Xanthan gum, Scientific Reports (2026).



How rising temperatures can destabilise ecosystems

Global warming is changing ecosystems, with the Earth's average temperature rising by 1°C. over the last century. Researchers from Divecha Centre for Climate Change and the Centre for Ecological Sciences studied how temperature increases (under 3°C) impact predator population patterns. While stable conditions allow for slight fluctuations, gradual warming results in a "transient chaos" phase that can cause predator population collapse. The findings highlight the importance of bioenergetics in studying ecosystems' vulnerability to environmental changes and can help guide future conservation efforts.

Reference:
Murthy KK, Kumar KS, Seshadri AK, Effect of current global warming trends on temperature-sensitive tri-trophic interactions, Ecological Complexity (2025).

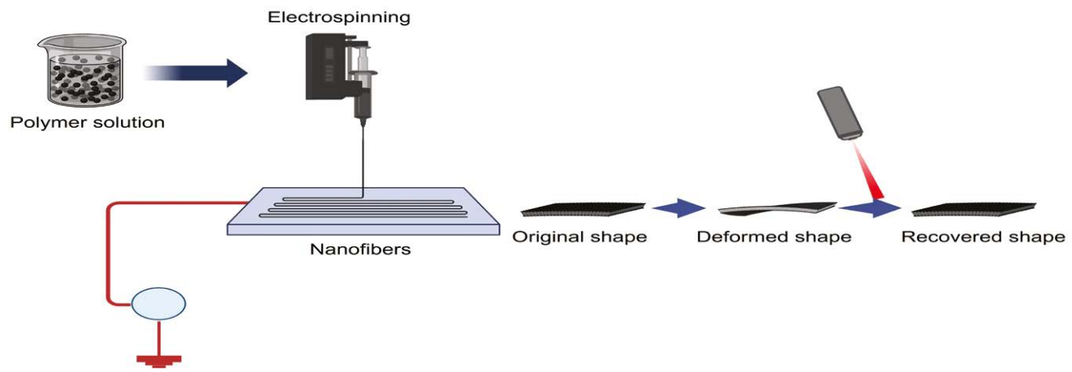


Research Snapshots
2025-26

Biocompatible, light-responsive nanofibers for smart scaffolds

Shape Memory Polymers (SMPs) can bend or stretch into a temporary shape and revert to their previous form when exposed to external stimuli. Scientists from the Departments of Materials Engineering and Bioengineering have now engineered a novel composite nanofiber that can be activated remotely and safely by near-infrared (NIR) light. The researchers created flexible strands that mimic the architecture of natural tissue, showing robust shape restoration, mechanical resilience, and flexibility. The findings could potentially pave the way for smarter medical solutions, like self-deploying implants, wound-healing scaffolds, and soft robotic devices.

Reference:
Vannaladsaysy V, Choudhury S, Datta S, Chatterjee K, NIR-responsive shape memory composite nanofibers as deployable matrices for biomedical applications, Smart Materials and Structures (2025).



3.5.1
Aerospace Engineering

Founded in 1942 as the Department of Aeronautical Engineering, it was renamed the Department of Aerospace Engineering in 1982 to reflect the growing activities in space research and education. The department offers PhD, MTech and MTech (Research) programmes, and currently has 29 faculty and about 150 students. From August 2026, the department will admit the first batch of students who will pursue B. Tech in Aerospace Engineering. The academic and research activities are in four major areas, namely, Aerodynamics, Structures, Propulsion, and Guidance and Control.

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IN NUMBERS
23 Academic Staff
6 Scientific Staff
77 PhD Students
10 MTech (Res)
56 MTech
32 MTech, 4 MTech (Res), 25 PhD conferment

Chair: Gopalan Jagadeesh



Core Research

Aerodynamics: Low speed flows - transition and turbulence, supersonic and hypersonic flows - mixing, drag, heat transfer, computational fluid dynamics, LES, DNS, aeroacoustics, stability, aeroelasticity, information theory and machine learning.

Aerospace Structures: composite structures, nanocomposites, functionally graded materials, vibrations, wave propagation, structural health monitoring, finite element analysis, non-destructive evaluation, metamaterials, shape memory alloys.

Propulsion: atomisation and sprays, combustion instability, supersonic combustion, flame structure and interactions, soot formation measurement and modelling.

Guidance and Control: optimal control, path planning, image processing, obstacle avoidance, multi-agent systems, Unmanned aerial vehicles, robotics and artificial intelligence.



Current Research

Aerodynamics
A strong experimental programme spanning low speed to hypersonic flows has been pursued in the several wind tunnels, Ludwieg Tubes and shock tunnels, fitted with instrumentation for classical measurements, modern diagnostics, and flow visualisation. Computational studies cover external aerodynamics of wings and full aircraft, DNS and LES of turbulent and transitional flows, aeroacoustics and new algorithms. New directions include a search for precursors of extreme events in turbulent regions, and information theory application to turbulence intermittency. Continuing studies are on phenomenology and origin of unstart in hypersonic intakes, unstart modes, hypersonic laminar to turbulent flow

transition dynamics, hypersonic aeroelasity and shock dynamics in supersonic ejectors.

Structures
Wave propagation, novel materials, structural vibrations, aeroelasticity, non-destructive evaluation are the major topics of study, incorporating emerging methods like deep learning. Wave propagation work included Bio-Inspired Suture Materials for efficient energy absorption, high wave attenuation and reduction in Group speeds, peri-dynamics, and modelling blast mitigation and design for protection. Application of Lead Zirconate Titanate (PZT) for vibration, noise control, actuation, de-icing, sensing and condition structural health monitoring of composite embedded systems; AI/ML for bearing defect identification; nonlinearity and disorder in energy transfer properties of topological materials; magnetoelastic lattices with multiple stable configurations for novel, reconfigurable materials.

Propulsion
Spray formation inside an engine combustion chamber is a complex fluid dynamic process involving several sub-processes such as liquid jet/sheet instability, ligament breakup, spray-wall interaction, and secondary atomisation. Current focus is on non-circular orifices major finding that mean droplet size is always higher. Droplet impact on flexible surfaces wings of drones, insect, leaves. Studies for gas turbines include soot formation, quenching, turbulent air/fuel mixing, and effect of hydrogen enrichment on soot and Nox; for combustion in high-speed flows, cavity flame holding.

Guidance and Control
The guidance and control group work on algorithms for various vehicles and verify them with experiments using several types of drones and ground vehicles. Problems have been formulated for guidance and control of Multi-UAV Systems, aerial manipulation, ML-based collision prediction and avoidance with applications to multi-agent biological entities for autonomous/precision agriculture, and station-keeping for satellites. New results include a novel guidance method using vector field-based commanded heading input, rogue drone interception, fuel cell powered drones, multi-UAV coordination-intersection planning, swarm guidance for narrow passages. Other applications are of UAV and AI for precision agriculture and zero gravity biomechanics.





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3.5.2

Centre for Atmospheric and Oceanic Sciences

The Centre for Atmospheric Sciences was established in 1982 and renamed Centre for Atmospheric and Oceanic Sciences in 1996. Growing from a centre focused on the Indian monsoon, research at CAOS now spans the entire realm of atmosphere, ocean, and climate science. The centre has been at the forefront of using atmosphere, ocean and climate models, data analysis, and focused field campaigns to study various facets of monsoons, oceans, and climate. Our vision for the next decade is ambitious. We believe that it is an exciting time in our field of science with the opportunity to bring things together and address grand challenges.

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Degree programmes offered: PhD, MTech (Res), and MTech in Earth and Climate Science
Technical Staff: 1
Office Staff: 0

IN NUMBERS
9 Academic Staff
28 PhD Students
0 MTech(R) Students
9 MTech Students
8 PhD and MTech conferments

Chair: P N Vinayachandran



Core Research

Monsoon dynamics and variability, oceanography, ocean modelling, air-sea interaction, cloud physics and tropical convection, hydrological cycle, extreme events, nonlinear climate dynamics, planetary boundary layer, aerosol physics and chemistry, large-scale waves and geophysical turbulence, ocean convection and small-scale turbulence, climate science, ocean and atmospheric modelling, AI and ML for data analysis, and theoretical geophysical fluid dynamics.



Current Research

Climate Change
An understanding of the climate response to different radiative forcing agents is fundamental for climate change studies. At CAOS, we use climate models to understand the climate response, especially the feedback and efficacies, to forcing agents (e.g., CO2, solar irradiance, methane, etc.). Efficacy refers to the effectiveness of a forcing agent, relative to CO2, in changing the global mean surface temperature per unit top of the atmosphere radiative forcing. Our goal is to provide a mechanistic explanation for the dependence of feedback and efficacy on the forcing agents. We use the radiative kernel technique and primarily focus on the Planck, water vapor, albedo, lapse rate and cloud feedback.

Solar Geoengineering
Solar geoengineering refers to recent proposals of deliberate planetary scale intervention options that would increase the amount of solar radiation reflected by our planet to ameliorate the detrimental impacts of climate change. Injection of sulphate aerosols into the stratosphere is one of several solar geoengineering approaches. In this approach, highly reflective aerosols such as sulphates injected into the stratosphere would reflect more incoming solar radiation. The consequent reduction in solar radiation would cool the planet.

Carbon Cycle Science
In the industrial era, human activities have led to an increase in the concentration of atmospheric CO2 and other greenhouse gases, resulting in global warming. As CO2 is the dominant driver of current climate change, it is important to understand the sources/sinks and the fate of anthropogenic CO2 emissions. At CAOS, we use Earth System Models that couple the climate system to the global carbon cycle to study the carbon cycle feedback involved in determining the fate of CO2 emissions and the evolution of atmospheric CO2 concentration on decadal to millennial timescales.

Monsoon Low Pressure Systems
One of the striking features of the Indian summer monsoon is the synoptic scale cyclonic disturbances that periodically pass over central India. These

cyclonic disturbances are called the monsoon low pressure systems (LPS). These systems usually form over north Bay of Bengal and propagate north-westward towards Rajasthan/ Gujarat. Monsoon LPS are attributed to produce around 60% of monsoon precipitation over central India. At CAOS, we study the statistics of these systems in terms of their frequency, intensity, and tracks in observational records and model simulations. We also assess the change in their statistics for greenhouse gas changes and solar geoengineering using climate models.

Climate response to greenhouse gases and solar forcing

Research in this area at CAOS examines a central question in climate change and geoengineering: how does the climate system respond not only to the magnitude of radiative forcing, but also to its spatial pattern and physical origin? Using climate-model experiments and radiative-kernel (i.e. Green's function) methods, our recent work shows that different forcing agents (such as CO_2, methane, and solar forcing) can produce systematically different warming responses even when their global-mean radiative forcing is similar. These differences arise because the associated feedback, especially lapse-rate, water-vapour, albedo, and cloud feedback, depend strongly on whether forcing is concentrated in the tropics, high latitudes, or one hemisphere. This feedback also depends on the vertical structure of the forcing. Our studies show, for example, that solar forcing generally produces a smaller global temperature response than equivalent CO_2 forcing owing to different feedback magnitudes; that forcing imposed at high latitudes can generate much larger warming than forcing imposed at low latitudes, mainly due to differences in lapse rate feedback; and that interhemispheric forcing asymmetries can shift tropical circulation and the ITCZ through cloud and heat-transport changes. More recently, we have also shown that methane and carbon dioxide differ in their slow climate responses because methane's forcing pattern alters cloud, lapse-rate, and albedo feedback. Together, these studies bring out the effects of the spatial pattern of radiative forcing on atmospheric circulation and various climate feedback, with implications for climate sensitivity, mitigation pathways, and the regional risks and trade-offs of solar geoengineering approaches.

The Quasi-Biweekly Oscillation

We examine the westward-propagating quasi-biweekly oscillation (QBWO) during boreal summer, with a focus on how background moisture and winds shape its structure and propagation. In dry regions, convection lags the circulation by nearly a quarter cycle, whereas in very moist regions it becomes nearly in-phase and extends across the QBWO gyre. As the background moistens, moisture anomalies increasingly align with the QBWO circulation. Despite differences in environmental moisture and wind conditions, several structural features remain robust: outgoing longwave radiation and moisture anomalies stay collocated, moisture and pressure-velocity anomalies remain vertically upright, and the filtered winds retain a first-baroclinic mode structure. A vorticity budget shows that, although the planetary vorticity-gradient term is important, both planetary stretching and horizontal advection are needed to explain the vorticity tendency—and their relative importance shifts with the moisture regime. In dry and moderately moist regions with easterly mean flow, mean winds primarily advect vorticity anomalies. In contrast, in very moist regions with westerly flow, anomalous winds instead advect the background vorticity. An analogous transition occurs in the moisture budget: in dry and moderately moist environments, zonal mean flow advection dominates, but in very moist regions, strong background moisture gradients allow eddy advection of the mean moisture field to become the leading term. In the moist regime, vertical advection, precipitation, and evaporation also contribute substantially to the moisture tendency.

Monsoon Spatial Structure and Variability

Monsoon rainfall over South Asia depends on the large-scale organisation of winds, moisture transport, and energy across the Indian Ocean region. A key question is how the monsoon can show abrupt seasonal transitions, especially at onset, while



remaining a robust and recurring feature of the climate system. Work in CAOS has addressed this using complementary energetics-based approaches. In the atmospheric boundary layer over the western Indian Ocean, we showed that the rapid onset of the Somali jet, a major conduit of moisture transport into the South Asian monsoon, is tied to a transition in kinetic-energy balance. As the jet forms from cross-equatorial flow near the equator, a distinctive regime emerges in which kinetic energy generation is nearly balanced by the northward transport of kinetic energy. This leads to a quadratic dependence of kinetic energy generation on the north-south pressure gradient, helping explain both the jet's rapid intensification and its slower seasonal retreat. Complementing this regional perspective, we developed a simple box model for the monsoon's dry static energy budget to examine whether monsoon energetics generically imply abrupt transitions or tipping behaviour. The analysis showed that while latent heating tends to amplify the circulation, horizontal export of a thermodynamic quantity called dry static energy acts as a strong stabilising influence. Once vertical thermal stratification is considered, tipping is not a generic outcome of such simple monsoon models. Together, these studies suggest that abrupt monsoon onset can arise from identifiable nonlinear boundary-layer processes even while the seasonal-mean monsoon remains dynamically robust.

High Resolution Ocean Modelling

Motions occurring in the ocean at scales of 1 to 10 km have profound influence on vertical mixing and thus on tracer distribution and biological productivity. To simulate motions at these scales very high (~1km) resolution models are necessary. We have employed such models to study these submesoscale motions in the Indian Ocean. The model simulation has revealed several new insights into the ocean circulation in the Bay of Bengal. One such study showed that cyclones over the Bay of Bengal suppresses submesoscale motions, but they re-emerge after few days of passing of the cyclone. Another study showed that both river plumes and rain plumes are potential zones of high submesoscale activity.

Ocean turbulence and circulation

This research focuses on understanding how small-scale ocean processes regulate large-scale climate dynamics, with a particular emphasis on the tropical oceans and the Southern Ocean. Turbulence and convection processes control vertical mixing, heat transport, and water mass transformation—key mechanisms that influence global ocean circulation and climate variability. A central theme of this work is to bridge the gap between microscale turbulence and basin-scale circulation using high-resolution large-eddy simulations (LES) and direct numerical simulations (DNS). In the tropical oceans, this research examines how enhanced evaporation and salinity-driven processes modify upper-ocean stratification, often counteracting warming-induced stability and leading to intensified vertical exchange. In the Southern Ocean and Antarctic regions, the focus is on ice–ocean interactions, including convection beneath sea ice, basal melting of ice shelves, and the role of turbulent eddies in transporting heat toward ice boundaries.



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3·5·3

Centre for Earth Sciences

Faculty are involved in innovative multidisciplinary research using geological, geophysical and geochemical tools to understand Earth processes. Equipped with state-of-the-art analytical facilities and wide-ranging expertise, they work on diverse problems in earthquake geology, global tectonics, core dynamics and magnetism, ocean-atmosphere interaction, climate change and paleoclimate studies, petrology and rock geochemistry, and chemical weathering of continents.

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Degree programmes offered:
PhD, MTech (Research) and MTech (Earth and Climate Science Programme)

IN NUMBERS
8 Academic Staff
38 PhD
9 MTech (Earth and Climate Science Programme)
5 PhD Conferments
13 MTech (Earth and Climate Science Programme)

Chair: Sajeev Krishnan



Core Research

Planetary magnetism, Dynamo theory, Climate Change (past and present), Isotope Hydrology, Climate-Tectonics Interaction, Environmental Tracers, Microchronology, Petrology, Metamorphism, Isotope geochemistry, Origin and evolution of the Solar System, Crust-mantle processes, Paleoclimate reconstruction, Early life signatures, Solid Earth Geophysics, Lithosphere dynamics, Mantle convection, Chemical weathering and planetary thermostat, Chemical Oceanography, Seismology, Machine learning applications in geophysics, Geodesy.



Current Research

Planetary dynamics and magnetism (Binod Sreenivasan)
The role of the mantle in magnetic polarity transitions in the core of Earth was investigated analytically as well as numerically. This leads to a "Whole Earth" paradigm, where the evolution of the core is integrated with the equatorial symmetry of the mantle heat flow pattern. Lower mantle heterogeneity in heat flux is also shown to propagate as far as the inner core. The findings have been submitted for publication.

A laboratory experiment of core convection, the first of its kind, showed the likely role of the lower mantle in the observed east-west heterogeneity of the Earth's inner core.

Earth evolution (Sajeev Krishnan)
The petrology group focused on the crustal growth processes on the Earth during the late Archaean period (~2.5Ga). The Archean-Proterozoic boundary represents a significant transitional period in Earth's evolution, marking a sudden rise in atmospheric oxygen and the beginning of present-day plate tectonics. The Late Archaean crust consists of several fragments of the Gondwana Supercontinent, such as India, Africa, Sri Lanka, and East Antarctica. Among these, the southern part of India is crucial as it contains several ~2.5 Ga crustal units metamorphosed at ~2.4 Ga, hence becoming the primary focus of research.

Deep Earth dynamics and surface observations (Attreyee Ghosh)
We evaluated time-dependent mantle convection models that combine kinematics, non-linear mechanics and observational constraints. We investigated the cause of the peculiar circular pattern of SKS splitting data in western North America and implemented pseudoplasticity

(a stress-dependent rheology) so that the effective viscosity drops significantly in regions of high shear stress like subduction zones. Further, we ran forward mantle convection simulations driven by different plate reconstructions starting from 140 myr ago. By comparing the present-day predictions of our forward models against actual observables, we could judge which plate motion model yields the most accurate internal and surface predictions today.

Geophysical inversion (Pawan Bharadwaj)
Geophysical inversion group continued its efforts to investigate the use of generative AI in seismology.

Near-surface geophysics: Used autoencoders to improve depth investigation by extracting subsurface responses from vehicle noise, enhancing the detection of deeper voids with less data and resources than traditional methods.

Enhanced crustal imaging: Trained variational autoencoders to extract crustal scattering effects from the seismic wavefield, enabling better analysis of anisotropy and the 3-D nature of the Earth's crustal structure.

Earthquake imaging: Showed that deep neural networks can better isolate earthquake information from seismic waves, allowing clustering analysis of earthquake sources, and generating virtual seismograms that facilitate precise examination of earthquake directivity effects.

Isotope geochemistry (Prosenjit Ghosh)
Development of innovative isotope geochemistry proxies for paleoclimate reconstruction and hydroclimate studies. Our recent publications demonstrated the use of triple-oxygen isotope ratios in rice phytoliths (Kaushal et al., 2025) and clumped isotopes in marine bugs (Shaktivel et al., 2025 and 2026) as a quantitative proxy for relative humidity, advancing monsoon reconstruction. We contributed to long-term Bay of Bengal paleo-productivity studies that link glacial–interglacial climate dynamics, monsoon variability, and Southern Hemisphere forcing over the past 1.3 million years (Banerjee et al., 2025). This has serious implications for the carbon dioxide drawdown and hydrological circulation in the past and also for the future.

Chemical Oceanography (Sambuddha Misra)
Our work on the spatio-temporal evolution of Ganga River chemistry was published in Chemical Geology and Earth and Planetary Science Letters. The study revealed that ion-exchange and authigenic clay formation processes drive a non-conservative behaviour metal in the estuarine region.

Hydroclimatic extremes, remote sensing (Bramha Dutt Vishwakarma)
Our group uses satellite geodesy with large scale geophysical models, in-situ observations, and other r emote sensing products to study earth system and its response to climate and anthropogenic forcings. We also collect in-situ glacier mass balance and velocity data from Ladakh.





Faculty & Staff

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SAJEEV KRISHNAN
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ATTREYEE GHOSH
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SAMBUDDHA MISRA
PhD (Florida State), Assistant Professor

PAWAN BHARADWAJ
PhD (Delft University of Tech.), Assistant Professor

BRAMHA DUTT VISHWAKARMA
PhD (Stuttgart), Assistant Professor (jointly with Interdisciplinary Centre for Water Research)

Associate Faculty

D NAGESH KUMAR
PhD (IISc), Professor

3.5.4

Chemical Engineering

The Department of Chemical Engineering is a Centre of Excellence in research and education. It comprises of thirteen full-time faculty and currently has 62 students carrying out research in fundamental and applied areas, and 43 MTech students.

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PhD, MTech (Res) and MTech

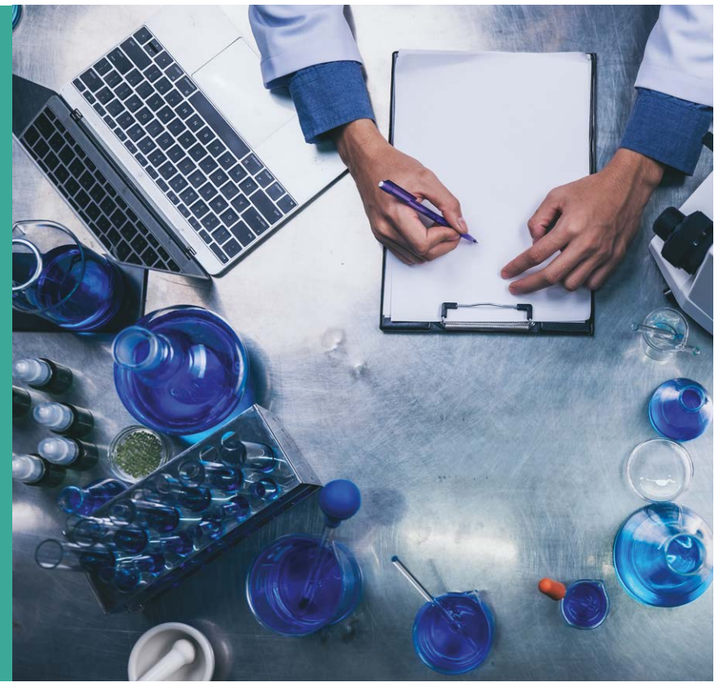
IN NUMBERS
13 Academic Staff
59 Ph.D Students
3 MTech (Res)
79 Publications
43 MTech
12 PhD Conferment

Chair: Sanjeev Kumar Gupta



Core Research

Biomolecular/Biological engineering, diagnostics and drug engineering, catalysis and reaction engineering, process intensification, membranes and water treatment, complex Fluids and granular materials, transport processes, paper microfluidics, nanomaterials, energy science and engineering, statistical mechanics and molecular simulations, active matter systems, environmental engineering; synthesis and modelling of soft materials.



Current Research

Particle and suspension dynamics: Dynamics of a turbulent particle-gas suspension plays a key role in fluidised bed reactors. The newly developed Fluctuating Force Fluctuating Torque (F3T) is shown to accurately model the dynamics. The effect of the magnetisation model on a spheroidal magnetic particle in a rotating magnetic field was studied. It was found that the problem could be mapped on to the dynamics of a spherical dipolar particle subjected to a steady magnetic field in a shear flow. Due to this mapping, there was found to be a one-to-one correspondence between previous results for a particle in a shear flow and a steady field and the present results for a particle in a rotating magnetic field.

Molecular modelling of materials and statistical mechanics: A machine-learnable framework to map nanopore chemical spaces, enabling predictions of 2D material properties, is developed. A 100-year-old debate in the field of statistical mechanics of constant energy systems is resolved. We introduced a pedagogical framework for microcanonical statistical mechanics that aligns with thermodynamic laws for nonideal fluids. In catalysis, we revealed a facet-dependent activity for oxygen evolution on iron-doped nickel oxyhydroxide. Additionally, we explored how surface and edge functionalisation modulate the mechanical properties of graphene oxide. Expanding into polymer research, we created the first model for inhibitor-modulated 2D polymer growth, offering insights into covalent organic frameworks. We have uncovered key pathways for MoS2 monolayer formation via organometallic chemical vapor deposition and proposed a charge assignment scheme for accurate water transport simulations in nanotubes.

Nucleation and formation mechanisms: The mechanism of crystal nucleation from solutions is poorly understood. Our studies have revealed the crucial role played by hydration on the free energy landscape of crystal nucleation of NaCl from aqueous solutions. Mechanistic details of organiser mechanism in Turkevich protocol for gold

nanoparticle is highly complex and non-classical. Previous studies have indicated that the reduction followed by nucleation is aided through an organiser molecules. Using molecular simulations and DFT studies, we have uncovered the mechanistic details of the organiser mechanism during the formation of gold nanoparticles.

Electrochemical energy storage: Our investigations into soluble lead redox flow batteries show that electrode degradation is caused by re-nucleation at every recharge, hence formation of inherently weak layered deposits. The conductive electrode area is at its lowest at the end of a discharge terminated by an unacceptably low potential, which alters the prevailing understanding that this area was at its maximum, and hence the charging potential at its lowest, at the onset of the next recharge. New scaling laws are discovered for the first time between the duration of disruption of charge by discharge and the time required for recovery of the charging conditions before disruption. A model in which discharge begins with small hemi-spherical cavities that grow and coalesce to form crevices explains two scaling laws observed experimentally.

Functional devices and printed sensors: Functional devices based on in situ formed percolating networks of palladium nanostructures for hydrogen leak detection are developed. Rigorous testing for sensitivity and resistance to interference as per ISO standards have shown that the fabricated sensor is responsive and selective. The novelty lies in developing the precursor solution, assembly method, and post-treatment step, collectively ensuring high-performance hydrogen sensing. We also collaborated with TCS research to additively fabricate meta-surface lens antennas suitable for mobile satellite communications. We collaborated with a team of physicians from Manipal to test inkjet-printed strips for detecting chloride ion concentration in saliva.

Separations, water treatment and polymer processing: Water treatment and catalysis research focused on developing novel catalysts for unconventional processes like photo-piezocatalysis. Efforts were also made to create mixed matrix adsorbents and membranes for selective contaminant separation, with a particular emphasis on using ion-exchange membranes for ion separation in multicomponent mixtures. New processing techniques for upscaling and recycling of polyolefins are under development. Design of drug molecules via targeted methylation is under investigation.

Computational immunology: Together with colleagues from France, a computational framework to draw inferences of in vivo immune responses to HIV using ex vivo data is developed. Applying it to data from macaques, we deduced that the early cumulative immune response was a good correlate of long-term natural control of HIV. In a second study, we identified a trade-off between the antiviral and immune-stimulatory effects of antibody therapies for HIV, which may be important in devising strategies to elicit lasting HIV remission.





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PRABHU R NOTT
PhD (Princeton) Professor

V KUMARAN
PhD (Cornell) Professor

SANJEEV KUMAR GUPTA
PhD (IISc) Professor, Chair

NARENDRA M DIXIT
PhD (Illinois) Professor

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PhD (IIT Bombay) Assistant Professor

3·5·5

Civil Engineering

The department spans five major areas: (a) Dam, (b) Geotechnical, (c) Structural, (d) Transportation Systems and (e) Water Resources and Environmental Engineering. A wide spectrum of research activities - analytical, numerical, and experimental methods are pursued. In addition to the doctoral and master's research, a unique MTech programme is offered where a student can opt for a major and a minor.

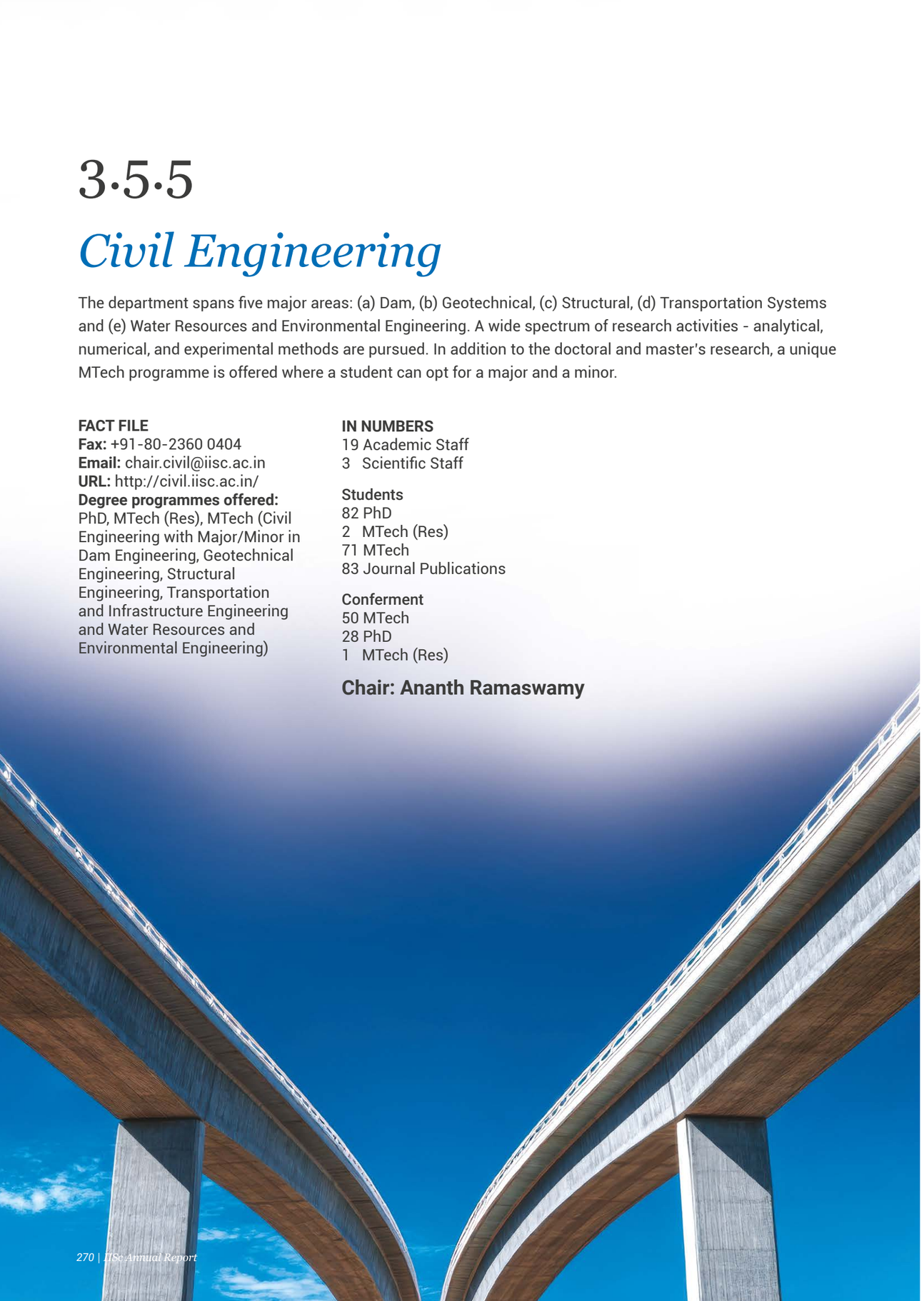
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Degree programmes offered:
PhD, MTech (Res), MTech (Civil Engineering with Major/Minor in Dam Engineering, Geotechnical Engineering, Structural Engineering, Transportation and Infrastructure Engineering and Water Resources and Environmental Engineering)

IN NUMBERS
19 Academic Staff
3 Scientific Staff

Students
82 PhD
2 MTech (Res)
71 MTech
83 Journal Publications

Conferment
50 MTech
28 PhD
1 MTech (Res)

Chair: Ananth Ramaswamy



Core Research

Some major research thrust areas are predictive science, theoretical and applied mechanics, large scale testing, development of novel construction materials, multi-scale modelling, seismic resistant design, water resources, environmental, dam and transportation systems engineering. While the analytical and computational research spans from theoretical development to high-performance computing, the experimental research spans from laboratory based to field studies.

Current Research

Primary focus has been on the development of hygro-chemo-thermo-mechanical model for concrete at meso scale in a multi-physics framework. The model has been examined in a standalone mechanical loading framework and in a hygro-mechanical framework to assess shrinkage and creep estimation in concrete. Extension to a thermal setting has also been undertaken to account for the degradation under fire (very high temperature). Modelling of 3D printed concrete and carbon capture in concrete were also studied. Health monitoring of structures to address issues arising out of effects of environmental effects on measurements have been addressed to get a corrected status of the structural condition. Crack propagation in composite laminates through phase field methods formed another study direction. Experimental research to understand the microcracking evolution and crack propagation in large sized concrete specimens under monotonic and fatigue loadings is undertaken with the help of acoustic emission and digital imaging.

The Interfacial Solid Mechanics Group works on diverse problems involving contact and interaction between solids at the continuum and sub-continuum scales and develops computational tools to enable first-in-class simulations. Recent areas of investigation include the micromechanics of deformation in honeycomb indentation, effect of subsurface voids on indentation hardness, large-strain plastic deformation in two-level metallic hierarchical solids, FE solvers for physically accurate adhesive interactions in elastic solids, and problems in applied contact mechanics (catenary-pantograph interaction dynamics in high-speed rail), among others.

The Infrastructure Materials Research Group works on developing low-carbon multi-blended cements, durability of structural concrete, multi-scale modelling of cementitious composites, thermodynamic and service life modelling, reactivity and activation of supplementary cementitious materials (SCMs), Microstructure and transport in concrete, and developing and optimising sustainable performance-engineered concrete. We also work on utilisation of alternative building materials in structural concrete, such as biomass ashes and biochar, steel slag, and construction and demolition waste.

Urban Floods: Impact of climate change and an increase in the urban population have resulted in increased urban flood vulnerabilities. To quantify the impact of climate change, the intensity, duration, frequency relationships the spatiotemporal variation in extreme rainfall distribution within an urban catchment is evaluated based on a dense network of telemetric rain gauge stations. An integrated urban flood model is developed to provide rainfall and flood forecasts over an urban city like Bengaluru, Karnataka. A Weather

Research and Forecasting (WRF) model is set up to provide short-term rainfall forecasts. The WRF model is further integrated with a hydrological model to provide flood forecasts at different locations. Further, the impact of urbanization on hydro-meteorologic variables across seven cities is investigated. A digital twin is currently being developed to provide a tool for evolving real time, rapid responses.

The Remote Sensing Ecohydrology Laboratory investigates the use of satellite-based solar-induced chlorophyll fluorescence (SIF) to monitor crop productivity in India. SIF, a direct indicator of photosynthetic activity, serves as a physiological proxy for gross primary productivity (GPP). The investigation provides the first analysis of how SIF tracks GPP across India's cropping systems, revealing that the GPP-SIF relationship is modulated by temperature, radiation, and soil moisture at different stages of the growing season. The lab also explores the potential of SIF yield (SIF normalised by absorbed photosynthetically active radiation) as an early warning indicator for agricultural drought. Compared to conventional hydrometeorological and greenness-based indicators, SIFyield shows the strongest correlation with GPP reductions and leads other signals by 1–2 months, making it valuable for early crop stress detection. The lab also employs spaceborne LiDAR to assess canopy structure and biodiversity across India's forest ecosystems, contributing to broader vegetation monitoring efforts.

Hydrological model calibration plays a crucial role in estimating optimal parameters for accurate simulation. Modelers commonly employ optimisation algorithms for calibrating hydrological models. By leveraging the strengths of Convolutional Neural Networks (CNN) and the Dynamically Dimensioned Search (DDS) algorithm, hydroCNN+DDS simplifies the model calibration process in complex physics-based models. This approach enables to capture the general patterns and relationships between discharge time series and parameters without compromising the underlying physics. We use hydroCNN+DDS to estimate parameters in the highly parameterized hydrological model, Structure for Unifying Multiple Modeling Alternatives (SUMMA) using hourly observed discharge. Notably, hydroCNN quickly generates sub-optimal parameters, serving as a good initial solution for DDS. This initialisation aids DDS in converging faster towards an optimal solution.

Streamflow elasticity and reservoir influence in data-scarce river basins is of great interest to understand hydrometeorological controls. This work provides new insights into the role of climate variability, storage, and land-use changes on long-term water availability. Another important research theme includes reconstructing historical streamflow and baseflow using a hybrid approach that combines conceptual hydrological models with machine learning, particularly in Himalayan basins prone to floods and landslides. We are exploring the integration of crowdsourced observations and remote sensing in validating environmental forecasts, especially for urban flood monitoring. Additionally, the group is initiating new research on the cascading impacts of forest fires on hydrology, sediment transport, and downstream flood risk in mountainous terrains.

To better represent groundwater processes for understanding feedback between the human and natural systems in hydrology models, a 2D groundwater flow model (AMBAHS-2D) was developed. This was coupled with the popular variable infiltration capacity (VIC) surface water hydrology mode. The coupled model was applied to different catchments in India and in southeast Asia. Using the case of Bengaluru City in India, it was demonstrated how fine-resolution data can inform model-based estimates of groundwater budgets.

The Kabini Critical Zone Observatory is managed in southern India. The observatory is a super site for carrying out Cal/Val studies for SAR microwave satellite platforms (Sentinel-1 and NISAR) and for the upcoming thermal satellite TRISHNA. Several studies are underway in the Berambadi agricultural catchment of the Kabini CZO for evaluating water-food-energy nexus issues, impact of land treatment interventions on hydrological budgets, and sustainable crop practices considering water and carbon fluxes.

Research on reduced order modelling of dynamical system in the context of reliability estimation and mechanics of nanocomposites. On the first topic we developed a novel computational scheme. On the second topic, through detailed molecular dynamics simulation we found crack propagation mechanism in a polymer nanocomposite (with carbon nanotube reinforcement). Understanding the effects of particle morphology on the intergranular and interfacial shear response of granular materials, with a special attention towards geomechanical processes like liquefaction, interface slip and flow through soils. A new framework for accurately characterising the size and shape of grains using 3D micro-computed tomography, spherical harmonic based geometric reconstruction coupled with a new watershed algorithm is developed. Use of natural coir fibres for effectively mitigating the liquefaction in sands is demonstrated for the first time. A new idea of geocell anchor cage is proposed and applied to significantly enhance the load bearing capacity of soils. Through 3D printing, textured geogrids are manufactured for the first time.

Extensive work on using x ray computed tomography for understanding the structure cohesive granular ensembles. In situ uniaxial compression tests were conducted as a part of this research and this extensive data set is being analysed. We have also initiated work on the indentation of a granular ensemble. The evolution of the deformation field is mapped with the progress of indentation. Examining the structure of a potter wasp nest using x ray computed microtomography. The labyrinth of cells and chambers in the potter wasp nest is currently being analysed. A photoelasticity set up for understanding force propagation in cohesive granular ensembles is functional. Using the set up to understand the influence of cohesive diads on the ensemble. The map of force propagation in the ensemble is analysed.

Modelling the rocking and sliding of free-standing objects using rigid body dynamics. The features of an open-source finite element software MASTODON, used for seismic analysis and risk assessment of critical infrastructure. Analysing the response of embedded structures such as tunnels and embedded nuclear power plants under near-fault earthquake loading conditions.

Experimental studies on homogenous earthen dams to observe dam breaching and analyse the erodibility of dam under controlled hydraulic and geotechnical conditions. Experimental results on breaching by overtopping erosion process in an earthen embankment in a laboratory flume and simulation of same model using Plaxis2D are reported in this report along with the details of the experimental set-up and procedures.

Parametric Study of Sand Behaviour with Experimental and Numerical Modelling using FLAC 3D. Stability of slopes subjected to rainfall are being studied and mitigations methods like microbially induced calcium precipitation is explored to increase the strength and reduce permeability under unsaturated conditions.

Hammer energy during soil testing of SPT of Indian testing was estimated and understand variation and studied effect of hammer energy on empirical correlation in Geotechnical engineering. Cavity formation of Urban areas was investigated, and understand the reason for the same, was given methods to investigate and treat the same before the collapse of the cavity. The main areas of research of IISc Sustainable Transportation Lab (IST Lab) have been; sustainable transportation planning and policy, integrated public transport planning and management, transport and quality of life (QoL), transport and climate change, disaster Resilient transport, modelling and optimization of transportation systems, travel behaviour analysis and modelling, pedestrian and crowd flow modelling, driver behaviour and road safety, Intelligent transportation system (ITS), traffic control and management etc.



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VIDYA SAGAR R
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3.5.6

Design and Manufacturing

Department of Design and Manufacturing (DM) is among the most research and technology intensive design and manufacturing schools in India, steeped in the ambience of Indian Institute of Science (IISc). DM is the design and manufacturing lead of IISc.

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Degree Programmes Offered:
PhD, MTech (Res), MDes (Product Design, Development and Management), MTech (Smart Manufacturing)

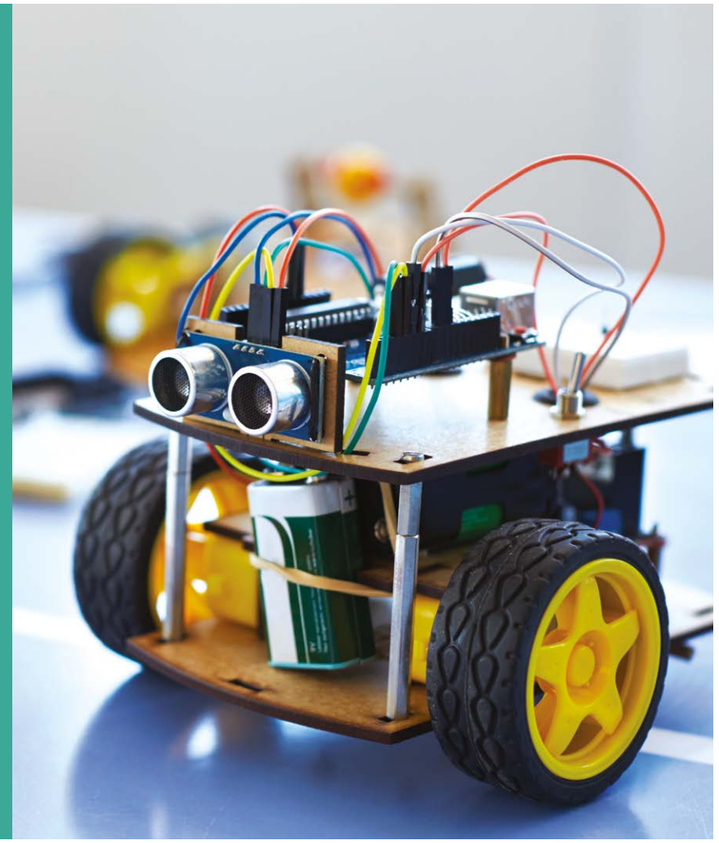
IN NUMBERS
10 Academic Staff
1 Scientific Staff
57 PhD Students
2 MTech (Res)
44 MDes PD&E and 37 MTech SM
46 MDes PD&E Conferments
25 MTech SM Conferments
11 PhD Conferments
1 MTech (Res) Conferment

Chair: Amaresh Chakrabarti



Core Research

Development Process, Informatics, AI (Creativity; Informatics, AI, CAD, CAE, NPD, DFMA); Mobility, Robotics (Robot Manipulation/Control, Mechanisms, Automotive Systems/Safety); Human Factors, Aesthetics (Ergonomics, HMI, DHM, XR/Haptics, UI/UX, Aesthetics; Psychophysics); Smart, Sustainable Systems (Smart Mfg, Digital Twin, Sustainable Materials/Processes, Construction 4.0); MedTech, Digital Health (Medical Device Design/Mfg/Certification, Medical Ultrasound/Implants, Assistive Devices); Materials, Manufacturing (Materials Design, AM, Biomaterials, Metrology)



Current Research

Development Process, Informatics, AI: A syntactic model for representing the behaviour of mechanical artefacts in product models. A mapping of intellectual Assets for Innovation in manufacturing for knowledge management in R&D Projects. Extension of SAPPhIRE Modelling to represent Product Service Systems. A Human-Centred Multidimensional Situation Awareness (SA) Framework for advancing (SA) in construction projects and organisations. A Simulation-Based Approach for evaluating financial investment utility of Plug-in Plug-out Modular Architecture for construction and real estate markets.

Human Factors, Aesthetics: XR and AI based Human in the Loop Assistance for Industry X.0. Method for assessment and enhancement of ergonomic safety in non-routine manufacturing processes. Study of interdependence of Grasp and Body Postures through Digital Human Modelling (DHM). A computational framework for autonomous task execution from instructions in DHMs. A unified effort measure for natural posturing of Digital Humans. A descriptive hierarchical approach to analyse activities through a causal mechanistic view. A tool for simulating natural human performance in DHM is developed.

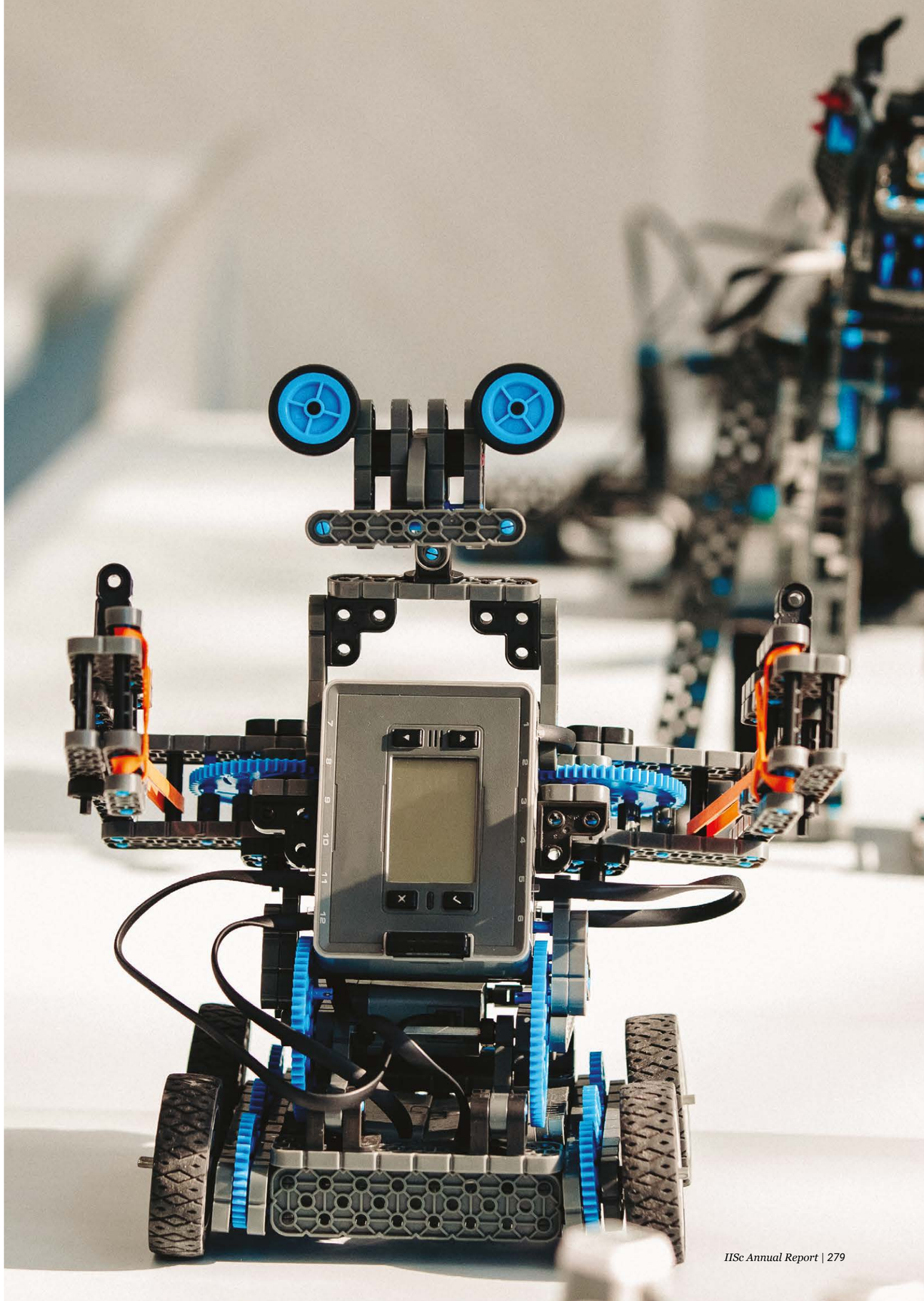
Mobility, Robotics: Development of bioinspired visual sensors-based mobile robot locomotion. Nonlinear control for real-time collision avoidance of nonholonomic mobile robots. Human-aware robot collaborative task planning. Social Robot Collaboration. Gear defect detection with robot vision. Development of AI tools for automotive subsystem design and advanced finite

element modelling procedures for assessing exhaust valve performance under dynamic pressure loads developed. Extended Reality based cobot control for manufacturing processes. Heterogenous multi-agent coordination in robotics. Development of multimodal cobots. Robotic systems for pipeline maintenance.

Smart, Sustainable Systems: Development of methods for sustainability assessment in manufacturing and a novel framework for capturing active impacts of products and manufacturing systems to help develop effective interventions. Development and characterisation of sustainable materials (e.g. AL-foam and bio-composites), with significant promise for reduction of environmental footprint. CNC machine characterisation and customisation. Development of a data-constrained data-driven digital twin for design and manufacturing. Development of a tool for digitalisation of Quality Management Systems (QMS) in the medical device industry for certification.

MedTech, Digital Health: Development of medical technologies/systems, e.g. for neonatal hearing screening; an imaging-based intraoperative probe for brain tumour delineation; label-free diagnosis of cancer from breast and brain tissues, assessment of stenosed trachea, force sensing with haptic feedback for catheter ablation, rapid detection of SARS-CoV virus, and therapeutic neurological intervention; piezoelectric micromachined ultrasonic transducer arrays for biomedical imaging and therapeutic ultrasound; paediatric intravenous catheterisation training; high-fidelity pulse diagnosis training. Development of a framework for computational evaluation of knee arthroplasty under physiological loading.

Materials and Manufacturing: Development of natural-based composites for packaging and clinical applications. Fracture, deformation, and wave propagation in lightweight materials (wood) for sports applications. Techniques for in-process warpage estimation and mitigation techniques in additive manufacturing. Development of a high-pressure compressive reciprocating shear process for severe plastic deformation of pure Magnesium. Inverse design of porous structures using Deep Learning methods for targeted physical properties. Production of powders for metal additive manufacturing applications using surface grinding.





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PRADIPTA BISWAS
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VISHAL SINGH
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RINA MAITI
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ND SHIVAKUMAR
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3·5·7

Centre for Sustainable Technologies

Department of Design and Manufacturing (DM) is among the most research and technology intensive design and manufacturing schools in India, steeped in the ambience of Indian Institute of Science (IISc). DM is the design and manufacturing lead of IISc.

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Degree Programmes Offered: PhD, MTech (Res), and MTech (Sustainable Technologies)

IN NUMBERS
7 Faculty Members (Core)
4 Faculty members (Associate)
1 Adjunct faculty member
0 Scientific Staff
30 PhD
21 MTech (Sustainable Technologies)
0 MTech (research)
35 Postdoc, research associate, and research assistant
53 Publications
11 Capacity Building Activities, Outreach Training
5 PhD Conferments
1 MTech (research) Conferments

Chair: G Madhavi Latha



Current Research

Restorative climate-responsive architecture and wellness: Building and architectural sciences dealing with climate-responsiveness and thermal resilience of vernacular and conventional building typologies, sensitivity to diversity in local resources, biodiversity, and culture, and climate-change adaptation and mitigation. Examining novel restorative approaches in the built environment for societal and planetary wellness. Wellness studies dealing with indoor environment quality, role of moisture and thermal comfort, health and productivity, integrated with ecological restoration. Integration of renewables in buildings, with particular emphasis on the integrability of building-integrated photovoltaics (BIPV) and end-of-life PV as a building material in tropical conditions. Smart building and energy neutrality assessments.

Sustainability science: An interdisciplinary systems approach to sustainability, examining its theoretical basis and application in architecture (buildings) and design. Sustainability assessment and forecasting in design and technology, identification of effective design-based interventions. Design for the BoP addressing multi-stakeholder empowerment, livelihood security, and health. Examining geographically characterised active impacts traceable to design and manufacturing.

Plasma Technology, Wastewater Treatment, Recycling and Waste to Energy: Non-Thermal Plasma Cleaning, Enrichment and Reforming of methane and tar compounds. Plasma-activated water characterisation and its application for wound healing, surface hygiene, and green fertilizer production. Plasma grey water treatment for recycling purposes. Decentralised wastewater treatment and recycling, modelling of plasma systems. Refuse-derived fuel characterisation for waste-to-energy applications. Green methanol and Green hydrogen production.



Turbomachinery: Fabrication of axial flow turbine-driven multistage pump and its detailed testing are conducted at the department. The constructed pumps work with an input head of 2-3 meters and pump water to 20-25 meters with an overall water-to-water efficiency of 50%. A hydraulic piston pump was experimentally tested at the department and implemented in Netanar village in Bastar on Kodari Bahar stream; it was commissioned in June 2022, supplying drinking water for 30 families, 40,000 litres per day. It is driven by a head of 3 meters and pumping to 34 meters continuously with electrical energy (flow input is 12-14 L/s). An MOU between IISc and the Chhattisgarh government was formed in December 2022 for the implementation of multiple non-electric hydro-powered pumps; pumps were installed in three villages.

Wastewater treatment: Biological wastewater treatment with focus on: Aquaculture effluents, Biocarrier development, Biofilm reactors, Greywater treatment, Nitrification, Nutrient recovery, Organic micropollutants (emerging contaminants), Saline effluents, and Water recycling.

Bioenergy and biomass: Green hydrogen towards fuel cell application is the major focus through the thermo-chemical conversion of biomass. Establishing the hydrogen purity to meet the ISO specification is achieved. As a part of biorefinery, the syngas generated paves the way for green chemicals and fuels like methanol, ethanol, DME, and syngas for Green ammonia and fertilizer. Downstream utilisation of fuels for application in Solid Oxide fuel cell (SOFC), PEM fuel cells.

Sustainable separation technologies: Recovery of valuable components from waste streams, extraction of a synthesised commodity from the reaction medium, or purification of an effluent stream before discharge into the environment are some examples where separation technologies are critical. Ongoing projects in this domain are solvent recovery from industrial waste streams using pervaporation, phytochemical extraction using reverse osmosis and nanofiltration, and arsenic uptake from groundwater using a rurally sustainable scheme using bioadsorbents.

Low-carbon construction materials and smart manufacturing: Low-carbon 3D printable materials for maximising carbon dioxide (CO_2) sequestration in buildings; CO_2 utilisation to develop novel construction materials; Earth-based building blocks using construction and demolition (C&D) fines and carbon dioxide; innovative design using 3D printing to remove the dependence on formwork and introduction of value-added features; Treatment methods to improve engineering properties of building materials containing industrial by-products; Bio-based building materials – introducing structural changes to tune the rheological properties and engineering performances for construction application. Sustainable catalytic pathways: Biomass conversion into fuels and chemicals; rare sugars production; plastic re/upcycling; new strategies for the catalytic conversion of biomass into functional chemicals such as amines and carbamates; conversion of waste plastics into monomers and fuels; fundamental understanding of sustainable waste management and utilization, particularly in the critical areas of fuels and polymers.



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3.5.8

Divecha Centre for Climate Change

The primary goal of the Divecha Centre for Climate Change is to understand climate variability and climate change and its impact on the environment. The Centre is working with various departments to identify technologies to mitigate/reduce the severity of climate change. The Centre frequently undertakes outreach activities to create awareness among people and policy makers about climate change and its consequences, especially on society.

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Core Research

Himalayan Cryosphere and Climate Change, Glacier mass balance and area retreat, Glacier Lake inventory and GLOF risk assessment, hanging glacier modelling, Hanging glacier avalanche modelling and vulnerability assessment, Hydrological modelling in glacierised basins. Climate Change and Women's Empowerment; Climate Change and Energy Demand from Residential Cooling; Unequal Growth and Precarity in Rural India; Economic Modelling of Climate Policies, Water Quality Studies in Rural and Peri-Urban Areas. Climate Change Biology-Our studies have revealed the importance of soil bacteria which play a crucial role in biogeochemical cycles, soil health, human health, agricultural practices and food security. Atmospheric Aerosols and Climate, Aerosol Chemistry and Optical Properties, Remote Sensing and Radiative Transfer Modelling, Aerosol–Radiation Interactions, Wildfires and Volcanoes, Ozone depletion, boundary layer.



Current Research

Decadal Changes in Glacier Area and Mass Balance
Long-term glacier changes were assessed in the Beas, Bhagirathi, and Baspa basins using Landsat and Sentinel satellite imagery from 1979 to 2024. Results indicate accelerated glacier retreat and increasing area loss after 2000. Glacier mass balance was estimated using the Improved Accumulation Area Ratio (IAAR) method, revealing strongly negative mass balance trends across all basins. The Beas glaciers recorded a cumulative mass loss of 17.75 Gt since 1951, while the Bhagirathi

Basin lost approximately 19.73 Gt between 1995 and 2024. Modified glacier-specific IAAR approaches applied in the Baspa Basin further improved the accuracy of mass-balance estimates.

Glacial Lake Inventory and Monitoring in Uttarakhand Himalaya

A comprehensive glacial lake inventory for Uttarakhand was developed for 2025 using remote sensing and GIS techniques. The study identified 370 moraine-dammed and other glacial lakes, along with 210 supraglacial lakes distributed across the Yamuna, Bhagirathi, Alaknanda, and Kali basins. Alaknanda Basin showed the highest concentration of both moraine-dammed and supraglacial lakes. The mapped lakes are located between elevations of 3500 and 5770 m above sea level.

Estimation of Glacial Lake Volume

Glacial lake volume was estimated using the Bayesian Estimated Glacial Lake Volume (BE-GLAV) model to improve the reliability of lake-volume assessments relative to conventional empirical approaches. The method was tested on Vasundhara Tal, a supraglacial lake in the Alaknanda Basin. The model estimated a lake volume of approximately 9.27×10^6 m³ for the year 2025.

GLOF Susceptibility Assessment in the Western Himalaya

A basin-scale Glacial Lake Outburst Flood (GLOF) susceptibility assessment was conducted across the Western Himalaya using multi-source remote sensing data and a multi-criteria evaluation framework. A total of 1,573 glacial lakes were inventoried and classified based on size, type, and elevation. Twelve geomorphological and dynamic parameters were integrated using the Analytic Hierarchy Process (AHP) to derive a weighted GLOF Susceptibility Index. The analysis identified 48 potentially dangerous lakes, of which 16 were categorised as highly susceptible. The Satluj Basin exhibited the highest susceptibility, followed by the Chenab and Jhelum basins.

Mass Movement and Dam Erodibility-Based GLOF

Assessment in Uttarakhand

A GLOF susceptibility assessment was performed for 130 glacial lakes larger than 0.01 km² in the Uttarakhand Himalaya. The analysis incorporated four key indicators, including dam type, slope of outflow channel, mean slope of surroundings, and slope between glacier and lake, to evaluate dam-failure and mass-movement potential. Lakes were classified into five susceptibility categories using integrated hazard indices. The Alaknanda and Kali basins emerged as the most vulnerable regions.

Hydrodynamic Simulation of GLOF Depth and Velocity

Hydrodynamic simulations were undertaken for eight high-risk glacial lakes in the Bhagirathi, Alaknanda, and Kali basins using the HEC-RAS 2D modelling framework. Simulations used a 75% lake-breach scenario to generate spatial outputs, including flood depth, flow velocity, and inundation extent. Four simulations have been fully completed, while additional simulations are in progress.

Avalanche and Hanging Glacier Modelling in Alaknanda Basin

Advanced process-based modelling using the RAMMS framework was employed to simulate avalanche dynamics of nineteen critical hanging glaciers in the Alaknanda Basin. Simulations integrated ALOS PALSAR DEMs and Sentinel-2 imagery under a 30-year return period scenario. Results indicated release volumes ranging from 0.2×10^6 m³ to over 14×10^6m³, with flow velocities exceeding 80 m/s and impact pressures greater than 6000 kPa in highly unstable glaciers. Several glaciers were identified as high-risk zones with potential impacts on downstream settlements, including Badrinath town.

Hydrological Modelling of Meltwater Runoff in Himalayan Basins

Hydrological modelling was conducted in the Upper Jhelum and Parvati basins using the SPHY v3.0 model to assess snowmelt, glacier melt, rainfall runoff, and future climate impacts. In the Upper Jhelum Basin, snowmelt contributed nearly 73–74% of total runoff, while glacierised area declined by approximately 45% between 2001 and 2020. In the Parvati Basin, model simulations highlighted the dominant role of snowmelt in sustaining streamflow, while future CMIP6 climate projections indicated increasing glacier melt and shifting runoff seasonality under warming scenarios.

Microplastic contamination in deep groundwater of hard-rock aquifers

Up to 3 microplastic fragments per litre have been noted in the groundwater pumped from borewells for public water supply in villages in eastern Karnataka. Low- and high-density Polyethene, Polystyrene, Polypropylene, Polyethene Terephthalate, and Polyamide microplastics have been identified. So far, microplastics in groundwater have been studied at 18 rural sites. A larger database is being created.

Excess nitrate in water can lead to blue baby syndrome and other gastrointestinal diseases. Data generated by WQG and the CGWB shows that nearly 20 per cent of bore wells in Central and Eastern Karnataka are discharging groundwater with nitrate concentrations exceeding 45 mg/l. These borewells are distributed in both canal-irrigated and non-canal-irrigated areas. Because nitrate contamination can arise from chemical fertilisers or organic contaminants (such as untreated sewage), the source of contamination is proposed to be identified using combined nitrogen and oxygen isotope studies.

Activated alumina beads were coated with iron oxide and roasted in an oxidising environment. These beads with a ferric iron oxide coating were used as adsorbents through which uranium-contaminated water was passed before the water was subjected to reverse osmosis. This technique removed more than 95 per cent of uranium from the groundwater, and the reject water from the RO unit had very low uranium levels.

During the year, uranium bioremediation experiments were conducted on groundwater samples. In these samples, sulphate-, phosphate-, and nitrate-reducing bacteria were identified by whole-genome sequencing. Ongoing experiments show that a sulphate-reducing bacteria culture could adsorb uranium and reduce uranium content by more than 99 per cent. In an area of Chikkaballapura district where groundwater exploitation has been intense and has reached a critical stage, perennial lakes were identified through a study of repeat satellite imagery to supplement drinking water supply. The water quantity in these lakes was estimated using digital elevation modelling. The quality of water in the perennial lakes is under investigation.

Empowered Women Key to Climate Adaptation

Preliminary Lessons from India's Agriculture Sector: In our study, we prove that women taking up farming in India is a climate adaptation strategy via occupational diversification. Second, farm profits of women farmers significantly increase with improved women empowerment indicators. Finally, we demonstrate that relation between women empowerment and farm profits is mediated by critical differences like gender relations, social norms, economic status and others.

Climate Variability Escalated Fractured Structural

Transformation in Rural India: Implications on India's Rural Workforce: In this study, we examine the impact of fissured/ fractured rural transformation on the employment of the rural workforce. Climate variability has led to high-cost low return and overcrowded agriculture sector. At the same time low-valued/ de-valued but highly sought after informal sector shaped employment in rural India.

Space cooling Appliances and Energy Usage in India:

Intense and long summers in India are increasing the demand for Space Cooling Appliances (SCA)-air conditioners and coolers. The study examines the adoption of SCA and energy consumption among Indian households. We also estimate how SCA adoption and energy used will escalate soon. We study the extent to which the pull and push factors- income and rising temperatures- determine SCA ownership in Indian households. We also bring to light the inequalities that lie in its adoption.

Inequality in Development and Sustainability in India:
This study brings together the Human Development Index and Carbon Footprint of different income levels. The purpose of this study is to examine the intra-country inequality in sustainable development.

Economic Modelling of Emissions Trading Scheme (ETS):
This study used a Computational General Equilibrium model to simulate the impact of the Indian Government's announced Emissions Trading Scheme on the electricity sector, and to consider the role of blending electricity from coal and renewables.

The role of historic global inequality in avoided climate destabilisation:
This study introduced a novel framework to evaluate responsibility for climate change. The global warming implication of an universal adoption of a particular country's historical per capita emissions trajectory, called the carbon footprint temperature (Tcf) is used analyse the implications of this framework.

Food Security and Malnutrition in Karnataka:
The prevalence of food security in South Asia, has always ranged from a little over 11 to approximately 20 percent of the population. This further gets aggravated with other social inadequacies in the region. Future Earth South Asia Regional Office is working to get a deeper understanding of the existing cropping patterns in Karnataka, India, examining the interconnections between crops grown and the climate.

Sustainable Community Development: Challenges, Pathways, and Policy Recommendation:
Sustainable communities represent an integrated framework of development that harmonises economic resilience, environmental stewardship, social equity, and inclusive governance to enhance the well-being of present and future generations. The Future Earth team at the Divecha Centre for Climate Change (DCCC), Indian Institute of Science (IISc), Bangalore, is planning a pilot study in a semi-urban region of Karnataka, in collaboration with various state government departments. Discussions for collaboration with government departments are currently ongoing. The objective is to develop a scalable and replicable model for sustainable communities. The initiative will focus on sustainable agriculture and soil health, renewable energy, public health, forest and environmental conservation, and women's empowerment.

Advancing Biochar-Based Climate Solutions and Digital MRV Frameworks for Sustainable Agriculture:
In 2026, the Future Earth South Asia Hub advanced stakeholder-driven initiatives on biochar as a climate-smart agricultural solution for soil restoration and carbon sequestration. Through consultations with researchers, agronomists, engineers, carbon-market experts, and institutional stakeholders, the Hub explored pathways for scaling biochar implementation in Indian agriculture, with particular focus on improving soil productivity and enabling smallholder farmers to access emerging carbon-credit opportunities. It is aimed at strengthening India's domestic scientific infrastructure for credible and farmer-inclusive carbon-credit verification systems.

The Aerosol Research Group continued its efforts toward improving the understanding of atmospheric aerosols, aerosol–radiation interactions, and their implications for regional climate through integrated observational, remote sensing, and modelling studies. The group also investigated air quality degradation, biomass-burning and volcanic aerosols, SO_2 emissions, boundary layer processes, hydrological droughts, stratospheric aerosols and chemistry, ozone depletion, polar stratospheric clouds, and their radiative impacts on regional climate. In addition to scientific research, the group actively participated in educational outreach programmes aimed at promoting awareness of aerosols, air quality, and climate change among school students.

Transported absorbing aerosols enhance mid-tropospheric heating over a semi-arid region of southern India. The study provides a comprehensive framework for the long-term assessment of aerosol radiative forcing and atmospheric heating over the Indian region, contributing to an improved understanding of aerosol-climate interactions in semi-arid environments.



Year-round observations of aerosol chemical composition and optical properties were conducted in Bengaluru, India, from February 2023 to April 2024 using an Aerosol Chemical Speciation Monitor (ACSM), an AE-33 Aethalometer, and an integrating nephelometer. The study investigated the seasonal variability, chemical–optical relationships, and atmospheric processing of urban aerosols in a rapidly urbanising tropical environment influenced by both local emissions and regional transport.

Closure of surface solar radiation fluxes using SBDART and pyranometer observations:
A radiative closure study was conducted to evaluate the consistency between observed and modelled surface shortwave radiative fluxes over Challakere. Aerosol-induced surface radiative forcing estimates were validated against independent measurements under clear-sky conditions. The comparison between modelled and measured monthly mean net shortwave fluxes showed excellent agreement, with: Correlation coefficient (R) = 0.96, Regression slope = 0.96, Negligible systematic bias. Seasonal analyses further demonstrated an inverse relationship between aerosol optical depth and surface shortwave flux. The strongest aerosol-induced surface dimming was observed during the post-monsoon season, whereas weaker relationships during winter reflected larger meteorological variability.

Genesis and Atmospheric Impacts of the Extreme Wildfire Event: A study has been carried out to understand its genesis and atmospheric impact by investigating one of the largest recorded wildfires, named the Australian Black Summer event 2019–2020. With new observational evidence, the study has revealed that the devastating Black Summer was strongly linked to extreme hydrological drought. A strong correlation is found between the depletion of

total water storage (surface and sub-surface) and the extent of burnt areas in southeast Australia. Liquid Water Equivalent Thickness reached a decadal low below -5 cm in December 2019, creating ideal conditions for intense fire activity. Furthermore, increased aerosol loading due to the wildfire, combined with higher surface albedo from drought conditions, led to enhanced outgoing shortwave radiation and regional cooling. Additionally, co-emitted carbon monoxide contributed to elevated ozone production at 850 hPa, further degrading air quality.

Interaction between Wildfire Aerosols and Polar Stratospheric Clouds: A dedicated study has been carried out to understand the consequences of the stratospheric injection of aerosols from the Australian Black Summer fires of 2019–2020. These aerosols played a crucial role in modifying stratospheric chemistry, polar stratospheric cloud (PSC) formation, and ozone depletion. Analysis of Aura's Microwave Limb Sounder data showed a sharp increase in nitric acid due to enhanced hydrolysis of dinitrogen pentoxide, leading to anomalously high coverage of ice PSCs, which exceeded 3 standard deviations above background levels. Lagrangian backward-trajectory analysis further demonstrated that 79% of liquid-nitric acid trihydrate (NAT) mixtures formed via the ice-free nucleation pathway. These NAT particles then served as nuclei for ice formation, accounting for 95% of observed ice PSCs.

Transport and Impacts of the 2025 Hayli Gubbi Volcanic Eruption Plume
The Hayli Gubbi volcano erupted explosively on 23 November 2025 after more than 12,000 years of dormancy. Multi-satellite observations and Massive-Parallel Trajectory Calculations were employed to investigate the plume's transport dynamics and its impacts over the Indian subcontinent and adjoining regions. It is found that the eruption released 0.18 ± 0.02 Tg of SO2 into the upper troposphere. Thereafter, it rapidly transported over 20,000 km within four days by the subtropical westerly jet, remaining confined between 9 and 13 km altitude with no stratospheric intrusion. Although the SO2 plume passed directly over northern India on 24–25 November 2025, it resulted in only a modest positive anomaly in aerosol optical depth, mainly over western India.

Validation and Characterisation of Atmospheric Boundary Layer Height over India:
Atmospheric Boundary Layer Height (Zi) is a crucial parameter in modelling cloud formation, weather, and air quality. In the study, India's first regional reanalysis dataset, the Indian Monsoon Data Assimilation and Analysis (IMDAA), for Zi is validated against multi-platform observations. Our analysis shows that IMDAA agrees well with radiosonde and satellite measurements and outperforms other global reanalysis datasets. However, it significantly underestimates Zi (<100 m) during December over humid subtropical regions such as Jammu and Gorakhpur, likely due to biases in net radiation, cloud cover, and surface energy partitioning. For the first time, a comprehensive characterisation of the daily maximum boundary layer height (Zi,max) has been performed. The results reveal that Zi,max reaches its peak around 15:30 IST across all seasons. Spatially, the highest values (~4500 m) occur over central India during the pre-monsoon season, while during the monsoon season, Zi,max reduces to ~2500 m and shifts to northwest India.

Establishment of Mobile Aerosol Laboratory at Lawrence School, Ooty:
A Mobile Aerosol Laboratory was established and deployed at Lawrence School, Ooty, to facilitate continuous monitoring of atmospheric aerosols and meteorological parameters in a high-altitude environment. The laboratory also serves as a platform for education and outreach, providing students with direct exposure to atmospheric measurements and scientific instrumentation.





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3.5.9

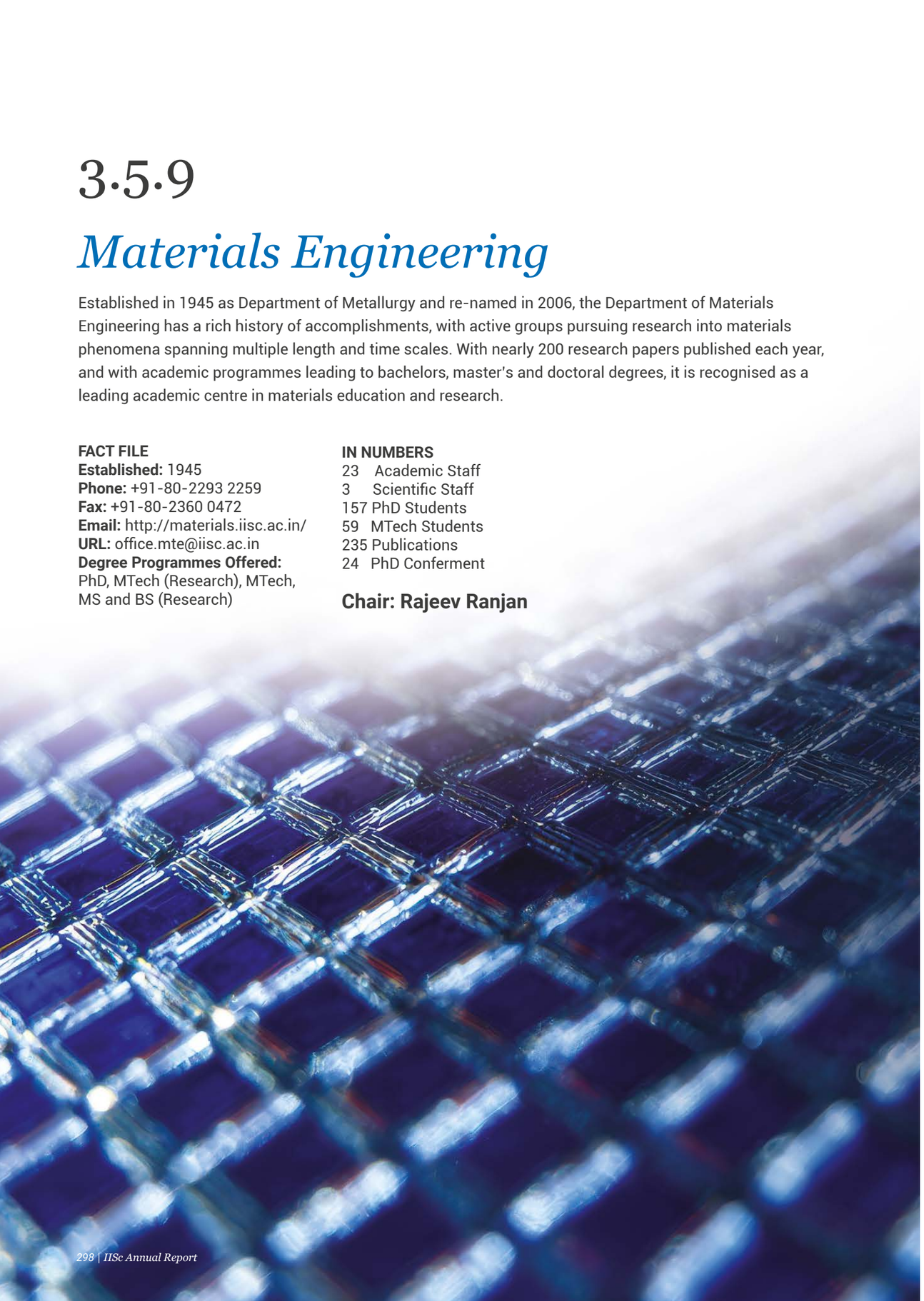
Materials Engineering

Established in 1945 as Department of Metallurgy and re-named in 2006, the Department of Materials Engineering has a rich history of accomplishments, with active groups pursuing research into materials phenomena spanning multiple length and time scales. With nearly 200 research papers published each year, and with academic programmes leading to bachelors, master's and doctoral degrees, it is recognised as a leading academic centre in materials education and research.

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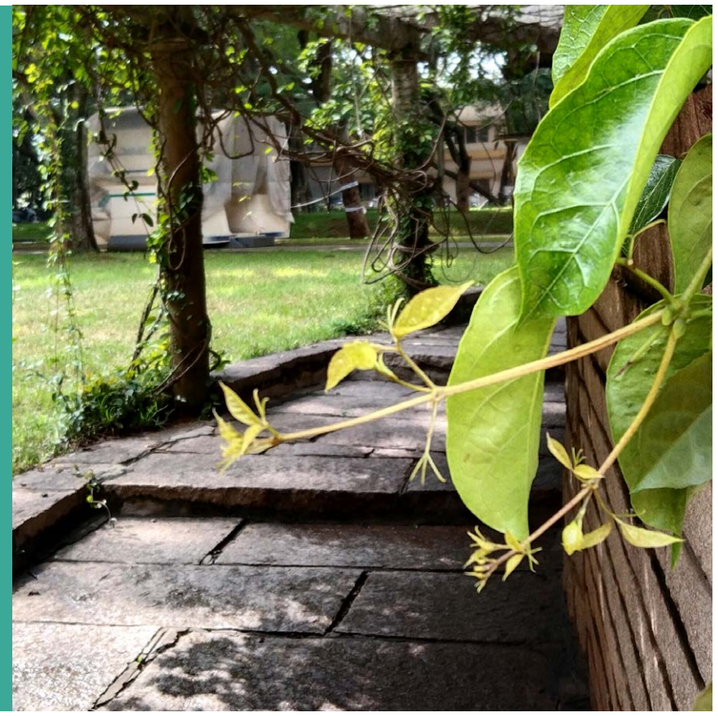
IN NUMBERS
23 Academic Staff
3 Scientific Staff
157 PhD Students
59 MTech Students
235 Publications
24 PhD Conferment

Chair: Rajeev Ranjan



Core Research

Metals and alloys; Structural alloys; Superalloys; Iron making; High temperature deformation; Materials processing and advanced characterisation; Ceramics; High temperature coatings; Electronic and structural ceramics; Electronic packaging materials; Energy materials; Printed and flexible electronics; Ferroelectric, magnetic, and multiferroic materials and devices; Sensors; Computational Modelling; Polymers and nanocomposites; Biomaterials etc.



Current Research

Some of the important research activities are highlighted below.

Printed and flexible electronics: Led by Subho Dasgupta, a major initiative has been launched in printed and flexible electronics in 2016. In a breakthrough, the group has fabricated a fully printable organic-inorganic composite semiconductor material. The ultra-flexible thin film transistors (TFTs) fabricated with such materials show linear mobility more than 45 cm2/Vs, at the same time no performance degradation for a bending fatigue test with bending radius of 1.5 mm. The work has been granted Indian patent recently. The laboratory has also developed methods to fabricate high performance printed TFTs and circuits that can be realised on inexpensive and flexible polyethylene terephthalate (PET) and paper substrates and can operate at >100 kHz operation frequencies. The group has also demonstrated first fully-printed transition metal dichalcogenide (TMD) TFTs and circuits with high current density, On-Off ratio and operation frequency. A patent for the same has been filed. Lastly, the group has demonstrated fully-printed subthermionic transport, negative capacitance field-effect transistors (nc-FETs) with both all-organic and organic-inorganic hybrid dielectric/ ferroelectric stack. In addition, fully printed smart sensor tag with printed sensors, amplifiers and (along-to-digital converters) ADCs has been demonstrated. Along the same line, a fully-printed, self-powered, anti-counterfeit tag with printed supercapacitor, sensor, resistor, ADC, current drive circuit and colour change material as the visual indicator has been fabricated. Exploiting the dielectrophoretic technique the group has demonstrated excellent TFT performance with indium oxide nanorods and MoS2 nanoflakes. In the latter case, 16000 TFTs have been fabricated in one shot on a 3" silicon wafer, thus demonstrating the scalability of the process. In a different activity the group has found a novel concept to fabricate additive-free, restacking-free

2D metallic, MXene ink that demonstrates a factor of 4 higher capacitance value of a printed micro-supercapacitor when compared with the standard MXene inks.

Organic electronics: Praveen C Ramamurthy's research is focused on the development of functional materials, electrochemical sensors, polymer/nanocomposite systems, photovoltaic devices, and sustainable environmental technologies. The work integrated materials synthesis, device fabrication, electrochemical and optoelectronic characterisation, computational analysis, and application-oriented validation. Key contributions during the period included biomimetic electrochemical sensors for nanoplastic detection, green-synthesised ZnO nanoparticle-based platforms for atrazine detection, electrochemical detection of tryptophan for biomedical relevance, PFAS-related environmental risk and removal analysis, and machine-learning-assisted prediction of perovskite solar-cell parameters. The group also contributed to research on PET plastic degradation, heavy-metal sensing, MXene-based wastewater remediation, and molecular/optoelectronic materials. Collectively, these works strengthen the Department's contributions in materials for water quality monitoring, environmental remediation, sustainable technologies, sensors, flexible/ electronic devices, a nd photovoltaics.

The Disruptive Electronic Materials and Nanoelectronic Devices (DEMAND) group, led by Bhagwati Prasad, is immersed in exploring thin film heterostructures of metals, oxides, and 2D materials. The group's research focuses on applications in memory, sensing, and energy storage, leveraging the principles of spintronics, ferroelectrics, piezoelectrics, and magnetoelectrics. Prasad leads a team of 18, which includes postdocs, research associates, Ph.D. students, master's and undergraduate students, and interns.
Over the past year, they have achieved significant milestones, including demonstrating ultrahigh-density energy storage devices, developing ultrasensitive magnetic sensors, discovering current-dependent switching in spin-filter tunnel devices, and developing energy-efficient voltage-controlled spintronics devices. They are also investigating novel materials for spin-orbit torque switching. The group has been successful in securing funding from various organisations, including SERB-Exponential Technology, SERB-CRG, ISRO-STC, CEFIPRA, SERB-ITS, Axis Bank Foundation, and STARS-MOE, enabling them to establish cutting-edge experimental facilities.
These include Pulsed Laser Deposition, DC and RF sputtering units, Magneto-optical Kerr Effect (MOKE), and a Cryogenic-based Magnetic and Transport Measurement System.

Drug Delivery & Tissue Engineering: The overall theme of Ashok Raichur's group is to study novel nano-sized and nanostructured materials for drug delivery and tissue engineering applications. During the past year, the group has focused on developing novel bioinks and their use across several applications. For example, methacrylated mucin has been developed and, in combination with methacrylated gelatin and polyacrylamide, used to develop a 4D curl-and-stick patch. Curling takes place in the presence of water. In another project, we have developed a bioink by harvesting active molecules from the placenta (a biological waste). The bioink is now being characterised and optimised for use in treating tympanic membranes. We have also developed a fast-dissolving microneedle patch, which is now being used to deliver Midazolam for the treatment of seizures. Detailed in vivo testing is in progress.

Diffusion processes in alloys: The group led by Aloke Paul has designed new experimental methods for studying the complex diffusion processes in multicomponent metallic alloy systems. They have mainly focused on solving the biggest challenge in solid-state diffusion, which remained unsolved during the last decades. It was textbook knowledge that meaningful diffusion coefficients could not be estimated in a multi-component system following the diffusion couple method. They can now estimate diffusion coefficients in any multicomponent systems by proposing completely new design thoughts of the diffusion couples and rewriting the equations relevant to such diffusion profiles. These methods are utilised to explain diffusion-controlled growth and microstructural evolution in Pt or Pd-modified NiAl bond coats and Ni-based single-crystal superalloys, which was not possible until recently because of the unavailability of suitable methods. They are also generating a mobility database in Ni- and Fe-based multicomponent systems to correlate with materials' various high-temperature physical and mechanical properties.

Laboratory of Texture and Related Studies: Satyam Suwas's research group continued to make contributions in the field of additive manufacturing, severe plastic deformation, crystallographic texture, titanium metallurgy, biomaterials, high entropy alloys, thermo-electrics, and computational microstructure science, during 2025–2026. The group's work reflects a rare integration of fundamental materials science with industrially relevant engineering applications.

A defining strength of the group has been in understanding microstructure–texture–property relationships in advanced metallic systems. Through sophisticated experimental characterisation combined with mechanics-based anisotropic deformation and creep in additively manufactured Ti6Al4V and Hastelloy X. These works significantly advanced mechanistic understanding of deformation localisation, phase stability, and crystallographic anisotropy in aerospace-grade alloys.

The group emerged as a major innovator in additive manufacturing science. Its publications on laser powder bed fusion and directed energy deposition of titanium alloys, stainless steels, Ti6AlNb, Mo-Si-Ti alloys, and biomedical Ti-Nb-Ta alloys established critical links between thermos-kinetics, solidification texture evolution, defect control, and mechanical performance. Particularly notable were contributions toward improving fracture toughness, mitigating creep anisotropy, and enhancing tribo-corrosion resistance in additively manufactured alloys, directly addressing major industrial challenges in aerospace and biomedical sectors.

In the area of severe plastic deformation (SPD), the group introduced transformative processing concepts, including the novel “high-pressure compressive reverse shearing” process and high-pressure compressive reciprocating shear techniques. These studies demonstrated elegant control of grain refinement and crystallographic texture in magnesium alloys and other structural materials, opening new pathways toward ultra-high-strength lightweight alloys with improved formability and fatigue resistance. The group's work on SPD-assisted enhancement of thermoelectric BiCuSeO further showcased its versatility in manipulating microstructures across diverse material systems.

Another major highlight was the group's substantial contribution to the rapidly evolving field of refractory high entropy and complex concentrated alloys. Through systematic investigations of NbCrTiMoVHf and highly stable eight-element BCC refractory alloys, the group elucidated the interplay between compositional complexity, phase stability, microstructural evolution, and mechanical strength. These studies contribute significantly to the global search for next-generation structural materials capable of operating under extreme environments.

Beyond metallic systems, the group expanded into interdisciplinary frontiers, including computationally efficient elastic wave propagation in textured polycrystals. Such breadth reflects an exceptional scientific culture driven by curiosity, rigor, and innovation.

Light Metals and Alloys & Composites: The group of Subodh Kumar focuses on processing, characterisation, mechanical behaviour, and corrosion protection of light materials and composites. Within the last one year, they have achieved the following.

Some research highlights are as follows:
Interlaminar shear strength (ILSS) and flexural strength (FS) of carbon fiber reinforced epoxy (CFRE) laminate increased by ~50% and 68% self-healing imparted to it by modifying epoxy matrix and carbon fiber reinforcement.

An environment friendly solution developed to recycle CFRE laminates.

Formability of Mg alloy sheet improved by alloy development and novel wrought processing Erichsen Index increased from 3.4 mm for commercial AZ31 Mg alloy rolled by conventional symmetric rolling to 6.3 mm for novel Mg-1.5Zn-0.5Ca-0.75Yb alloy rolled by novel asymmetric and reverse rolling.

Corrosion resistance of commercial AZ31 Mg alloy improved by five orders of magnitude by applying plasma electrolytic oxidation (PEO) coating followed by layered double hydroxide (LDH) coating on it – I_{corr} of bare AZ31 Mg alloy decreased from 6*10-2 mA/cm^2 to 3.3*10-7 mA/cm^2 for the PEO+LDH coated AZ31 Mg alloy.

Decarbonisation of Steel and Power Sectors: The group is led by Govind S Gupta and focuses on fundamental and applied research in Process Metallurgy. The notable achievements of the group in the past year are: establishing a company (Rescons Solutions Private Limited) under the faculty entrepreneurship programme of IISc; Working with the Australian government (through CSIRO) on a multi-crore green steel project; working on rare earth extraction of elements (a Government of India initiative on strategic metals) with an industry (Adani Enterprises); replacing sand by blast furnace slag in the coating for water carrying pipe (by Tata Metaliks Limited); applying discrete liquid flow theory (developed by our group) to heap leaching process; developing a multiphase model for iron ore reduction by hydrogen in a shaft furnace (towards producing green steel); proposed a method to determine the void shape and size in a packed bed.

The IISc–Adani–Rescons (IISc team led by Govind S Gupta) research team has successfully developed a complete process flowsheet for the extraction of Rare Earth Elements (REEs) from phosphogypsum, representing a major advancement in sustainable resource recovery from industrial waste. Building on this achievement, Adani Enterprises is planning to establish a pilot-scale plant at its facility to implement the developed technology, marking an important step toward industrial-scale commercialisation. In addition, the team has developed a novel room-temperature REE extraction process that offers higher efficiency, reduced energy consumption, and improved environmental sustainability compared to conventional methods. This innovative process is currently being pursued for patent protection, highlighting its technological significance and commercial potential.

Abhik Narayan Choudhury's group has been primarily involved in three major activities related to strategic projects funded by DRDO. The foremost among them has been the exploration of additive manufacturing as a route to produce single-crystal parts for use in the high-pressure compressor stage of the Gas Turbine engine. In this direction, a novel multi-physics model was formulated that can be used to simulate the thermal histories during the Laser-based Direct Energy Deposition process. Using a combination of modeling and experiments

The group has developed strategies for deposition of single-crystalline microstructures as rods and walls using the second-generation Ni-based superalloy CMSX-4. A new indigenously integrated L-DED system has been installed which is capable of 5-axis 3D printing under controlled atomospheric conditions.

A new development in the group is the study of microstructure evolution in the presence of applied magnetic fields achieved through the coupling phase-field models of phase separation with the LLG equations for magnetic domain evolution. These models are being used to simulate the magnetic hysteresis curves for different compositions in the ternary Fe-Cr-Co ternary system. Lastly, Choudhury's group has contributed to the latest release of their open-source software MicroSim. The latest addition involves modules for the coupling of flow with microstructure evolution.

P. Padaikathan is working on Enhanced thermoelectric performance of Ag-Bi-Te through thermomechanical processing (TWIN ROLL CASTING).

Nanostructured criss-crossed eutectic morphologies used for the thermoelectric generating materials processed under the conditions of far-from thermodynamic equilibrium using thermo-mechanical processing routes by indigenously developed Twin Roll Casting (TRC) technique. A distinct process for combining rapid freezing and plastic deformation occur at a single step. The strips are formed by varied frequencies of copper wheels, this route has better control of microstructures, defect generations, strength, stability with an enhanced FIGURE OF MERIT (zT). Nano-composites produced with Ag added Bi2Te3 enhanced zT ~1.5@400K, by multiple electron scattering sources with a reduced thermal conductivity 0.5Wm-2K-1at 700K. The samples processed under TRC, enables the n-type conduction to p-type by addition of Ag- having to both defects of interstitial also substitutional atomic species.

The TRC processed Multicomponent aluminum alloys for High Temperature applications: Al-Co-Nb-Ni-Hf-Zr Alloys generate defect structure with cells and sub-cells. To synergise the flow properties also to be mutually inclusive at elevated temperatures of ~0.5Tm-Al, attempted to combine the nano-sized lenticular and spherical shaped particles. Needle shaped second phase particles were formed in the matrix of aluminum, having the anisotropy of interfacial energy also due to elastic interactions. Dispersions of stable/metastable state of compounds of



Al9(Nb,Ni,Co)2 with monoclinic structures embedded in the aluminum matrix with reduced lattice misfit of ordered precipitates of Al3(Hf,Zr) obtained from rapidly solidified suction cast route. Improved strength has been observed of the flow properties enabled by multilayered core-shell. With addition to multicomponent the enthalpy of activation rose to 200kJmole-1. The Er added alloys with Ni-Co in Al have shown high temperature stability with a yield strength (300MPa) anomaly at 575K.

Ti-alloys being the highest demand structural materials in AEROSPACE/SHIP BUILDING but has several disadvantages including low resistance to high temperature oxidation and corrosion properties. The properties of the Ti alloys can be improved by the additions of Ta, Zr, Nb, Mo.

Titanium alloys without Chromium (Cr) rely on the rapid formation of a passive, dense TiO2 oxide film for high corrosion resistance, particularly in seawater and oxidising acidic environments. While adding Cr can stabilise the passive film in reducing acids, non-Cr alternatives like Zirconium (Zr), Niobium (Nb), or Molybdenum (Mo) are highly effective at enhancing corrosion resistance by refining grain structure and stabilising the passivation. (58.44g/mole of NaCl) Tests were carried out 0.1M-NaCl and plotted. The aim is to stabilise the microstructure of the third-generation Ti-alloys by the addition of Nb and Mo to refine the microstructure which is expected to improve the passivation of TiO2. If, oxygen absorbed by Ti is spent not only forms thick scales also dissolves in it.

Chandan Srivastava's research group focused on three research areas: (a) investigating the correlation between microstructure, texture, and corrosion behavior of electrodeposited metallic coatings, (b) developing hydrogen permeation-resistant coatings and (c) developing metal nanoparticle–graphene-based sensor materials.

Materials under Extreme Environments: Ankur Chauhan's research group focuses on understanding material responses under extreme environments. Addressing the critical issue of fatigue, responsible for 90% of structural failures, Prof. Chauhan's group has demonstrated that a Mo-alloyed CoCrNi system is a high-performance alternative to traditional alloys. The research demonstrates that small molybdenum additions significantly enhance fatigue strength by increasing solid-solution strengthening and lowering stacking fault energy. Furthermore, the group identified a transition from stable planar slip to deformation twinning at high strain amplitudes. By applying slip-compatibility metrics, they proved that the orientation of annealing twin boundaries governs crack initiation, while the formation of nano-twining and shear banding creates tortuous paths that effectively slow crack growth. These findings provide a definitive methodology for designing superior fatigue resistance within single-phase alloy systems.

To address irradiation hardening in nuclear materials, Ankur Chauhan's group investigated the irradiation resistance of a low-SFE CoCrFeMnNi alloy. The team found that proton irradiation results in defect densities notably lower than those in conventional austenitic steels, with depth-dependent hardening directly associated with defect density as a function of depth. This hardening is primarily driven by faulted Frank loops. Notably, the research also explored the alloy's potential for recovery through post-irradiation annealing; at temperatures above 400°C, the material shows significant hardness recovery as defects are annihilated. By combining TEM analysis with numerical estimations, this work helps establish a framework for using these alloys to improve the durability of structural components in reactor environments.

Advanced manufacturing and Materials Processing: The present work at Advanced Manufacturing and Materials Processing Laboratory, Materials Engineering, IISc headed by Prosenjit Das is centred on the theme “Fundamentally backed Development of High-Performance Components through Advanced Rheo Gravity and Pressure Die Casting techniques for Strategic Industrial Application," focuses on establishing a comprehensive science-to-technology pathway for next-generation component development. Through advanced Rheo gravity casting and semi solid high-pressure die casting infrastructure, integrated with die design, die filling analysis, process simulation, and rigorous microstructural, mechanical, thermal, and high-end characterisation, Efforts are directed to develop high-performance components for strategic sectors such as mining, defence, and electronics. The developed rheocast components till date includes structural links, brake discs, connecting rods, and thermal management systems such as CPU and LED heat sinks—are backed by fundamental studies of process–microstructure–property correlations to ensure optimised performance and reliability. This approach combines rigorous basic research with translational engineering to create not only superior products but also robust processing methodologies and indigenous technological capabilities. The goal is holistic process, product, and technology development, enabling scientifically engineered, application-specific solutions for critical industrial sectors.

Materials, Microstructure and Process Design: Pikee Priya's research group focuses on the design of materials, processes, and microstructures by integrating multiscale computational methods, including data-driven approaches—with experimental studies in the advanced manufacturing of metals and alloys. Currently, the group is working on an ISTC-funded project aimed at improving the printability of AA6061 aluminum alloy for complex satellite structures. AA6061 presents challenges in laser-based additive manufacturing (AM) due to its wide freezing range, which leads to hot tearing. This issue has been mitigated or eliminated through internal inoculation (via Zr alloying) and external inoculation (using TiB_2 particles), both of which promote a fine, equiaxed microstructure. To investigate the solidification behavior, the team developed a coupled Discrete Element Method (DEM) and Computational Fluid Dynamics (CFD) model for the Laser Powder Bed Fusion (LPBF) process. This model captures thermal gradients and cooling rates that govern the transition between equiaxed and columnar grain structures, which are critical for printability. A nearly fully dense AA6061 sample—approaching theoretical density—was achieved using 1% Zr addition. Internal inoculation proved more effective than external inoculation in improving printability, as illustrated in the figure below.

The research group is also working on data driven techniques to develop processing maps for industrial alloys using ML based classification of printing defects such as lack of fusion, balling, and keyhole porosity. Data driven techniques are also used for the design of High Entropy Alloys for molten salt corrosion resistant applications.

Irradiation-Induced Deformation and Microstructural Evolution in Nuclear Materials (Crystal Mechanics Lab led by Suchandrima Das): Understanding the evolution of irradiation-induced defects and their interaction with deformation mechanisms is necessary for developing radiation-resistant structural materials for advanced nuclear fusion reactors. Tungsten (W), a primary candidate for plasma-facing components, and Reduced Activation Ferritic/Martensitic (RAFM) steels, modelled as Fe–Cr alloys, are two of the most critical structural alloy systems that have been extensively investigated by the group over the past year. Structure-property correlation insights into these irradiated body-centred cubic (BCC) systems require a deep understanding of both atomistic defect-dislocation interactions and macro-scale strain-rate and length-scale phase behaviours.

The group performed extensive Molecular Dynamics (MD) simulations to investigate chromium segregation and defect-dislocation interactions in Fe–Cr alloys with varying Cr concentrations (3%, 5%, and 10%). They discovered that an increase in Cr concentration leads to enhanced solute segregation at the dislocation core, which significantly suppresses dislocation mobility and increases the shear stress required for sustained plastic

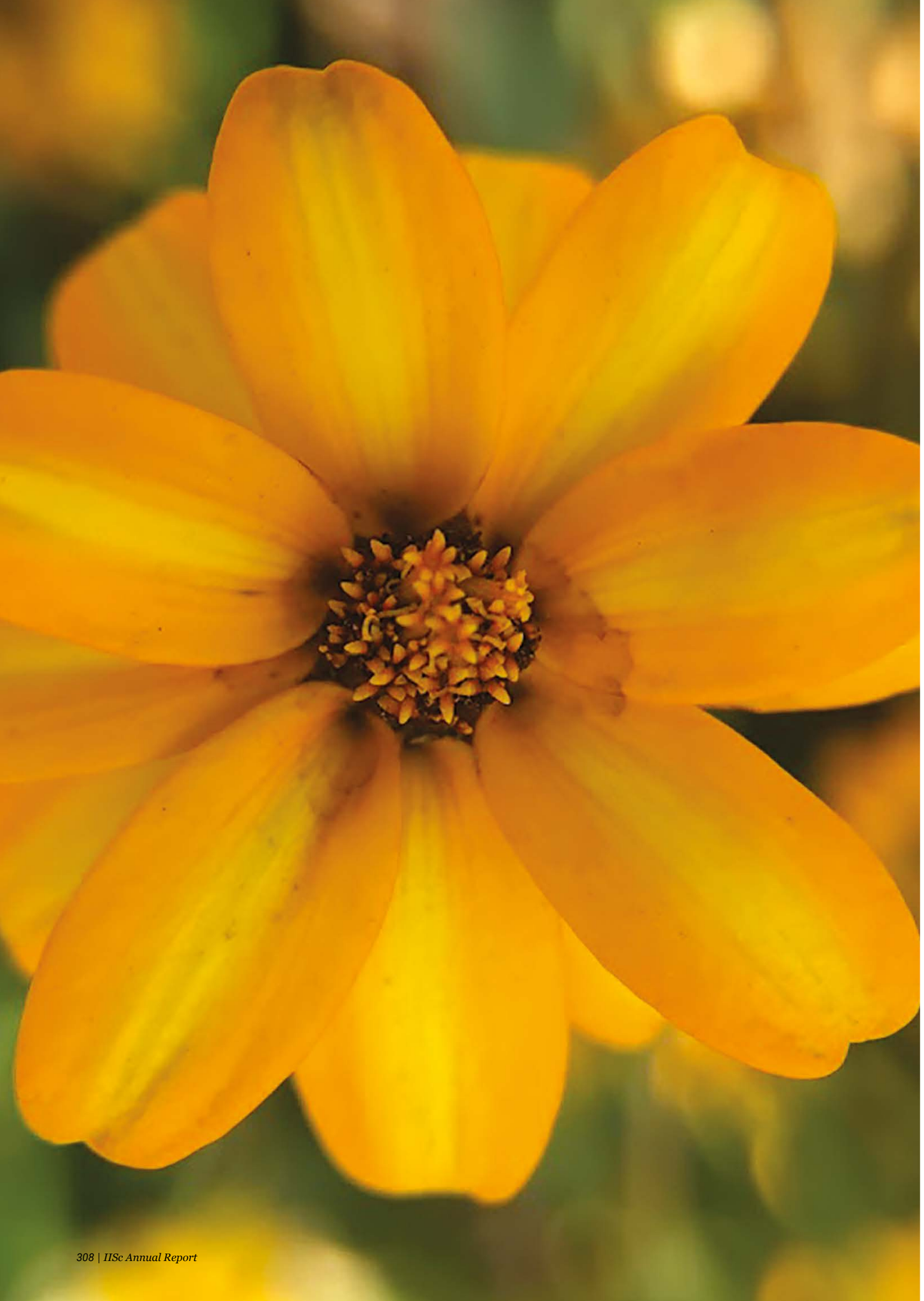
flow. Furthermore, moving dislocations interact strongly with nanoscale vacancy clusters and stable interstitial, leading to pronounced pinning and depinning events that drive irradiation hardening.

To bridge these nanoscale findings to macroscopic structural properties, we developed a Crystal Plasticity Finite Element (CPFE) framework calibrated using in situ experimental data from spherical nanoindentation, atomic force microscopy (AFM), and depth-resolved X-ray Laue microdiffraction. This coupled approach accurately captures the orientation-dependent surface pile-up, irradiation-induced hardening, and the formation of defect-free slip channels that characterise severe strain localisation in these irradiated ferritic alloys.

In parallel, they evaluated pristine and neutron-irradiated single-crystal Tungsten, where transmutation and displacement cascades generate complex fields of prismatic vacancy loops, interstitial clusters, and nanovoids. Through MD simulations, they found that the pinning strength of these loops is highly dependent on their size and crystallographic orientation, often resulting in the formation of sessile segments or the transformation of closed loops into stable open vacancy platelets upon interaction with edge dislocations. By integrating these atomistic unpinning stresses into our strain-gradient CPFE model and validating against continuous stiffness nanoindentation and high-resolution electron backscatter diffraction (HR-EBSD) experiments, they systematically decoupled the conflicting effects of strain rate and indentation depth. They established that neutron irradiation drastically increases geometrically necessary dislocation (GND) densities and residual elastic lattice strains, shifting the Tungsten matrix from a regime of rate-dependent, distributed plasticity to highly confined, defect-controlled local deformation.

In summary, in the past year, they have developed a comprehensive multiscale framework capable of predicting the mechanical behaviour of irradiated BCC metals. This framework can precisely explain the compositional and strain-rate trends of both the weak-field local lattice distortions and high-field macroscopic yield properties, serving as a robust predictive tool for the design and lifecycle estimation of future fusion reactor components.





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3.5.10

Mechanical Engineering

Mechanical Engineering activities at IISc commenced in 1945 in the Department of Internal Combustion Engineering that later merged with the subsequently created Mechanical Engineering department. Research interests in the department have evolved to span a broad range of areas, from the traditional to emerging fields, with applications in related industries.

FACT FILE
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PhD, MTech (Res) and MTech

IN NUMBERS
27 Academic Staff
4 Scientific Staff
140 PhD Students
4 MTech (Res)
100 MTech
40 MTech Conferments
15 PhD Conferments

Chair: Raghuraman N Govardhan



Core Research

Biomechanics and Medical Devices; Fluid Mechanics and flow physics; Heat Transfer and Energy Systems; Manufacturing and materials; Mechanics of solids and structures; Mechanisms, Design and Optimisation; Micro- and Nanoscale processes and devices; Robotics and control systems; Vibrations, acoustics, and control.



Current Research

Biomechanics & Medical Devices: Nonlinear mechanics of soft biological tissues and elastomers; protein rubbers; mechanical characterisation of biological cells; mechanobiology and bio-micromanipulation; bio reactors and cell culture in scaffolds and computational design of proteins; biomaterials research and biomimetics; tissue engineering.

Fluid Mechanics & flow physics: Stability of unsteady boundary layers; unsteady boundary layer separation; transition and turbulence; turbulence modelling; fish- like propulsion; shear flow control, stall flutter; shock boundary layer interaction; drag reduction using micro-bubbles; two-phase flows; electro-hydrodynamics; atomisation of liquid jets. Multi- dimensional modelling of processes involving two- phase flow, turbulence, and combustion chemistry; application of laser-based diagnostic techniques in combustion and multiphase flow research.

Heat Transfer & Energy Systems: Turbulent Rayleigh-Benard convection; double-diffusive convection, mixed convection, heat pipes, heat exchangers, thermal management of electronic systems; heat and mass transfer in buildings; heat and mass transfer in food products; two phase flows and heat transfer, heat transfer in renewable energy systems; solar thermal systems, numerical heat transfer; refrigeration and air-conditioning; automotive climate systems, adsorption coolers and gas storage; mathematical modelling and simulation of thermal systems; thermal modelling and experimentation in solidification; fluid flow and heat transfer at micro/nano scales, encapsulated nanoparticles for thermal storage, fuel spray characterisation; trapped-vortex based combustor research, Laser-Induced Incandescence (LII) imaging for soot formation studies, Bio-fuels, Fuels transesterification, Engine Performance, Combustion diagnostics and Emission analysis.

Manufacturing and materials: Fretting friction mechanics; impact fracture; Fracture Mechanics and Tribology fragmentation dynamics, mixed mode, indentation; thin film; tribology; contact mechanics of impact and indentation; nanotribology of boundary lubrication; metal cutting, metal working; scanning

probe microscopy; fracture of single crystals, polycrystalline alloys and amorphous metals, computational fracture mechanics; nano composite coatings and mechanics at small scales; effect of roughness and surface asperities on the solid-liquid interface, eco-friendly, cutting oil studies, friction stir welding and friction stir processing; semisolid forming; die casting and squeeze casting; mould design and metal flow analysis by CFD; computer aided design of near-net shaped castings; meso-scale manufacturing with metals.

Mechanics of solids and structures: Analytical, experimental and computational studies on crack-tip fields and void growth in ductile face-centred cubic (FCC) single crystals, pressure-sensitive yielding, internal friction, flow softening, Poisson's ratio and mode-mixity in the fracture response of bulk metallic glasses (BMGs), formulation of the finite element method with hybrid elements, experimental and computational work in biomechanics of tissue and cells, mechanics of insect boring, role of geometry in slender structures such as beams, ribbons, and shells, mechanics-based design of compliant mechanisms, growth modelling in plant leaves and inverse problems in elastic mechanics, pathways in bistable arches and shells.

Mechanisms, Design and Optimisation: Structural and dimensional synthesis of kinematic and compliant mechanisms; theoretical kinematics; multi-disciplinary design optimisation; dynamics and control of robot and multi-body mechanical systems; computer-controlled mechanical systems; bio-medical devices; constructing 3D models from sketches, assembly sequence planning and evaluation, tools for early stages in design, nonlinear dynamics, vibrations, structural shape and topology optimisation, kinematic assembly modelling, geometric and topological modelling.

Micro- and Nanoscale processes and devices: Modelling, design, and micro-fabrication of Micro-Electro-Mechanical Systems (MEMS); energetics of micro and nano devices; nano-mechanics; acoustic sensors, rate gyroscopes, accelerometers, ultrasound sensors, and polymer pumps; development of analysis tools for coupled multi-physics problems; optimalsynthesis methods for MEMS; micromanipulation; in-situ TEM nanoindentation, deformation mechanisms of materials.

Robotics and control systems: Foundational and applied aspects of kinematics, dynamics, control and motion planning, multi-fingered hands, wheeled and walking robots, hyper-redundant snake robots, and nonlinear control, motor learning and coordination, pipe-crawling robot, haptic aid for cutting tissue, commercialised endoscopy simulator with haptics and graphics, autonomous micro robotics, flexible robotics, deep learning for path planning.

Vibrations Acoustics and Control: Sound from turbulent flows, asymptotics in structural acoustics, nonlinear structural acoustic interactions, precision motion control, with applications in metrology and robotics, at the micrometer and nanometer length scales, development of new measurement techniques, probes, actuation techniques, and advanced control.





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3.6 *Division of Physical and Mathematical Sciences*

Research in the division covers a wide variety of areas in the physical sciences, including fundamental investigations in string theory, particle phenomenology, field theory, condensed matter physics (both theoretical and experimental), soft-matter and complex systems, biology-inspired physics, biomolecular structure and biophysics, atomic and optical physics, astronomy and astrophysics, and cutting-edge applied physics research including MEMS-based and fibre-optic sensors, multifunctional materials such as graphene and carbon nanotubes, super resolution fluorescence microscopy, nano-scale imaging, optics and microfluidics, energy and health monitoring instrumentation, and cryogenic technologies (including cryocoolers, cryogenic instrumentation, and cryogenic treatment on materials). Research in mathematics covers major areas, both pure and applied, including probability, partial differential equations, analysis, geometry, topology, algebra, algebraic geometry, and analytic number theory.

Faculty members in this division have received several awards and honours for their research. Their research has been supported by grants from major agencies and ministries such as the Department of Science and Technology, the Council for Scientific and Industrial Research, the Department of Biotechnology, the Defence Research and Development Organisation, the Indian Space Research Organisation, and the University Grants Commission.

Themes

Given the diversity of this Division, there are a wide variety of research themes. These can be gleaned from the core research areas mentioned above. Many of these areas lie in the exact sciences, both theoretical and experimental. Along with these, there are growing interdisciplinary programmes, such as in mathematical biology and nanoscience. Translational research is also being carried out and products based on innovative and cutting-edge technologies, are being brought into the market by faculty entrepreneurs in the division.

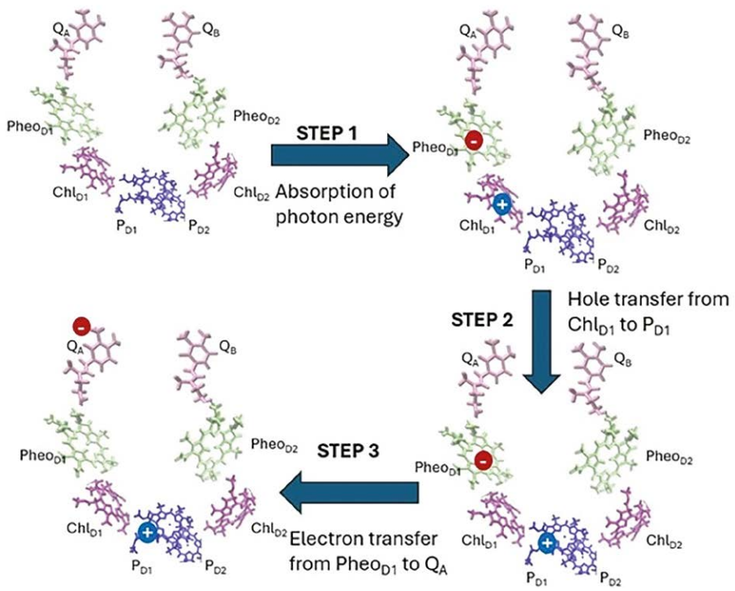
Departments | Centres | Units

- Centre for Cryogenic Technology
- Centre for High Energy Physics
- Department of Instrumentation and Applied Physics
- Department of Mathematics
- Department of Physics

Unlocking branch selectivity mystery in photosynthesis

Photosynthesis involves a series of chain reactions in which electrons are transferred across multiple pigment molecules. It is not fully understood for several reasons – the components involved are too many and too complex, energy transfer happens at ultrafast speeds, and different organisms carry it out slightly differently. Understanding these processes can help design efficient artificial leaves, fuel cells, and other systems that mimic photosynthesis. Researchers at the Department of Physics and the California Institute of Technology (Caltech) have solved a long-standing mystery involving the first steps of photosynthesis. The team has shown why initial electron movements that are critical for energy transfer happen across only one arm of a key protein-pigment complex.

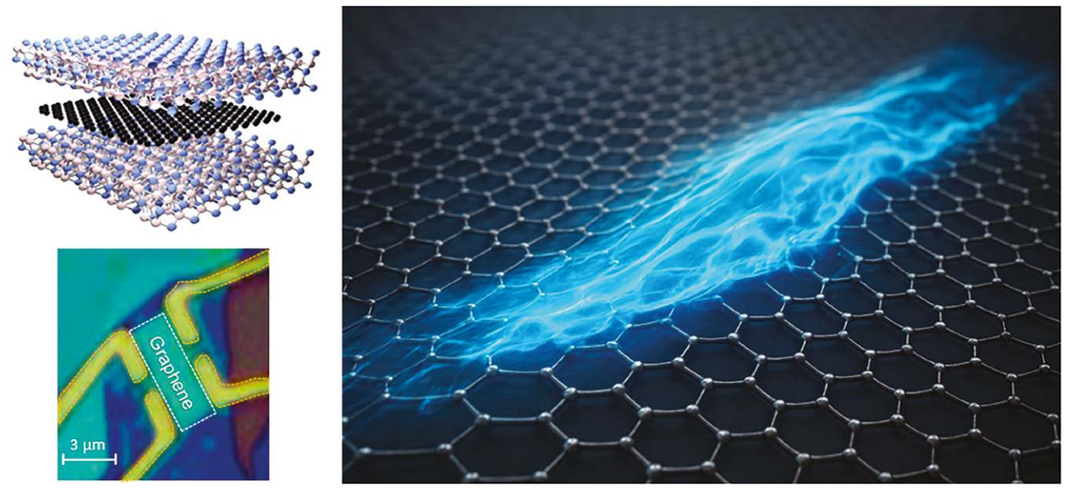
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Cracking graphene's quantum code

Can electrons behave like a perfect, frictionless fluid with electrical properties described by a universal quantum number? Researchers at the Department of Physics, along with collaborators from the National Institute for Materials Science, Japan, have now finally detected this quantum fluid of electrons in graphene – a material consisting of a single sheet of pure carbon atoms. The results open a new window into the quantum realm and establish graphene as a unique tabletop laboratory for exploring hitherto unseen quantum phenomena. The findings establish graphene as an ideal low-cost platform for investigating concepts from high-energy physics and astrophysics, such as black-hole thermodynamics and entanglement entropy scaling, in a laboratory setting.

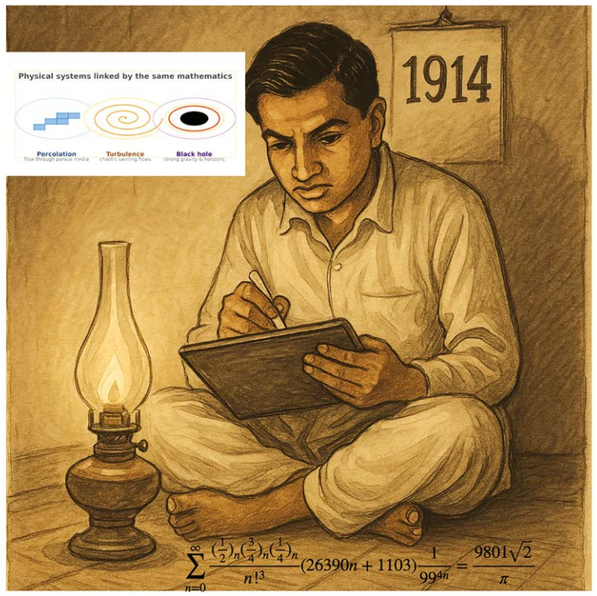
Reference:
Majumdar A, Chadha N, Pal P, Gugnani A, Ghawri B, Watanabe K, Taniguchi T, Mukerjee S, Ghosh A, Universality in quantum critical flow of charge and heat in ultraclean graphene, Nature Physics (2025).



How Ramanujan's formulae for pi connect to modern high energy physics

Most of us first hear about the irrational number π (pi) – rounded off as 3.14, with an infinite number of decimal digits – in school, where we learn about its use in the context of a circle. More recently, scientists have developed supercomputers that can estimate up to trillions of its digits. Now, physicists at the Centre for High Energy Physics (CHEP) have found that pure mathematical formulae used to calculate the value of pi 100 years ago has connections to fundamental physics of today – showing up in theoretical models of percolation, turbulence, and certain aspects of black holes. The study shows that Ramanujan's century-old formulae have a hitherto hidden application in making current high-energy physics calculations faster and more tractable.

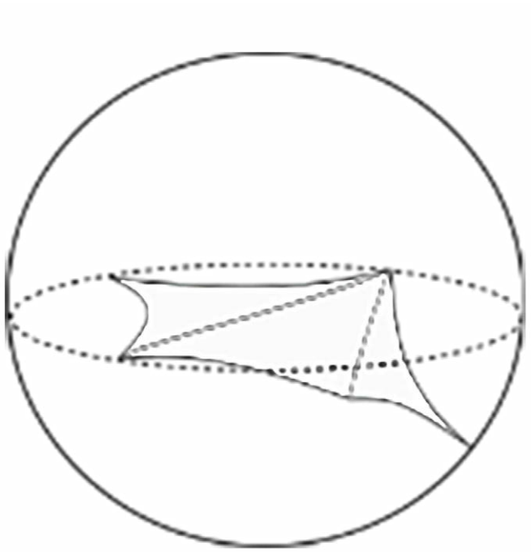
Reference:
Bhat F, Sinha A, Ramanujan's 1/ series and conformal field theories, Physical Review Letters (2025).



Harmonic maps in hyperbolic space

In differential geometry, harmonic maps from the plane to three-dimensional space minimise the total stretching or "energy" and are closely related to the study of soap films. Researchers at the Department of Mathematics focused on harmonic maps from the plane to hyperbolic space, a non-Euclidean counterpart of ordinary three-dimensional space. They show that, given any "twisted polygon" in hyperbolic space whose vertices lie at infinity, there is a harmonic map from the plane that approaches it at large distances. They constructed the map by starting with a rough model and using a gradient flow to reduce its energy. They also proved that prescribing additional data near infinity makes the resulting harmonic map unique.

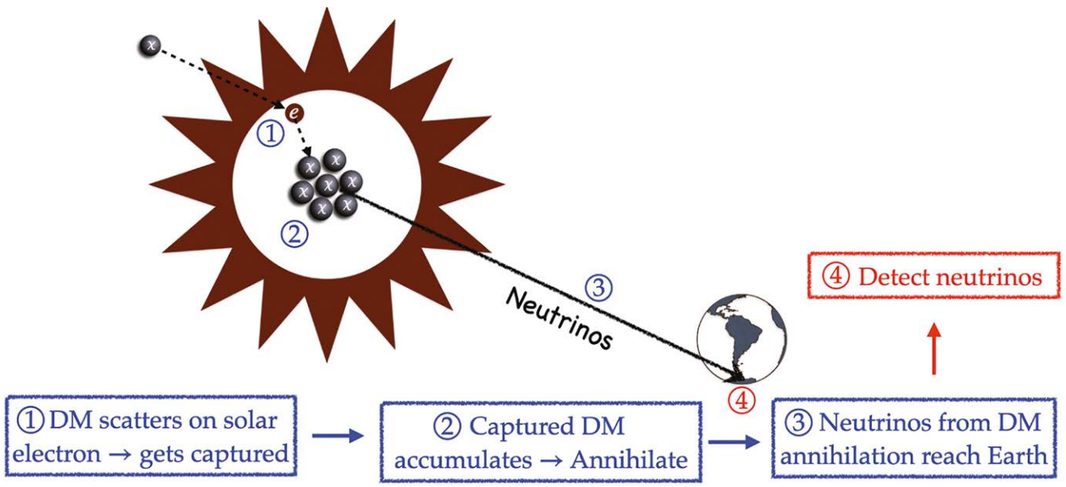
Reference:
Gupta S, Sau Gobinda, On harmonic maps from the complex plane to hyperbolic 3-space, Journal of Geometric Analysis (2025).



High-energy neutrinos from the Sun may shed light on dark matter

We know very little about dark matter – called as such because it does not interact with light or other electromagnetic radiation – even though it makes up more than 85% of all matter in the universe. Scientists have traditionally focused on probing direct interactions between these dark matter particles and atomic nuclei. But a new study from the Center for High Energy Physics (CHEP) proposes using the Sun and the neutrinos emitted from it to understand how dark matter may interact with electrons. By monitoring neutrinos – particles that are infamously hard to detect – scientists can effectively use the immense gravitational potential of the Sun as a natural dark matter detector. Neutrino astrophysics can serve as a precision probe of particle interactions in the "dark" sector, which is inaccessible to lab experiments.

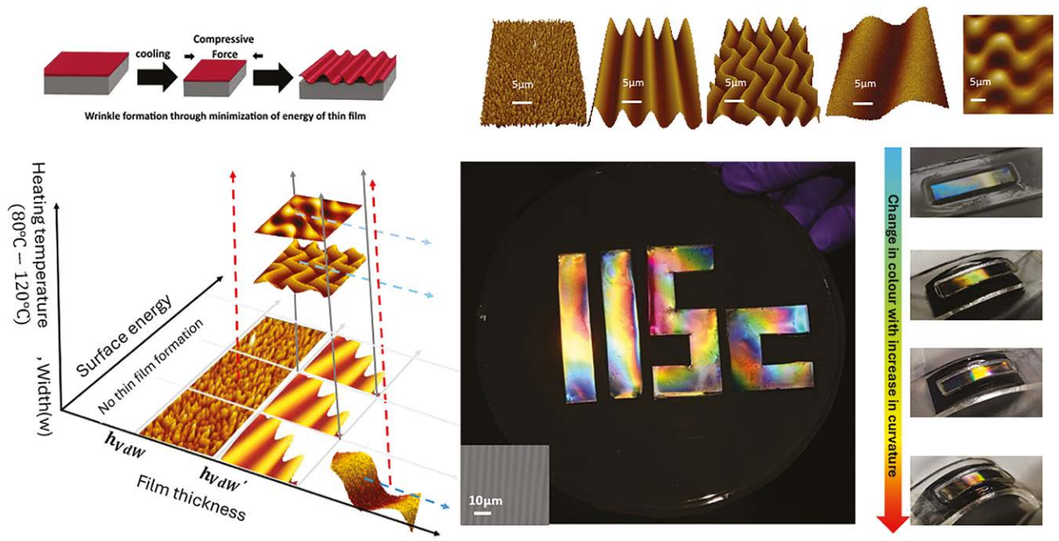
Reference:
Maity TN, Saha AK, Mondal S, Laha R, Neutrinos from the sun can discover dark matter–electron scattering, Physical Review D (2025)



Turning tiny wrinkles into smart technologies

Responsive surfaces that can reversibly change their microscopic structure are emerging as a powerful platform for adaptive optics, wearable electronics, secure data storage, and anti-counterfeiting. However, developing such smart surfaces using simple, low-cost, and scalable manufacturing methods has remained a major challenge. Researchers at the Department of Instrumentation and Applied Physics have now developed an easy way to create tiny wrinkle-like patterns on flexible materials by carefully controlling heat. These microscopic patterns can change colour, detect bending, and securely hide or reveal information on demand. The technology offers a practical route toward next generation anti-counterfeiting labels, wearable sensors, intelligent optical devices, and highly secure data storage systems.

Reference:
Biswas S, Meena S, Das TA, Self-assembled metal-elastomer wrinkles for reversible coloration and curvature sensing, Optical Materials Express (2026).
Biswas S, Sahu RR, Shinkre ODN, Meena S, Ramnishanth S, Vailshery M and Gupta TA, Thermally engineered multilevel hybrid encryption device with dynamic erasure and high data concealment capacity, Communications Materials (2026).



3.6.1

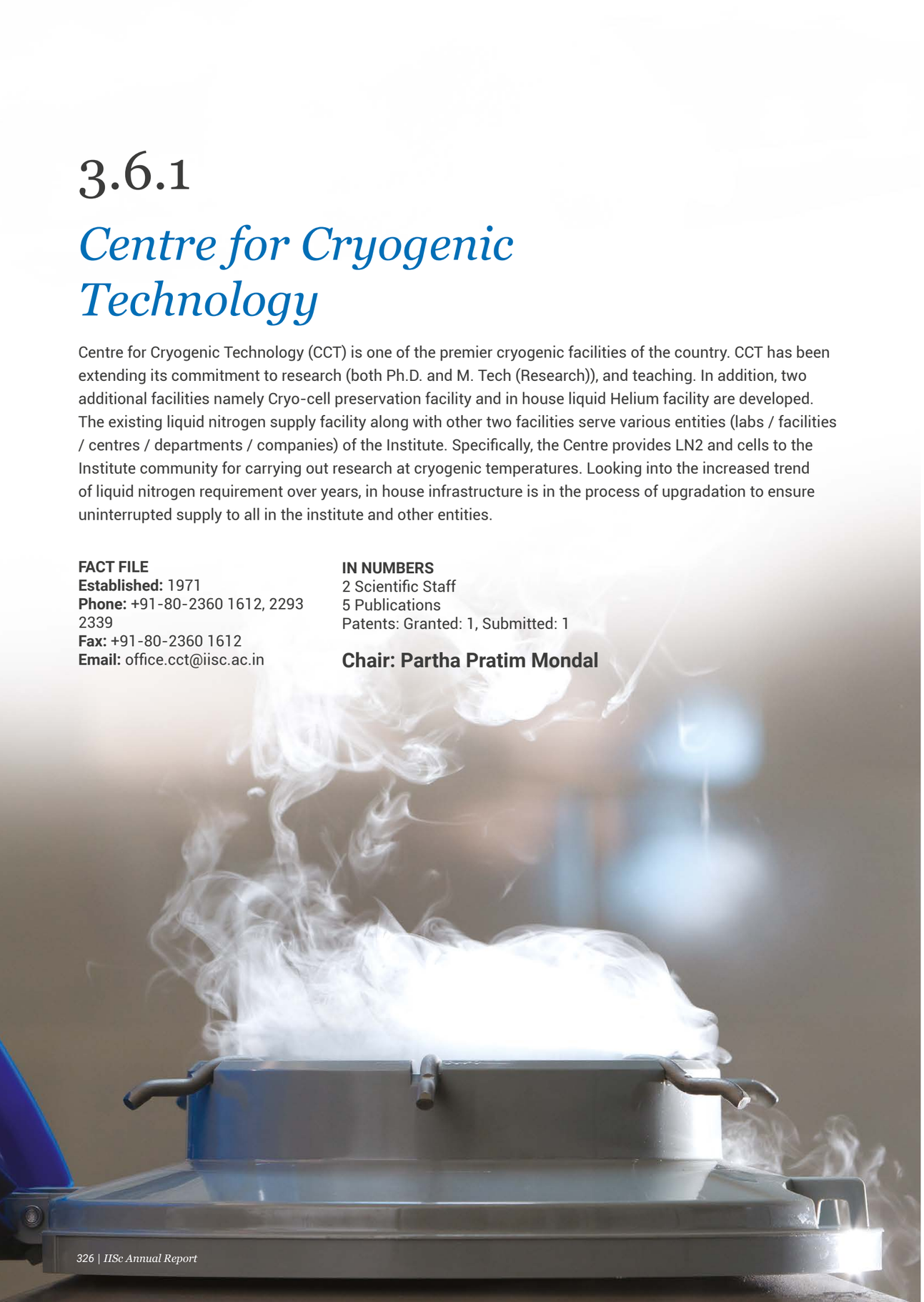
Centre for Cryogenic Technology

Centre for Cryogenic Technology (CCT) is one of the premier cryogenic facilities of the country. CCT has been extending its commitment to research (both Ph.D. and M. Tech (Research)), and teaching. In addition, two additional facilities namely Cryo-cell preservation facility and in house liquid Helium facility are developed. The existing liquid nitrogen supply facility along with other two facilities serve various entities (labs / facilities / centres / departments / companies) of the Institute. Specifically, the Centre provides LN2 and cells to the Institute community for carrying out research at cryogenic temperatures. Looking into the increased trend of liquid nitrogen requirement over years, in house infrastructure is in the process of upgradation to ensure uninterrupted supply to all in the institute and other entities.

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IN NUMBERS
2 Scientific Staff
5 Publications
Patents: Granted: 1, Submitted: 1

Chair: Partha Pratim Mondal



Core Research

Cryogenic engineering research is rapidly advancing in multiple directions in space technology, medical science, superconductivity studies, cryocoolers, super-resolution microscopy, cryo-electron microscopy, biological sciences, etc. In line with high expectations, faculty and students in CCT are engrossed in analytical and experimental research in several areas of cryocooler technology, cryogenic systems and instrumentation, cryogenic transfer lines, calibration of temperature and level sensors for ISRO, thermal conductivity studies at low temperatures, strength properties of materials at cryogenic temperatures, cryogenic treatment on metals, development of high-resolution microscopy (with -88oC detectors), imaging, cryo-cell preservation, ultra-low temperature detectors and development of small-scale helium/hydrogen/ nitrogen liquefier.

Current Research

Transfer of cryogenic fluids is a daily occurrence in cryogenic labs and systems. Hence, efficient transfer of cryogenic fluids with minimal evaporation is an important aspect of all cryogenic transfer lines. Studies are in progress both for rigid and flexible cryogenic transfer lines. Our faculties have also been involved in design and development of cryo-transfer lines for various missions of national importance.

Production of ultra-low temperatures without the use of cryogens is another important area of cryogenics for space and defense applications. Cryocoolers can achieve very low temperatures for these applications wherein the regenerator plays the most important role in producing ultra-low temperatures. An experimental setup has been developed, and studies are in progress for various regenerator materials such as lead, Er_3Ni, $HoCu_2$, etc in the temperature range of 30K - 4.2K towards development of indigenous miniature cryocoolers for space applications. Cryogenic temperature sensors of the cryogenic rocket engine control many vital parameters of the launch vehicle for successful transfer of the payload to the specific orbit. The cryo-temperature sensors of the cryogenic rocket engine are being calibrated at CCT with precise accuracy for reliable operation of the launch vehicles.

Recently, a new project on super-resolution imaging and light sheet microscopy based on ultra-low temperature detectors is funded by the Department of Biotechnology, New Delhi. The research work is focused on the development of optical microscope operating at low temperatures that is capable of spatio-temporal super-resolution, optical systems design, low-temperature detectors and cryo-cell preservation. The lab is actively engaged in developing new optical imaging techniques based on single molecules at low temperatures and light-sheets for applications in physical and biological sciences, including cryo-cell preservation, cryo-electron microscopy and revival to study fundamental biology. The main thrust is to develop and extend these advanced techniques for applications in fundamental low temperature Physics and Biology.

Dimensional stability and linearity are major issues for the long-term performance of the diaphragms of pressure transducers which are extensively used for propellant pressure measurements. These diaphragms are cryotreated at 98 K for 36 hours in a dedicated cryotreatment system using liquid nitrogen to enhance both dimensional stability and linearity. Nearly six hundred and fifty diaphragms were successfully cryotreated and delivered to LPSC, ISRO.



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Professor

UPENDRA BEHERA
PhD (IISc), Principal Research Scientist

D S NADIG
M Tech (IIT Kharagpur), Principal Research Scientist

3.6.2

Centre for High Energy Physic

The Centre for High Energy Physics was carved out from the erstwhile Centre for Theoretical Studies in 2004. Faculty in CHEP carry out research in the general area of particle physics, field theory, string theory, quantum gravity, and condensed matter physics.

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PhD and Int. PhD

IN NUMBERS
14 Academic Staff
25 PhD Students
26 Int. PhD Students

Chair: Sudhir Vempati



Core Research

The core research areas of the Centre are quantum field theory, its applications, and experimental high energy physics. The theoretical research areas include lattice gauge field theory, conformal field theory, quantum chromodynamics, beyond standard model physics, phenomenology of standard model and its extensions, string theory, astro particle physics, black hole physics, quantum field theory applications to condensed matter physics, quantum information and quantum computing. Experimental high-energy physics is a part of the CMS experiment at CERN, Geneva.

Current Research

Low dimensional condensed matter systems: It was shown that the periodically driven Aubry-Andre model with quasi-periodic potential and a nearest-neighbour hopping amplitude exhibits richer phase structure than its static counterpart. Spin-splitting of bands in single-layer graphene was observed experimentally, and a theoretical model was proposed to explain this phenomenon.

Particle Phenomenology: Renormalisation group summed perturbation theory scheme has been improved to determine the strange quark mass. Machine learning models for tagging the top quarks using N-sub-jettiness and energy correlation functions as inputs were developed. The parameter space of the minimal supersymmetric standard model was explored using collider and astrophysical constraints. It was shown that only a very narrow region of light electroweakinos was allowed. This region is within the reach of Run-3 of the Large Hadron collider. A new method to calculate the QCD equation of state based on cumulant expansion with improved convergence was developed.

Quantum Field theory: Edge modes and super selection sectors in gauge theories were studied in detail. A manifestly duality invariant action describing the edge modes in gauge theories was studied. It was shown that the crossing symmetric dispersion relation for 2-2 scattering leads to a connection with knot theory and q-deformed algebras.

Entanglement entropy: The quantum entanglement properties of the graviton have only been recently investigated. The contribution of the edge modes of the graviton to entanglement across a spherical surface was evaluated, and its relation to Harish-Chandra characters was pointed out. The growth of entanglement entropy due to quantum quenches caused by curvature excitations was studied in detail.

Astro-particle Physics and Cosmology: The implication of dark matter sub-structures to electron recoil and electron direct detection rates in dual phase Xenon experiments were studied. The sensitivity of these experiments to resolve dark matter sub-structure was explored. The possibility of re-heating of cold neutron stars due to accretion of dark matter was explored. It was shown that such warm neutron stars could be detected by James Webb Telescope. The most symmetric generalisation of the standard cosmology compatible with cosmic flow was proposed. A key observation in this cosmology is that cosmic flow can grow while anisotropy dies even at late time acceleration.

An automated Mathematica package to derive the system of partial differential equations (GKZ-system) satisfied by a Feynman Integral and to solve it in terms of hypergeometric functions was developed. The package was demonstrated on several one-loop and a two-loop Feynman integrals.
A review which aims to provide a pedagogical introduction to the analytic conformal bootstrap programme was published. This review has details of large spin perturbation theory, Mellin space methods and the Lorentzian inversion formula.



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INSA Senior Scientist

ROMESH KAUL
Ph.D., (Delhi 1976), FASc, FNA

3.6.3

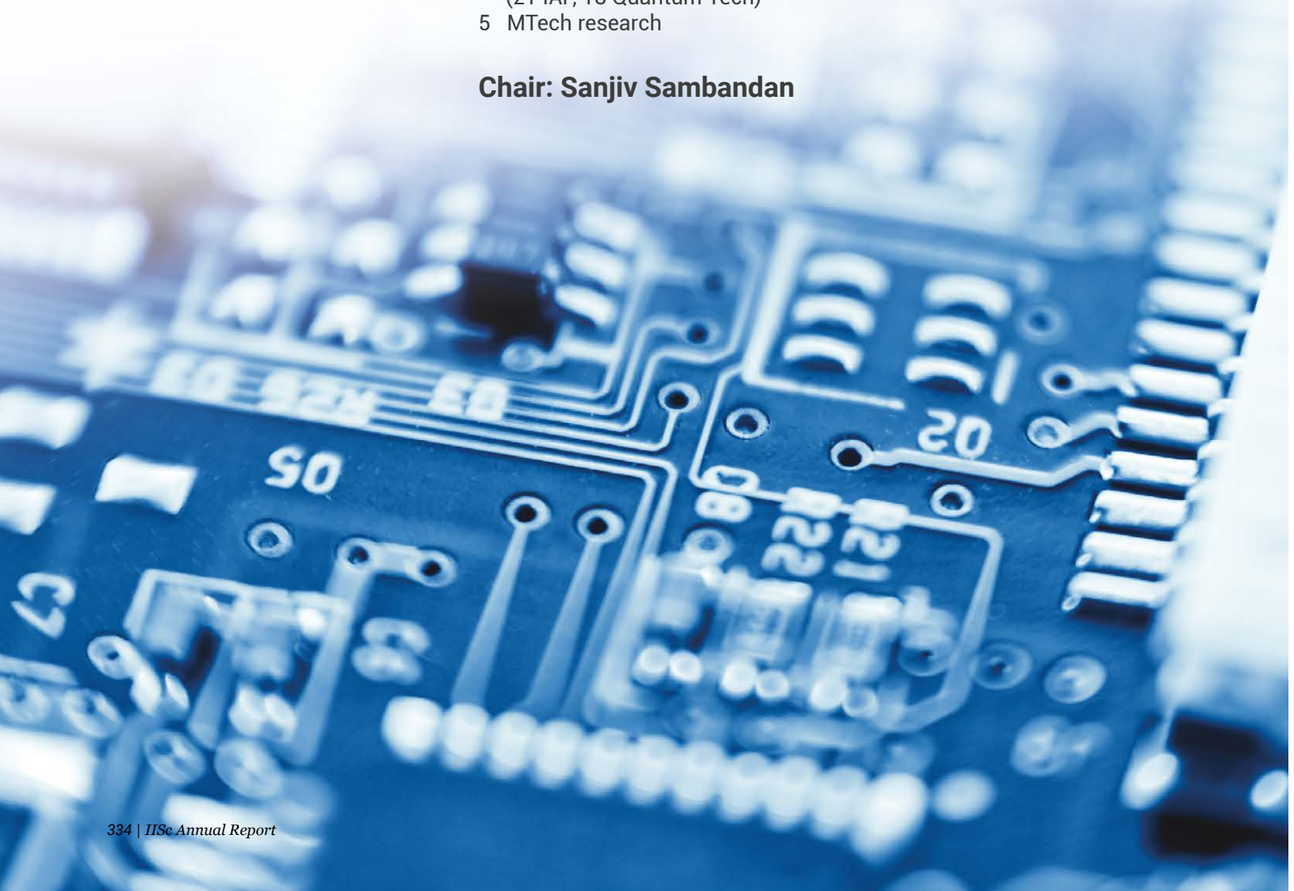
Instrumentation and Applied Physics

The Department of Instrumentation and Applied Physics was established in the year 1996. The department pursues a wide area of interdisciplinary research activities in the domain of instrumentation engineering and applied physics and provides postgraduate degrees in this area. With 13 faculty members offering 17 courses, the department is progressing towards running an exquisite MTech programme.

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Degree Programmes offered:
PhD, MTech (Research) and MTech in Instrumentation and MTech in Quantum Technologies

IN NUMBERS
13 Faculty
5 Office Staff
2 Adjunct Faculty
2 Inspire Faculty
30 Publications
2 Technical Assistants
5 Patents
7 PhD students
39 MTech Students
(21 IAP, 18 Quantum Tech)
5 MTech research

Chair: Sanjiv Sambandan



Core Research



The core research areas pursued in the department encompass quantum computation and quantum optics with superconducting circuits, quantum dots, quantum dot fibres, carbon quantum dots, QD based single photon sources, terahertz spectroscopy, cavity-quantum electrodynamics, terahertz communication, metasurfaces and nanophotonics, metasurface, reconfigurable photonics, large area nanostructure, optical instrumentation, 2D materials and heterostructures, spin-valley qubits in graphene, moire quantum matter, dielectric and gate engineering in 2D systems, single molecule physics, super-resolution microscopy, light Sheet microscopy, imaging cytometry, optical tweezers, quantum imaging, point-of-care diagnostics, optical instrumentation, microfluidics, invitro diagnostics platforms, photoacoustic imaging/sensing, inverse problems in image reconstruction, deep learning for image reconstruction, polarised photoacoustics, deep tissue optics, biomedical optics, glucose sensing, atomically thin interfaces for molecular sensing, self-powering micro-supercapacitors, precision motion control, microelectromechanical systems, scanning probe microscopy, micro-robotics and nanometrology.

Current Research

The research in the department is highly interdisciplinary and spans the horizons of physics and engineering, applied to the areas of device physics, healthcare, quality control, food-processing, life-sciences, electronics among others. The varied research can be summarised to applied photonics (sensing, microscopy and nanoscale imaging), materials research (material science and engineering, surface engineering) and integrated systems (integrated systems and electronics, system design and instrumentation).

QTL lab works on Josephson quantum limited amplifiers of different kinds, as well as single and entangled microwave photon sources. They are working on improving the quality factors of superconducting qubits and theoretically pursuing research into non-Markovian open quantum systems.

Nanostech lab works on highly confined 0-D materials - quantum dots, encompassing their synthesis, characterisation and application. The lab is working on synthesising and developing various types of QDs including

Carbon-QDs, TMDC QDs, Perovskite QDs, InP QDs and CdSe/CdS thick shelled QDs etc. Development of QD filled fibres as single photon sources for is also being carried out. Highly stable carbon dots have been developed which are stable for 10 days in ambient conditions.

The FIST lab at IAP is working on developing glucose sensing using polarised photoacoustic effect in which they are trying to understand the utility of photoacoustic signals to estimation optical rotation by chiral biomolecules, and in turn estimate glucose concentration. They also work on understanding the physics of polarised photoacoustics. In the project based on miniaturised photoacoustic sensors, they are trying to develop LED and pMUT-based photoacoustic sensor which could potentially enable point of care measurements for various biomarkers like oxygen saturation, blood pressure, and glucose estimation. Further, they are working on developing deep learning-based tools to accelerate photoacoustic image reconstruction and evaluate the performance with limited data scenarios.

Flexible Electronics lab works on thin film devices and inkjet printed electronics. The focus is on semiconductor device physics and analog integrated circuits applied to building systems for applications such as healthcare, environment, space applications etc. Their group is currently working on integrated circuits on biodegradable materials, electronic pill made of resorbable materials, modelling and development of a new corrugated TFT device for enhanced gain, new circuit ideas for self-compensating circuits such as self-balancing inverters.

Optics and Microfluidics Instrumentation lab is working on development of accurate point-of-care quantification of haemoglobin, point-of-care technology for Sickle Cell Anaemia (SCA) diagnosis, point-of-care technology platform using optothermal ultrafast PCR, development of a pulse-oximeter-sized device for the detection of sickle cell anaemia, system for quantifying absorbance and scattering in blood samples in visible region, miniature optical spectrophotometer and single test kit development.
Nanoscale devices laboratory focuses on developing the necessary tools and techniques to understand and explore correlated electronic phenomena in low dimensional heterostructures. The broad research scope encompasses state-of-the art nanofabrication and low temperature electron transport techniques to investigate novel electronic states in quantum materials.

Nanobioimaging lab pursues both fundamental and applied research in the broad area of optical and applied physics with a special emphasis on single molecule physics. This research area includes, single molecule physics, light sheet microscopy, optical tweezer, super-resolution microscopy, nano fluidics and devices, optical microscopy, fluorescence microscopy, ultrafast imaging, imaging cytometry and quantum imaging. The research work is focused on the development of optical microscopes that is capable of spatio-temporal super-resolution and optical systems design. The lab is actively engaged in developing new optical imaging techniques based on single molecules and light-sheet for applications in physical and biological sciences.

Sensors and self-powered devices lab is working on a project which aims to provide solutions for the *Gaganyaan* project in the detection of the level of oxygen and methane in the crew chamber. Sensors were fabricated and successfully tested to provide the capability as per the requirements of the project. Other projects use meta-FET devices for the optoelectronic communication within the visible range. On-chip supercapacitors provide an advance platform for the energy storage with a capability to integrate with the CMOS devices in various applications.

Laboratory of Advanced Nanostructures for Photonics and Electronics study and develop new process technologies such as cost-effective process which can be used to fabricate micron or sub-micron feature sized photonic and electronic devices and components, finding a suitable material platform for this



process, to develop instruments based on optics for large area fabrication of nanostructures. In last few years to attain the above process technologies, three main projects were considered: using liquid metals to develop soft, stretchable mechanochromic devices, using liquid metals to develop soft, stretchable electronic devices and using DLP based process to develop 3D lithographic systems.

The research at TeraQuanta lab aims to explore nanophotonic and quantum devices in terahertz frequencies, with a specific goal to investigate the physical properties and quantum dynamics in the hybrid vacuum-matter system. Ultimately, impact of the research ascribes in finding new and powerful ways of controlling and manipulation of terahertz light at the nanoscales and in the quantum regimes to instigate and drive the development of novel devices and innovative technologies in the emerging realm of THz Nanotechnology and cavity quantum matter. Two main problems that the group is focusing on are -THz spectroscopy of nanomaterials and Micro/ nanophotonic inspired THz cavity quantum electrodynamics.

Nanometrology research lab is involved in studying voice coil motor-based nano-positioners. They have developed voice coil motor-based nano-positioning systems that simultaneously possess large range (several millimetres), high speed, high positioning precision and multi-axis actuation capability. For Parametrically excited magnetic manipulators, they have demonstrated, both through theoretical modelling and experiments, that parametric excitation can be employed to trap and re-orient magnetic micro-particles. In squeeze-film based stage levitation project, Foster's type-II networks were designed and implemented to drive piezo-actuators at high frequencies and with arbitrary periodic waveforms. In active ball and socket joints project, a magnetically actuated ball and socket joint was developed. They also work on large range, linear piezo-electrically actuated nano-positioners where they have identified scaling laws for the best achievable linearity for multi-stage bridge amplifiers and their dependence on the amplification factor and the range.

In the area of ion mass spectrometry, work on power series expansion of axially symmetric toroidal harmonics for toroidal ion trap was undertaken.

A different study used an optical grating with irregular spacing and the nature of light coming out was analysed. This has application in precision spectroscopy mainly in astrophysics. Differentiation in a non-invasive way between different types of brain lesions is important in both diagnostics and treatment. This work concentrated on differentiating Ischemia and brain tumour using statistical analysis.

FBG Lab works on development of newer techniques for monitoring strains using fibre optic sensors, addressing the important need of developing integrated systems for structural health monitoring of aircrafts, ships etc. Their group is also involved in the development of fibre optic sensor system for underwater applications including tsunami sensing.

ADVANCES AND INNOVATIONS: Some of the key findings during the last academic year involves the following:

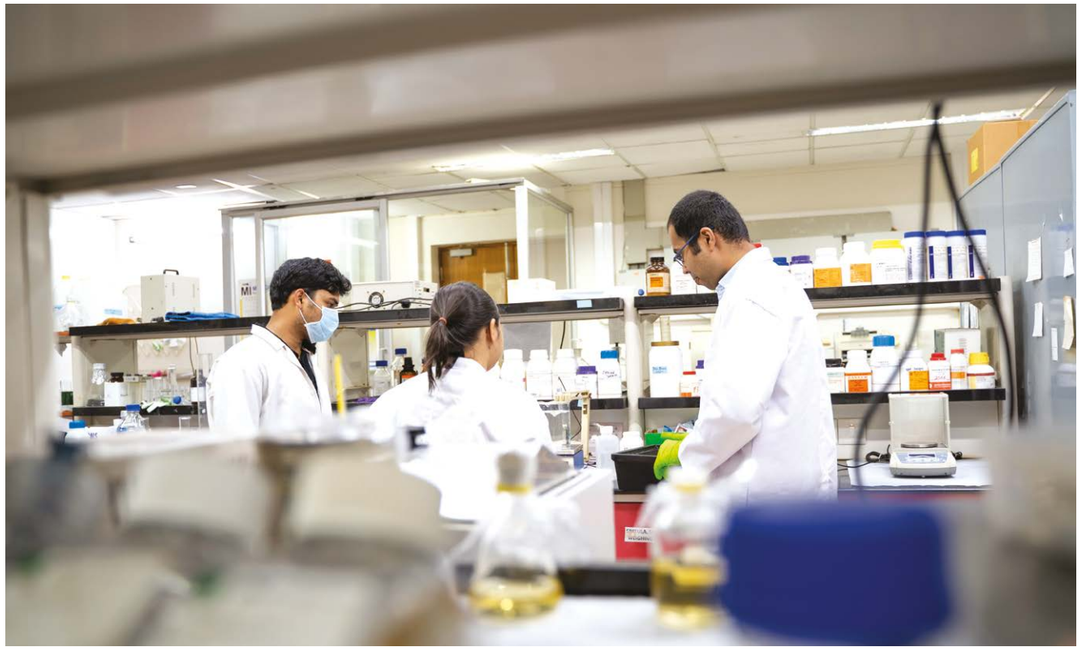
Over the last academic year, the department has developed a patented device for polarized photoacoustic-based chiral molecular sensing. This breakthrough addresses a major limitation of traditional optical polarimetry, which is restricted to depths of less than 1 mm due to light scattering. By utilising the photoacoustic effect, his work enables the estimation of chiral molecular concentrations from deep tissue regions, such as sensing glucose in capillary blood vessels. This capability is vital for the in-vivo and non-invasive identification of sugars, proteins, and drug distribution.

The ability to confine and interrogate living specimens (cells) in a plane is an incredible feat that paves the way for new kinds of studies. Currently, there is no available technique that can trap microscopic living objects in a 2D plane. The successful trapping of live cells in a plane, and high-resolution fluorescence imaging on the go, have applications in the broad field of fluorescence microscopy, optical physics and biotechnology. The non-structural protein NS2B plays a critical role in the maturation of Dengue virus (DENV Type 2). The underlying mechanism and the role of NS2B are largely unknown due to the unavailability of its location of activity in the target organelle at single molecule level. This is largely due to the incapability of existing optical microscopes to resolve features beyond the diffraction limit of light which is limited to a few hundred nanometres.

We have also developed a portable multi wavelength system for optical interrogation of the High-performance Optical Spectroscopy (HPOS) assay for accurate diagnosis of Sickle Cell Anemia. The system consists of an optical setup for sample interrogation and a single board computer for data acquisition. The system was optimised for low power use, and the acquired data can be transferred using wireless connectivity. The biochemical assay was optimised to improve the separation of optical properties of the samples when interrogated with the newly developed optical system. A novel data analytical method was also developed that significantly improves the accuracy of classification. Successful Technology Transfer, post joint development of HPOS Technology, to ShanMukha Innovations Pvt. Ltd., FSID incubated startup, which enabled IISc to join the CSR initiative with IOCL and GoK-NHM (Project CHAnDAna) for strengthening 422 Primary Health Centres (PHCs) of Karnataka in 2024 and perform point-of care diagnostic testing of two lakh tribal population in Mysuru, Kodagu and Chamarjanagara districts aligning with the National Sickle Cell Anemia Elimination Mission. 712 Community Health Officers (CHO) and 2849 ASHA workers have been trained to effectively use IISc's technology in delivering quality comprehensive care for the tribal population across 2056 villages.

Further, we have developed a new way to estimate haemoglobin (Hb) using a 2-LED Point-of-Care (PoC) device. The core of this approach is an algorithm that calculates the absorbance difference between the two LEDs, which significantly reduces errors in haemoglobin quantification.

To realise such a high-throughput multicolour interrogation modality, we have developed a light-sheet based flow imaging system that can visualise multiple sub-cellular components with organelle-level resolution. This is possible due to the unique optical design that combines an illumination system comprising



two collinear light sheets illuminating the flowing cells and a dedicated dual-colour 4f-detection, enabling simultaneous recording of multiple organelles. The data is then computationally processed (filtered using ML algorithm, shift-corrected, and merged) and combined to reconstruct the 3D multicolour volume. Drug treatment studies were carried out for healthy and cancerous HeLa cells to check the performance of the proposed system.

We have also advanced implementation research by embedding High-Performance Optical Spectroscopy (HPOS-TreuHeme Test) into Karnataka's public health system, enabling Community Health Officers to deliver reliable point-of-care diagnostics across hundreds of villages with tight control of false negatives in detecting Sickle-Cell Disease, Carriers, Sickle-Thal, and Thalassemia. Translational research yielded MiniHeme and MicroHeme low-cost biochemical analysers and SpectroHeme, a battery-operated spectrophotometre for multi-parameter testing. In molecular diagnostics, developed an Optothermal PCR test completing 30 cycles in 30 minutes. The lab's IP portfolio expanded with filing two new inventions, one PCT application, and a granted patent on fluorescence readout for PCR.

We also developed a novel multiscale, multi-material fabrication platform that combines lithographic patterning with droplet-on-demand (DoD) material deposition for applications in optics, electronics, and packaging. This hybrid approach leverages mask/maskless lithography, photolithography, direct laser writing, and nanoimprint lithography (NIL) for precise nanoscale features, while DoD techniques such as inkjet, aerosol jet, and electrohydrodynamic printing (EHD) enable controlled deposition at micro- to millimetre scales. A key feature of this technology is its ability to process diverse materials, including high-index polymers, dielectrics, active materials, functional oxides, conductive inks, and optical and structural composites, enabling the fabrication of integrated photonic circuits, microelectronics, and advanced packaging solutions. It also facilitates the precise deposition of passivation layers, conductive traces, and encapsulation materials essential for IC and photonic integrated circuit (PIC) packaging.

Our department is also involved in 2D materials research. We reported planar tunnelling spectroscopy measurements

on metal-WSe2-twisted bilayer graphene heterostructures across a broad range of gate and bias voltages. Our experimental data revealed a relaxed in-plane momentum matching condition in twisted bilayer graphene, contributing to a significant enhancement in tunnelling compared to Bernal bilayer graphene. Furthermore, our theoretical analysis provides a rigorous quantitative framework that supported the data and helped in identifying the low-energy phonon modes that predominantly contribute to electron tunnelling. The novelty of these results is expected to open avenues where planar tunnelling can be a potent tool for studying various systems. We also designed and developed a new metamaterials platform using Bernal bilayer graphene, where external, modulated electrostatic gate potentials can be used as a tunable knob to engineer superlattices and flat electronic bands.

During the last year, we reported significant advances in visible and ultraviolet dielectric metasurfaces. A comprehensive design framework for high-performance super-oscillatory metalenses was developed, demonstrating deep sub-diffraction optical focusing while systematically establishing the trade-offs among hotspot size, focusing efficiency, sidelobe suppression, and fabrication tolerance. Complementary work on bilayer achromatic RGB metalenses introduced a compact platform capable of broadband visible operation with substantially reduced chromatic aberration, providing new opportunities for miniaturised imaging and computational optical systems.

We also developed a metalens-assisted laser direct writing platform that replaces bulky high-numerical-aperture objectives with planar meta-optical components. The resulting system demonstrated high-resolution optical lithography with subwavelength feature sizes while significantly reducing system complexity.

In the area of plasmonics, the department continued its research on liquid-metal nanophotonics. Recent studies revealed unconventional thermoplasmonic behaviour in gallium nanostructures embedded in flexible polymer matrices, demonstrating temperature-dependent spectral tuning driven by thermo-optic effects rather than conventional thermal expansion. Additional investigations established multilayer liquid gallium architectures with enhanced optical transparency, electrical conductivity, and mechanical flexibility, providing new design strategies for transparent electrodes, flexible electronics, and dynamically tunable plasmonic devices.

A major translational milestone during the year was the successful realisation of the indigenous CPAM Nanolitho platform under the Centre for Promotion of Additive Manufacturing (CPAM). The system provides submicron projection lithography capabilities for rapid fabrication of photonic integrated circuits, metasurfaces, optical computation chips, and semiconductor microstructures. The technology establishes an indigenous manufacturing capability for advanced photonic devices and forms the technological foundation for future wafer-scale meta-optics manufacturing.

In the department, one of the key research centres on developing functional sub-THz (100-300GHz) and THz (>300GHz) devices that leverage unique wave properties to strongly enhance wireless communication performance. The Orbital angular momentum beamforming/multiplexing and THz holography play a key enabling role in the enhancement of data-capacity and channel width in the 5G/6G networks. Using the established THz-TDS and pump-probe THz spectroscopy platform, our group has been able to probe sub-picosecond/ non-equilibrium carrier dynamics in topological quantum materials with non-trivial band topology with the bandgap in the THz frequencies. Another major area of research focuses on light-matter interactions in quantum materials, specifically using THz cavities to control material properties and phase transitions.





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DR. SHIVAKUMAR SASTRY
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PhD (CSIR-CERI, India)

3.6.4

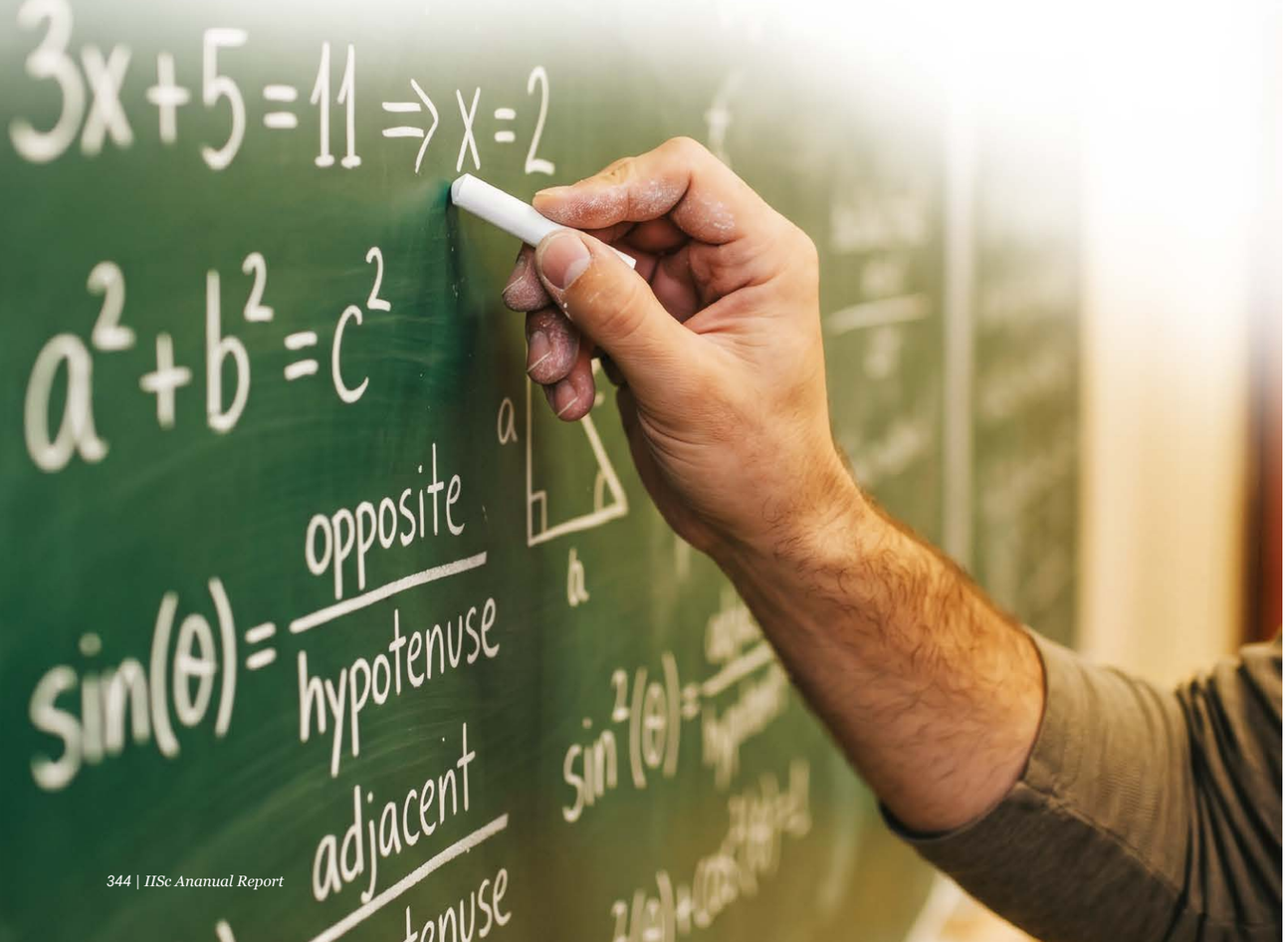
Mathematics

The Department of Mathematics of the Indian Institute of Science is a leading centre for research and advanced education in pure and applied mathematics. Established in 1956, the department conducts internationally recognised research across algebra, analysis, geometry, topology, probability, differential equations, and mathematical physics.

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Fax: +91-80-2360 0146/0683
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URL: http://math.iisc.ac.in
Degree Programmes offered:
Integrated PhD and PhD, participate in the BSc (Research) programme, BTech (Math and Computing) programme.

IN NUMBERS
29 Academic Staff
3 Inspire Faculty
16 Postdocs
28 Ph.D. Students
26 Int. Ph.D. Students
4 Int. Ph.D. Conferment (April 25-March 26)
4 Ph.D. Conferment (April 25-March 26)
1 MS (Res) Conferment (April 25-March 26)

Chair: Tirthankar Bhattacharya



Core Research

Algebra and Number Theory; Functional analysis, Harmonic analysis and Matrix analysis; Differential Geometry and Geometric Analysis; Probability Theory and Stochastic Processes; Partial Differential Equations; Numerical Analysis; Combinatorics; Topology; Representation Theory; Nonlinear Dynamics; Algebraic Geometry; Several Complex Variables; Time Series Analysis; Mathematical Physics.



Current Research

The Department of Mathematics is actively engaged in cutting-edge research spanning both foundational and interdisciplinary mathematics. Research in algebra and number theory includes automorphic forms, modular forms, Galois representations, arithmetic geometry, algebraic K-theory, Iwasawa theory, and aspects of the Langlands programme. Representation theory research covers Lie algebras, Kac–Moody algebras, quantum groups, and related combinatorial structures.

In functional analysis, harmonic analysis and matrix analysis, researchers study harmonic analysis on Lie groups and symmetric spaces, spectral multipliers, multivariable operator theory, positivity-preserving matrices, and structured kernels. Several complex variables and complex geometry constitute another major thrust area, with work on holomorphic mappings, invariant metrics, pluripotential theory, extension theorems, and complex dynamical systems.

The department has strong activity in differential geometry and geometric analysis, including research on Einstein manifolds, Kähler geometry, Teichmüller theory, Yang–Mills equations, harmonic maps, and geometric flows. Low-dimensional topology research focuses on hyperbolic geometry, geometric group theory, three- and four-manifolds, and Heegaard Floer theory. There is also significant work in automated theorem proving and homotopy type theory.

Research in probability and stochastic processes includes random matrix theory, stochastic differential equations, branching processes, diffusion models, integrable probability, stochastic geometry, and random graphs. Faculty members also investigate applications of probability to finance, manufacturing systems, and complex stochastic networks.

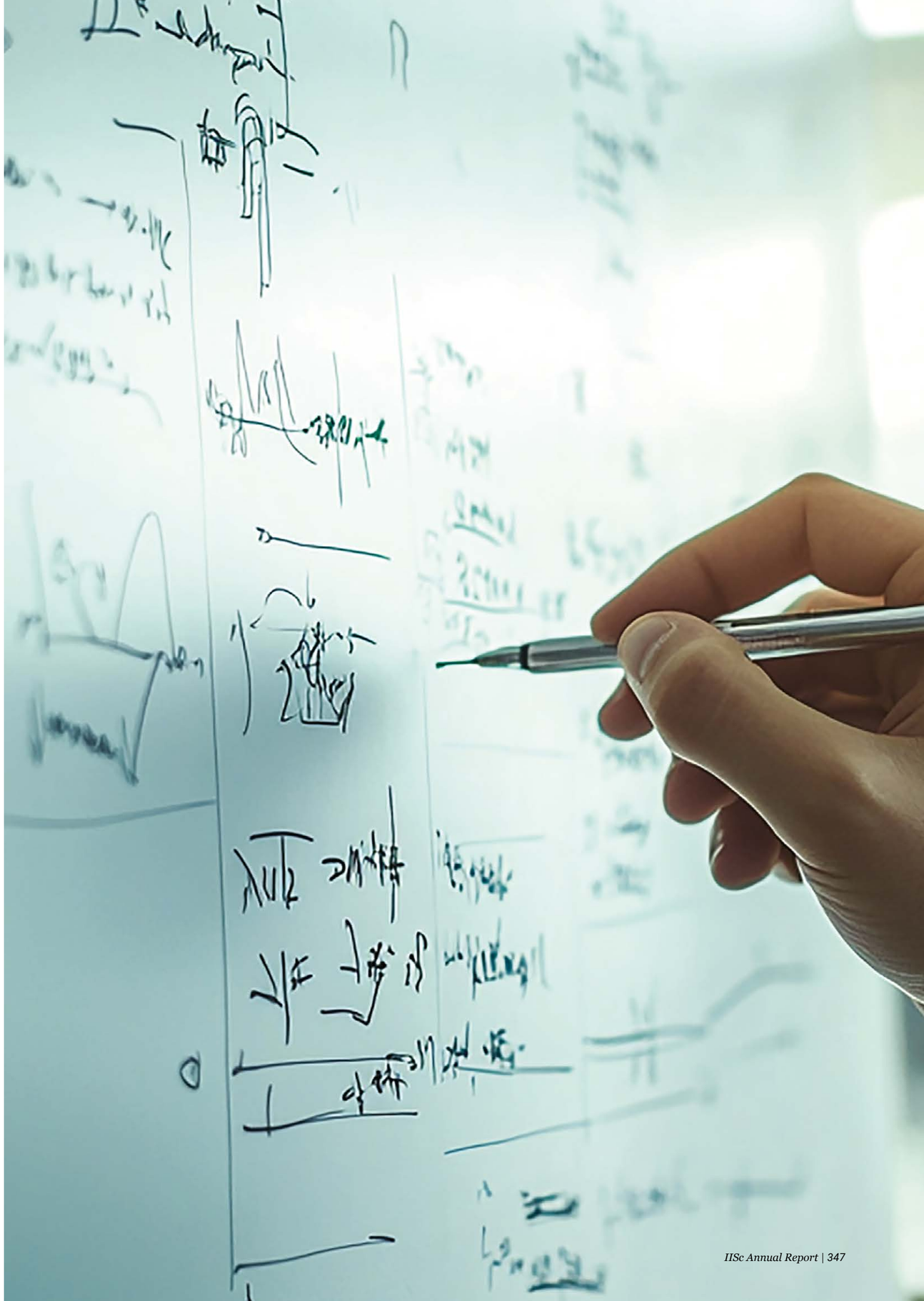
In differential equations and numerical analysis, ongoing research addresses nonlinear elliptic and parabolic partial differential equations, homogenisation, controllability, viscosity solutions, optimal control, and finite element methods. Researchers also develop computational techniques for solving fractional

differential equations and applied PDE models arising in physics and engineering.

The department maintains active programs in combinatorics and discrete mathematics, studying graph theory, symmetric functions, Schur polynomials, Coxeter groups, tessellations, lattice polytopes, and algebraic combinatorics. Nonlinear dynamics research investigates synchronisation, coupled dynamical systems, fractal analysis, and applications of dynamical systems theory to neuroscience and other applied domains.

Interdisciplinary collaborations are an important feature of current research. Through the IISc Mathematics Initiative and collaborations across departments, faculty and students work on mathematical biology, computational neuroscience, control systems, imaging, data-driven modelling, and scientific computing. These collaborations connect mathematics with engineering, physics, biology, and computer science.

The department also hosts postdoctoral researchers working in contemporary areas such as harmonic analysis, operator theory, algebraic number theory, spectral graph theory, representation theory, control theory, numerical methods for fractional differential equations, and nonlinear integrable systems. To summarise, the department is a vibrant hub of discovery, where faculty members, students, post-doctoral fellows and (short and long term) visitors work together to explore the beauty and power of mathematics — from its purest forms to its applications across science and technology. The department web site has more details.



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VED DATAR
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Ph.D. (Brandeis), Assistant Professor

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Ph.D. (CalTech), Professor

RADHIKA GANAPATHY
Ph.D. (Purdue), Associate Professor

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Ph.D. (Yale), Associate Professor

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MANJUNATH KRISHNAPUR
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PhD (Princeton), FASc, FNA, Professor

NMI Distinguished Associates

V.S. BORKAR
(FASc, FNA, FNAE, FNASc, FTWAS; Fellow of AMS, IEEE)

K.B. SINHA
(FASc, FNA, FTWAS)

3.6.5

Physics

The Department of Physics was established in 1933 by the Nobel Laureate CV Raman. Illustrious names from Indian science, such as Ramaseshan and TV Ramakrishnan, have been associated with this department. It is now a well-established research centre for condensed matter physics and astrophysics. Since 1982, the department has been successfully running the Joint Astronomy Programme (JAP) – a unique PhD programme in Astrophysics and Cosmology along with IIA, ISRO and RRI.

FACT FILE
Established: 1933
Phone: 080-2293 3334
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Email: chair.phy@iisc.ac.in
URL: www.physics.iisc.ac.in
Degree Programmes offered:
PhD, Int PhD and BS/MS (Research)

IN NUMBERS
31 Academic staff
3 Scientific staff
6 Technical Staff
123 PhD students
102 Int PhD students
254 Publications
6 Int. PhD conferment
11 PhD conferment

Chair: Jaydeep Kumar Basu



Core Research

Astronomy and Astrophysics: Cosmology, early universe physics, black holes, nuclear astrophysics, galactic dynamics, interstellar medium, solar physics, and plasma physics

Atomic and Optical Physics: Topological photonics, femtosecond laser fabrication, ultrafast optical phenomena

Experimental Condensed Matter Physics: Spectroscopy, electrical transport, low-temperature physics, two-dimensional materials, thermoelectrics, superconducting quantum devices, photonic topological materials, biophysics

Theoretical Condensed Matter Physics: Strongly correlated electrons, topological insulators, twistronics, many-body quantum dynamics, soft matter, biophysics, and nonlinear physics



Current Research

Astronomy, Astrophysics and Cosmology
Research spanned from compact objects and gravitational waves to large-scale cosmology.

Hydrodynamic simulations were used to demonstrate that downstream expansion in starburst-driven galactic winds suppresses the growth of embedded cold gas clouds. Because these clouds maintain isobaric equilibrium with the expanding wind, their density and their contrast with the background wind drop steeply, leading to downstream dissolution and a head-to-tail emission gradient that aligns with observations.

In compact-object astrophysics, theoretical studies modelled continuous gravitational wave emission from rotating white dwarfs with magnetic-field-induced quadrupole deformation, incorporating angular-momentum-loss-driven amplitude decay, and showed that highly magnetised systems—such as ZTF J1901+1458—could be detectable by LISA.

A novel methodology was proposed to probe the primordial

chirality of high-frequency gravitational waves (HFGWs) using CMB observations. Through the Gertsenshtein-Zel'dovich effect, the conversion of HFGWs into chiral photons in cosmological magnetic fields induces a Stokes V-mode spectral distortion, leading to strong constraints on the HFGW strain at 40 and 150 GHz.

Experimental Condensed Matter Physics

Experimental efforts have strongly advanced quantum materials, 2D systems, and thermoelectrics.

In 2D materials, studies of ultraclean graphene revealed universal quantum critical transport of charge and heat, showing inverse relation of electrical and thermal conductivities with conductivity converging to a quantised value, alongside a giant Wiedemann–Franz law violation and near-minimal viscosity-to-entropy ratios at high temperature.

A study explained the origin of Fano interference and its tunability with near-field interactions in guided mode-resonant metasurfaces, quantifying resonance redshifts and linewidth narrowing that take place due to change of the excitation.

Femtosecond laser-written photonic structures provide a versatile platform for exploring topological phenomena. Using photonic lattices with quasiperiodic couplings, topological Anderson transitions were probed via mean chiral displacement measurements. Nonlinearity-induced band-gap transmission was demonstrated in dispersive and flat-band lattices, revealing new transport mechanisms beyond the linear regime. Intensity-correlation measurements demonstrated phase- and photon-number-dependent localisation-delocalisation of NOON states in flat-band lattices. Additionally, inter-orbital interactions were explored, paving the way for higher-orbital topological photonics.

Cu_2Se thermoelectrics were improved by inducing controlled copper deficiency and Te-substitution for Se. Te-substitution raises the Cu-ion migration barrier, enhances carrier mobility, and reduces lattice thermal conductivity via phonon scattering, yielding a peak zT of 1.98 at 975 K and 52 mW module output at $\Delta T = 670$ K.

Theoretical Condensed Matter Physics

Recent theoretical work has focused on nonequilibrium dynamics, quantum phases, and emergent collective behaviour.

In quantum many-body systems, a general Schwinger-Keldysh (SK) field theory for nonequilibrium dynamics of pure states of fermions was developed, which was used to demonstrate universality in the dynamics of pure states in the Sachdev-Ye-Kitaev (SYK) model, showing that pure-state dynamics in a fixed particle sector is governed by universal large-N Kadanoff-Baym equations. Advances in exciton physics introduced symmetry-based frameworks using time-reversal and space-group symmetries to obtain excitonic eigenstates in the entire Brillouin zone and classify them, significantly reducing computational complexity in calculations.

Further, a study reported that machine-learned interatomic potential-assisted molecular dynamics simulations predict the thermal conductivity of the metal-organic framework CALF-20 with first-principles accuracy, exhibiting an ultralow value desirable for thermoelectric applications.

In disordered systems, fermions on square lattice subjected to disordered random Z2 gauge fields that arise from flux defects were studied. At half filling, under BDI symmetry, a new class of critical states emerges, with zero-energy states showing multifractality dependent on defect concentration and correlations, and a non-freezing spectrum across all concentrations, linked by a robust conductivity-Lyapunov exponent relation.

Soft Condensed Matter and Active Systems

Recent work has emphasised collective phenomena and non-equilibrium statistical physics.

In active soft-matter systems, a study using the active-rotor Cahn–Hilliard–Navier–Stokes framework revealed that increasing activity drives a crossover from phase separation to turbulence in a two-dimensional system of counter-rotating spinner assemblies, characterised by vorticity fields coupled to rotational phases, power-law energy spectra, intermittency, and complex flow-topology statistics with potential biological relevance.

High-resolution near-surface imaging of the immunological synapse, combined with tracking algorithms and modelling, challenged the long-held paradigm that T-cell receptors move exclusively inward toward the central supramolecular activation cluster (cSMAC), as a significant pool of TCR clusters was observed moving anterogradely toward the cell periphery, driven by outward-propagating actin waves that couple to the microclusters via the Wiskott-Aldrich Syndrome Protein.

Plasma Physics

Research in plasma physics advanced fusion energy science. Using the global Gyrokinetic Toroidal Code (GTC), turbulent transport in the W7-X and QSTK optimised stellarators was studied, demonstrating that zonal flows are critical in suppressing turbulent transport and enhancing plasma confinement. Additionally, investigation of the stabilisation of sawtooth instabilities via short-pulse gas injection in the ADITYA-U tokamak offered crucial insights into sustaining stable plasma operation for long-pulse fusion experiments. Together, these studies contribute significantly to advancing plasma stability and confinement for viable fusion energy.

Other highlights

Aveek Bid:

This group made significant advances in the study of interaction-driven quantum phases, topology, and electronic structure engineering in graphene-based van der Waals heterostructures. A major highlight of the year was their observation of even-denominator fractional quantum Hall states in ABA-stacked trilayer graphene, including incompressible states at half-filled Landau levels within the zeroth Landau level manifold. These results establish ABA trilayer graphene as a new platform for studying paired electronic phases and possible non-Abelian quasiparticles. They further investigated the role of Landau-level mixing, symmetry breaking, and electric-field tuning in stabilising correlated phases in multilayer graphene systems.

They also reported giant gate-controlled odd-parity magnetoresistance in magnetised bilayer graphene at room temperature, demonstrating electrically tuneable nonreciprocal transport in graphene-based magnetic heterostructures. They also developed a transport-based spectroscopic technique to quantitatively detect strain-induced pseudomagnetic fields in graphene through Shubnikov–de Haas beating patterns.

In moiré graphene heterostructures, they demonstrated displacement-field-driven band reconstruction and electrically tuneable coupling to moiré superlattice potentials in ABA trilayer graphene/hBN devices.

K Ramesh:

Glass formation, physical ageing and structural relaxation of bulk chalcogenide glasses are studied to effectively tune the compositions for a desired application. High pure bulk chalcogenide glasses, particularly Te-based glasses are prepared in large sizes 15 - 60 mm diameter with a thickness of about 20 mm. The oxide impurities were removed by an indigenously developed distillation method. Their compositions were optimised to transmit IR light from near infrared to far infrared for space and defence applications.

Tin Oxide (SnO_2): A wide optical band-gap (3.6 eV – 4.0 eV) material, SnO2 offers attractive advantages, such as high transmittance spectra in the visible spectrum, excellent chemical stability, high electron mobility (up to 240 cm2V–1s–1), and easily handled by low-temperature process. Generally, the stable phase of SnO2 at ambient conditions is a tetragonal rutile phase (P42/mnm). At high pressures (> 21 MPa), SnO_2 forms a cubic phase that is unstable at normal conditions. For the first time, we have shown that a stable Cubic Phase of SnO_2 (C- SnO_2) can be prepared at ambient conditions. The gas sensing properties of this cubic SnO_2 were found to be superior to

those of tetragonal SnO_2 and any other known materials used for CO (carbon monoxide) detection. C- SnO_2 has also been used as an electron transport layer in the triple cation perovskite solar cells. The conversion efficiency and stability were found to increase considerably compared to the standard tetragonal phase SnO_2 (T- SnO_2).

Phase change memory materials: GeTe based phase change memory materials are studied for their non-volatile random accessory (NVRAM) applications. The size effect of different dopants like, Se, As, Al and Bi on the phase change properties has been studied systematically.

Thermoelectric Properties:
Thermoelectric energy conversion of the bulk chalcogenide glasses is studied. Bulk Cu-As-Se glasses prepared by melt quenching method are subjected to a controlled crystallisation to have a partially crystallised glass to realise the phonon glass and electron crystal principle and enhance the energy conversion efficiency.

Prerna Sharma:
This group investigated turbulence-like dynamics in dense suspensions of the swimming unicellular alga *Chlamydomonas reinhardtii* under quasi-two-dimensional confinement. Unlike conventional active turbulence in bacterial or nematic systems, their system exhibited neither orientational order nor motile topological defects.

Extracellular macromolecules and particles often bind and diffuse over cell membranes during transport processes like endocytosis, exocytosis, drug imbibition, etc. However, imaging the real-time dynamics of these phenomena at nanometre scale resolution is highly challenging. They used a model system of polystyrene microspheres diffusing over the surface of colloidal membranes as 3 orders of magnitude scaled-up analogue of this process. They found that the microsphere causes local deformation in the membrane, behaving as an inclusion that diffuses freely in the bulk but, surprisingly, becomes radially trapped near the edge. They identify the critical particle size and membrane composition required to observe particle trapping at the membrane edge. A quantitative analysis of the motion of the particle he particle in the bulk enabled us to determine the local membrane interfacial viscosity of the colloidal membranes. Overall, their study shows that the complex interplay of membrane fluctuations and particle characteristics can lead to a rich phenomenology even in highly simplified few component model systems.

Ashish Meena:
This group worked on the detection prospects of a strongly lensed 21cm HI signal at cosmological redshifts. They highlighted certain lensed systems in which lensed HI can be detected in < 100 hours with uGMRT.

They discovered two swallowtail image formations in MS 0451.6-0305. Both swallowtail image formations are highly magnified and reveal parsec-sized clumps in the background source.

They are developing a versatile gravitational lensing package, named, LensFactory.jl. At present, the package has support for basic (single- and multi-plane) lensing along with parametric strong lens modelling and singularity map generation. Soon, they will add support for hybrid and free form lens modelling as well as microlensing.

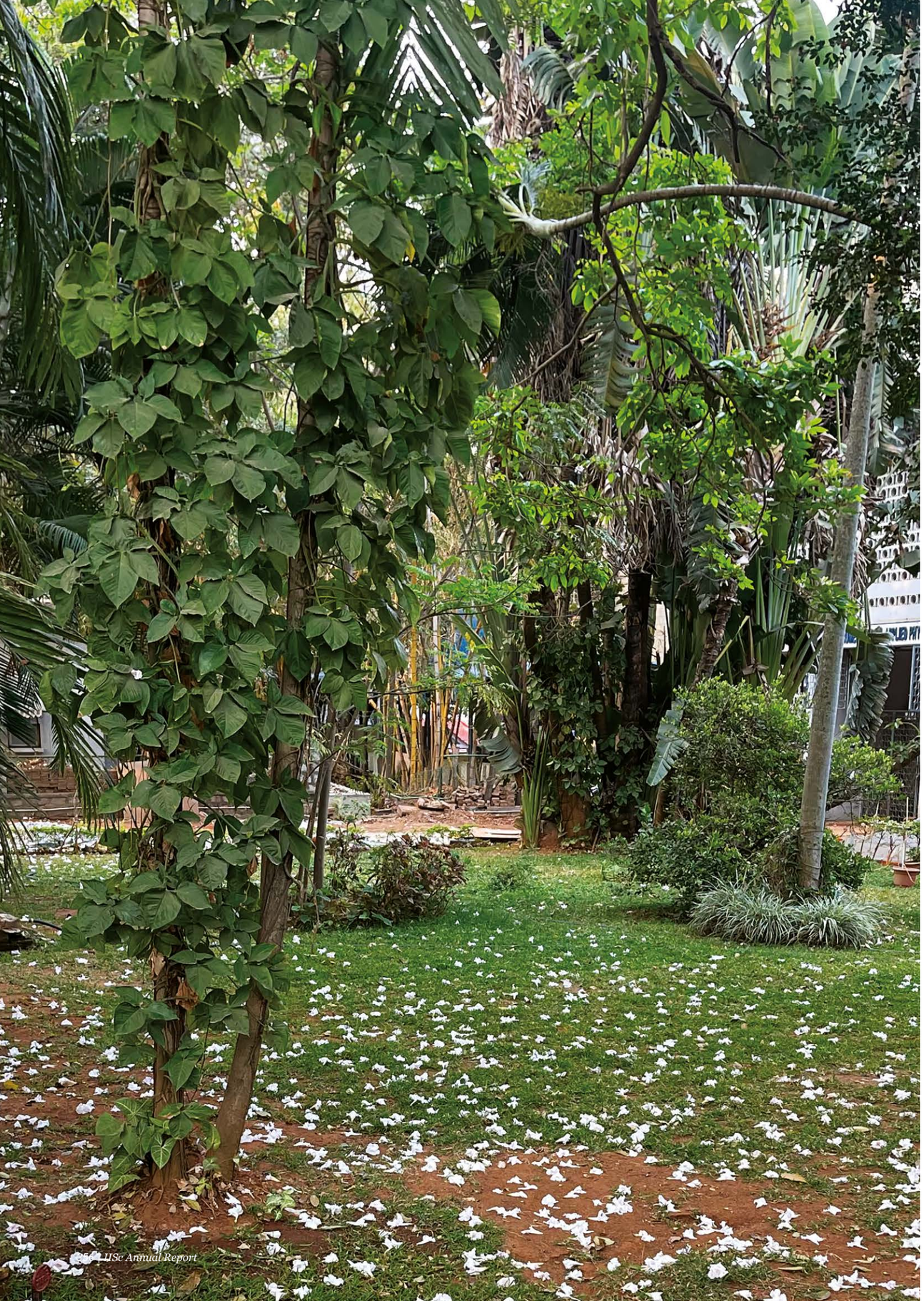
Anindya Das:
Topological phases are unique states of matter where properties like electrical or thermal conductance are governed by global particle entanglement rather than local effects (defects, impurities, perturbations etc.). They can manifest as specialised “Quantum Hall” (QH) States where thermal and electrical conductance increase in precise integer steps. On the other hand, thermal conductance increasing in half-integer steps has been considered smoking gun evidence for exotic phases such as Majorana edge modes, a key to future quantum computing. They carefully designed a complex device consisting of two stacked layers of graphene (bilayer graphene), in which they achieve carefully designed a complex device made of two stacked layers of graphene (bilayer graphene), in which we produced half-integer thermal conductance using integer QH states. They showed that this emerges from a mundane process called ‘equilibration', challenging a



long-held the long-held notion on the evidence for Majorana edge modes. Their work calls for advanced studies to distinguish such exotic matter.

Ganesan Rajamanickam:
This team is working in chalcogenide-based solar cell materials and topological insulators. Particularly in solar cell materials, they have been focused on CZTS system, because it attracted a great deal of interest as potential absorber materials for thin film solar cells, the constituting elements are less toxic and easily available. The CZTS has prepared bulk as well as thin films by various techniques and studied the optical, electrical, and structural studies on these materials. Recently, they have been focused on CdSe, SnS, SnS doped Ag, SnSe and SnSeâ‚‚/TiOâ‚‚ heterostructures thin films for photo detector application. Another important research area is topological insulators which have recently emerged as an exciting class of materials that are insulating in the bulk and conduct electricity.

Srimanta Middey:
High-entropy oxides (HEOs), complex crystals featuring five or more transition metals or rare-earth elements, represent a frontier in condensed matter physics and materials science. These materials unlock unprecedented potential for next-generation electronics and energy storage. A primary hurdle in the field has been deciphering how microscopic structural distortions dictate macroscopic behaviour. This research group has successfully bridged this gap, moving beyond observation to mastery of these complex interconnections. Their recent work has established the definitive link between local lattice environments and functional properties: Electronic Transport: They demonstrated how precise control over local structural disorder can be used to tune electronic pathways. Their team identified the mechanisms by which atomic-scale distortions influence long-range magnetic order.



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HR KRISHNAMURTHY
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RAHUL PANDIT
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AK SOOD
PhD (IISCc, FASC, FNASC, FNA, FTWAS, FRS, Professor



3·7 *Centres under the Director*

3.7.1

JRD Tata Memorial Library

Established in 1911, the JRD Tata Memorial Library is among India's oldest and most advanced science and technology libraries. Over the past century, it has built a rich and diverse collection of books, scholarly journals, technical reports, theses, Indian patents, standards, rare reference materials, and archival back volumes of leading scientific journals. Complementing its extensive print holdings, the library provides seamless access to a wide range of electronic journals, eBooks, and online databases, serving as a vital source of knowledge and information for the Institute's academic and research community.

Librarian: Umeshareddy Kacherki



During 2025–26, the library further strengthened its collections by acquiring 522 books and 13 eBooks, and by processing 21 books for departmental libraries. In addition, 666 books were received through gifts and donations, enriching the library's holdings. The institutional repository and scholarly collections were expanded with 395 PhD theses and 25 MTech (Research) dissertations. The library's total collection now exceeds five lakh physical documents, including books, bound journal volumes, technical reports, standards, and theses.

In alignment with its commitment to digital access and scholarly communication, the library predominantly subscribes to electronic resources. At present, it provides access to approximately 13,000 e-journals, 15,000 eBooks, 37,800 standards, and 26,000 conference proceedings, supported by an annual investment of nearly Rs. 9.65 crore in information resources.

During the reporting period, the Circulation Section registered 1,688 new members, reflecting sustained growth in the utilisation of library services. A total of 23,645 circulation transactions, including the issue, return, and renewal of library materials, were processed. In addition to routine circulation activities, Library staff undertook extensive reshelving, shelf rectification, and collection shifting to ensure systematic organisation, efficient retrieval, and enhanced accessibility of resources for users.

The library continues to maintain pre-eminence in providing access to many e-resources, both through the ONOS scheme and IISc subscriptions. Some of the IISc subscribed e-resources include the following:

1. American Institute of Aeronautics and Astronautics (meeting papers)
2. American Association of Cancer Research (AACR)
3. American Physiological Society
4. ASTM Journals and Standards
5. Begell House Digital Library
6. Company of Biologists
7. Foundations and Trends in Computer Science, Engineering and Technology collection – 18 Journals (Emerald)
8. EMS and MSP journal packages
9. EBSCO Business Source Complete
10. JAMA Network Journals (American Medical Association)
11. JSTOR
12. Microbiology Society
13. New England Journal of Medicine Evidence Bundle
14. Proceedings of the National Academy of Sciences of the United States of America
15. Rockefeller University Press
16. Royal Society of Chemistry - All journals and their archive
17. Society for Industrial and Applied Mathematics (SIAM)
18. The Royal Society Collection

Newspaper and Magazine Database

1. Edzter.com

New Databases

1. Lecture Notes in Computer Science (LNCS) – eBooks database
2. Tracxn – Market Research Tool

New Subscriptions

1. New England Journal of Medicine Evidence Bundle
2. EUCLID Prime Collection
3. Duke Mathematical Journal
4. Zootaxa (Magnolia Press)
5. ASME Conference Proceedings
6. Journal für die reine und angewandte Mathematik (Crelle's Journal)
7. Foundations and Trends in Computer Science, Engineering and Technology collection – 18 Journals (Emerald)
8. JAMA Network Journals (American Medical Association)

New Procurement of Reference Management Software License - EndNote Desktop Edition

Institutional Membership

1. arXiv All-Star Institutional Membership
2. International Federation of Library Associations and Institutions (IFLA)
3. United Kingdom Serials Group (UKSG)

One Nation One Subscription (ONOS): The Government of India's landmark initiative, One Nation One Subscription (ONOS), has significantly enhanced access to scholarly information resources across the country. The programme aims to provide seamless nationwide access to high-quality scholarly journals and research publications for students, faculty members, and researchers affiliated with government-funded higher educational institutions and research and development organisations.

Through ONOS, the JRD Tata Memorial Library has substantially expanded access to scholarly content, enabling the IISc community to benefit from a broader range of high-impact research literature. The initiative complements the library's existing collection development efforts and strengthens support for teaching, learning, and research activities across the Institute.

Currently, JRDTML has online access to all the full-text journals published by the 30 prominent publishers through ONOS.

1. ACM Digital Library Journals
2. American Chemical Society Journals
3. American Institute of Aeronautics and Astronautics Journals
4. American Institute of Physics (AIP) Journals
5. American Mathematical Society Journals
6. American Physical Society Journals
7. American Society for Microbiology Journals
8. Annual Reviews Journals
9. ASCE Library Journals
10. ASME Digital Collection Journals
11. Bentham Science Journals
12. BMJ Journals
13. Cambridge University Press Journals
14. Cold Spring Harbor Laboratory Press Journals
15. Elsevier Journals (Science Direct)
16. Emerald Publishing Journals
17. ICE Publishing Journals
18. IEEE Journals
19. IndianJournals.com
20. Institute of Physics (IOP) Journals
21. Lippincott William and Wilkins (Wolters Kluwer) Journals
22. Oxford University Press (OUP) Journals
23. Project Muse Journals ect Muse Journals
24. Sage Publications Journals
25. Science (AAAS) Journal
26. SPIE Digital Library
27. Springer Nature Journals
28. Taylor and Francis Journals
29. Thieme Journals
30. Wiley Online Journals

Koha Library Management System: The JRD Tata Memorial Library continues to utilise Koha, an open-source Integrated Library Management System (ILMS), for managing acquisitions, cataloguing, serials, circulation, and reporting activities. The Koha-based Online Public Access Catalogue (OPAC) enables users to search library collections, place reservations, and access a wide range of electronic resources, thereby enhancing resource discovery and user access.

Conventional and Contemporary Library Services: The JRD Tata Memorial Library continued to play a pivotal role in supporting the Institute's teaching, research, and knowledge creation activities through a range of specialised information services. Core services, including document delivery, reference and referral assistance, and reprographic support, facilitated seamless access to scholarly resources and research literature. By providing timely, reliable, and user-focused information support, the library strengthened the academic and research ecosystem of the Institute and contributed to the advancement of scholarly inquiry and innovation.

Some of the contemporary services provided by the library include:

1. **IISc Publications Repository (ePrints@IISc)**
   ePrints@IISc (http://eprints.iisc.ac.in) is one of the country's earliest and largest institutional repositories for the institute's research publications. The erstwhile National Centre for Science Information (NCSI) started the ePrints@IISc service. Since May 2012, the library has been administering and managing the service.
   The repository collects, preserves, and disseminates the research output created by the IISc research community. The repository content can be accessed through the search and browse functionalities. As of the date, the repository contains nearly 69,000 publications.

2. **IISc Theses and Dissertations Repository (ETD@IISc)**
   ETD@IISc (https://etd.iisc.ac.in) is one of the country's earliest institutional repositories for theses and dissertations. NCSI started the service in 2005. Since then, the library has been administering and managing the service. ETD@IISc is a digital repository for the theses and dissertations submitted by the IISc students. The repository captures, disseminates, and preserves the theses and dissertations of IISc. The repository content can be accessed through the search and browse functionalities. As of the date, the total number of records in the repository is more than 9870.

3. **IISc Faculty Profiles**
   The Indian Research Information Network System (IRINS) serves as the Institute's Research Information Management (RIM) platform for collecting, curating, and showcasing the scholarly contributions of IISc faculty and researchers. By integrating research publications, academic identifiers, citation data, collaborations, and other scholarly outputs, the platform enhances the visibility, accessibility, and impact of the Institute's research. IRINS supports research assessment, academic review processes, institutional ranking initiatives, and evidence-based decision-making, while promoting the global discoverability of IISc's scholarly output. The platform currently hosts profiles of 563 faculty members representing diverse academic disciplines across the Institute.

4. **Remote Access to Subscribed Online Resources through Shibboleth-based Single Sign-on Service**
   The library continues to provide seamless remote access to subscribed online resources through a Shibboleth-based Single Sign-On (SSO) service. This secure authentication mechanism enables authorised users to access a wide range of scholarly databases, journals, and digital content from any location using their institutional credentials. By eliminating the need for multiple logins and ensuring secure access, the system significantly enhances user convenience while maintaining compliance with publisher access policies.

5. **APC Support for Open Access Publications**
   The library has continued its read and publish agreements with the following six publishers: EDP Sciences, European Mathematical Society, Microbiology Society, Rockefeller University Press, Company of Biologists, and The Royal Society Publishing. These agreements have expanded our access to scholarly content without any enhancements in the subscription renewal costs. In 2026, the American Physiological Society was added to the existing list of publishers. The read-and-publish agreements allow our researchers to publish research in open access journals without paying Article Processing Charges (APC). These agreements represent a significant milestone for the library.

   The library also coordinates with the Government of India's ONOS initiative to facilitate APC funding support for first and corresponding authors from IISc publishing in fully open-access journals that meet the ONOS eligibility criteria for centrally funded APC assistance.

6. **Accessible Information Services through KIBO**
To further strengthen inclusive access to information resources, the JRD Tata Memorial Library has implemented the KIBO assistive reading and scanning system. The system enables users to scan printed documents and convert them into accessible digital formats, including audio output, thereby supporting independent access to information for differently abled users, particularly those with visual impairments. In addition, KIBO offers multilingual translation capabilities across more than 100 languages, facilitating access to content in diverse linguistic formats. This initiative reflects the library's commitment to leveraging assistive technologies to promote accessibility, inclusivity, and equitable access to knowledge for all members of the Institute community.

7. **Technology-Enabled and Inclusive Library Services**
The JRD Tata Memorial Library continues to leverage technology-driven solutions to enhance service delivery, accessibility, and user experience. The fully implemented RFID-based library management system supports self-service transactions, efficient circulation, rapid stock verification, faster retrieval of library materials, and improved collection security, thereby streamlining library operations and enhancing resource management. The library has also implemented QR code-based navigation with audio guidance to facilitate independent access to collections, particularly for differently abled users. In addition, ergonomic and wellness aids are provided to support user well-being and create a comfortable, inclusive, and user-friendly learning and research environment.

User Engagement Programmes Organised by JRD Tata Memorial Library

The following user engagement programmes are conducted to enhance awareness of library resources and services, strengthen information literacy, promote effective utilisation of scholarly resources, and foster greater interaction between the Library and the IISc community.

1. Training session on "Use of Web of Science with Research Assistant and EndNote in Research" on 2 April, 2025.
2. Training session on "Use of InCites, JCR, and ESI in Research" on 3 April, 2025.
3. Workshop on "Unlocking knowledge and opportunities: How LNCS supports your research and academic growth" conducted in association with Springer Nature on 22 April 2025.
4. Organised two lectures as part of "Eugene Garfield Birth Centenary Celebration" in association with Centre for Policy Research, on 16 September 2025.
5. Training Session on "Turnitin Originality Check with AI Report Analysis" conducted in association with Turnitin India Pvt Ltd. on 18 September 2025.
6. National Library Week Celebrations during November 10-14, 2025.
   - 10 November 2025 – Open Book Quiz
   - 11 November 2025 – Treasure Hunt
   - 12 November 2025 – Poster Competition on the theme: "Silence to Success: Library in your Academic Story"
   - 13 November 2025 – Book Talk in association with KALPANA Literature Club
   - 14 November 2025 – Workshop on "Academic Publishing and Research Integrity" conducted in association with American Institute of Physics.
7. Seminar on "Evolving Research and Publishing Landscape" by Dr. Sudip Parikh, CEO, American Association for the Advancement of Science (AAAS) on 2 March 2026.
8. User awareness programme on "Harnessing EBSCO Business Source Complete for Global Business" conducted in association with EBSCO on 5 March 2026.

Professional Contributions:

Senior library professionals at the JRD Tata Memorial Library have continued to demonstrate leadership and academic engagement through their active participation in the scholarly community. They have been invited as speakers at national and international conferences, served on advisory boards, academic committees and panels across reputed institutions. Their research contributions, published in esteemed journals and conference proceedings, reflect the library's dedication to advancing the field of library and information science and addressing emerging challenges in the digital knowledge landscape.

Publications:

Ashish Kumar Ahirwal

1. Ahirwal, Ashish Kumar, J. Shivarama. "Altmetric study of Indian Agricultural and Biological Sciences Publications Covered by Scopus Narrow Subject fields: special reference with Mendeley readership", Journal of Agricultural Informatics, (2025).
2. Ahirwal, Ashish Kumar, J. Shivarama. "Mendeley Readership and Citation Metrics of Scopus-Indexed Indian Affiliated-Books: An Altmetrics Analysis", DESIDOC Journal of Library & Information Technology (DJLIT) (2026).

Suresh Balutagi

1. SK Sukula, M Rani, P Babbar, S Balutagi, J Singh. "Open Data Sharing in Contemporary Research Publishing", International Journal of Library Information Network (IJLINK) (2025)

Invited Talks:

Umeshareddy Kacherki

1. "Enhancing Library Collection and Resource Curation" during Leadership Development Programme for Senior Library Professionals, organised by the Goa Institute of Management, Goa, between 4-6 June 2025.
2. "Library's Role in Historical Research" during a workshop on 'Deciphering the past, enriching the present: Epigraphy, Indic heritage and the library's role in historical research' organised by the Mythic Society, Bengaluru on 12 August 2025.
3. "Digital and Smart Libraries: Transforming Access, Services, and User Experience" during the Indian Association of Special Libraries and Information Centres (IASLIC) 34th National Conference held at Karnataka State Akkamahadevi Women University, Vijayapura from 5 – 7 January 2026.
4. "Connecting the Dots in Modern Librarianship: Integrating Education, Practice and Innovation" during the conference on 'Bridging the Gap: Connecting Practice, Education, and Innovation' held at the Documentation Research and Training Centre (DRTC), Indian Statistical Institute (ISI), Bengaluru from 11-13 March 2026.

Professional Activities:

Umeshareddy Kacherki

1. Member: "Committee for Selection of Citation Databases", Department of Higher Education, Ministry of Education, Govt. of India.
2. Member: "Shodhganga National Steering Committee (SNSC)", INFLIBNET Centre, An Inter University Centre of University Grants Commission, Gandhinagar, Gujarat.
3. Member: "Technical Committee, Documentation and Information, MSD 05", Bureau of Indian Standards (BIS), New Delhi.
4. Subject Expert: "Brainstorming session on the transformation of the Central Library, IIT Bombay, into a world-class academic library" organised by the Central Library, IIT Bombay, on 20 September, 2025.

5. Subject Expert: Served as a subject expert member on Selection Committees of various institutes for the recruitment of library professionals.
6. Member: “University Library Committee”, Symbiosis International, Deemed University, Pune.
7. Member: “South Asia Library Advisory Board (SALAB)”, Cambridge University Press.
8. Moderator: Panel discussion on “The Role of Libraries in Realising the Vision of NEP 2020: Best Practices” during a one-day online conclave on “Sustainable Development of Libraries Through Technology Integration in Alignment with NEP 2020” organised by JSS University, Noida, on 15 April, 2025.
9. Member: Panel Discussion on “Enhancing Library Experiences with Artificial Intelligence (AI)” during the international conference on ‘Changing Landscape of Science & Technology Libraries (CLSTL 2025), ‘ organised by IIT Gandhinagar, Gujarat, on 25-27 September, 2025.
10. Member: Panel Discussion on “The Competency Edge: Preparing for Library Careers” during the National Library Week, organised by IEEE on 18 November, 2025.

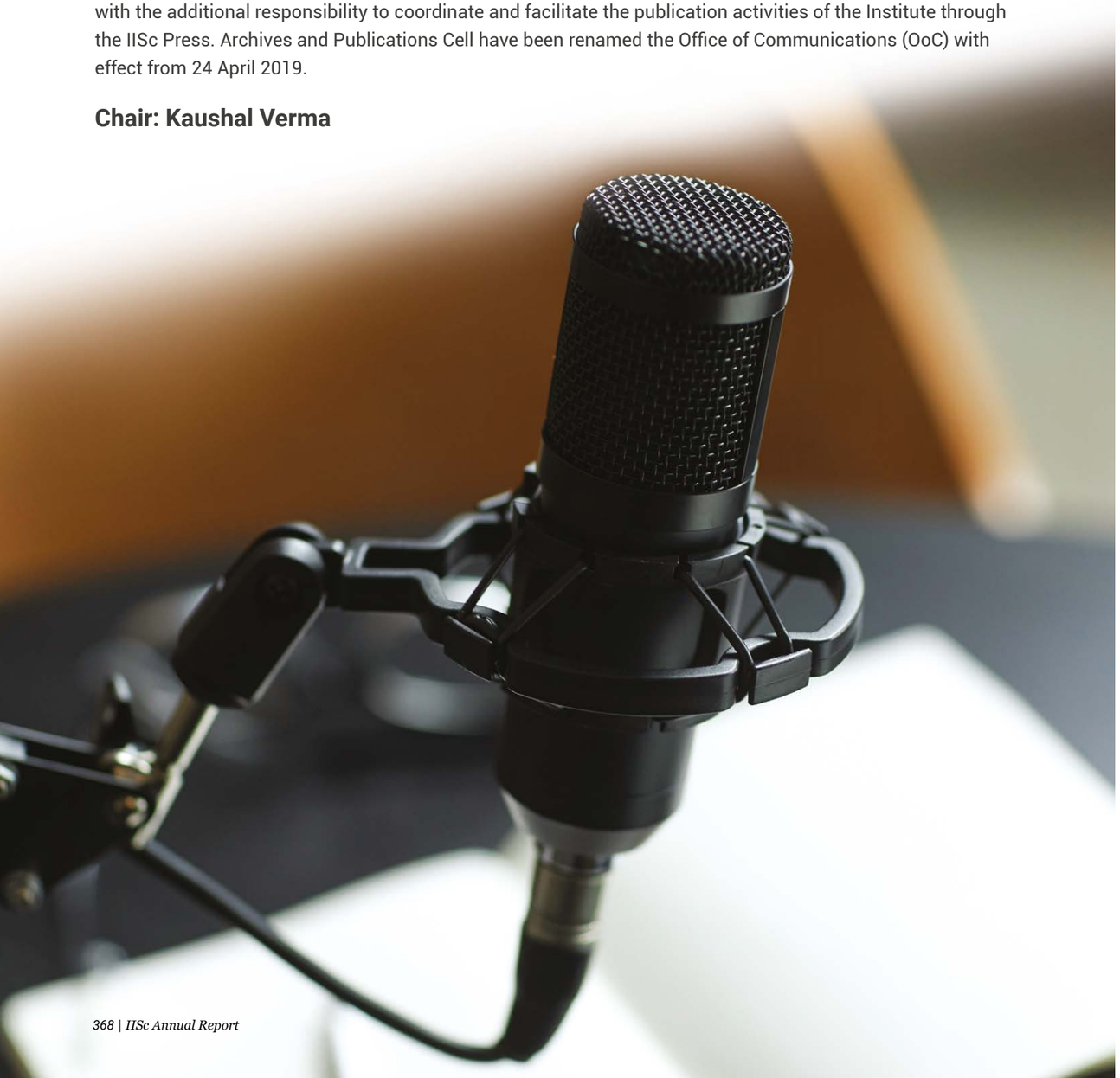


3.7.2

Office of Communications

The Archives Cell was established in 2007 with a mandate to collect, catalogue and preserve all documents, images, and other articles of relevance to the Institute. It became Archives and Publications Cell (APC) in 2008 with the additional responsibility to coordinate and facilitate the publication activities of the Institute through the IISc Press. Archives and Publications Cell have been renamed the Office of Communications (OoC) with effect from 24 April 2019.

Chair: Kaushal Verma



Some notable initiatives:

- OoC has extended the copy-editing services to the Institute community, students and faculty members for their papers, thesis, books, and so on.

- The office has established the Writing Centre to help and train students with academic writing.

  Tutorship: The Writing Centre appoints paid tutors (senior PhD students and postdoctoral researchers from IISc) who will contribute five to ten hours a week for a period of three months to assist with the activities of the Centre.

  Short Course: The Writing Centre offers multiple sessions of a short course for Master's, Integrated PhD and PhD students called *Writing for Researchers*.

  Undergraduate Course: The Writing Centre offers a course specifically for undergraduate students called 'Essentials of Research Communication'. The elective, offered in the seventh semester of the undergraduate programme, is designed to help students with their professional communications skills.

- **Workshop:** OoC also started a short-term science writing workshop through the Centre for Continuing Education.

Gifts and memento display and sale are one of the major tasks at OoC since from 2018. Alongside these, IISc merchandise is available which are open to public for purchase.

- **Courses Offered at the Office of Communications:**
  - The course CO 201 Art of Communication for Leaders is being offered through the Office of Communications which is a 2-credits course for UG, PG and PhD students. This is a course that upskills students in areas such as facing interviews confidently and expressing themselves clearly.
  - The course CO 203 Stars, Optics and Fun is a first-of-its-kind course at IISc is to provide students an opportunity to understand basic astronomy and basic techniques of astrophotography. It will also serve as a platform to get hands-on experience with a range of tools and techniques and an exposure to astrophotography.
  - The CO 204 Science Communication is being offered to both UG and PG students. The course comprises of skills such as pitching stories, conducting interviews, basics of science writing, writing news stories and short features, narrative writing, introduction to podcasting, editing, feedback, and refining drafts, exploring intersections of science and art, etc.
  - CO 301 History of science is about discussion of the methodological and ideological issues concerning how the history of science should be written and will focus on two topics: (i) the scientific revolution during the European Renaissance giving rise to modern science; (ii) the transmission of Western science to India during the colonial era.
  - **Philosophy of science:** After a brief overview of various philosophical schools that influence(d) the scientific enquiry, it shall focus on the following topics (i) Scientific methodology and inference, (ii) From computational science to the era of artificial general intelligence (iii) Science as a human endeavour: role of ethics, ideology, etc

- **Samvaada** is a new initiative that aims to provide an informal platform for IISc staff members to come together and share



something about themselves with a larger audience. A total of four sessions have been completed and the same are uploaded in the YouTube channel of Office of Communications.

- **IISc-Agastya Science Enrichment Programme 2026:** The IISc-Agastya Science Enrichment programme for school students (Class 11-12 students) was organised for the second time in the summer of 2025. It was envisaged as a short immersive programme that offered a range of activities (for the participating students visits to experimental facilities, interaction with IISc student clubs and finally, the short lab projects).

In-house publishing:
OoC is coordinating the overall publication process like copy editing, design and layout and printing of the in-house publications of the Institute to the following documents:

- Annual Reports (Hindi and English)
- Annual Accounts (Hindi and English)
- Court Report
- *Connect* (Quarterly magazine of IISc)
- *Journal of the Indian Institute of Science*: Quarterly (co-published by Springer)
- IISc Directory and Planner
- Student Information Handbook and Scheme of Instructions (Four-Year Bachelor of Science (Research) programme
- *Quarks* (A magazine of the undergraduate students)
- IISc note pads
- Faculty information handbook
- Student certificates and transcripts along with folders
- Medal certificates folders
- Faculty award certificates and special folders
- KERNEL (Monthly Newsletter of IISc)
- Translation of IISc Kernel Newsletter to Kannada and Hindi

PARASPAR Series:
Office of Communications, IISc started a Paraspar Talk series. This is a platform for conversations about knowledge systems, particularly science. During the past year, 12 lectures were organised.

IISc Press:
The following committee for IISc Press is continuing with effect from January 2017:
Chair: **Amaresh Chakrabarti**
Members: **Justin David, Arpita Patra, Mohit Kumar Jolly**
Ex-officio Chair, OoC:
Kaushal Verma

IISc Press was established in 2008, with a mission to bring quality books at affordable prices for helping Indian post-graduated education in science and engineering. Anurag Kumar was appointed as the first Chairperson of the IISc Press.

Besides self-publishing, IISc Press publishes a variety of books with its co-publishing partners, and brings out research monographs, collected works of distinguished scientists, lecture notes, textbooks, biographies, popular science books, general books, and other books.

The IISc Press has been publishing books in collaboration with World Scientific Publishing Company (WSPC) since 2008. IISc Press signed a co-publishing agreement with Cambridge University Press (CUP) in 2013 and with Taylor & Francis in 2022.

The series that are published with co-publishers are:

IISc PRESS – CAMBRIDGE SERIES
Cambridge-IISc
Research Monographs
Cambridge-IISc
Centenary Lectures
Cambridge-IISc
Lecture Notes

Other than co-publishing agreement, IISc Press has also published the following books under these series:

- *Geometry: Just beyond school texts* Second edition by AK Mallik
- *We May Not be Alone, Yet Alone* by Dileep Mampallil
- *Ecology, Evolution and Everything* by Kartik Shanker

JOURNAL OF THE INDIAN INSTITUTE OF SCIENCE:
The Director appointed a new committee for Journal with the external members w.e.f. 9 October 2018:

Editor-in-Chief: GK Ananthasuresh, P/Mech Engg, IISc
Executive Editor: Kaushal Verma, P/Mathematics | Chair, Office of Communications

Editorial Board
E Arunan
P/ Inorganic and Physical Chemistry (IPC), IISc
Rashna Bhandari
Centre for DNA Fingerprinting and Diagnostics (CDFD)
Madhavi Latha Gali
P/Civil Engg., IISc
Anil Kumar
Dept. of Chemistry, IIT Bombay
Prabal K Maiti
P/Physics, IISc
Biman B Mandal, Biosciences and Bioengineering, IIT Guwahati (IITG)
Sanjay P Sane, NCBS, Bangalore
Aravind Srinivasan, Department of Computer Science and UMIACS at UMD,
Rajesh Sundaresan, P/RBCCPS, IISc
Gaurav Tomar, AcP, Mech Engg, IISc
Leelakshi MV, Editorial Assistant

3·7·3

Office of International Relations

Considering that internationalisation plays a critical role in the global outreach of faculty, students and staff, the Office of International Relations (OIR) was incepted in 1998. It aims at strengthening the academic and research collaborations with existing partners as well as exploring the new connections, by supporting various international programmes and activities:

Former Chair during the reporting period: Ramray Bhat
Current Chair: Baladitya Suri (since March 27, 2026)



- Overall coordination of the admission of international students to various programmes [BS (Research), BTech, MTech/M Des/ MMgmt/MSc (Course), MTech and PhD (Research) and its wider advertisement through foreign consulates, partner institutes and Indian embassies abroad
- Facilitation of the international exchanges and visiting programmes to augment the cooperation in education and research at all levels: students, faculty and researchers
- Formulation of the Memoranda of Understanding (MoU) and agreements with the institutions abroad and their execution
- Coordination of the visits of international academic and diplomatic delegations to the Institute, and planning the Institute's high-level/ academic delegations to foreign universities to explore the potential collaborations and develop strategic relationship
- Identification of the Institutional-level areas of interest for collaborations through online surveys and supporting the scientific networking through joint exploratory workshops, seminars/webinars and informative sessions
- Providing all the possible support to international students, faculty and researchers, including the overall guidance for their visa application, campus accommodation and necessary formalities with the FRRO Bangalore
- Liaise between international students/researchers and their sponsoring agencies for the required support
- Organise annual orientation programmes for newly joined international students at the time of their admission and facilitate their networking by connecting them to the Institute' international students, OIR members and student community

The Institute of Eminence (IoE) status bestowed by the Government of India, has provided a strong impetus to further our internationalisation strategy and increase the number of foreign students and faculty on campus through various programmes. This includes the establishment of bilateral seed funds with selected partners to nurture the joint research proposals, joint PhD supervision and degree programmes, summer internships, study abroad programmes, visiting programmes for faculty, students and researchers from international universities etc.

Academic meetings and Delegations to the Institute:
OIR coordinates the physical and virtual meetings with academic universities, dignitaries and diplomatic staff across the globe, with an objective of identifying the areas of mutual or complementary interest and exploring the potential ways of new collaborations or strengthening the existing ones through strategic programmes/activities.

During the year 2025-26, we have coordinated a total of 170 meetings that included some of the high-level IISc visits by Jenny Dixon, Provost of the Universitas 21; Thu-Hua Liu, President of the Ming Chi University of Technology, Taiwan; Chris Hodges, Consul General at the U.S. Consulate General in Chennai; Kathrin Meyer, Head of Division, Federal Ministry of Research, Technology and Space (BMFTR), Germany; Rémi Quirion, President of INGSA and Québec Research Fund; Sunil Kumar, President of Tufts University, USA; Franziska Giffey, Mayor of Berlin; Didier Vanderhasselt, Ambassador of Belgium; Peter Varghese AO, Chancellor, University of Queensland, Australia; Johann Wadephul, Federal Foreign Minister of Germany; Horst Bischof, Rector, Technical University of Graz, Austria; Ushiki Tasuo, President of Niigata University, Japan; Kazuhiro Hono, President of National Institute for Materials Science, Japan; NAGATA Kyosuke, President of the University of Tsukuba, Japan; Silke Launert, Parliamentary State Secretary, Federal Minister of Research, Technology and Space, Germany; Gilles Alcaraz, New Director of CNRS Bureau in India; Lal Krishna KC, Board Member and Chairperson of the Executive Committee of the University of Nepal Ahmed Ali Alraeesi, Vice-Chancellor, United Arab Emirates University (UAEU); HE Friedrich Merz, German Chancellor (Prime Minister); Edward McCauley, President and Vice-chancellor, University of Calgary, Canada; Julian Rodríguez, Rector,

University of Austral, Argentina; Tunku Zain Al-'Abidin, son of the Rular Negeri Sembilan of Malaysia; Caroline Gutjahr, Director of the Max-Planck Institute of Molecular Plant Physiology, Germany; Hon'ble Andrew Barr, Chief Minister of Australian Capital Territory; Yassine Lakhnech, President of the University of Grenoble Alpes, France; Susan Martinis, Senior Vice Chancellor for Research and Innovation, University of Illinois at Urbana-Champaign, USA; Dick Schoof, Hon'ble Prime Minister of the Netherlands Esther Dweck, Brazilian Minister of Management and Innovation in Public Services (MGI) and Kakama Allen Joy, Commissioner, Ministry of Public Service, Government of Uganda.

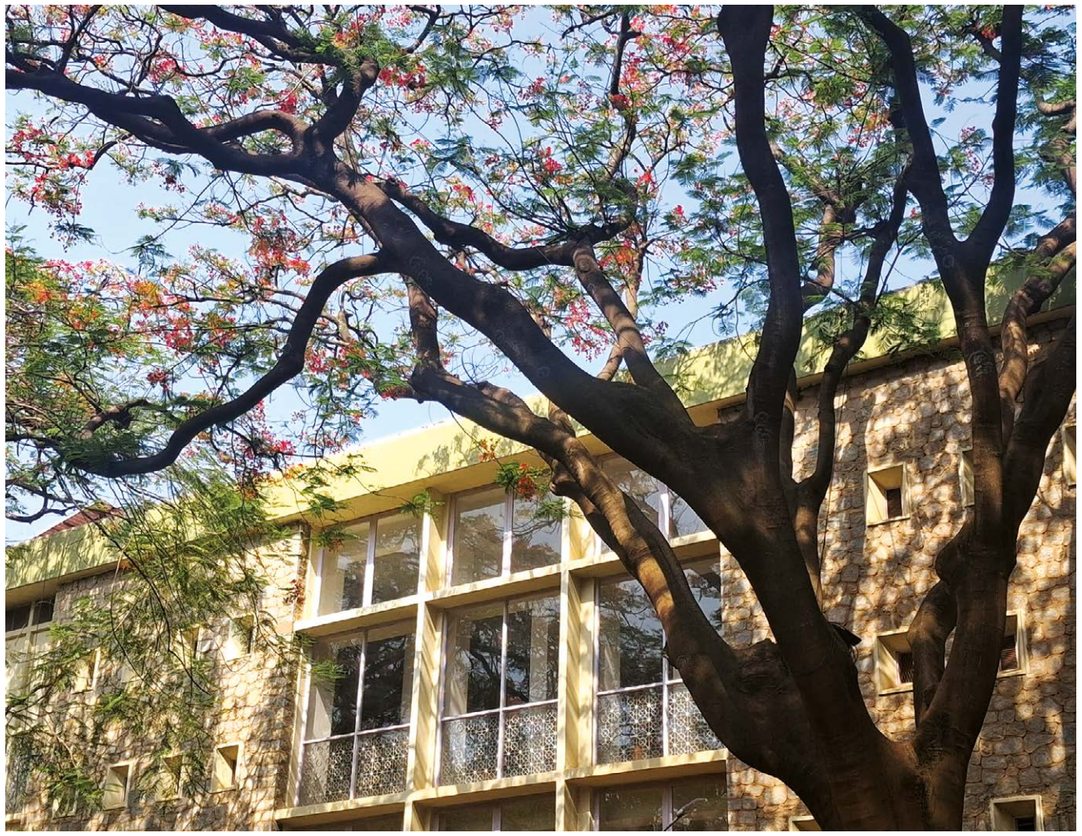
In addition, we had a pleasure to discuss the partnership opportunities with seven Brazilian universities, led by the Rector Luis Eduardo Bovolato (Federal University of Tocantins), Zvonimir Troskot, Member of Parliament at Croatia and a 33-membered business delegation, led by Melanie Leonhard, Senator of Hamburg, Germany. This may open several avenues of our cooperation with the universities and industries in Brazil, Croatia and Germany.

MoU/Agreements with Academic partners: IISc has numerous long-standing formal cooperation with top international universities/institutes that allows the academic members to explore possible collaborations in all areas of science and engineering. As on March 31, 2026, we have about 137 active MoUs and agreements that supports the academic and research cooperation through joint research collaborations, exchange of students, faculty and researchers and joint workshops/symposia.

During the reporting period, OIR has facilitated the formulation and execution of 44 MoUs/ agreements with global universities/institutions for enhancing the Institute' academic & research cooperation. Among them, the notable ones were the Educational Cooperation Agreement with the Ministry of Higher Education Science and Technology (MESCYT), Dominican Republic; Framework cooperation agreement with the Deutsches Elektronen-Synchrotron (DESY), Germany; Joint/Co-PhD Supervision Programme agreement with the Imperial College London, UK; Partner agreement for Educational Exchange with the Space Machines Company (SMC), Australia; Inter-Institutional agreement with the University Cote d'Azur, France; Joint PhD Collaborative research agreement with the University of Queensland, Australia; Agreement for Multidisciplinary International quality improvement through Joint PhD Supervision Programme with the Ministry of Education in Ethiopia that includes their 47 public universities; Cooperation Agreement for the Summer Study Abroad Programme 2026 at IISc with the Georgia Institute of Technology, USA and Joint Seed Fund Agreement with the University of Liverpool, UK.

Bilateral Workshops, Seminars and Informative Sessions: As done previously, OIR has been instrumental in coordinating several online/in-person exploratory workshops with international universities by identifying the areas of interests at both sides. It provided a common platform for understanding each other's research strengths and exploring the potential collaborative opportunities through individual meetings and in-depth discussions.

This year, we have been successful in facilitating six joint workshops, six webinars, seven technical talks and eight informative sessions, and explored the potential collaborative opportunities and knowledge sharing. These included the joint exploratory workshops/webinars with the Tufts University in Nutrition Science and Medicine, University of Saskatchewan in Energy, Biotech and One Health, University of New South Wales in Electrical, Electronics and Computer Science, Kyoto University in Ecological Sciences, High Energy Physics and Design, University of Liverpool in One Health; University of Oklahoma in Weather modelling, Brazilian experts in Artificial Intelligence and its applications. Furthermore, we hosted the "Swedish–India Strategic Water Collaboration" in association with IVL, Special conferral Prof S Ramaseshan Memorial Lecture by President Kazuhiro Hono of the National Institute for Materials Science and British Great Talks by



Christopher Hogg from the University of London.

Lastly, we coordinated several information sessions with our partner universities for our Undergraduate and Postgraduate students that included the University of Toronto, Kyoto University, Vanderbilt University, Rice University, Technical University of Munich and University of Cambridge.

Institute's Nomination Process for various International Opportunities: In addition to announcing the calls for various funding opportunities, OIR coordinates the Institute's nomination process for highly competitive scholarship programmes and opportunities for students and faculty members. During this period, OIR has processed the nomination for the following flagship programmes of partner universities:

- **Schmidt Science Fellows Programme 2026:** As a nominating partner, seven out of 18 PhD students were recommended for this prestigious programme, and one of our students, Vivek Jadhav was successful in receiving the fellowship for this year.
- **Kyoto University (KU-STAR) Programme 2025 and 2026:** Kyoto University offered the KU-STAR fellowship to two Master's students in summer 2025, while one Undergraduate (UG) in 2026.
- **Walter and Eliza Hall Institute of Medical Research (WEHI)' InSPIRE Programme 2025:** Two out of four IISc-UG students were awarded this fellowship and they successfully completed their internships in summer 2025.
- **Université Polytechnique Hauts-de-France** selected one of our PhD students for the research internship for six months under the collaborative research (Sept 2025 to March 2026).
- **University of Toronto:** Under the Fields-Mitacs Undergraduate Summer Research Programme (UGSRP), three out of five

nominated students were successful in securing the prestigious summer research fellowship.

- **Cornell University:** Two out of four IISc-UG students got an offer for the Cornell' Summer Research Academy 2026 with the complete fee waiver.
- **University of New South Wales (UNSW):** UNSW has selected five out of eight IISc students for their Global Taste of Research – India Summer Practicum Scholarship Programme.
- **National Institute for Materials Science, Japan:** Under the IISc-NIMS International Cooperative Graduate Programme 2026, one of our PhD students got selected for the advanced collaborative research training at NIMS.

In addition, we have nominated students for the Nanyang Technological University Singapore' Global connect programme in 2026 (6) and 2027 (12) and Ecole Polytechnique' International Talent Research Programme 2025 (5).

Joint funding and visiting programmes with Strategic Partners: Like previous year, we continued to work with our selected partners under the joint supervision/degree programmes for strengthening the collaborative research. Here, we had run this programme successfully for the third time and recruited a total of 11 so far. This year, we have entered into the Joint Supervision Programme with the Adelaide University and selected two students from each institution for the 2025-26 annual call.

At the faculty level, our four academics were successful in acquiring the Imperial College London' Global Faculty Fellowship Mini Visits Programme, while four secured the spots for Florida State University' Visiting scholars' programme in 2026.

International Students, Faculty and Visitors at IISc:
Full-Time International Students: As on March 31, 2026, IISc has about 94 full-time foreign students from different parts of the world. The Institute offers its highly competitive international programmes in Course and research that leads to BS (Research), BTech (Math & Computing), MTech (Course & Research) in Engineering and Doctoral (PhD) degrees in Science and Engineering.

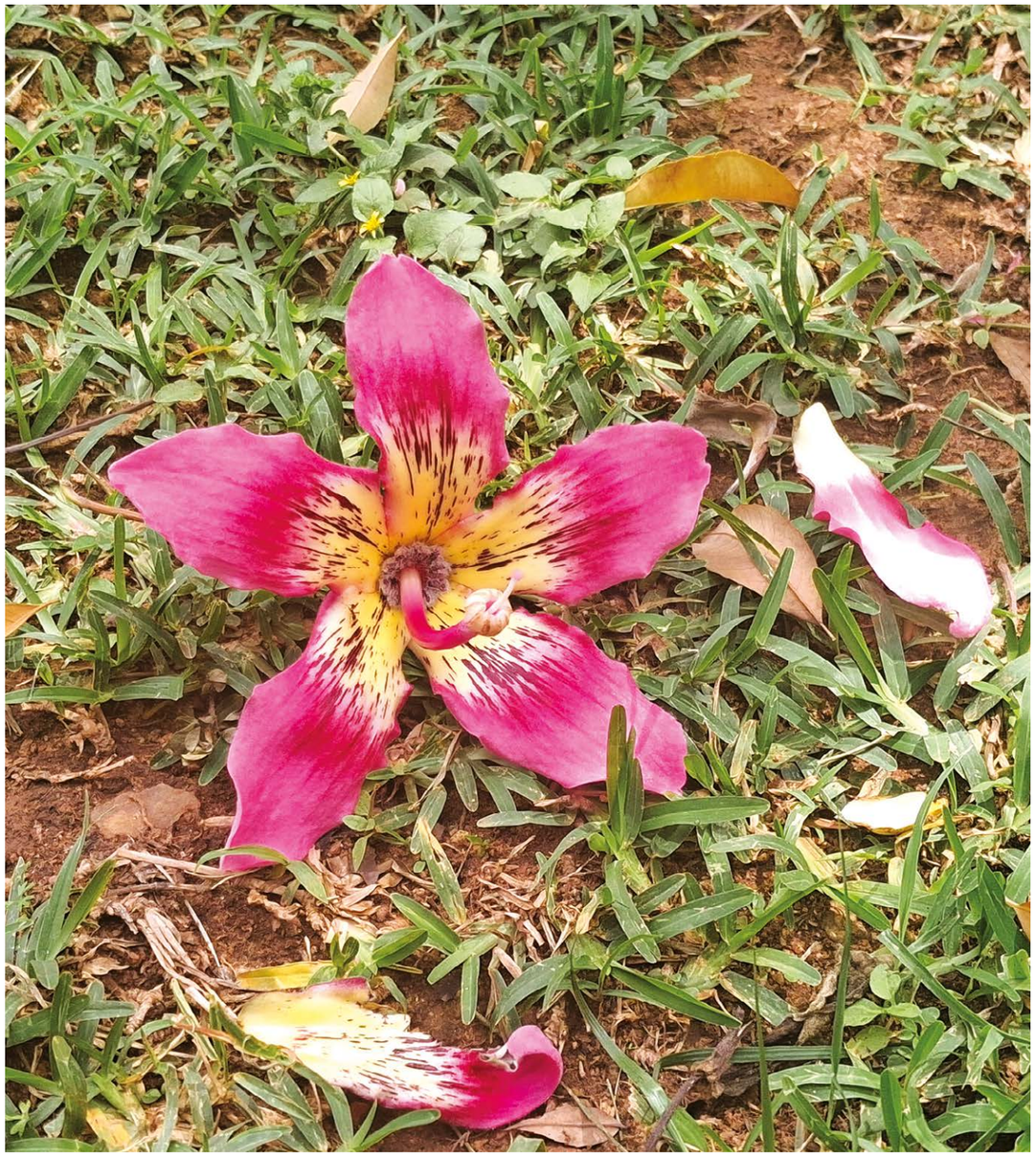
Annual Admission for the academic year 2025-26: During the reporting period, OIR has facilitated the admission process of international students for the postgraduate Course (MTech/MDes/MSc/MMgmt), Research (MTech and PhD) and Undergraduate programmes (BS-Research, BTech-Math and Computing) for the academic year 2025-26 and received a total of 373 applications (230 PG and 143 UG). All the applications were segregated and forwarded to the concerned departments, where 33 departments have participated in the screening and interview process (both online and In-person). Out of 151 shortlisted candidates, 31 (26 PG and 5 UG) were offered admission.

An orientation programme was hosted in August 2025 for the newly admitted international students, to welcome them formally and introduce them to the institute, on-roll students and OIR committee/staff. It also aimed at helping the new students to connect with the existing students and give them a sense of belonging to the Institute.

Mid-year PhD admission AY 2025-26: We have received a total of 94 applications, and eight departments have participated in the screening process of 6 out of 46 candidates. Out of which, two joined the Institute in January semester.

Towards the end of year 2025, we hosted a Get-Together for all the full-time and short-term students on campus light interactions, fun games and Hi-tea. It also served as a way of connecting with our international community outside the office.

Short-Term Students/Visitors: IISc has always embraced the importance of short-term international visitors. It provides a stimulating international environment and exchange of best ideas and practices. Majority of our short-term students come with secured funding, which are often sponsored, co-developed by their IISc faculty host or Institute' short-term visiting programmes. During this period, about 572 students, researchers and faculty members have visited



or are presented at the Institute for collaborative research and discussions from various universities/institutes around the world. These include the visiting scientists, fellows or postdoctoral researchers from Australia, Bulgaria, Canada, China, Ethiopia, France, Germany, Indonesia, Italy, Japan, Nepal, Nigeria, Norway, Poland, Serbia, Singapore, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, UK and USA.

During this duration, we continued our global engagements by hosting a group of 25 undergraduate students, along with their faculty mentors from Niigata University at the Centre for Earth Sciences under Inter-University Exchange Project and a group of 8 undergraduate students and faculty mentors from the Princeton University at the Centre for Ecological Sciences under their *'Summer Study Abroad programme 2025'*.

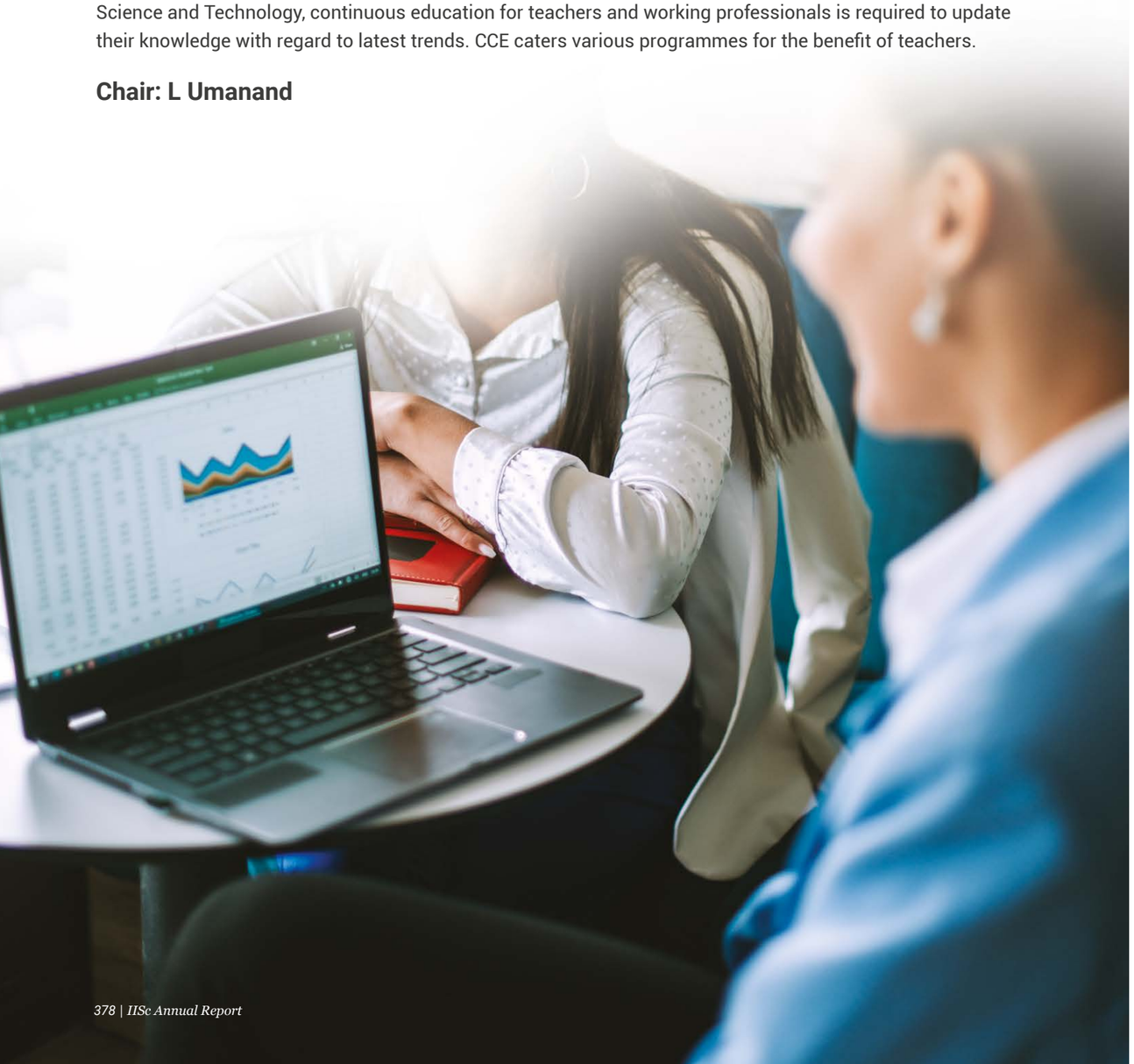
In the coming years, we look forward to working towards expanding these programmes through focused joint activities and strategic global networking.

3.7.4

Centre for Continuing Education

The Centre for Continuing Education (CCE) has been rendering and organising several refresher/specialised courses for teachers/working professionals from different target groups ranging from high school science teachers to research Scientists/Engineers of the Industries/Institutions. In view of rapid advancements in Science and Technology, continuous education for teachers and working professionals is required to update their knowledge with regard to latest trends. CCE caters various programmes for the benefit of teachers.

Chair: L Umanand



Programmes conducted during April 2025 – March 2026 is given below:

SUMMARY OF PROGRAMMES

Sl.No.	Programme Type	Details	Students/Participants benefited
1.	National Programmes	a) QIP: Degree programme PhD	1
2.	Industry Oriented Programmes	a) CCE - Proficience: **29 Semester courses**	1250
		b) Industry sponsored short term /full term courses : **58 Self Support Courses**	1234

Programmes in detail

1. National Programmes:

a) QIP (Quality Improvement Programme)

Programmes Leading to Award of Degrees:

During the current year, under this programme, only one student was admitted for PhD

During the year 2025 - 2026	At IISc (PhD)
Students admitted	1
On Roll	10

Industry Programmes:

a) CCE – Proficience Programme: The programme is the first of its kind and unique in India. Under the CCE - Proficience programme in two semesters during the year 2025-26, 29 courses were conducted, students/ professionals attended and completed the programme. Under this programme, a sum of Rs. 1,98,63,288 has been received, towards application and course fee.

b) Self-supporting Courses: CCE organises various refresher programmes to enable the participation of Scientists and Engineers working in different organisations. During the year, 58 such courses were organised from different organisations with a total participation of 1234. Under this programme a total sum of Rs. 11,80,13,901 has been received as overheads to the Institute.

c) Curriculum Development Cell: The Curriculum Development Cell provides financial assistance for book writing, Preparation of Laboratory Manuals, Holding of Conference, Workshops, Seminars, Special Lectures and Panel Discussions, for the preparation of monographs and audio-visual aids for teaching etc. Since 1979, the Centre has provided financial assistance for 101 faculty members for book writing, out of which, 56 books have been published/completed. CCE is using CCE-FACE funds for this purpose.

3. Extension Lecture Programme: This programme is also unique in the country. Under the Continuing Education Programme, Extension Lectures have been organised by the Institute faculty since 1990 in institutions of higher learning at the technical level, in Engineering and science colleges and in schools, public/cultural organisations, Doordarshan and All India Radio at the popular level. These extension lectures are expected to be of great help in the transfer of information on the latest scientific developments in this Institute and other organisation in India and abroad.

These lectures are arranged not only in Bangalore, but also in centres in the entire state of Karnataka and sometimes even outside the state. Even though the majority of these are in English, lectures are also arranged in regional languages like Kannada, if specific requests are received.

Extension Lecture Programme with GATE-JAM 2025-26

Faculty members from Institute were encouraged to participate in

the Extension Lecture Programme during their visit to different Institutions for GATE-JAM DUTY. 55 faculty members were involved in providing Extension Lecture with this initiative. Many of these lectures were supported by demonstration, slides, and models.

4. Hoysala Guest House:
Centre for Continuing Education runs a Hoysala Guest House named after the famous Hoysala Dynasty, which ruled ancient Karnataka. It has 60 self-contained and fully furnished single rooms. These are mainly intended for accommodating the participants of the programmes conducted by CCE like short term courses and invitees to the Institute. During this year, revenue of Rs. 89,91,570 was received through Hoysala Guest House.

NEW INITIATIVES AT CENTRE FOR CONTINUING EDUCATION

MTech Online programme:
MTech Online programme was introduced in the year 2021 and in the present academic year 24 courses were offered with 716 enrolments and under this programme, a total sum of Rs. 13,37,39,100 has been received as revenue to the Institute:

Critical thinking in English Workshop series for Institute students:

- A new course on English language usage has been introduced for improving the proficiency of regular students by external language expert.

- It was an eight-week course which was conducted every Saturday with 21 enrolments in Batch 1, 24 in Batch 2, 26 in Batch 3 and 18 in Batch 4 (10 weeks) respectively.



3·7·5

Office of Development and Alumni Affairs

The Office of Development and Alumni Affairs (ODAA) was established at the Indian Institute of Science in 2015 to build a vibrant Industry-Institute-Alumni ecosystem, and raise funds for various special projects from corporates, philanthropists and alumni. In addition, the Office of Development and Alumni Affairs provides support for alumni-related activities and engagement programmes at the Institute.

Chief Development Officer	Ishwar Poojar
Development Officers	Sooraj Ravindran
	Tanveer Sayeed
	Laavanyaa
Alumni Relations Officer	Atrayee Bhattacharya
Donor Relations Manager	Arushi Jain
Technical Designer	Megha Ramachandra
Projects and Administration	Sheshagiri Rao
Programme Assistants	Annie Sunil George
	Amala S
Secretarial Assistants	Prashanth M
	Minhaj Sahar
	B Bhagyashree

Chair: KJ Vinoy



Student Affairs

ODAA manages a comprehensive ecosystem of student support initiatives designed to nurture academic excellence and global research engagement across all levels of study.

- This support includes a wide array of endowed **fellowships** for undergraduate, Master's, and PhD students – many specifically targeting women in STEM – which provide essential financial resources for groundbreaking research.
- Beyond base funding, ODAA oversees numerous **student awards** and prestigious **medals** that recognise outstanding research contributions and academic merit in specialised fields ranging from Space Science to Artificial Intelligence.
- Furthermore, the office actively facilitates global exposure through **travel grants**, which allow senior research scholars to present their work at international conferences.

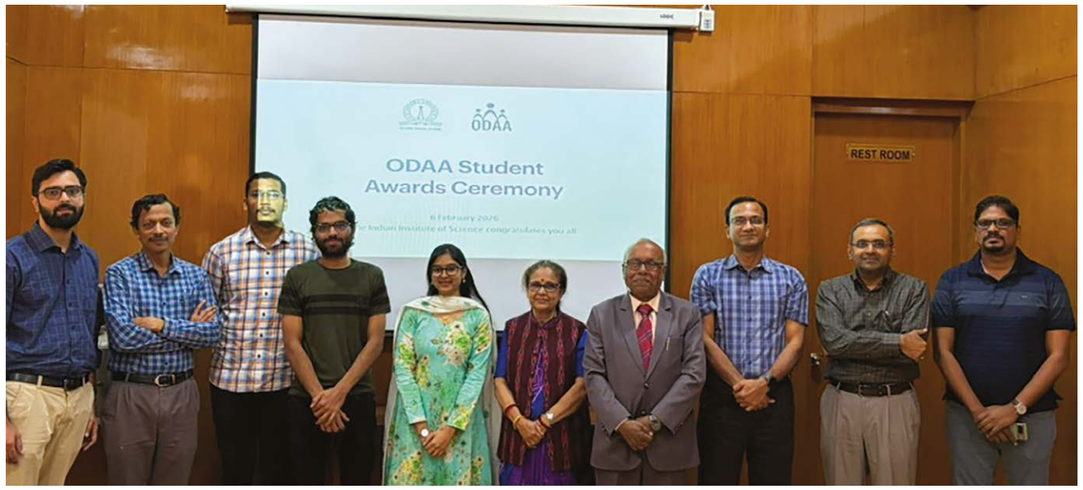


Sony India Software Centre Women MTech Fellowships 2025-26

Structured efforts to disburse funds efficiently led to over 225 students receiving fellowships and travel grants across various academic programmes. New student fellowships were initiated by Tenneti Chandrakaladhara Rao and Vijayalakshmi Endowment, Sycamore Informatics, SquarePoint Foundation, Synchronoss Technologies, Accelequant, Shraman Foundation across various programmes, in addition to pre-exiting fellowships. Other alumni funded student support initiatives are mentioned in the section below.

	BSc and BTech	MTech and MSc	PhD
Fellowships	56	94	17
Awards	3	5	10
Medals (during 2025 convocation)	3	6	2
Travel Grants	2	0	7

New Initiatives facilitated by ODAA



Combined ODAA Student Award Ceremony





ODAA continues to drive transformative growth at IISc through a variety of impactful initiatives, from supporting new infrastructure and research grants to launching community-focused programmes.

- **K Subramonian Centenary Memorial Building** (Biological Sciences Annexe), with support from the Lakshan Foundation, was inaugurated on 26 September 2025 at IISc to house labs and facilities belonging to the Division of Biological Sciences, specifically the Molecular Biophysics Unit (MBU), as well as other research facilities in the division. Spanning a total area of 5,882 square metres, the building includes 15 laboratories, 9 central equipment rooms, 1 lecture hall, and 4 conference/ classrooms. The researchers who will benefit from this building include 13 faculty.

- **WIN Centre of Excellence** set up by Wadhwani Foundation, it will support innovation and translating multidisciplinary research into new products and startups in broad areas of Artificial Intelligence, Semiconductor Technology, Quantum Computing/ Advanced Computing, Bioengineering and Healthtech, Biotechnology and Synthetic Biology.

- ANZ Group Capability Centre inaugurated the 88-seater **ANZ Lecture Hall** at the Chemical Sciences Building, IISc. The ANZ Lecture Hall will support academic programmes, lectures, and student engagement within the Chemical Sciences, contributing meaningfully to IISc's mission of advancing science and education.



ANZ Lecture Hall

- **EkStep Foundation's** Support for Research at the Centre for Neuroscience Department. The research aims to gain a deeper neuroscientific understanding of reading in children, which can potentially inform language teaching and learning processes, practices, solutions, school-based interventions, and policy.

- **Mass Spectrometry Facility** established by Kris Gopalakrishnan and Pratiksha Trust under the Longevity India initiative at IISc. The contribution will enable state-of-the-art infrastructure to generate the highest quality omics data essential for advancing aging and longevity research.

- **City-Scale Multi-Modal Mobility Demand Modelling (M3DM)** project established by Bosch India in collaboration with IISc to create sophisticated modelling tools and software which aid in effective decision-making processes to support in addressing Bengaluru's urban mobility challenges.

- **Cybersecurity Education for STEM** faculty across India IISc in partnership with British Telecom Group, via British Asian Trust India aims to train faculty members on cybersecurity.



Cybersecurity Education for STEM

- Mrs Dharma Rajaraman has supported the establishment of the **Prof V Rajaraman Memorial Lectures,** an endowment fund in memory of her husband, V Rajaraman, ex-professor of Supercomputer Education and Research Centre (SERC), IISc. These funds are to be utilised for the arrangement of an annual lecture at SERC and any remaining balance is to be distributed as cash awards to deserving students within the BTech (Mathematics and Computing) programme.

- **Groww CeNSE Semiconductor Skill Development Programme** has been established with the objective to encourage girls to pursue the deep science area of semiconductor technology, it has three sub-programmes: Akanksha – STEM for Girls (11th Grade), Women in STEM – Research Experience Programme (UG/PG) and Research internship programme for students graduating from the Ministry of Tribal Affairs skill development programme.

- **Volvo supports Road Intelligence Infrastructure:** This initiative builds a real-time, data-driven ecosystem – integrating large-scale datasets and ML models – to track highway hazards and traffic geometry. By providing a unified platform for manufacturers, fleet operators, and government bodies to share crowdsourced information, the project aims to significantly enhance safety for heavy vehicle drivers and all road users across India.

New Chair Professorships

- **Nokia Chair Professorship** awarded to faculty conducting frontier research in the broad area of Artificial Intelligence and Communications in the Division of Electrical, Electronics and Computer Sciences.
  2025 Awardee: Chandra R Murthy, Dept of Electrical Communication Engineering.

- **The Prof V Rajaraman Chair Professorship on Information and Computation Sciences** for Professors of the Institute has been established to promote research excellence in relevant departments in IISc (departments under EECS division and other departments such as CDS, SERC, RBCCPS etc), honouring the distinguished academic contributions of V Rajaraman, who taught and had a great influence on Rajagopalan Srinivasan (ME 1988 (ECE)), who has established this chair professorship.

- **Lt Prof PC Guha Chair Professorship:** Subrata Mitra, a partner at Accel India has established a new Chair Professorship in Honour of Lt Prof PC Guha at the Tata IISc Medical School.

- **Usha and SR Venkataramana Chair on Computational Endocrinology and Chair on Nephrology** by IISc alumnus SR Venkatramanan and wife, Usha Venkatramanan established at the Tata IISc Medical School.

- **PFI Chair Professor** on Energy Independence supports faculty carrying out research in the area of 'Technologies in the Power Sector promoting Energy Independence'.
  2026 Awardee: Vinod John, Dept of Electrical Engineering



- Triveni Turbine Limited and IISc signed an MoU in November 2025, to establish the **Dhruv Manmohan Sawhney Turbomachinery Chair Professorship** at the Institute. The Chair Professorship will support faculty members in carrying out teaching and research in the areas of thermal engineering, metallurgy and energy transition and efficiency, and so on.
  2026 Awardee: Gopalan Jagadeesh, Dept of Aerospace Engineering



2025 Awardee	
1983 Batch Alumni Prof BS Sonde Chair in EECS Division	Shalabh Bhatnagar, Dept of Computer Science and Automation
Shriram Group RT Chair in Computational Mechanics	GK Ananthasuresh, Dept of Mechanical Engineering
BIS Standardisation Chair Professorship	Ashok M Raichur, Dept of Materials Engineering

Alumni Relations

ODAA acts as a bridge that connects IISc alumni to their alma mater. The alumni engagement efforts initiated by ODAA continue steadily. 2025 saw the establishment of two new portals – an exit form portal that students are required to fill out before they graduate from the Institute that captures extensive details about their academic journey at IISc. The second portal is a simple form that allows the creation of updated Alumni Digital cards easily.

Alumni Contributions

Alumni and other well-wishers have continued to come together in large numbers to support IISc's mission.

- **Rajagopalan Srinivasan** has funded a diverse range of institutional upgrades and academic honours across several departments at the Institute. At the broader Division of Electrical, Electronics, and Computer Sciences (EECS) level, he has established the **Prof V Rajaraman Chair Professorship on Information and Computation Sciences** for Professors of the Institute to promote research excellence in relevant departments in IISc (departments under EECS division and other departments such as CDS, SERC, RBCCPS etc), honouring the distinguished academic contributions of V Rajaraman. He has also supported various initiatives in three departments of IISc – Electrical Communication Engineering (ECE), Supercomputer Education

and Research Centre (SERC) and Computer Science and Automation (CSA). He has established the **Rajagopalan Srinivasan Medal at ECE** which is awarded annually to a student pursuing PhD programme, broadly in the areas of high-frequency circuits and systems (which includes antennas and electromagnetics, circuits, photonics, and devices).

- **Manorama and Sitharama Iyengar Lecture Series** in Interdisciplinary Science by SS Iyengar (ME, 1970).



- **Class of 1967 BE IISc Endowment:** Lecture Series and Travel Grant for students from EE/ECE/Materials Engineering departments at IISc.



- Gowramma and Ubrani Venkateshiah Travel Grant for Science stream and the Smt. Sharada and Sri SK Ramanna Travel Grant for Engineering stream established by **Ubrani Venkataram** (OC, 1980) and his wife for UG students.



- The 1980-83 Bachelor of Engineering (BE) batch of IISc has made history by establishing the first-ever Chair Professorship funded by a batch of alumni. The **1983 Batch Alumni Prof BS Sonde Chair** has been established to promote excellence in the EECS division at IISc, honouring the distinguished academic contributions of BS Sonde. The cohort has also come together to set up a fund to aid in travel support for students from the Materials Engineering department.

- Rekha and Braja Narayan Das Student Travel Grant by **Braja Narayan Das** (ET, 1954) and Rekha Das.

- **1975 BE EECS Batch Fellowships** for students in the Bachelor of Science (Research) and BTech (Mathematics and Computing) programme and for funding UG student travel.

- **Prof Rajeshwari Chatterjee Scholarship** by 1971-74 Batch Alumni to the most deserving BE students.

- Prabakar Family Foundation Early PhD Awards by **Prabakar Sundarrajan** (1981) for second year PhD students at the CSA Department and more recently established, for second year PhD students at the ECE Department.

- Prof M Narasimha Murty Medal by **Siddanagouda Patil** for the highest academically scoring students in the BTech Mathematics and Computing programme.

Annual Alumni Reunion 2025

The Annual IISc Alumni Reunion was held from 19–21 December. Highlights of day one included talks on translational healthcare diagnostics, responsible AI for population-scale healthcare, and innovations in telecom diagnostics, followed by a panel on India in the Second Space Age featuring experts in aerospace and satellite technology. On day two, sessions on AI in Science and Engineering covered molecular AI, materials engineering, education, and industry trends, culminating in a talk by Young Alumni Medalist Anjani Priyadarsini on accelerating R&D with quantum computing. The Distinguished Alumnus/ Alumna Awards and Young Alumni Medals ceremony honoured five distinguished alumni (B Dattaguru, Murthy Gudipati, Sharmila Mande, Suman Chakraborty, and V Muralidharan) and three young leaders (Anjani Priyadarsini, Arpita Biswas, and Pranesh Padmanabhan) recognising their global contributions to science, technology, and society.











Tata IISc Medical School

IISc is setting up a multi-Speciality, not-for-profit Bagchi-Parthasarathy Hospital along with the IISc Medical School within its Bengaluru campus. The academic centerpiece of this initiative will be an integrated dual degree MD-PhD programme aimed at creating a new breed of physician-scientists, who will pursue careers in clinical research to develop novel therapeutics and healthcare solutions, driven by a bench-to-bedside philosophy. They will simultaneously be trained in the hospital as well as in the science and engineering laboratories at IISc.



New contributions

1. REC Ltd Funds Key Equipment for Robotic Surgery:
REC Limited has committed CSR support to fund specialised equipment in robotic surgery at the upcoming Tata IISc Medical School.

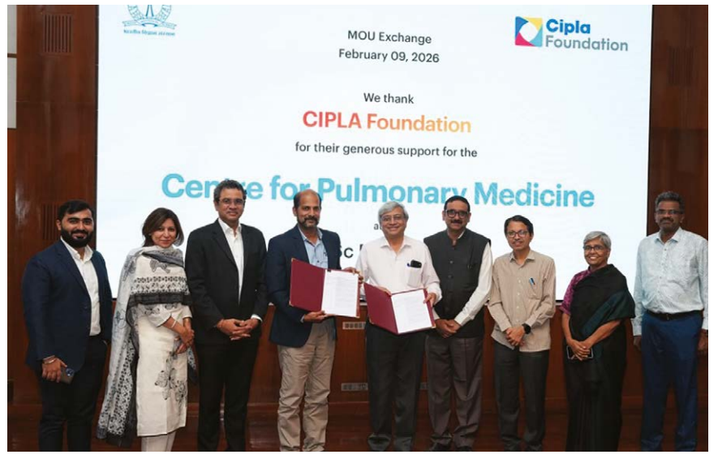
The Robotic Surgery specialty at the upcoming Tata IISc Medical School will aim to achieve two key objectives:

- Providing advanced, minimally invasive surgical care for patients with complex clinical conditions that are either inaccessible or difficult to treat through open methods
- Offering hands-on training for postgraduate doctors in the use of sophisticated robotic surgical systems for precision procedures

2. NTPC Centre for Advanced Neurosurgery: at the Tata IISc Medical School has been established with generous support from National Thermal Power Corporation (NTPC) Limited under its Corporate Social Responsibility (CSR) initiative. The centre addresses India's critical gap in advanced neurological care by combining cutting-edge neurosurgery, research, and rehabilitation to tackle the nation's growing burden of neurological disorders.



3. Cipla Foundation sets up Centre for Pulmonary Medicine to Advance Respiratory Care & Research: The Centre will support the development of India-specific guidelines for Chronic Obstructive Pulmonary Disease (COPD), Interstitial Lung Disease (ILD), and asthma, alongside research in biomarkers, pharmacogenomics, AI-based lung diagnostics, and therapeutics. The Centre will also train pulmonologists and allied specialists, promote knowledge sharing through workshops and global collaborations, and drive community programmes on early screening, air quality awareness, smoking cessation, and preventive lung health.



4. Lt Prof PC Guha Chair Professorship: Subrata Mitra, a partner at Accel India has established a new Chair Professorship in Honour of Lt Prof PC Guha at the Tata IISc Medical School.

5. Chair Professorship set up by Alumnus SR Venkatramanan and wife Usha Venkatramanan: The endowment will support, in perpetuity, young faculty members at the Assistant Professor level working on cutting-edge medical research, specifically in areas related to endocrinology and nephrology, with the goal of developing solutions for curing type 1 diabetes in children and to prevent or reverse kidney impairment, to avoid or reduce dependency on dialysis and improve the quality of life for the people affected by kidney disease.



6. Interdisciplinary Centre for Nutrition Science and Medicine: IISc and Tufts University have come together to establish the Interdisciplinary Centre for Nutrition Science and Medicine (ICNSM), which will be housed within IISc and co-directed by the Dean, Division of Medical Sciences at IISc and Christina Economos, Dean Friedman School of Nutrition Science and Policy, Tufts University. Vision: To transform the future of health by integrating nutrition science and medicine to inspire global change.

3.7.6

Intellectual Property and Technology Licensing

Chair: Suryasarathi Bose



1. Department Profile

IPTeL (Intellectual Property and Technology Licensing) is the Institute's gateway to filing for intellectual property protection and technology licensing. The mandate of this office is to ensure that the knowledge being generated at the Institute is protected and then leveraged, by responsible licensing, for the benefit of the Institute and thereby to the society at large. IPTeL strives to enable rapid filing for IP protection, so that it does not unduly delay the submission of results to academic journals.

The activities at IPTeL thus fall in two large buckets. One is IP management that includes all the processes from IP disclosure by IISc staff and students to maintaining the patent till its point of expiry. Two, licensing of the IP so generated in the form of know-how and patents. During the calendar year 2017 IPTeL embarked on the process of automating the IP management system, so that more emphasis could be placed on licensing. Towards this end, IPTeL had planned to increase its interface with industry by various licensing modes. From the year 2017 onwards, IPTeL had worked towards testing and getting the IP Management software (ProrIISe) at IPTeL up and running, which was successfully launched in April 2021.

During the year 2025–26, IPTeL focused on the overall strengthening of IP-related activities at IISc. Key initiatives included organising inventor meetings, promoting IP awareness among internal departments and educational institutions across the state, filing and prosecuting patent applications, and advancing the commercialisation of technologies. IPTeL also collaborated with the Department of Higher Education, Government of Karnataka, the Karnataka State Council for Science and Technology (KSCST), and the Bengaluru Science Cluster (BeST) to foster an IP ecosystem in government engineering, degree, and diploma colleges across the state.

As part of these efforts, IPTeL conducted and participated in 27 programmes and events across various platforms. These covered a wide range of topics, including research methodology, intellectual property rights (IPR), entrepreneurship, and skill development related to IP creation and commercialisation.

In 2025–26, IPTeL achieved significant milestones, including the filing of approximately 215 patent applications, with 184 Invention Disclosure Forms (IDFs) received. Additionally, 164 patents were granted during the year. Detailed information on IP prosecution is provided in the basic IP portfolio index.

1. IP Awareness/Workshops Programmes

Sl.no	Year	Description of the Programme	Association with / Host organisation	Date
1	2025	Regional Level One-Day Workshop on Intellectual Property Rights (IPR)	Government First Grade College, Tumkur	7 May 2025
2	2025	2-Day Advanced Workshop on Technology Transfer	Entrepreneurship Development Center Venture Center (Registered Trademark), Pune	17 & 18 June 2025
3	2025	IISc UG Orientation Programme - IPTeL	Indian Institute of Science (IISc) & FSID	24 July 2025
4	2025	One day workshop on IPR	Government First Grade College Devanahalli	28 July 2025
5	2025	3 Day FDP IP & Entrepreneurship	Navkis College of Engineering, Hassan	31 July, 1 & 2 Aug 2025
6	2025	Technology Readiness Level (TRL) Assessment Programme	JSS Academy of Higher Education & Research (JSSAHER).	23 Aug 2025

Sl.no	Year	Description of the Programme	Association with / Host organisation	Date
7	2025	Three-day Certificate Programme on “Intellectual Property Rights	Karnataka Science and Technology Academy (KSTA) GoK	10-12 Sep 2025
8	2025	"IP Session for Cyber Security startups	CySeck GoK & IISc	17 Oct 2025
9	2025	State level CME on "Intellectual Property Rights - Innovation Secured, Ideas Protected"	Sri Devaraj Urs Academy of Higher Education and Research, Kolar	7 Nov 2025
10	2025	10th Cohort - IP & Entrepreneurship	NaaViC ICAR -NIVEDI Bengaluru	25 Nov 2025
11	2025	Seminar on Intellectual Property Rights (IPR)	RR Institute of Technology, Bengaluru	28 Nov 2025
12	2025	One day National Level Webinar on IPR and Innovation	Government First Grade College Vijayapura (Online)	5 Dec 2025
13	2025	4th Online Bootcamp Sessions on Intellectual Property	Bharat Innovates MedTech and Healthcare Theme (FSID)	15 Dec 2025
14	2026	Patent Drafting Filing and Commercialisation	The Oxford Coll of Engineering and VTPC Bengaluru	24-25 Jan 2026
15	2026	Awareness on Intellectual Property Rights (IPR)	MSME - Kammgonadnahalli Small Industry Association	30 Jan 2026
16	2026	Workshop on IPR	NaViC ICAR -NIVEDI Bengaluru	13 Feb 2026
17	2026	Awareness on Intellectual Property Rights (IPR)	MSME and Bidadi Industrial Associations	17 Feb 2026
18	2026	Basic and Intermediate Level Training Programme on Intellectual Property Rights	KSCST, IPTeL IISc and BeST	16-20 Feb 2026
19	2026	Awareness on Intellectual Property Rights (IPR)	MSME - Malur Industrial Association and Dr. TTIT KGF	25 Feb 2026
20	2026	Workshop on IPR	Govt. Degree College, Chintamani	26 Feb 2026
21	2026	IP mining event	Government Engineering College, Talakal, Koppal	27 Feb 2026
22	2026	Advanced Level Training Programme on Intellectual Property Rights	KSCST, IPTeL IISc & BeST	2-6 March 2026
23	2026	IP mining event	Government Engineering College, Kushalnagara, Kodagu	9 March 2026
24	2026	IP mining event	Government Engineering College, K R Pete, Mandya	11 March 2026
25	2026	IP awareness Programme	DCTE - Govt Womens College Bangalore	12 March 2026
26	2026	IP awareness Programme	GEC Mosalehossalli, Hassan	13 March 2026
27	2026	IP awareness Programme	GFGC Whitefield (online)	15 March 2026

2. *Patent Licensing*

IPTeL is increasingly engaged in licensing activities and facilitating the transfer of technologies to industry partners. During the year 2025–26, IPTeL successfully executed licensing agreements with 13 companies, resulting in the licensing of a total of 19 intellectual properties (IPs) to these organisations.
The list of companies is provided in the accompanying table for reference. A representative sample of these engagements is outlined below.

Sl.no	Name of the Company/Industry	Patent/ Technology
1	Biocon Biologics UK Limited	Nucleotide sequence, expression vectors, recombinant yeast cells and applications thereof
2	Theranautilus Private Limited	• Controlling motion of magnetically-driven microscopic particles • Magnetically augmented plasmonic tweezers • A method for locomotion of a nanorobot and implementations
3	Genophe Biotech Pvt Ltd	A method for the treatment of epilepsy
4	SFO Technologies	Method and system for suppressing stimulated brillouin scattering effect
5	Strideaide Private Limited	Dynamic pressure offloading insoles
6	Quan2D Technologies Pvt Ltd	Opto-mechanical production of nanosheets from layered materials Refractory materials and implementations thereof"
7	Tiden Technologies	• Eye tracking and analysis to track, monitor, and records eye behaviour • Signal and image analysis associated with eye-tracking
8	Aagyavision Pvt Ltd	Radar-on-chip Technology and its system-level implementation using UMC l80nm technology
9	Absolute Cold Sustainable LLP	Method for synthesising flexibte and self-healing bio-based vitrimer epoxy foam
10	Carbsorb Solutions Private Limited	Amendment of License
11	Agnit Semiconductors Pvt Ltd.	Amendment of License
12	Lab to Market Innovations Private Limited	Machine Vision-Based Inspection System (MVIS) for Automated Train Health Monitoring
13	Mynvax Private Limited	• Stabilised immunogens derived from spike of coronavirus, compositions and methods thereof • Hemagglutinin based immunogenic polypeptides, compositions and methods thereof • Disulphide-linked oligomerisation domain, polypeptides, and uses thereof • Engineered rsv f variants with improved stability, expression, and prefusion conformation immunogenic polypeptides and vaccine compositions against diverse sarbecoviruses

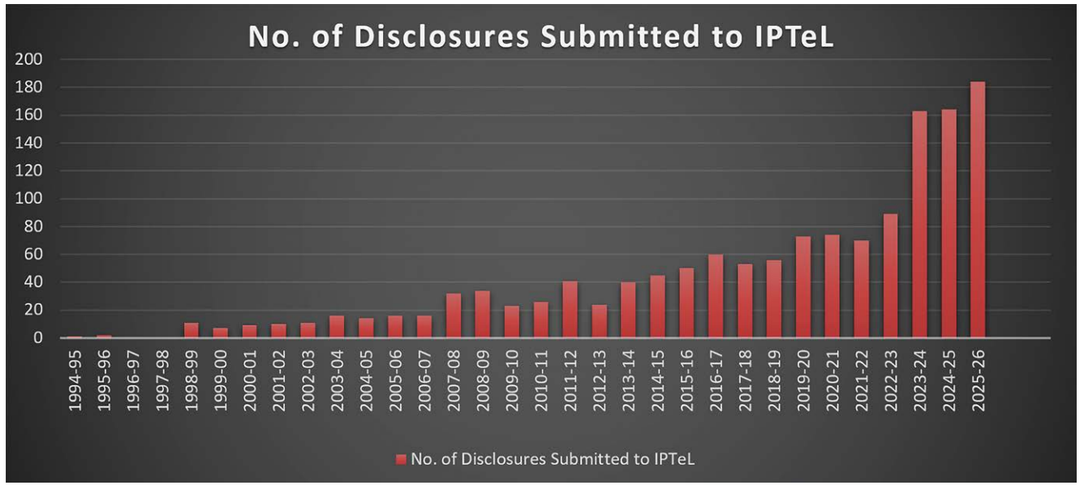
IISc Patents Licensed/Amended/ Addendum to IISc Start-ups in the year 2025-26:

- Theranautilus Pvt Ltd
- Aagyavision Pvt Ltd
- AGNIT Semiconductors Pvt Ltd
- Carbsorb Solutions Pvt Ltd

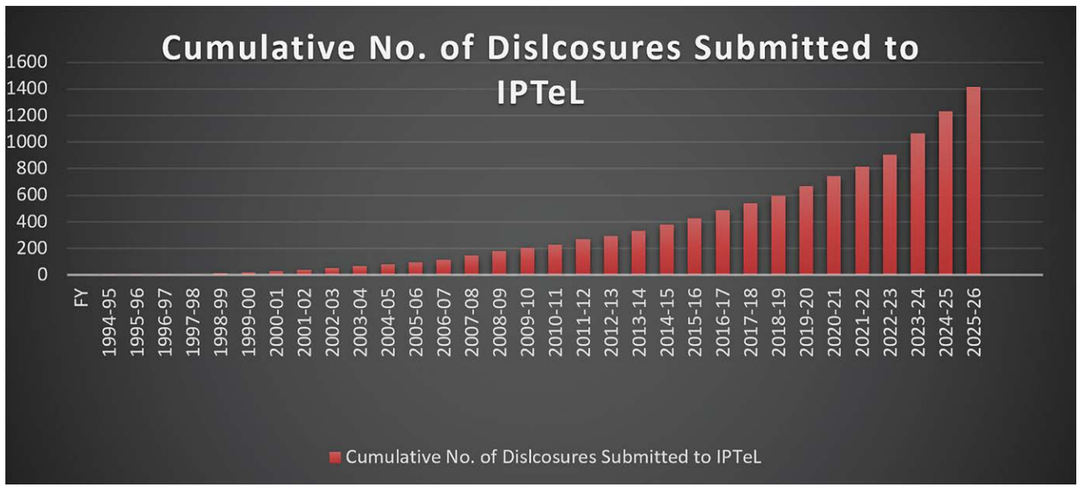
3. *Basic Portfolio Index 2025-26*

IPTeL embarked on the process of taking the IPTeL-Inventor-Attorney interface online through the IPMS software. IPTeL has also worked towards compiling the data porting of the existing portfolio that was available in soft format into the IPMS software, to aid subsequent automation of most processes requiring manual monitoring, making the IISc IP portfolio management and licensing procedure easier. The IISc portfolio is now available on the software and has also been made available for download in a standard format on the IPTeL website. The current portfolio is as follows:

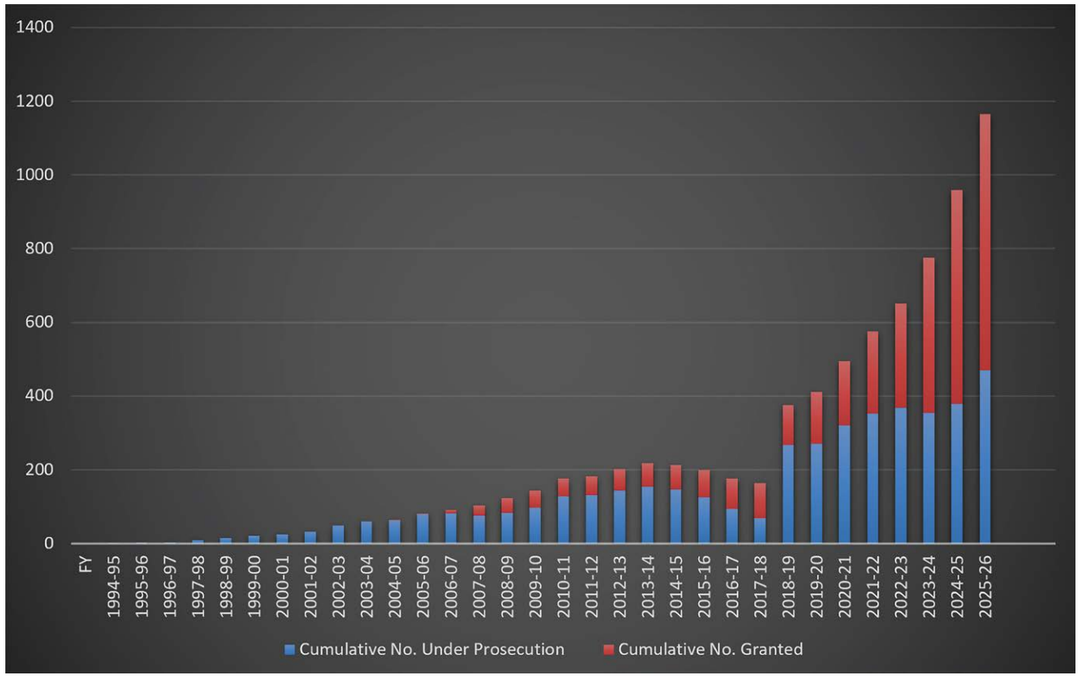
Total disclosures submitted by IISc faculty to IPTeL (1995 – March 2026): 1414



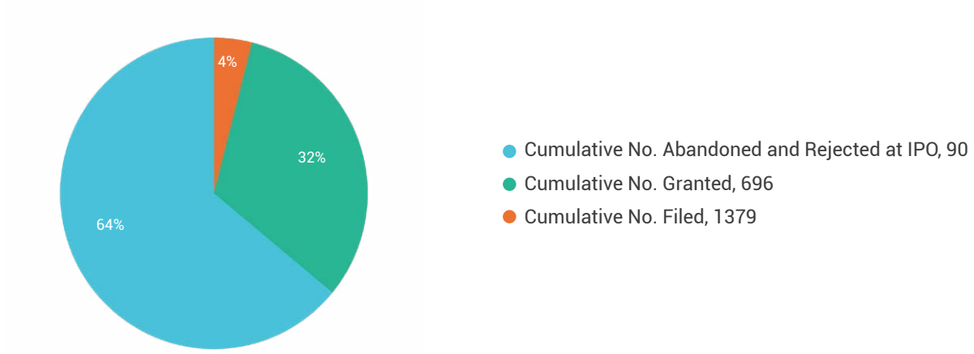
1. Year Wise Break-up of Disclosures Submitted to IPTeL



II. Year Wise Break-up of Disclosures Submitted to IPTeL; Cumulative



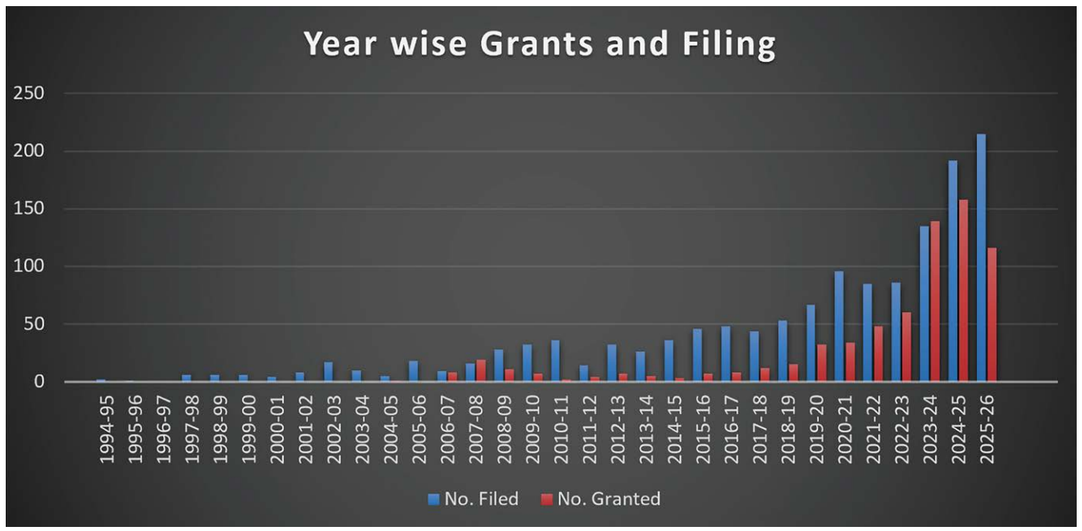
III. Year-wise Break-up of Patent Applications Under Prosecution and Patent Applications Granted (Indian)



IV. Cumulative Nos. of Filed Applications, Patents Granted and Applications Abandoned/ Rejected at IPO (Indian)



V. Year-wise Break up of Cumulative Nos. of Applications Under Prosecution, Patents Granted and Applications Abandoned/ Rejected at IPO (Indian)



VI. Year-wise Break-up of Patent Filing

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Challakere Campus

Convener: B Subba Reddy



THE HAL-IISc SKILL DEVELOPMENT AND TALENT DEVELOPMENT CENTRE KHUDAPURA, CHALLAKERE, IISc

A. Teachers Training Programmes

Training programmes conducted (April 2025 – March 2026): 22
Total beneficiaries: 1615

Extra-curricular activities for the participants:

a. To make the teachers more involved in the training activity, the following activities were initiated during the academic year 2025-26.
b. An extra day is added to all the existing training programmes; one day during the training period is treated as a break day. The participants are encouraged to visit historical places nearby like Hampi, Chitradurga Fort, Vanivilas Sagar Dam and so on.
c. The participants are given an opportunity on one of the evenings for cultural events. The participants themselves perform at the SDC auditorium.
d. Few of the best overall performing teachers are recognised and presented with a memento and certificate on the Valedictory day.
e. Some indoor game kits like chess boards, carrom boards and more are provided for the participants at hostels.
f. Night sky watch is arranged for the participants at SDC auditorium and at hostels
g. The Teachers Training Programme was further extended from high school teachers, senior secondary/ PUC teachers, UG and university faculty.

MoUs

New MoU s signed with Govts of Uttarakhand, Chhattisgarh, Punjab and Lakshadweep etc

B. Skill Development Programmes / Courses

Total courses offered (April 2025 – March 2026): 12
Total beneficiaries: 841

C. Honourable Visitors

1. The Hon'ble Vice-Chancellor and other senior officials of the University of Nepal visited the TDC and SDC at IISc Challakere campus on 29 January 2026.
2. IISc alumni visited the IISc Challakere campus on 15 March 2026.
3. Senior officials of Tata-Indian Institute of Skills visited IISc Challakere campus on 9 April 2026.

D. Students and Teachers' Visits

During the academic year (2025-2026), more than **1072** students from Government and private High school / PU college/ degree students from 14 institutions in and around Challakere, Chitradurga, Davangere, Mysore, Shimoga and Bellary districts visited SDC/TDC Centres on Education trip/ Vigyan Jyothi Programmes etc.

Special interactive sessions with the faculty members were arranged. Students were informed about various aspects of physics, chemistry, biology and mathematics. The students were also allowed to conduct laboratory experiments on their own with the support of TDC faculty.

E. National Science Day Celebration

The National Science Day was celebrated in honour of Prof Sir CV Raman at our IISc Challakere campus on 28 Feb 2026. There were about 4,000 School/College students, Teachers, other visitors participated from the nearby Chitradurga, Davangere, Bellary Districts etc.

The following activity was planned / and demonstrated on the National Science Day:

- Models and experimental arrangements for Physics, Chemistry, Biology and Mathematics.
- Poster presentations both in Kannada and English pertaining to Science and Skill related activity to benefit the rural/ semi urban school/ college students.
- Posters related to the activity at Divecha Centre and other labs at Challakere campus.
- Basic installation and flying of small drones at planned intervals were demonstrated.
- Mini rocket model launching at planned intervals was demonstrated.
- Students and teachers participated in on spot drawing and quiz competitions.

F. Some Important Data on programmes

(a) Teachers Training Programme
Details of State-wise Teachers Trained at Talent Development Centre (TDC) from 2011-2025.

(b) Skill Training Programme

G. TDC/SDC - Collaborations

1. LabXchange Harvard University and Talent Development Centre, IISc Challakere campus
(soon to be launched)

LabXchange is a free online platform from Harvard University dedicated to delivering expert-curated digital educational content and skill development tools for learners and educators worldwide. The content is meticulously curated by experts, ensuring that educators and learners have access to reliable, cutting-edge resources without the need to navigate the unverified and vast expanse of the internet. It offers a rich array of learning materials including videos, texts, images, quizzes, and virtual interactive labs with cutting-edge facilities, providing a great resource particularly for educators lacking access to advanced laboratories. Educators have the flexibility to organise content into tailored learning pathways that align with their syllabi, teaching goals, or styles, and then share these with their students. Worldwide, LabXchange is used by nearly 56 million educators and learners.

H. Infrastructure / Laboratories Installation in Progress

1. Parking work at SDC Truss work: Completed.
2. Fire structural facility: Building construction completed.
3. Precision agriculture: Greenhouse framework, electricity and water supply work completed
4. Astronomy and astrophotography laboratory: Work in progress
5. CC road work: Storm water drain work completed. DLC concreting 2 kilometres completed.
6. Construction of 24 single bed and 24 double bed residential quarters including water supply, sanitary installations, drainage, electrical: Works in progress.

I. Future Plans

- Recently IISc TDC/SDC signed MoUs with the Governments of Punjab, Uttarakhand, Lakshadweep, for Teachers Training and Skill Training Programmes.
- TDC/SDC programmes have reached all the States and Union Territories in India.
- TDC will extend Teachers Training Programmes to BSc and MSc teachers in the near future (Uttarakhand Government) including short training programmes for high school and college students.

3.7.8

8 Centre for Scientific and Industrial Consultancy

Chair: Ambedkar Dukkipati



During the year under review, the Centre for Scientific and Industrial Consultancy (CSIC) has strengthened the faculty-industry interactions in the form of informal discussions and advice to formal projects, involving design, development and transfer of technology. The Centre has strived to enhance, qualitatively and quantitatively, the nature of Institute-Industry linkages. The Centre has undertaken major consultancy projects of national significance involving scientific and technological challenges, with the goal of technology transfer for industrial development.

The ranges of professional consultancy services offered by the Institute's faculty through CSIC include:

- Systems design/analysis
- Software development
- Product design/development
- Process design/development
- Model investigations
- Advice on R&D
- Transfer of technology
- Evaluation/overview
- Diagnostics

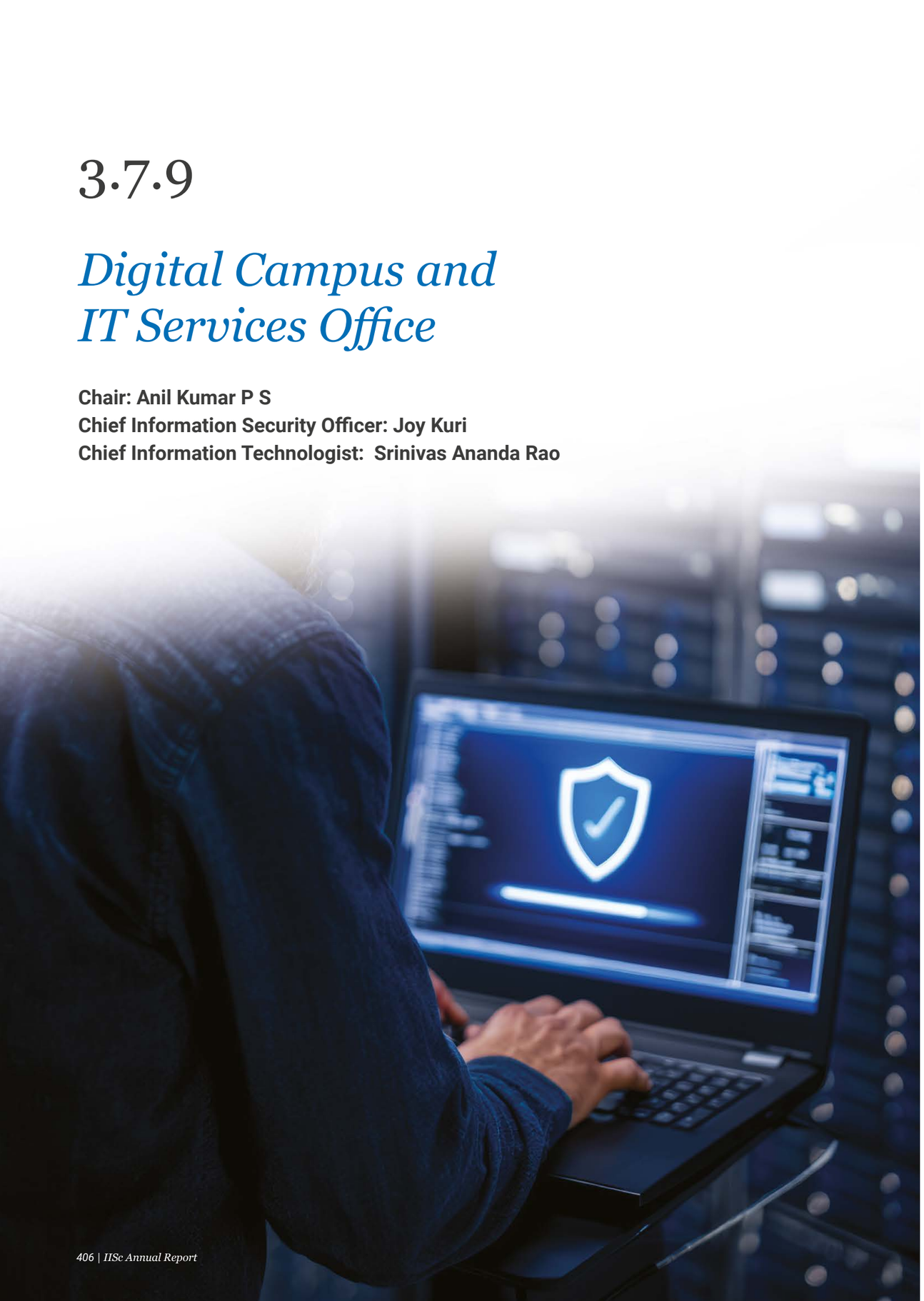
The above services have been utilised by a wide range of clientele, comprising of educational/research institutions, health / pharmaceuticals industries, department of space, defence laboratories/ organisations, irrigation departments, electricity boards, electronics/telecom industries, engineering industries and chemical industries from both the public and the private sector.

During the financial year starting from 1 April 2025 to 31 March 2026, 273 consultancy project proposals costing INR 3162.12 lakh were communicated to the clients. In the above said period 201 consultancy projects with an outlay of INR 2431.55 lakh materialised. Receipts from consultancy projects and consultancy test projects amounted to INR 2431.55 lakh.

3·7·9

Digital Campus and IT Services Office

Chair: Anil Kumar P S
Chief Information Security Officer: Joy Kuri
Chief Information Technologist: Srinivas Ananda Rao



The DIGITS (Digital Campus and IT Services) Office is a unit set up by the Institute to conceive, plan, and create a best-in-class information technology (IT) and networking system, and implement agile IT and networking services for operational excellence in the Institute. The DIGITS office has the mandate to consolidate and coordinate all digitalisation activities and services across the Institute.

During April 2025-March 2026, the activities of DIGITS have resulted in the following outcomes:

Project ISTAR

(Implementing SAP S/4 HANA ERP for Transforming Administration and Research):

❖ **SAP Upgrade and Infrastructure**

- The institute initiated the SAP S/4HANA upgrade project (1709 → 2025) with SAP under a premium engagement agreement.
- The existing infrastructure reached the end of its life, and a new landscape has been provisioned with CtrlS Datacenters.
- Mock system and upgraded environments were provided by SAP for technical validation and module-level testing.
- Development environment migration has been executed alongside upgrade activities.
- The Quality System has been upgraded and released for ISTAR and Business UAT, which is currently in progress.
- SAP has successfully completed a production dry run (dress rehearsal) to validate cutover readiness.
- The project is currently in the technical upgrade phase, with a functional transformation phase planned next.
- Tentative go-live is targeted for end June–early July 2026.

❖ **Operations and Maintenance (O&M) of SAP Version 1709**

- The O&M support for Wave-1 and Wave-2 applications has stabilised across all quarters.
- Focus has been on issue resolution, enhancements, and process stabilisation across modules.
- The following enhancements were carried out module-wise during 2025-2026.

Finance and Accounting

- Multiple report enhancements (TDS on GST, SBI E-Pay, investment register corrections) improved compliance and reporting accuracy.
- Vendor onboarding automation and bank/ payment integration improvements streamlined financial operations.
- Budget validation issues (WBS, scholarship posting) were addressed to ensure financial accuracy and control.
- Enhancements in asset accounting, depreciation, TRM flows, and posting validations strengthened financial governance.
- Introduction of new fields, validations, and compliance-driven changes aligned the system with regulatory requirements.

HR and Payroll

- System updated to reflect statutory changes (Professional Tax revision, tax slabs), ensuring compliance.
- Enhancements were introduced for bank detail change notifications, improving financial control.
- Leave workflows, validations, and automation significantly improved employee self-service processes.
- Corrections in salary planning, designation visibility, and workflow routing improved HR accuracy.
- Improvements in employee data capture and payroll-related validations strengthened system reliability.

Project Systems (PS)

- Enhancements were introduced in HR service requests, budget validation logic, and project visibility.
- Improved validations in Project Builder ensured better data integrity.
- Extended budget-tracking timelines and improved clarity in project identification enhanced usability for PIs and stakeholders.

Sourcing and Procurement

- Strengthened controls through validations in MIGO/ ML81N and PO processes, reducing process errors.

- Release strategies have been enhanced (including additional approval levels), improving governance.
- Improvements in PO forms, clauses, and mandatory fields increased compliance and transparency.
- Development of custom reporting and UI simplifications improved procurement efficiency.

Sales and Distribution

- System enhancements ensured better control over credit memo creation and invoice linkage.
- Implemented validations to prevent incorrect document references and ensure compliance.
- Improvements in number ranges, pricing procedures, and business area usage strengthened financial traceability.

Hostel and Mess System

- Multiple corrections and enhancements ensured accurate data for mess allocation, charges, and student handling.
- Improved automation, search functionality, and audit controls in hostel processes.
- Enhanced communication triggers and reporting accuracy for financial and operational clarity.

Student Lifecycle Management (SLM)

- Significant enhancements in scholarship validation, course registration, and academic processes improved student experience.
- Development of reports (DAP, transcript, NAD integration) improved academic transparency and compliance.
- Simplification of rules around course repetition, substitution, and financial assistance reduced administrative effort.
- Annual updates ensured alignment with academic structure and Senate requirements.

Adobe Products

- The institute has purchased licenses for Adobe Sign (24,500 transactions), Acrobat Pro DC (620 licenses), and the Creative Cloud (60 licenses).
- The Sign and Acrobat are assigned by default to all the faculty and admin officers and to others in specific cases.
- The Adobe Sign plan is based on the number of transactions/documents per year, and the other two are user-based licenses.
- As of now, Adobe Sign has around 800-plus users, including many admin assistants.
- DIGITS has been managing user technical issue resolution and, where necessary, working with Adobe technical contacts.

Grammarly

- Grammarly is an automated tool to Eliminate Grammatical Errors & Other Writing Issues, Improve Word Choice.
- The institute has a Grammarly Premium license. These are assigned to all faculty, administrative officers, and PG/PhD students.
- Plug-in support for both Windows and Mac systems.

Overleaf

- Overleaf is a collaborative cloud-based LaTeX editor used for writing, editing, and publishing scientific documents.
- The Institute has a subscription to Overleaf Premium.
- This is used by the faculty and students.
- Users can auto-sign up with their IISc mail ID.



TINA highlights for Apr25-Mar26

Network

- Procured 1250 Wi-Fi 6 Access Points and 210 network switches through a global tender to upgrade the ageing Wi-Fi infrastructure in the Institute with the objective of providing better bandwidth and coverage. The new devices are deployed in the labs and faculty rooms, and each has 2.5Gbps backbone link. Department-wise status:

Sl.no	Department	Number of Wi-Fi Access Points	Implementation status as of March 2026
1	Admin Building	6	Ongoing
2	Aerospace	118	Completed
3	Biological Sciences	152	Ongoing
4	CAoS	30	Completed
5	CeNSE	82	Completed
6	CES	14	Ongoing
7	Chemical Sciences	56	Completed
8	CIVIL	83	Ongoing
9	CNS	52	Completed
10	CPDM	39	Ongoing
11	CSA	69	Completed
12	DCCC	22	Completed
13	DESE	30	Completed
14	ECE	115	Completed
15	IAP	35	Completed
16	ICER	26	Completed
17	JN Tata Auditorium	15	Completed
18	Library	24	Completed
19	Main Building	15	Ongoing
20	MGMT	18	Completed
21	Physics	154	Completed
22	SERC & CDS	53	Completed
23	Outdoor	40	Ongoing
	Total	**1248**	

- Designed and planned the core network upgrade at SERC using a three tier architecture with dynamic routing, VLAN containment within distribution switch domains, hierarchical MSTP and 10Gbps uplink to all departments with dual patch redundancy. Testing and phased implementation are underway with minimal planned downtime.
- To enhance the information security posture, we have enabled the Proactive DNS service. This solution actively blocks access to malicious domains, helping prevent phishing attacks, malware infections, and other DNS-based threats, ensuring a safer browsing experience for all users.
- To enhance the Wi-Fi coverage outside the department, 40 outdoor APs have been procured, configured and installed on major roads and junctions across the campus.
- Coordinated with CPWD teams on the design and deployment of network infrastructure under construction - UG, BTech, MBU, Physics Annex and ICER building. This includes reviewing and recommending changes to improve the institute's Wi-Fi and LAN needs.
- Tested and implemented a mechanism to restrict Internet access for the machines identified by the ISO team as sources of Command and Control (C2) traffic.
- Tested and implemented a mechanism to restrict Internet access for students during an open-book exam.
- To mitigate the DHCP spoofing incident in CNS, which caused serious network issues at CNS and ECE. We implemented DHCP spoof protection. The same is implemented across the campus.
- For enhanced security, the CCTV cameras from the LAN network are moved to an isolated network.
- Supported and provided network connectivity for Open Day 2026 YouTube Live streaming.
- Upgraded the distribution switch at CSA and DESE and enhanced the uplink to 10Gbps uplink.
- Over the course of the year, we have extended network connectivity to:
  - CSA Annexe
  - CST Annexe
  - CySeck
  - DESE Annexe
  - IQTI Lab
  - Mathematics Annex
  - MBU Annex
  - Mphasis Lab
  - PD1
  - PD2

Security/ISO:

- The ISO Policy rollout—which included the Infosec Policy and Acceptable Usage Policy—was implemented to ensure that end users acknowledge and accept the policies, thereby confirming their awareness and acceptance of the organisation's ISO policy. After about two weeks, acceptance of the policy became mandatory and was enforced via the Office 365 login. A system has been implemented to require any newly created user to review and accept the ISO policy during their initial login before accessing the institute's IT resources.
- The Email and Information Security team has now enabled and implemented multi-factor authentication (MFA) for all user accounts (barring a few exceptions) for access to the email and all portals and applications linked with the account. This has enhanced the overall security of the accounts and the IISc resources.
- Incorporated InTune as a UEM (Unified Endpoint Management) and MDE (Microsoft Defender for Endpoint) for proactive endpoint security and centralised security policy implementation on all Desktops in the DIGITS and HR sections.
- For centralised management and security compliance over 170+ devices in administrative departments have been onboarded onto Microsoft Entra ID with Microsoft Defender for Endpoint installed on all enrolled devices. Also, implemented Intune security policies, including browser extension blocking, USB device restrictions and endpoint hardening controls.
- The team is now actively investigating NCCC reports, including IOCs, IOAs, honeypots, and other threat intelligence alerts, taking appropriate remediation actions. Additionally, the process is automated to fetch user email and MAC address details, improving incident response efficiency.
- As part of Cyber Security Awareness Month, the team conducted a phishing campaign across the institute to assess user awareness and improve it. Also, banners and posters are displayed on digital boards to raise awareness.
- Conducted Vulnerability Assessment and Penetration Testing (VAPT) on 75+ IISc websites, including multiple re-audits and follow-up security assessments across various departmental and laboratory applications to ensure effective remediation and compliance.
- Managed and investigated 60+ Microsoft Defender alerts across various departments, successfully removing malware and conducting thorough system rescans to ensure complete remediation and endpoint security.

Email

- Automated the process of migration and deletion of email accounts when the account holder superannuates, graduates or completes employment duration. This includes removal from groups, with sufficient time given to the account holder to take necessary action. This will ensure that the email user data is in sync with SAP data.
- Upgraded the Microsoft licenses to ensure that we could get all security features and additional storage at a much-discounted rate than if we had got these as add-on licenses.
- During admissions, the team created email accounts for 1,633 students, added them to the appropriate groups, and supported them in configuring their accounts.
- Microsoft has drastically reduced IISc's storage allocation from 14.5 PB to 124 TB. The team has been actively reclaiming storage space in the Microsoft environment to reduce costs. A total of 72 TB has been recovered.
- The team has
  - Moved 1000+ students and staff accounts to the alum domain
  - Created about 2300 user accounts and about 70 service accounts.
  - Deleted about 900 accounts
  - About 2000 accounts were disabled and marked for deletions
  - Migrated 63 IISc email accounts to the FSID domain.

Azure

- To enhance security, a major architecture change was made on the production database.
- Azure Blob Storage of 100TB was provisioned, and comprehensive support was provided to the lab to facilitate seamless data uploads to the storage solution.
- About 25 new VMs were created to host new applications/websites and successfully launched after the VAPT and fixing all identified vulnerabilities.

Procurement and Other Operations

- Engaged with Microsoft on contract renewal, negotiating enhanced licenses aligned with the Institute's security and operational needs, while successfully securing reduced pricing and temporary complimentary storage to enable a seamless transition.
- Engaged with Red Hat and obtained a discounted price and completed the renewal of 70 instances of Red Hat Enterprise Linux for critical servers and VMs hosted on Azure.
- Floated an Expression of Interest for RFID-based smart cards for all the faculty, staff and students. Four prospective bidders were identified. The tendering process is ongoing.
- Successfully procured a vast array of items from Desktops, Laptops, RAM, SSD, NVMe storage, connectors, printers, headphones, book scanner, monitor, keyboards, Pen drive, UPS and batteries, laptop bags, to stationery items, kitchen utensils and hardware like a ladder, all via GeM. We assisted CCMD in procuring a tractor via GeM.
- A BOQ bid was successfully completed, and the order was awarded on GeM for the procurement of 140 RAM modules and 80 SSD units, comprising a wide range of configurations that include laptop RAM modules of various types and capacities, desktop RAM modules with different speed and performance specifications, as well as SSDs and NVMe storage devices of multiple configurations.
- Conducted GSAC, Students Council and Faculty Club elections on the ElectionBuddy platform.
- Supported users on Adobe, Grammarly SMS service, and Zoom platforms.
- Procured and installed over 20 SSL certificates for websites and applications hosted on Azure and on premises.
- Managed the campus bulletin service for the institute.

Portals/Websites and Applications (New/Enhancements & Support)

- Successfully launched the Admission Management System (AMS) with all three portals — Applicant, Admin and Department — live and operational, enabling end-to-end admissions activities across application submission, administrative processing, departmental shortlisting, interview management and offer-related workflows.
- Expanded the new CC Avenue payment gateway across major institutional payment workflows, including admissions, student dues, transcripts, CCE courses, conferences and payment links through the Receipts Portal.
- Delivered and launched the Guest House Booking Portal with AD-based authentication, single and bulk booking, room availability, check-in/check-out, allotment and re-allotment workflows.
- Launched or advanced multiple institutional portals, including Student ID Card, Student Exit Form, Alumni ID Card Form, Information Security Policy acceptance, Campus Bulletin, Official Transcripts, Convocation and Mediclaim Insurance portals.
- Strengthened security, compliance and infrastructure through VAPT remediation, database hardening, Azure firewall and network restrictions, database decentralisation, RHEL deployments and cloud cost optimisation.
- Provided technology and payment support for more than 30 conferences, workshops, seminars and institutional events during the year.

Admissions Management System (AMS)

- Completed key enhancements for AMS Applicant, Admin and Department portals and deployed multiple releases for QA/UAT and production readiness.
- Successfully launched the Applicant Module of the IISc Admissions Portal, enabling applicants to apply to multiple degrees in a single flow.
- Stabilised core admissions workflows covering candidate shortlisting, GATE paper grouping, interview scheduling and attendance, Interview slot allocation, candidate recommendations, call letter generation and notifications.
- Resolved critical and major issues related to login/routing, shortlisting, interview and recommendation workflows, dashboard loading and Linux API deployments.
- Supported admissions operations, including offer release, document verification, automated email ID creation for admitted students and data porting activities for 2025-26 admissions.
- Implemented a separate portal for viewing and downloading application data and PDF application forms.
- Completed VAPT fixes for admissions-related systems and received go-live confirmation from the ISO/security review process.

Payment Gateway and Receipts Portal Integrations

- Completed major migration and integration activities for the new CC Avenue payment gateway across institutional payment workflows.
- Integrated CC Avenue payments for Student Dues, Student Transcripts, CCE Courses, IISc Admissions, conference websites and payment links through the Receipts Portal.
- Implemented invoice generation, receipt download, hosted payment forms, validation and admin reporting workflows for relevant payment modules.
- Stabilised payment workflows across portals and provided integrated payment support for conferences and academic services.

Guest House Booking Portal

- Delivered the Guest House Booking Portal from work-in-progress stage to UAT readiness and successful launch.
- Implemented Microsoft AD login integration and authentication middleware to validate users, prevent unauthorised access and log user activity.
- Delivered major functional workflows including single and bulk room booking, room availability, check-in/check-out management, room allotment, room re-allotment and bulk upload of booking data.
- Resolved core booking issues such as random room number assignment, incorrect edit updates and accompanying guest detail update failures.

Institutional Portals and Major Enhancements

- Student ID Card Portal was completed and made live for institutional use.
- Information Security Policy and Acceptable Usage Policy acceptance system was implemented for users.
- Student Exit Form and Alumni ID Card Form were made live to capture academic completion details, job offers, salaries, next steps, feedback and alumni card requests.
- Email Support Portal automation was implemented for seamless student email ID creation after document verification and L2 approval.
- Convocation Portal and its Admin Portal were enhanced and made live for convocation awardees.
- Mediclaim Insurance Portal was opened for employees and pensioners to submit additional coverage requests.
- Campus Bulletin Portal was developed as a centralised platform for events, seminars, conferences, notices, subscriptions, review/approval workflows and automated email notifications and was made ready for UAT.
- Official Transcripts Platform was launched for testing with payment integration, document upload, request tracking and admin workflow.
- Amenities Portal enhancements were implemented for admin feedback/rating downloads, individual feedback viewing, automated monthly reports and performance improvement.
- NTSRP was enhanced to provide application view access to multiple users based on posts.

Mobile Applications

- IISc Mobile App enhancements were incorporated and fully tested, making the app ready for go-live.
- IISc Open Day 2026 mobile app was refactored, updated, integrated with APIs and uploaded to the App Store and Play Store.

Conference and Event Technology Support

Technical and operational support was provided for more than 30 conferences, workshops and institutional events. Support included event registration, payment integration, hosted payment pages, website and communication updates, validation and admin reporting workflows.

- Major supported areas included semiconductor manufacturing, quantum computation, biophysics, computational science, AI/ML, signal processing, finance, biology, entrepreneurship and international collaborations.
- Representative events included TQC 2025, CeNSE Summer School 2025, ACEPS13, ETAAV 2025, CASML 2025, OSHS 2025, Electron 2026, RTQF 2026, RNA India Meeting and multiple semiconductor/photonic/structural biology workshops.
- New conference payment pages and payment workflows were created and deployed for selected events, including validation, gateway integration and admin reporting support.

Security, Compliance and VAPT

- Implemented Azure firewall and network restrictions for database VMs, including restricting outbound access from DB VMs to trusted update sources.
- Completed critical production database VAPT remediation and security hardening activities.
- Resolved vulnerabilities in dataoffice.iisc.ac.in and made the site live after remediation.
- Completed admissions-related VAPT observations and ISO/security confirmation for go-live.
- Supported VAPT remediation and security reviews for institutional portals including INUP CeNSE and other systems.
- Performed database compromise and security assessments to verify that there was no unauthorised access, data integrity was maintained and systems were safe for production rollout.
- Initiated and progressed database server decentralisation to improve security, reduce risk concentration, clarify operational ownership and strengthen access governance.

Azure Infrastructure and DevOps

- Provisioned and configured Azure VMs and supporting infrastructure for departments, applications, conferences and testing environments.
- Completed full deployment and configuration of AMS on Red Hat Enterprise Linux, including web server configuration, reverse proxy setup, environment configuration, API hosting and UI hosting.
- Completed deployment and configuration of the Guest House application on the RHEL server environment.
- Executed database migration activities with pre-migration and post-migration validations to maintain data integrity and minimise downtime.
- Managed Azure resource provisioning, scaling, decommissioning and governance alignment across projects.
- Optimised Azure usage by removing unused resources, resulting in an estimated recurring saving of close to Rs. 1 Lac per month.
- Completed operational infrastructure activities such as SSL certificate updates, Active Directory key rotation, disk upgrades, MySQL fixes, DB VM forensic support and AMS-UAT environment setup.

Website Management and Operational Support

- Maintained regular content and communication updates for major institutional and departmental websites including IISc main website, DIGITS, BS UG, BTech, Health Centre, Wellness Centre, NMR, Bioimaging and other departmental sites.
- Provided continuing technical support for critical institutional systems including Hostel Management, Health Centre portals, Admissions, Vendor Information Portal, FRP, MSFRP, NTSRP, Post-Doctoral Application Portal, Medals Portal, ODAA-related forms and other portal services.
- Sustained user assistance, troubleshooting and operational continuity across multiple public-facing and internal portals throughout the year.

Consolidated Annual Outcome

During FY 2025-26, the Portals and Websites team delivered significant progress in admissions digitisation, payment gateway modernisation, guest house automation, institutional portal services, conference/event support and cloud/security hardening.

The year moved several systems from development or UAT into production use, while also strengthening infrastructure governance, security posture and operational resilience across IISc digital services.

At-a-Glance Summary

Area	Consolidated Annual Achievement
Admissions	New AMS launched; Admin/Department workflows stabilised for shortlisting, interviews, slot allocation, call letters and notifications.
Payments	CC Avenue integrated across admissions, student dues, transcripts, CCE courses, conferences and payment links.
Guest House	Portal launched with AD authentication, booking, availability, allotment, check-in/check-out and bulk workflows.
Institutional Services	Student ID, Exit Form, Alumni ID Card, Convocation, Mediclaim, Campus Bulletin and Transcript workflows advanced or launched.
Security and Compliance	VAPT remediation, DB hardening, firewall/network restrictions, security assessments and database decentralisation progressed.
Infrastructure	RHEL deployments, database migrations, VM provisioning, governance activities and Azure cost optimisation completed.
Events	Technology, payment and website support provided for 30+ conferences/ workshops/events.

ScholarOne, GSuite and SharePoint

ScholarOne Thesis Processing System

- Completed all feasible enhancement requirements in the ScholarOne system.
- Prepared and submitted weekly status reports and periodic reports for PhD and M.Tech review meetings.
- Provided technical support and user assistance to all ScholarOne stakeholders, including administrators, reviewers, Deans, and students.

G Suite

- o No of new IDs created: 1624
- o No of IDs deleted: 1441
- o Technical support

SharePoint:

- Campus Intranet Site: With the help of the Departments, the course details and others were updated in the departments' SharePoint pages, and the same was linked to the intranet site Provide technical support and maintenance for SharePoint environments. Guide various department teams (HR, CPDM etc) on best practices for structured document preservation, version control, and secure document sharing to ensure seamless collaboration.



3.7.10

Office of Research Grants

The Office of Research Grants (ORG) was established at the Indian Institute of Science in 2020 to provide professional grant management support to the institute's researchers. ORG serves as the primary administrative contact for services and support related to sponsored projects at the Indian Institute of Science.

Chair: Sandeep M. Eswarappa

Grants Manager: Rohit Kumar HG

Grants Officer: Ramya Mohan, Devi R. Krishnan, Darshan Shanthaveerappa Tuppad



1. Dissemination of funding opportunities
The ORG, in collaboration with DIGITS, has developed a comprehensive grant database portal that compiles funding opportunities from around the world, covering various research areas relevant to the institute's researchers. ORG maintains and updates this database, which currently includes over **1,500** funding calls from national and international grant agencies. Institute researchers can access this portal using their IISc credentials.

The office regularly disseminates funding opportunities from national and international agencies via email. During FY 2025-26, more than **100** funding opportunities were communicated to the institute community through regular emails. Additionally, grant opportunities were compiled and shared electronically through the ORG monthly newsletter, **"STREAM."** (Issues 55-66).



STREAM

Funding Newsletter from Office of Research Grants

Issue 63 | December 2025

NEWS from ORG Desk

Dear Campus Researchers!

UPCOMING DEADLINES

January 2026

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

CONTACT



SCHOLARSHIP/FELLOWSHIPS

First two pages of STREAM Issue 63 December 2025

2. Support to faculty members
The office regularly assists faculty with grant submissions to national and international agencies. In FY 2025-26, ORG provided both pre- and post-award support to a total of 145 projects, in addition to responding to many queries. This support includes assistance with grant submissions and the activation of awarded projects.

Sl. No.	Registrations / Certifications	Role of ORG
1	System for Award Management (SAM)	Registration and its annual renewal
2	Office of Research Integrity (ORI) certification	Annual report submission for renewal
3	Shastri Indo-Canadian Institute (SICI)	Annual membership renewal and report submission
4	Payment Management System	Institution account creation
5	Events	Technology, payment and website support provided for 30+ conferences/workshops/events.

3. Assistance in Grants Administration
ORG has streamlined the international grant submission process at the Institute. The office currently manages the following important registrations and certifications required for international grants submissions:

ORG assists the faculty members in creating user accounts on the eRA commons portal required for NIH grant submissions. The office also coordinates between different administrative offices of the institute to facilitate the smooth and timely submission of grant proposals.

ORG has assisted in registering the institute on BioRRAP (Biological Research Regulatory Approval Portal), which is a centralised mechanism created to facilitate Biological Research Regulatory Approval process. The office may be contacted for any assistance in creating user IDs.

4. Facilitating Research Funding Programs

The ORG plays a critical role in facilitating and managing research funding programs at IISc. By collaborating with corporate and philanthropic partners, ORG ensures the seamless implementation of funding initiatives, from the formalisation of agreements and proposal calls to project monitoring and reporting. These programs enable faculty to pursue cutting-edge research, address societal challenges, and contribute to scientific advancements across diverse disciplines.

4.1. CSR Funding from Syngene

In 2025, the ORG played a pivotal role in ensuring the smooth execution of the funded projects through the following activities:

- Ensuring project implementation in accordance with the specific project addendums.
- Assisting in the timely compilation and submission of technical and financial reports for the funded projects at the end of each financial year.
- Acting as a liaison between the Principal Investigators (PIs) and Syngene to obtain any necessary approvals for the project extensions.
- Monitoring project progress and expenditures while following up with faculty to ensure timely updates and compliance.

4.2. IISc BFI-Biome Programme

Phase-I: During Phase-I, three research projects were selected for funding in the previous year and are currently in progress. ORG continues to monitor the progress of these projects and facilitates periodic progress reviews, submission of reports to BFI, and coordination among the Principal Investigators (PIs), Institute offices, and BFI to ensure smooth implementation.

Phase-II: IISc received USD 300,000 (INR 2,56,02,750) from BFI in March 2025 towards the second funding cycle of the program. ORG invited proposals from institute researchers to submit their innovative project ideas and coordinated the internal review process of the submitted proposals. Total of four projects were selected for funding by the BFI, which are now being implemented.

5. Execution of MoUs

Establishing Memorandums of Understanding (MoUs) with various external agencies in research areas of mutual interest, in collaboration with the legal and administration departments at the institute, also falls within the scope of tasks performed by ORG.

To date, ORG has facilitated the establishment of MoUs with several reputed organizations, including the Indian Navy, Air Force Technical Institute, Blockchain for Impact, and Syngene International Pvt. Ltd., and Plaksha University among others.

6. MBBS/MPH internship program

Since FY 2022–23, ORG has been coordinating the MBBS research internship programme with philanthropic support, which was extended to include MPH students in FY 2023–24. The objective of this programme is to provide clinical students with the opportunity to gain research experience in one of the participating laboratories on campus, fostering the development of physician-scientists in the country. A total of **36** students were selected under the guidance of **25** faculty members for FY 2025-26, and they stayed on campus for 4 to 8 weeks to complete their internships.

7. IISc Grants Management Internship Programme

The office offered the IISc Grants Management Internship Programme, a structured capacity-building initiative aimed at providing practical exposure to research grants administration at IISc. During the reporting period, three PhD students were selected and trained over a three-month period by the ORG team on core aspects of grants management, including grant writing, pre-award and post-award processes, and institutional compliance requirements.

8. Global Health Innovation Grand Challenge 2025

The ORG coordinated IISc's participation in the 2025 Global Health Innovation Grand Challenge, an international student competition focused on innovation in medical technologies. The final event was organised by the Global Consortium for Medical and Engineering Innovation and 24 hosted at the University of Illinois Urbana-Champaign, USA, from 6–8 April 2025, with selected teams competing for awards from a total prize pool of USD 250,000. ORG invited and reviewed student applications at the Institute and facilitated the internal selection of one team for institutional endorsement from among seven applications received. The selected student from the shortlisted team represented IISc at the final event, with participation fully sponsored by the Institute. Through this initiative, ORG enabled IISc's representation at a prominent international innovation forum.

9. Events

9.1 Online Course on "Research Grant Writing and Management"

The ORG, in collaboration with the Centre for Continuing Education (CCE), IISc, organised an online course on Research Grant Writing and Management from 19–21 January 2026.

The course provided participants with a comprehensive introduction to grants administration, covered key topics such as identifying funding opportunities, proposal writing and review, common pitfalls in grant applications, post-award grants management, and case studies. The programme aimed to equip early-career researchers, students, and professionals with practical skills and insights to navigate the research funding landscape effectively. This course attracted over 220 participants from across the country, including faculty members, early-career researchers, and grants administrators.

9.2. Meet 'n Greet

A 'Meet 'n Greet' event was held on 14th July 2025, to promote networking and facilitate interaction between MBBS/MPH interns and distinguished faculty members. The event was designed to create an informal platform that encouraged meaningful conversations, collaboration, and mentorship.

A total of 20 interns and 7 faculty members participated in the event, engaging in substantive discussions and exchanging insights on current trends, challenges, and opportunities in medical and public health education and research. The interns also provided brief introductions and articulated a well-defined trajectory for their future research, along with reflections on their experience at IISc.



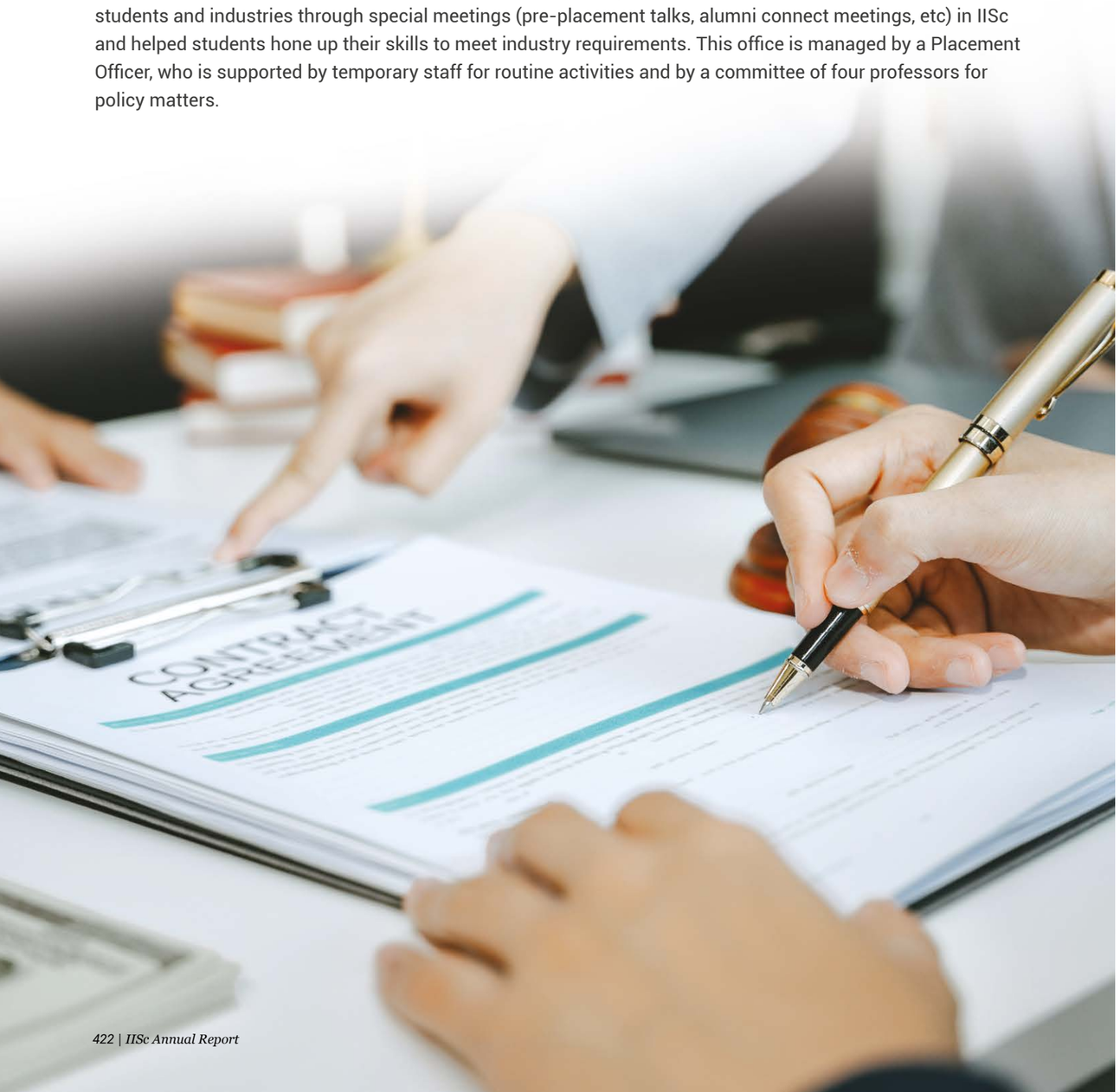


MBBS/MPH internship Programme: Meet N' Greet Event at Faculty Hall Foyer

3.7.11

Office of Career Counselling and Placement

The Office of Career Counselling and Placement (OCCaP) Centralised the management of campus Placement & Internships. Several placement activities and events were organised to facilitate interaction between students and industries through special meetings (pre-placement talks, alumni connect meetings, etc) in IISc and helped students hone up their skills to meet industry requirements. This office is managed by a Placement Officer, who is supported by temporary staff for routine activities and by a committee of four professors for policy matters.



A. Completion of final placements for batch 2019-20
B. Connect with batch 2020-21 & batch 2021-22
C. Pre-placement offers post internship – batch 2020-21
D. Final placement campus season 2020-21
E. Special counselling for specific students
F. Internship placements 2021-22
G. Special attempts for PhD & Post Doc students
H. Technical and soft skills for students
I. Final placement campus season 2021-22
J. Connect with batch 2022-23
K. Internship placements batch 2022-23
L. Final placements campus season for 2022-23 (in-process)
M. Internship placements for batch 2023-24 (In-process)
N. Completed full-time placements for the 2022-23 batch
O. Organised a "Thanksgiving" event for the 2022-23 student placement coordinators
P. Established connections with the 2023-24 batch
Q. Completed internship placements for the 2023-24 batch
R. Pre-placement offer post internship for the 2023-24 batch
S. Conclusion of final placements: Batch of 2023–24 (Graduating in 2024)
T. Internship placements for the 2024-25 batch (completed)
U. Ongoing full-time (batch graduating in 2025) and summer placements (batch graduating 2026)
(1.) Final placements (batch graduating in 2025)
(2.) Summer internship placements (batch graduating in 2026)
V. Student support events and industry engagement
W. Conclusion of final placements: batch of 2024–25 (graduating in 2025)
X. Ongoing full-time placements: batch of 2025–26 (graduating in 2026)
Y. UG summer internship placements: batch graduating in 2027 (only UG)
Z. Summer internship placements: batch graduating in 2027 (all programmes)
AA. Student support events and industry engagement

A. Completion of Final Placement 2019-20
Final placement for batch 2019-20 continued and closed in June 2020 for UG, MTech, MTech (Res), MDes, MMgmt and PhD students registered with OCCaP to seek placement support

B. Connect with Batch 2020-21 and Batch 2021-22
Students from batch 2020-21 were addressed in July/ August 2020 and students of batch 2021-22 were addressed in January/ February 2021. These interactive sessions with the students were to understand their inclination for campus placements, share information about placement process/ policies and to identify their needs for personal skills and those necessarily requiring additional attention.

C. Pre-Placement Offers Post Internship – Batch 2020-21
About 50% students from batch 2020-21 received direct pre-placement full time offers (PPO) in September 2021 who participated in internship season 2020.

D. Final Placement Campus Season 2020-21
Pre-Placement Talks (PPT's) for UG/Master/ PhD/ Post Doc students scheduled from August and continued till September.

- Pre-placement talks by companies were scheduled virtually in August and September
- Placement process, PPT, Test, Interviews conducted via virtual mode.
- Campus Placement interviews commenced from 10 September 2020.
- 180+ companies participated in campus hiring for full-time placements.
- 294 students secured full-time jobs with highest of 95.3 Lakh JPY as highest international offer and 61.2 LPA highest domestic offer

Final Placement	2020-21**	2019-20*	2018-19	2017-18	2016-17
Total Students Placed	294	238	269	235	207
Highest CTC (LPA)	95.3 L JPY (international) and 61.2 L (domestic offer) (international) and 61.2 L (domestic offer)	43.3	62.4 L (International) 43.3 (domestic)	45	30
Average Annual CTC (LPA)	21.8	21.9	20	16.7	15
No. of students placed with >40 LPA	10	13	7	1	NA
No. of students placed with 30- 40 LPA	50	43	45	10	2
No. of students placed with 20-30 LPA	97	76	56	53	33
No. of Master students placed	261	192	231	194	198
No. of PhD/ Post Doc Students Placed	28	34	35	31	3
No. of UG Students Placed	5	12	3	10	6

** ** L – Lakh, JPY – Japanese Yen*
***2020-21 – placements commenced in mid-September 2020 and to continue till July 2021*
**Note: 2018-2020 MTech admission (batch 2019-20) was only 268 compared to 346/457 in the previous year*

E. Special Counselling for Specific Students

Students who were finding their way difficult to get through the interviews and secure a job were addressed to understand their problem areas beyond technical domain and help them overcome the same to prepare for further interviews.

F. Internship Placement (Batch 2020-21)

- Internship placement for batch 2020-22 commenced in March 2022.
- Virtual internships for selected students for 8 weeks duration staring from June.
- Highest Stipend –1.25 L per month (PhD and Master's programme)

G. Special Attempts for PhD and Post Doc students

Continuous meetings with PhD and Post Doc students to familiarise them with the prospective work opportunities available in industries. PhD/ Post Doc placement for final placement and internship open round the year.

H. Technical and Soft Skills

- Technical/ soft skills/ mentorship sessions(virtual) with industry leaders free of cost to students
- Student Mentorship sessions in association with Talent Acquisition leaders of industry to take them through various aspects like Expectations of Industry on a Fresher, Future Skills, Creative Problem Solving, preparing a Great CV, Virtual Interview, How to Crack Virtual Interview etc.,
- Technical & soft skill sessions by BT Leaders on - Big Data Technical, Cloud Computing, Women in Technology, Importance of Communication, Agile, DevOps etc.,

I. Final Placement Campus Season Batch 2021-22 (*In-process)

Pre-Placement Talks (PPT's) for UG/Master/ PhD/ Post Doc students scheduled from August-2021.

- Pre-placement talks by companies were scheduled virtually in August and September
- A special 1-credit course to improve students' communication skills was organized during the year. A couple of sessions of coding bootcamp was also facilitated during the year. These have been extremely useful in bridging the gap between students' capabilities and employers' expectations.
- Placement process, PPT, Test, Interviews conducted via virtual mode.
- Campus Placement interviews commenced from 10 October 2021.
- 150+ companies participated in campus hiring for full-time placements.
- 356 Masters/UG, PhD students secured full-time jobs with highest of 60.00 LPA domestic offer.

Final Placement	*2021-22	2020-21	2019-20	2018-19	2017-18	2016-17
Total Students Placed	356	294	238	269	235	207
Highest CTC (LPA)	60.00 LPA (Domestic Offer)	95.3 L JPY (international) & 61.2 L (domestic offer)	43.3	62.4 L (International) 43.3 (domestic)	45	30
Average Annual CTC (LPA)	23.2	21.8	21.9	20	16.7	15
No. of students placed with >40 LPA	8	10	13	7	1	NA
No. of students placed with 30-40 LPA	73	50	43	45	10	2
No. of students placed with 20-30 LPA	154	97	76	56	53	33
No. of Master students placed	331	261	192	231	194	198
No. of PhD/ Post Doc Students Placed	18	28	34	35	31	3
No. of UG Students Placed	7	5	12	3	10	6

J. Connect with Batch 2022-23

Students from the batch of 2022-23 were addressed in July 2022. These interactive sessions with the students were to understand their inclination for campus placements, share information about the placement process/ policies, and identify their needs for personal skills and those requiring additional attention. Completed the pre-registration process for the full-time placements, and approximately 538 students registered, including PG, UG, PhD, and Post Doc.

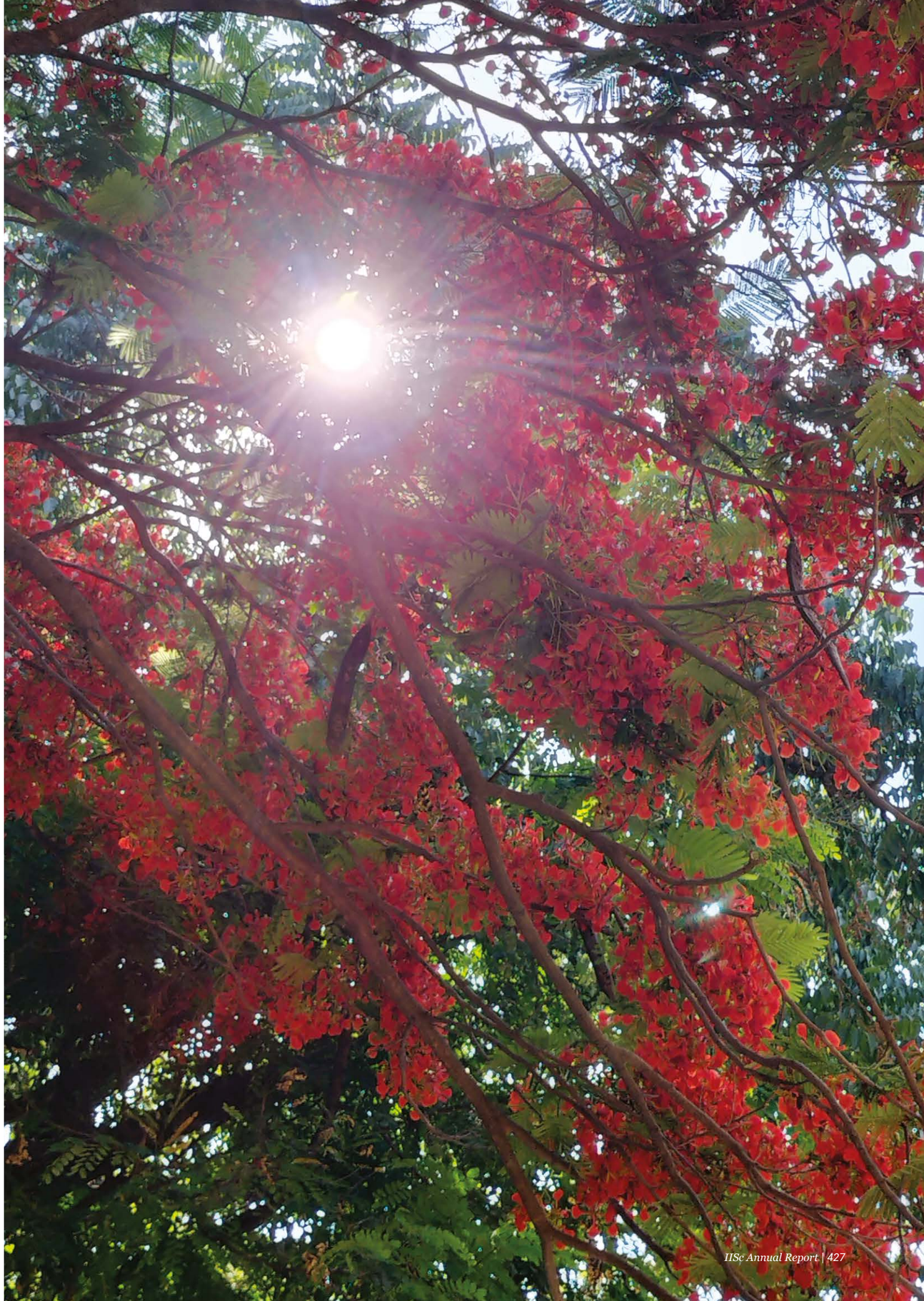
K. Internship Placements Batch 2022-23

- Internships open for UG/ Masters/ PhD/ Post Doc students
- Student meetings to take them through placement process and policies
- Batch 2023 internships commenced from March 2022
- 108 students secured internships
- Highest monthly stipend – 1.5 L

L. Final Placements Campus Season for 2022-23 (In-process)

- Placement activities for students graduating in the academic year 2022-23 were initiated in September 2022 with interactive sessions with the students to understand their interest in campus placements, share information about the placement policies and procedures, identify their need for personal/ inter-personal skills, and offer additional help to those requiring special attention.
- The pre-registration process for full-time placements has been completed, including UG, Masters, PhD students, and post-doctoral fellows. In addition, we organised periodic meetings with PhD students and Post Docs to familiarise them with work opportunities in the industry.
- This year, OCCaP prepared an attractive pamphlet of 12 departments to circulate to potential recruiters. Several recruiters were contacted, and many have responded positively with opportunities for our students.
- Some new recruiters such as Cerebras Systems, Capital One, Silicon Labs, Fujitsu Research of India, Pvt. Ltd. British Petroleum, SAP Labs, Super Six Sports, IDFC, Infobell, and Humanetics have been added to our list of eminent recruiters from earlier years.
- Pre-Placement Talks (PPTs) for students were scheduled during September and November 2022. OCCaP continues to use an online Portal developed a few years ago for managing key processes of matching students' interests with companies' requirements.
- The full-time hiring process for the academic year started in October 2022.
- This year, a total of 412 full-time offers have been made, and 379 UG, Masters, and PhD students secured jobs through OCCaP. The highest international CTC was 85.71 LPA, the highest domestic CTC was 66.79 LPA, the average CTC was 27.59 LPA, and the median CTC was 27.06 LPA. The placement process is still ongoing, and a few more students are expected to be placed through OCCaP in the coming months.
- The below table displays the placements comparison between 2022-23 and 2021-22.

Final Placement Statistics	2022-23 (In-process)	2021-22
Average Annual CTC (LPA)	27.59	23.2
No. of Master's students placed	346	331
No. of PhD Students Placed	30	16
Total Students Placed	379	356
Summer Internships	102	108



3.7.12

Foundation for Science, Innovation and Development

The Office of Career Counselling and Placement (OCCaP) Centralised the management of campus Placement and Internships. Several placement activities and events were organised to facilitate interaction between students and industries through special meetings (pre-placement talks, alumni connect meetings, etc) in IISc and helped students hone up their skills to meet industry requirements. This office is managed by a Placement Officer, who is supported by temporary staff for routine activities and by a committee of four professors for policy matters.

Director: B Gurumoorthy



I. CORE

II. Additive Manufacturing Centre of Excellence (AMCoE) – FY 2025–26

The polymer additive manufacturing machine, Apollo 350, which was launched at IMTEX 2025, is currently under Technology Transfer (ToT) licensing discussions with industry partners. This is a single-laser 3D printing machine that has been indigenously designed and developed in India. A two-laser machine is also under the final stage of completion. The high-performance polymer powder plant has commenced operations and has successfully started producing powders. The Technology Transfer (ToT) process is currently underway with a leading industry entity, and the agreement is under discussion. The ToT is expected to generate significant royalty revenue for FSID in the future.

A. CoE for Critical Minerals Mission – FY 2025–26

IISc was recognised as a Centre of Excellence for Critical Minerals under the National Critical Minerals Mission. FSID CoRE played a leading role in developing and coordinating the proposal.
The proposal is consortium-based and involves three academic institutions along with more than six industries working in the field of critical minerals. Two major proposals are currently under evaluation and are expected to be awarded during this year.

B. Projects Sanctioned

During the period under review, FSID received 142 projects sanctioned, covering different departments of the Institute involving the participation of a larger number of faculty.

C. Industry R&D Centres in FSID/ IISc Campus

Co-innovation Labs

1. ALT Carbon Tech PVT LTD
2. Toyo Ink PVT LTD
3. Garrett Motion Engineering Solutions PVT LTD
4. BEML LTD
5. SAFT India PVT LTD
6. United Technologies

D. Agreements/MoU:

Agreements with the following organizations have been entered into during the period under review.

Sl No.	MoU	MRA	RA	AA
1	VDC	Boeing	IIT Madras	Nokia
2	SBI	BEML	IIT Roorkee	Shell
3	ARAI	Prana	IIT Kota	HTS
4.	UST	Think Molecular	SETS	DTICI
5	TCS	GSK	PGCoE	TCE
6			IIT Bombay	HSFC
7			E P Kamat Group	ISRO
8				ADSL
9				Garrett

Project and Programme MoU Pipeline

Sl No.	MoU	MRA	RA	AA
1	DFCCIL	Emcure Pharmaceuticals	WSU	Fujitsu
2	L2M	Saft	CuNex	Sony
3	Blue Cloud	Unilever	AstraZeneca	Shell
4.	AstraZeneca	CarbonStrong	GE Vernova	TCS
5	NHA	Boeing	Minor Irrigation and Ground Water Department	Tata Steel
6	TANUH	Wipro	Hitachi	Toyo Ink
7	SAI	HCL	Herbalife	Collins Aerospace
8	nxtQ	Alt Carbon		Nokia
9	GBA	STX		Intel
10		IFB		
11		TRL Krosaki		
12		C-DOT		
13		Atonarp		
14		PwC		
15		SDAL		
16		Emcure Pharmaceuticals		
17		Atlas Copco		

III. STEM CELL

1. Companies (External) currently being incubated in FY 2025-26:

Sl No.	Incubation MM/YY	Company	Incubatee	Technology Area	Status	Impact Area
1	Nov/2025	Thinking Near Space Pvt Ltd.,	Saurabh Suhas Chalke, Rushabh Suhas Chalke	Aerospace, Climate-tech, Hardware, ML	Early Stage	Disaster Resilience
2	Aug/2025	Ferry Lifesciences Private Limited	Rohit Vikas Sagvekar, Ayyagari Vinaya Surya Vardhan, Anirudh Anilkumar	Medtech	Early Stage	Healthcare
3	Aug/2025	SustivonAI	Harsha Marigowd, Archana	Compliance Tech	Early Stage	Maritime Sustainability
4.	Aug/2025	Mankomb Technologies Private Limited	Mrudul Mudotholy, Dinesh Babu, Jawahar Arumugam	AI Hardware	Early Stage	Waste Management
5	Aug/2025	Eco Saathi Green India Private Limited	Kshirod Kumar Rout, Ajit Kumar Pallai	Sustainable Materials	Early Stage	Circular Economy
6	May/2025	Quixotix Bioprinting Pvt. Ltd	Sahasrabda Sai Pradhan	Bioprinting MedTech	Early Stage	Affordable Healthcare
7	Apr/2025	IndyAstra Technologies Pvt Ltd	Mr. Padmanabhan Desikachari	Defense AI	Early Stage	National Security

2. Companies incubated under the Faculty Entrepreneurship Programme in FY 2025-26:

Sl No.	Incubation MM/YY	Company	Incubatee	Technology Area	Status	Impact Area
1	Nov/2025	Wegro Greenlabs Private Limited	Vishal Singh, Suraj Kesri, Sunandan Paul	Agritech Hardware	Early Stage	Urban Sustainability
2	Jul/2025	Etherx Ai Private Limited	Chetan Singh Thakur, Sarat Tadanki	Edge AI	Early Stage	Healthcare/ Aerospace
3	FY25-26	Ezchem Solutions Private Limited	Prabhakaran E.N.	Chemistry EdTech	Early Stage	Scientific Research

3. Companies incubated under TBIs (CPDMED & InCENSE) in FY 2025-26:

Sl No.	Incubation MM/YY	Company	Incubatee	Technology Area	Status	Impact Area
CPDMED						
1	Sep/2025	nxtQ Private Limited	Muramalla Satya Srinivas Subrahmanyam, Durga Kumari Muramalla	Biomechanics AI	Early Stage	Preventive Healthcare
2	Jun/2025	Macof Innovations Private Limited	Dr Amita Rani Thakur	Biosensors MedTech	Early Stage	Diagnostics
InCENSE						
1	Jul/2025	Aagamiseq Technologies Pvt. Ltd.	Prof. Manoj Varma Mukunda, Dr. Divya Mohan Yadav, Muddukrishna P	Nanopore Biotech	Early Stage	Precision Diagnostics

1. Startups Supported under NIDHI SSP in FY 2025-26:

Startup	Investment Amount	Remarks
Eco Saathi	25 Lakhs	Fund transferred- CCD
Mankomb Technologies Pvt Ltd	25 Lakhs	Fund transferred- CCD

2. Startups Supported under iDEX

Sl No.	Name of Start-up	Name of Challenge	DOC/ISC/Prime Details	Current Milestone
1	Prayasta 3D Innovations Pvt Ltd	(TCL)Designing thermal agile mannequin to measure comfort parameters in simulated high-altitude environment	DISC 6 (TCL)	M2
2	Astrome Tech	4G/LTE Tactical LAN (IA)	DISC 1	M5
3	Astrome Tech	Four-Axis stabilised Antenna for C & Ku Band Operation (IN)	DISC 3	M3
4	Tsall Aerospsce Technologies Pvt Ltd	Caged Drone with TIC for Firefighting in Confined Spaces	DISC 7 #44	M4
5	Tsall Aerospsce Technologies Pvt Ltd	An integrated system for surveillance & reconnaissance, border mapping and targeting solutions	OC 6(Indian Army)	M3
6	Tsall Aerospsce Technologies Pvt Ltd	Autonomous Cargo Carrying Ariel Vehicle	0C 6 (Indian Navy)	M0

Sl No.	Name of Start-up	Name of Challenge	DOC/ISC/Prime Details	Current Milestone
7	Bellatrix Aerospace Pvt Ltd	Micro Propulsion Systems for cubesats	DISC 8 Ch: 35.2	M3
8	Bellatrix Aerospace Pvt Ltd	Hall Effect Plasma Thrusters for Spacecraft Orbit Corrections	DISC 8 Ch: 35.3	M3
9	Next Defence Pvt Ltd	DMAG (Drone Mounted Autonomous Gun)	OC 6(Indian Army)	M4
10	Astrome Tech	Customised Remote Modem with Ruggedised FPGA based platform with inbuilt Post quantum Encryption for VSAT baseband for Naval Platform	DISC VIII, Ch 31	M3
11	Agnit Semiconductors Pvt Ltd	Advanced Gallium Nitride Semiconductors	OC 7 - BEL	M4
12	Bellatrix Aerospace Pvt Ltd	Altitude Determination and Control System for CubeSats	DISC 8 Ch: 35.1	M2
13	Digantra Research and Technologies Pvt Ltd	Space Domain Awareness for Space Military	OC 7 (IAF)	M2
14	SpaceFields Pvt Ltd	Smoke Generator for Sarang Display Team	DISC X (Airforce) Ch:13	M3
15	SpaceFields Pvt Ltd	SparkType Ignitor Box and ignitors	DISC X Ch: 35	M3
16	Akashlabdhi Pvt Ltd	Developmentof IR Identifier Patches	DISC X Ch: 11	M3
17	Falcon Victor Pvt Ltd	Wireless Headset for Flight Gunners	DISC X Ch: 14	M3
18	AerX Pvt Ltd	To develop a machine learning Assisted Pilot Debrief and Assessment System	DISC 11, Ch: 14	M3
19	TIEA Connectors	MIL Grade Airborne Connectors	DISC 12, Ch: 29	M2
20	SpaceFields Pvt Ltd	Development of Green and Saffron Dye for Suryakiran (HAWK MK-132)	DISC X Ch: 10	M3
21	SpaceFields Pvt Ltd	Low-Cost Indigeneous Pyrotechnic Systems for Naval Application	OC 11, Sl. No. 9	M3
22	Digantra Research and Technologies Pvt Ltd	Imagery Data Fusion for Optical and Radar data Sources	DISC X, Ch: 58	M1
23	Digantra Research and Technologies Pvt Ltd	Geo-Spatial AI based Multi-Sensor (Optical/ Radar) Siting Simulation	DISC X, Ch: 59	M1
24	Tonbo Imaging Pvt Ltd	Design and Development of High Power Microwave Weapon System	ADITI-3, Indian Navy	M0
25	Astrome Techologies Pvt LTd	Training Simulator for Space Activites	PRIME X, DSA	PI due diiligence done, awaiting agreement signing

7. Incubation Pipeline:

STEM Cell has a healthy pipeline of proposals from prospective incubatees. The following are in advances stages of evaluation and discussion:

Domain	Product / Initial Offering
Healthcare	• Immunyfit Healthtech • Aagamiseq Technologies Private Limited • Vashishtha Research Private Limited • DeepLase Technologies Pvt Ltd • Akylo Healthcare Private Ltd • OUI Medical Pvt Ltd • RNT Health Insights Private Limited • NIRDHARYA LAB INDIA PVT LTD • BabyCue Private Limited • Quixotix Bioprinting Private Limited • Beavr
AI	• Neocosmicx • Tanay- EIR • Appan
Spacetech	• OrbtrixSpace • Antariksham Pvt Ltd., • Andura Labs • Blueway Horizon
MedTech	• Nxtq Private Limited- CPDMED • Macof Innovations- CPDMED • Frialta Medical- CPDMED • Gurucose
Sustainability	• Nanostrata Innovations Pvt Ltd • MEINE ELECTRIC AUTOMOTIVES PRIVA • Reenvo • Earthloka
Climate Tech	• SBH Electrocloud
Longevity	• Ferry Lifesciences • Namita Rao- EIR • Ashwini – EIR
Others	• VedaCrunch

8. Others:

- For FY 2025–26, Honeywell has committed funding of INR 3.5 crore.
- FSID is supported by Zerodha through CSR funding amounting to ₹4 crore over two years.
- The NIDHI-SSP scheme has been extended until September 2026.
- FSID is implementing the Bharat Innovates Program.
- Started disbursement under NIDHI SSP.
  - Discussions are at an advanced stage for collaborations with BEL, KREDL, and others.
  - The first cycle of SISF funding has been fully utilised, and a new application has been submitted under FSID for the second round of funding.
  - Opex under AIM has been exhausted, while Capex is being allocated to the Bio Lab as in-kind support. Equipment procurement is in progress, pending a transition to a new payment module.
  - Startups Success Stories/Investment:

Name of the Start-up	Amount received (in Rupees)	VC/ Investor
Aakashalabdhi Pvt Ltd	10,00,00,000	LetsVenture, Riceberg Ventures, and Angel Investors
Agnit Semiconductors Pvt Ltd	43,00,00,000	3one4 Capital, Zephyr Peacock, Angel investor
Agnit Semiconductors Pvt Ltd	10,00,00,000	Angel Investors
Al Health Highway Pvt Ltd	4,70,00,000	Social Alpha, Keiretsu Chennai, Venture Catalysts, The Chennai Angels,IIM CAN,Lead Angels
Al Health Highway Pvt Ltd	14,00,00,000	Turbostart, Rainmatter, TCA
Astrome Technologies	1,35,00,00,000	Apollo Global Management, Indian Angel Network, Urania, EvoNexus, Integra Micro Systems, ManSat
Avgarde Systems Pvt Ltd	4,00,00,000	Multiple Angels
Avgarde Systems Pvt Ltd	6,80,00,000	3one4 Capital, Zephyr Peacock
Azooka Labs Pvt Ltd	2,05,00,000	IKP, Friends & Family
Bellatrix Aerospace	1,02,00,00,000	Parampara Capital, Inflexor and BASF, Angel Investors
Centenarians Lifescience Pvt Ltd	20,00,00,000	IVY Growth Associates, Nine Spar Partner, Angel Investors
Dfine Bioinnovations Pvt Ltd	31,00,000	Director Capital
Digantara Research and Technologies Pvt Ltd	98,28,85,080	Karan Bhagat, Yatin Shah, Kalari Capital, GB-VIII Opportunity, Campus Fund, Peak XV, Athmanirbhar VC, Naman Finance Investment
Digantara Research and Technologies	5,00,00,00,000	360 ONE Asset, SBI Investment Co., Peak XV Partners, Kalaari Capital
Fanplay IOT Pvt Ltd	1,20,00,000	Ceramet Consultants, IISc, Angels
General Aeronautics	64,00,00,000	Mela Ventures, Wealthy Ideas and Fowler Westrup, Angel Investors
Green Collar Agritech Solutions Pvt Ltd	41,95,000	SISF, Technology Business Incubator, Honeywell CSR
Gyroid Photonics Innovations and Technologies Pvt Ltd	10,00,00,000	Angel investor
Gyroid Photonics Innovations and Technologies Pvt Ltd	18,00,00,000	Ideaspring Capital, Navam Capital
Indiaspeaks Research Pvt Ltd	2,00,00,000	TANSIM
Lab to market Innovations Pvt Ltd	5,90,84,980	HNI
LatentForce Intelligence Pvt Ltd	14,60,00,000	Ideaspring Capital
Mynvax Pvt Ltd	46,93,00,000	Accel,1 Crowd, Kotak, Inviga healtcare, Baldota
Mynvax Pvt Ltd	88,60,00,000	Accel, Legacy Assets and Nadig Advisors
Nabhdrishti Aerospace Pvt Ltd	80,01,810	Angel investors (Vanita & Lildhar)
Nabhdrishti Aerospace Pvt Ltd	30,00,00,000	Accel, IIMA Ventures
OpenWater.in Pvt Ltd	11,00,00,000	Forbes Marshall, IKP Knowledge Park and BIRAC
OpenWater.in Pvt Ltd	1,25,00,000	HNI
Pantherun Technologies Pvt Ltd	27,56,00,000	Capital TwoB
Pantherun Technologies Pvt Ltd	1,75,00,00,000	Sahasrar Capital, Info Edge Ventures, ThinKuvate, Capital 2B, Faad Capital, Piper Serica, Credentia Trustee
Papyrus Diagnostics Pvt Ltd	34,91,429	C-CAMP
Papyrus Diagnostics Pvt Ltd	10,00,876	C-CAMP
QPiAi India Pvt Ltd	3,88,00,00,000	Parishi Capital, Valour Capital, Avataar Ventures and YourNest
QPiAi India Pvt Ltd	38,23,80,084	SIDBI VC,Younest, SBS Bottelbrush, Sahasrar Capital private limited, Progressive silicon systems, Investt trust
Quan2D	3,77,00,000	NQM
Simyog Technology Pvt Ltd	19,99,89,521	Ideaspring Capital Future, MV Coretech Fund1, 1Funds trust 2, MV Coretech fund
Simyog Technology Pvt Ltd	36,00,00,000	Mela Ventures and 1Crowd, Ideaspring Capital, Angel Investors
Spacefields Pvt Ltd	3,42,51,000	Angels(Series 2 CCD)
SpaceFields Pvt Ltd	60,00,00,000	Rockstud Capital, Venture Catalysts, SiriusOne, Jamwant Ventures, AIC GUSEC
Theranautilus Pvt Ltd	11,00,00,000	pi Ventures, Golden Sparrow
TIEA Connectors Pvt Ltd	5,63,00,000	Multiple Angels
TIEA Connectors Pvt Ltd	36,00,00,000	Plantain Tree Ventures, Jamwant Ventures, IvyCap Ventures Advisors, Angel Investors
Ykrita Lifesciences Pvt Ltd	58,00,00,000	Inflexor, EyeMyEye, Bharat Innovation Fund, Turbostart
Ykrita Lifesciences Pvt Ltd	14,45,00,000	Angel investors
Dayu Robotics Pvt Ltd	2,00,00,000	Antler
Qosmic Satellite Systems Pvt Ltd	2,50,00,000	South Park commons
Sakar Robotics Pvt Ltd	8,00,00,000	PSNS Venture Private Limited

IV. TIME2

Product Accelerator `Samriddhi' funded by MHI in ongoing with 7 companies and 8 products.

(Multiple faculty member from Mechanical Engineering, Electrical Engineering, Aerospace and Materials)

Product Innovation Centre (PIC) has been established for developing an axial pump for ADA.

(R N Govardhan)

Design Verification project for Light Armored Multipurpose Vehicle for BEML – Involvement of faculty from the Mechanical Engineering department

Small-Scale Non-Biological Treatment System for High and Low volumes of STPs and

Large-Scale Biological Treatment System for High volumes of STPs – Involvement of faculty from the Centre for Sustainable Technologies

V. TARGETED RESEARCH (SEED)

1. STI Hub Outreach Programs

To strengthen engagement with local farmer groups, women's communities, weaving clusters, and school students, a series of outreach activities were conducted across the Challakere region and IISc campuses during 2025–26. These included design thinking awareness programs that reached 155 participants from rural communities, as well as science and career guidance workshops, school outreach sessions, and participation in the Science Day celebration at IISc Challakere campus. Collectively, the initiatives helped identify key community needs related to skill development, livelihood enhancement, and Science and Technology integration. Based on interactions and feedback, work has been initiated on products, technology interventions, and educational programs relevant to both local community groups and students.

Outreach Activities:

Activity Type	Awareness Program	Date	Place	No. of Participants
Design Thinking	Farmers through Farmer Producer Company. (via Shree Manjunatha FPC, Turuvanuru)	17/12/2025	Shree Manjunatha Farmer Producer Company (FPC), Turuvanuru	44
Awareness Program	Rural Community Women Gowripura.	17/12/2025	C-BELT Community Hall Gowripura	30
	Farmers through Farmer Producer Company. (via Biliniru Chilume FPC, Kondlahalli)	18/12/2025	Biliniru Chilume Farmer Producer Company (FPC), Kondlahalli	32
	Rural Community Weavers Neralagunte.	19/12/2025	Neralagunte	32
Community Visit	IISc DM students visit to sisal unit, wool related activities and basket weaving community	01/02/2026	Challakere	17
Science and Career Program	Full day programme in collaboration with IISc Innovation Council (IIC) for school students across India. Amitava Pramanik was the sole speaker, presenting three structured sessions on science and career guidance.	04/06/2025	FSID, IISc	40
School Outreach Program	Amitava Pramanik presented a two hour session to ATL Sarathi school students from 6 ATL schools of Bengaluru.	19/01/2026	FSID, IISc	70
Science Day Celebration	Team presented science experiments; approximately 4000 students and teachers visited.	28/02/2026	IISc Challakere Campus	~ 4000

2. Science Innovation and Technology Development

Building on last year's technology screening and prototype development, this year focused on piloting and testing innovations in real-world rural contexts. The emphasis remained on low-cost, scalable solutions that align with traditional occupations while introducing scientific advancements for improved productivity and sustainability. Key initiatives included:

a. **RAS Fisheries Pilot:** A study using a biofilter developed by Prof Sreenivasan Ramaswami (CST, IISc) was conducted between 07-05-2025 and 08-11-2025. Out of 60 fish stocked, 39 survived, yielding a survival rate of 65%. This pilot provided valuable insights into the feasibility of Recirculating Aquaculture Systems (RAS) for small-scale rural fisheries.

b. **Hydrothermal Dryer for Fruits and Vegetables:** A stainless-steel dryer was designed and fabricated, successfully removing 60% of moisture from bananas in 6 hours. While initial performance was promising, design improvements are underway. The dryer was also used to prepare fruit and vegetable samples for demonstration during Farmer Producer Company (FPC) surveys, strengthening farmer engagement.

c. **Portable Glass Dryer:** A portable glass dryer was developed for outdoor drying applications. Field trials are planned to evaluate drying speed and performance under varying environmental conditions, with the goal of offering farmers a flexible, low-cost drying solution.

d. **Fuel-Efficient Charcoal Kiln:** A masonry kiln was constructed and tested for charcoal production using coconut shells. The system achieved a carbonisation efficiency of 31.4% and reached a maximum temperature of 320°C inside the charcoal container. This innovation demonstrates potential for sustainable energy generation at the farm level.

e. **Keratin Extraction System:** The keratin extraction process from waste wool has achieved more than 50% yield, with clear evidence of structural preservation and biocompatibility. Ongoing cell studies are being conducted in Prof. Kaushik Chatterjee's laboratory (BE, IISc) to further validate the material's potential applications in biomedical and value-added products.

This year's innovations advanced across aquaculture, food preservation, energy, and

biomaterials. Together, they represent a significant step toward integrating science and technology into rural livelihoods, with strong potential for income generation, sustainability, and community empowerment.

3. Hands on Science for Rural Schools

To nurture a STEM mindset and strengthen scientific temperament among rural high school students, the SEED/STI hub team adopted four rural high schools located at Neralagunte, Abbenahalli, Naykanahatty and Nelagathanahatti for the academic year 2025–2026. The initiative focused on building conceptual clarity and critical thinking through weekly hands-on science sessions.

Activities Conducted:

a. Weekly science sessions: 40 one-hour sessions were organised across the four adopted schools.
b. Chapter-wise demonstrations: Experiments aligned with the Karnataka state curriculum were conducted for 10th standard students.
c. Mobile science labs: Infrastructure gaps were addressed by deploying mobile labs, with support from Prof. Vishal Singh (DM, IISc).
d. Low-cost experiments: Demonstrations used locally available materials to connect textbook concepts with real-world applications.
e. Affordable Science Kit Development: The SEED team is designing a cost effective toolkit to promote hands on science learning, making experiments accessible for both students and teachers, and inspiring interest in STEM careers through locally relevant activities.

List of Adopted Schools:

Name of School	Type	Duration	No. of Student
Government High School, Abbenahalli.	Govt	02/07/2025 -16/01/2026	43
Government High School, Nelagetanahatti.	Govt	23/07/2025 -16/01/2026	57
S.T.S.R. Composite P.U. College, Nayakanahatti	Govt Aided	17/07/2025 -13/01/2026	137
Sri Venkateshwara Rural High School, Neralagunte	Govt Aided	10/7/2025 -12/01/2026	53
Total Students Benefited			**290**

The initiative fostered curiosity, strengthened scientific temperament, and gave 290 rural students hands on exposure to STEM concepts through accessible, practical demonstrations.

VI. Programme Office Status Report - Large Strategic Programs Status Report

Sl No.	Programme Name	Ministry/ Corporate	Status	Remarks
1	ITsB2: Indian Institute of Science and Tata Chemicals Limited supported BIRAC Biofoundry	BIRAC	Awaiting Final Sanction	• **Overview** - The Indian Institute of Science (IISc), Tata Chemicals Limited (TCL) and FSID, propose establishing a bio foundry and biomanufacturing scale-up facility aligned with strategic priorities for India, as articulated by Department of Biotechnology and BIRAC. • **Strategic Need** - Currently there is a need for a pilot-scale fermentation infrastructure; proposed 30–100L systems for start-ups, MSMEs, and Corporates to optimise the parameters of fermentation while scaling from laboratory scale to commercial scale. • **Current Status** – Awaiting signed MoU from TCL which is a pre-condition from BIRAC to formally sanction the funding for the program.
2	ISRO - Execution of Mission focussed Research projects"	ISRO	Ongoing	• **Purpose of this framework MoU** is to engage IISc (through FSID) for executing Mission focused Research projects of ISRO. It shall provide thrust to the collaborative research and development of critical technologies and products required for the future space missions, bringing in an academia and research organisation closer for economical and faster development. • **Current Status** – 8 projects have been approved for funding under this MoU and are currently being executed by various faculty members at IISc.

3.7.13

Centre for Brain Research

The Centre for Brain Research (CBR), established in 2014 with a generous endowment from the Pratiksha Trust, is dedicated to advancing the frontiers of knowledge on brain aging and age-related neurological disorders. CBR's core mission is to preserve cognitive health across the lifespan and to reduce the burden of neurodegenerative conditions through cutting-edge, interdisciplinary research aimed at early diagnosis, prevention, delaying disease onset, and evidence-based health interventions. Working at the intersection of neuroscience, genomics, epidemiology, clinical medicine, data science, and public health, CBR brings together a diverse team of faculty, scientists, clinicians, engineers, and students. In parallel with its research endeavours, CBR invests actively in outreach, capacity-building, and partnerships with national and international institutions to multiply its impact and strengthen the ecosystem for brain health research in India.

Director: KVS Hari





Teamwork at Scale: *Members of Team CBR who organised "Cerebral Safari", the Centre's showcase at IISc Open Day (7 March 2026), attracting over 4,000 visitors*

Research Projects

Community-based longitudinal cohort studies offer opportunities to study the complex interplay of genetic, environmental, lifestyle, and clinical factors that shape trajectories of healthy and pathological brain aging. These studies generate rich, multimodal datasets that yield insights of direct relevance to dementia prevention and management in the Indian context.

CBR-Srinivaspura Aging, Neuro Senescence and Cognition (CBR-SANSCOG) Study

CBR-SANSCOG is CBR's flagship community-based, prospective cohort study, funded by the Pratiksha Trust and conducted in the rural population of Srinivaspura taluk, Kolar district, Karnataka. Targeting 10,000 participants across over 200 villages, the study follows an interdisciplinary, multimodal approach incorporating clinical, neurocognitive, biochemical, genetic, and neuroimaging assessments with long-term follow-up. A notable milestone was reached in February 2025, when the target recruitment of 10,000 participants was achieved. Since then, activities have centred on conducting follow-up assessments across multiple visit rounds. A home-visit protocol was also implemented during the year, enabling home-based assessments for participants with mobility or logistical. Community engagement through telephonic and in-person contacts has remained vigorous throughout the year, ensuring sustained participant follow-through across the extensive rural catchment area.

Tata Longitudinal Study of Aging (CBR-TLSA)

CBR-TLSA is a long-term cohort study of older adults in Bengaluru, launched in 2015 with generous support from Tata Education Trusts. The study, which now has approximately 1,500 active participants, tracks cognitive aging and neurodegenerative risk through periodic multimodal assessments. This year, the team prioritised completing follow-up visits across all visit rounds, achieving a follow-up completion rate exceeding 94% at multiple intervals. A shortened assessment protocol was developed and implemented to reduce participant burden, and home-based assessments were extended to those with mobility limitations, both of which have meaningfully improved

participant experience and retention rates. Another highlight of the year was the completion and internal review of the one-year pilot intervention study, which tested a multimodal lifestyle-based programme combining dietary modification, physical activity, mindfulness, cognitive training, and vascular risk management.

GenomeIndia
GenomeIndia is a pan-India initiative funded by the Department of Biotechnology, Government of India, involving 20 premier research institutions and coordinated by CBR. Its objective is to create a comprehensive repository of genetic variations in the Indian population, enabling future genetic studies and advancing the understanding of complex inherited disorders. The project has sequenced 10,074 individuals, yielding a final dataset of 9,768 individuals representing 83 ethnolinguistic groups, with over 129 million high-confidence genetic variants identified, 9.19% of which are novel to the Indian population. The year saw significant advances in the analysis and publication pipeline. A haplotype reference panel developed in-house achieved greater than 99% imputation accuracy and substantially outperforms existing panels for diverse South Asian populations - a resource of immense value for future genome-wide association studies. This panel will soon be made available at the Indian Biological Data Centre (IBDC). The GenomeIndia flagship paper, which consolidates the project's most important findings on fine-scale population structure, disease-relevant and pharmacogenetic variants, and founder population effects, is under review.

YLOPD Study
The Young and Late-Onset Parkinson's Disease (YLOPD) study, funded by the SKAN Research Trust and conducted in partnership with NIMHANS, aims to recruit 1,000 individuals with young-onset or late-onset Parkinson's disease (PD) with periodic follow-ups to elucidate the natural course of the disease and identify genetic risk factors specific to the Indian population. During the year, the study advanced mechanistic investigations using preclinical models and established analytical pipelines for prioritisation of non-coding genetic variants. Manuscripts based on genomic analyses and mechanistic studies are under review.

Other computational and experimental neuroscience programmes at CBR also continued to generate interesting findings related to aspects such as neuroinflammation, synaptic dysfunction, APOE4-mediated neuronal dysfunction, translational regulation, and genetic underpinnings and molecular mechanisms underlying neurodegenerative disorders.

Other Initiatives

To complement its research mission, CBR has pursued a wide array of initiatives spanning partnerships, capacity-building, outreach, and engagement with the broader scientific and clinical fraternities.

Collaborations and Partnerships
FY 2025-26 was a landmark year for CBR's collaborative endeavours. A key event was the launch of the CBR Biomarker Centre of Excellence, a pioneering collaborative initiative with the UK Dementia Research Institute (UK DRI) and with support from Gates Ventures. Inaugurated on 28 October 2025 by Dr. Kris Gopalakrishnan in the presence of Prof. Govindan Rangarajan and numerous valued well-wishers, the Centre is designed to create an advanced platform for the discovery and validation of fluid biomarkers and digital biomarkers for neurodegenerative diseases. Complementing this, the CBR-UK DRI Postdoctoral Fellowship Programme was launched in September 2025 with a focus on biomarker science, digital health, and AI in healthcare. In its inaugural cycle, two postdoctoral researchers have been selected through a competitive process.



***A pivotal milestone:** Inauguration of the CBR Biomarker Centre of Excellence, launched in partnership with the UK Dementia Research Institute and Gates Ventures (28 October 2025)*

In its effort to build a national consortium for healthy brain aging research, CBR formalised Memoranda of Understanding with organisations such as the Madras Diabetes Research Foundation (MDRF) in Chennai, Centre for Chronic Disease Control (CCDC) in New Delhi, Parkinson's Disease and Movement Disorders Clinic in Bengaluru and the LV Prasad Eye Institute (LVPEI) in Hyderabad. CBR also signed MoUs with Trinity College Dublin (including the Global Brain Health Institute), the University of Southern California (for the LASI-DAD study), and Shanmukha Innovations, Bengaluru. A visit to Niigata University, Japan, facilitated the inaugural IISc-Niigata University Joint Neuroscience Symposium and launched early discussions on a trilateral partnership between CBR, the IISc Centre for Neuroscience, and the Brain Research Institute at Niigata University.

To communicate CBR's vision of a multi-institutional collaborative framework for brain aging research and to explore its modalities with potential partners, a cohort networking meeting titled 'Building a Collaborative Framework for Brain Aging' was held at CBR on 28-29 October 2025, supported by Bristol Myers Squibb.

External Grants and Fellowships
CBR researchers secured a number of research grants, fellowships, and recognitions during the year, further reinforcing the Centre's standing as a vibrant research organisation. These included the Indian Council of Medical Research (ICMR)-Department of Health Research (DHR) International Long-Term Fellowship, the Atlantic Fellowship for Equity in Brain Health at the Global Brain Health Institute (GBHI), early-career and postdoctoral fellowships from the Anusandhan National Research Foundation (ANRF), and research grants from agencies such as the Department of Biotechnology (DBT), Department of Science and Technology (DST), and ICMR. Additional support included a research partnership grant from the Swiss State Secretariat for Education, Research, and Innovation (SERI), as well as an ISTAART Ambassadorship from the Alzheimer's Association.

Capacity-Building
Seven new Visiting Faculty Members joined CBR this year, out of which five are from IISc, further strengthening ties with the Institute.

The year saw continued investment in nurturing the next generation of researchers. The 2025 edition of CBR Research and Innovation (CBRAIN) Internship Programme attracted nearly 9,200 applications from institutions across the country, from which 7 candidates were selected for a 3-month multidisciplinary internship programme focused on brain aging research. The 2026 edition, launched in March 2026 with a focus on cohort data curation and analysis, received over 4,400 applications.

The CBR Distinguished Visitor Programme (CBR-DVP), kindly supported by philanthropist Ms. Nirmala Jay Pullur, continued to enrich the intellectual environment at CBR. Prof. Barbara Bendlin (University of Wisconsin-Madison) delivered the second lecture, sharing cutting-edge findings on the gut microbiome and its influence on Alzheimer's disease biomarkers and neuroinflammation. Dr. Tanveer Syeda-Mahmood (IBM Fellow and Adjunct Professor, Stanford University) delivered the third lecture, on multimodal fusion frameworks for advancing precision medicine.
A Distinguished Lecture co-organised with the Division of Biological Sciences, IISc, featured Prof. Charles Cantor, co-founder of the Human Genome Project. CBR also co-organised the third annual BDBio (Big Data Algorithms for Biology) Symposium which

brought together leading scientists from academia and industry for sessions in bioinformatics, computational biology, and systems biology.

The year also marked the first two doctoral dissertations to emerge from CBR, both successfully defended, representing a remarkable milestone in the Centre's journey.

The Amba Subba Rao Fellowship for Women Researchers was launched in September 2025, supported by a generous philanthropic donation from the family of the late Mrs. Amba Subba Rao. This competitive fellowship supports early-career women scientists affiliated with CBR to participate in international conferences, undertake collaborative visits, undergo specialised training, defray publication costs, etc. Three inaugural awardees were selected in March 2026 following a rigorous evaluation process.

In its role as Secretariat for the Pratiksha Trust Extra-Mural Support for Transformational Aging Brain Research (EMSTAR) programme, CBR continued to support administration, monitoring, and review of four externally funded interdisciplinary research projects on the aging brain.

CBR Day was celebrated on 12 August 2025, marking eleven years since the Centre's inception, with a special lecture by Prof. Arun SP (Centre for Neuroscience, IISc) on the neural basis of real-world vision, and a recognition ceremony for long-serving team members. The day also featured a creative painting challenge for CBR team members.

Engagement with the Scientific Community

CBR's growing reputation as a hub for brain aging research was reflected in the large number of distinguished visitors it hosted during the year, spanning scientists, clinicians, policymakers, and industry leaders from India and abroad. Notable among them were representatives from Gates Foundation, Bristol Myers Squibb, Abbott Laboratories, Tata Consultancy Services, UK DRI, the National Institutes of Health (NIH), and leading universities across the USA, UK, Europe, and Japan. CBR made its debut as an exhibitor at the Alzheimer's Association International Conference (AAIC) in Toronto in July 2025, presenting ongoing and upcoming initiatives to a global audience. CBR researchers presented research findings at several major international conferences, including AAIC, AD/PD 2026 International Conference on Alzheimer's and Parkinson's Diseases (Copenhagen), and multiple other forums related to genomics, neuroscience, neuropsychology, and aging research.

Outreach and Public Engagement

CBR continued its strong tradition of engaging with the public through a range of events and initiatives. In September 2025, CBR co-organised 'The Memory Dialogue: Science, Care and Community', a World Alzheimer's Month awareness event in partnership with Dementia India Alliance, Nightingales Medical Trust, and Vayah Vikas, featuring thematic sessions on prevention and care. CBR also participated in DemCon 2025, the second edition of the national dementia conference organised by Dementia India Alliance, held at Visakhapatnam in December 2025. A national consultative meet on India's dementia strategy in New Delhi, attended by representatives from key ministries and institutions, was another important forum in which CBR actively participated.

During IISc Open Day in March 2026, CBR's "Cerebral Safari" exhibit attracted over 4,000 visitors of all ages, featuring brain health posters, interactive neuroscience quizzes, live demonstrations of real-time brain activity monitoring using EEG headbands, and hands-on educational activities. Earlier in the year, CBR also hosted a book talk and panel discussion on machine learning and artificial intelligence, as well as a workshop on CRISPR gene-editing technology for students and early-career researchers. School students from the North-East visited CBR under the 'Mukhya Mantrir Bigyan Pratibha Sandhan' programme.

Research Publications

Building on the momentum of previous years, CBR researchers published over twenty papers in peer-reviewed journals during FY 2025-26. The work spans a wide spectrum ranging from epidemiological and genomic findings rooted in the flagship cohort studies to discoveries from laboratory models of neurodegeneration. Notable journals in which work was published include *Alzheimer's and Dementia, The Lancet Regional Health – Southeast Asia, Autophagy, Life Science Alliance, PLOS One, BMC Public Health, BMC Medical Genomics, Journal of Medical Systems, Scientific Reports, RNA Biology,* and *Annals of Indian Academy of Neurology,* among others. The team also presented their work extensively at national and international conferences through invited talks, oral presentations, and poster sessions.

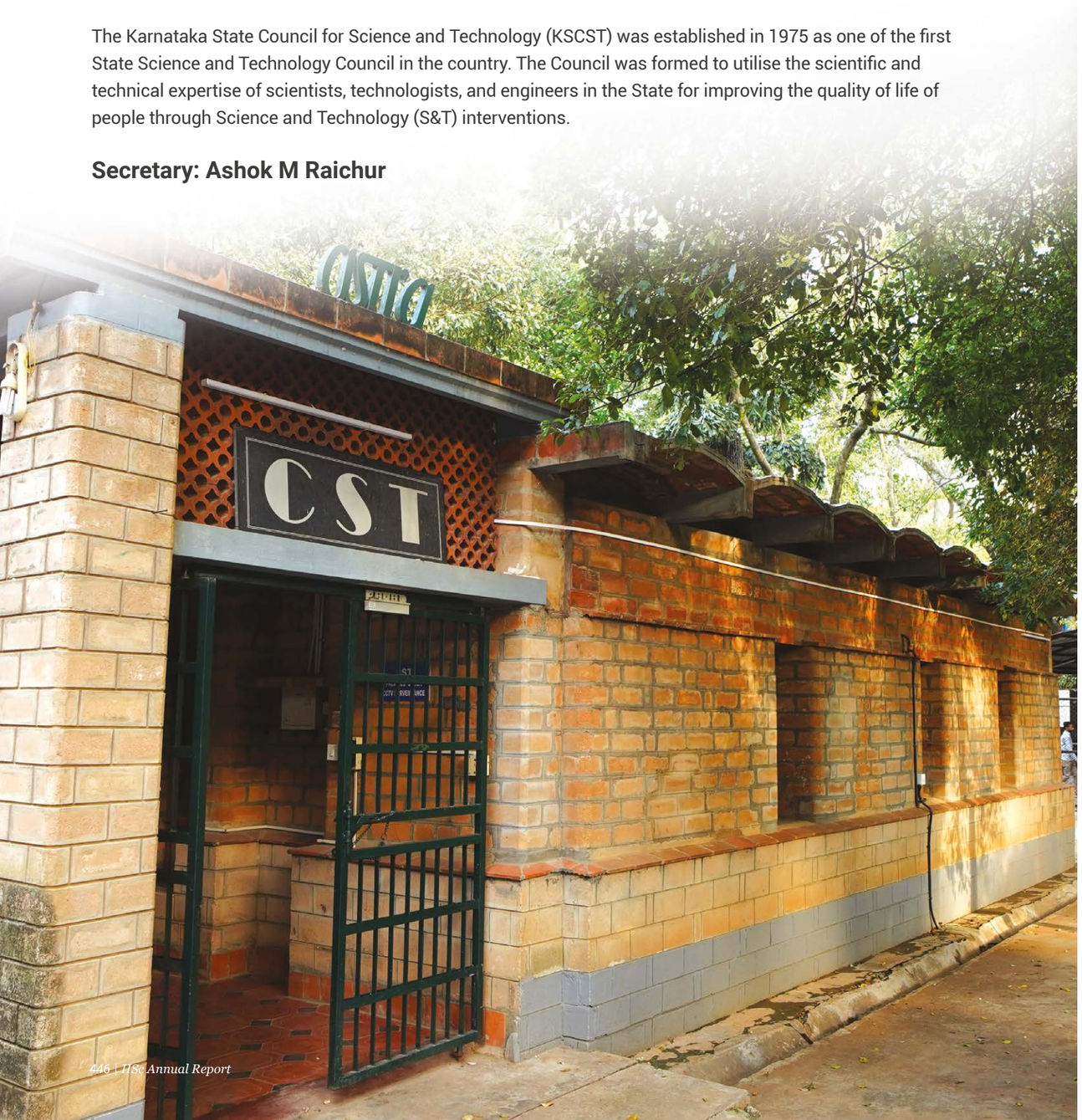


3.7.14

Karnataka State Council for Science and Technology (KSCST)

The Karnataka State Council for Science and Technology (KSCST) was established in 1975 as one of the first State Science and Technology Council in the country. The Council was formed to utilise the scientific and technical expertise of scientists, technologists, and engineers in the State for improving the quality of life of people through Science and Technology (S&T) interventions.

Secretary: Ashok M Raichur



The Karnataka State Council for Science and Technology (KSCST) was established in 1975 as one of the first State Science and Technology Council in the country. The Council was formed to utilise the scientific and technical expertise of scientists, technologists, and engineers in the State for improving the quality of life of people through Science and Technology (S&T) interventions.

Education, water, energy, housing, geospatial technologies, and natural resource management are among the major sectors identified by KSCST for promoting research, development, and dissemination of ideas, products, services, and technologies with support from both the State and Central Governments and R&D institutions such as IISc., and other major institutions.

Some of the earlier success stories of KSCST include the design and dissemination of novel biogas plants, solar collectors, solar ponds, gasifiers, alternate building technologies, high-efficiency cooking stoves (ASTRA Ole), establishment of rural energy centres, and innovative utilisation of sisal plants.

Recent major initiatives undertaken by KSCST for societal benefit include geospatial action plans for informed decision-making, rainwater harvesting, rejuvenation of traditional water harvesting systems, Karnataka Geoportal, village mapping, Student and Faculty Project Programmes, Patent Information Centre, SC/ST Cell activities, watershed management, digital mapping of heritage sites and museums, renewable energy initiatives, implementation of virtual classrooms in schools, and various science outreach programmes.

KSCST also supports the State Government in the formulation of Science and Technology-based policies and assists both Central and State Governments in scientific surveys, project implementation, evaluation, coordination, monitoring, organisation of scientific meetings, and awareness campaigns. Apart from playing a catalytic role in implementing sustainable technologies for addressing societal problems, KSCST has also been actively promoting research, development, and innovation in universities and academic institutions.

VISION:

Application of Science and Technology for the management of resources, improvement of the environment, enhancement of quality of life, and socio-economic development of the people of Karnataka.

MISSION:

To coordinate research and development activities for generating knowledge-based scientific interventions, develop and popularise appropriate technologies for adoption by civil society to address local-specific problems, and strengthen human resources in the Science and Technology sectors in the State.

Major Programmes: Activity Report 2025-26

Health & Nutrition Initiatives

- **Sickle Cell Anaemia Project:** The project supports the National Sickle Cell Eradication Mission by screening tribal populations through 238 Primary Health Centres (PHCs) across Mysuru, Chamarajanagar, and Kodagu districts. During 2025–26, KSCST and the IISc CHAnDAna Project conducted IEC awareness and screening programmes, including rallies, camps, pamphlet distribution, oath-taking programmes, interactive sessions, and street plays in tribal Gram Panchayats, covering approximately 2.56 lakh tribal population.
- **Establishing SHG/FPO Enterprises to Address Malnutrition and Generate Rural Livelihoods in Yadgir District:** Supported by the Department of Science and Technology, Government of India, this project aims to reduce post-harvest losses, improve nutritional security,

and generate sustainable rural livelihoods through fortified food production in Yadgir District. A fortified food production centre was established in collaboration with Centre for Sustainable Technologies (CST-IISc) and Aero Centre for Public Nutrition (ACPN). Four variants of fortified food products received FSSAI certification and are being produced in Yadgir through the local SHG production partner, Shri Mailaralingeshwara Sangha. The products are marketed through NGOs and SHGs. From December 2025 onwards, the project operations were transferred to ACPN and the SHG for continued production and management.

- **Establishment of Non-Timber Forest Products Collection Enterprise (NTFPCE) at Karnataka State LAMPS Cooperative Federation, Mysuru and LAMP Society, Koppa:** This project focuses on enhancing tribal livelihoods through value addition and ensuring fair pricing for Non-Timber Forest Products (NTFPs) in Karnataka. During 2025–26, a 1000 kg/day honey processing plant at Mysuru became operational. Installation of 1000 kg/day capacity Amla and Shikakai processing and packing plants is currently underway and is expected to be completed by the end of June 2026. In addition, installation of a 500 kg/day capacity Shikakai processing and Honey bottling plant is in progress at the LAMP Society, Koppa in Chikkamagauru District.

Intellectual Property & Innovation

- **Patent Information Centre (PIC):** Through its Patent Information Centre (PIC) and Technology and Innovation Support Centre (TISC), KSCST strengthened the Intellectual Property Rights (IPR) ecosystem in Karnataka through awareness programmes, training, patent facilitation, and commercialisation support. During 2025-26, KSCST established four new IP Cells, organised 24 IPR programmes, facilitated intellectual property registrations and GI applications, and received the National IP Award 2025 under the category "Special Citation for Patent Information Centre".

Spatial Planning and GIS

- **NRDMS Centres:** The Natural Resources Data Management System (NRDMS) programme continued supporting decentralised planning in Karnataka through GIS-based spatial databases, thematic mapping, and geospatial applications across multiple sectors. During 2025-26, GIS activities, action plans, technical support, and capacity-building programmes were carried out for various Government Departments at district level, Panchayat Raj Institutions, and district NRDMS officials across Karnataka.
- **Karnataka Digital Museum:** KSCST, in collaboration with the Department of Archaeology, Museums and Heritage (DAMH), is implementing the Karnataka Digital Museum (KDM) Project using 3D laser scanning and geospatial technologies for digital preservation of museum antiquities. During 2025-26, a total of 2,071 antiquities, coins, and paintings were digitally documented across multiple museums. The project was inaugurated by Shri Siddaramaiah, Hon'ble Chief Minister of Karnataka, at Lakkundi (historically significant village located in the Gadag district of Karnataka) in June 2025.

Water Technology and Rainwater Harvesting

- **KSCST–RWH Cell:** The KSCST Rainwater Harvesting (RWH) Cell conducted awareness programmes, workshops, and training programmes across Karnataka during 2025–26, benefiting around 2,380 participants and promoting rainwater harvesting and groundwater recharge practices. Technical guidance, DPR preparation, and support through the RWH Help Desk were extended to several Government, educational, and research institutions, including Raj Bhavan, CSIR-NAL, and DSCE.

Student Project Programme (SPP)

KSCST's Student Project Programme (SPP), initiated during 1977-78, continues to promote innovation and practical problem-solving among engineering, undergraduate, and postgraduate science students across Karnataka. During 2024-25, a total of 1,714 projects were supported (48th Series), while 1,429 projects were supported during 2025-26 (49th Series) with financial and technical assistance.

The 48th Series SPP Annual State-Level Poster Presentation and Exhibition was conducted at Jawaharlal Nehru New College of Engineering, Shivamogga during 1-2 August 2025, involving experts from IISc, NAL, CMTI, and industries to encourage research, innovation, and industry-oriented learning. A total of 50 projects were identified as "Best Projects of the Year". The programme is being co-hosted by the Artificial Intelligence and Robotics Technology Park (ART-Park), IISc.

Science Outreach Activities and Popularisation

- KSCST hosted 40 Class XI students and six officials from Assam under the "Bigyan Darshan" programme, facilitating visits to premier R&D institutions in Bengaluru including IISc, ISRO-URSC, and NAL.
- National Space Day, National Mathematics Day, and National Science Day were celebrated across Karnataka through technical talks, exhibitions, workshops, competitions, and sky-watching activities benefiting thousands of students.
- Around 600 students participated in painting competitions and science model exhibitions focusing on environmental sustainability, irrigation, waste management, and safety technologies.
- KSCST conducted a five-month Science Outreach Programme in 20 rural schools of Mandya district, benefiting 2,449 students through hands-on experiments and interactive sessions conducted by IISc research scholars.
- KSCST collaborated with academic institutions and NGOs in organising workshops, training programmes, and national conferences including AIMAR 2025 and a conference on hydrological dynamics and climate change.
- The KSCST Regional Centre, Kalaburagi organised science and technology outreach programmes during 2025–26 benefiting over 1,000 students through exhibitions, competitions, and technical sessions. Workshops on rainwater harvesting, teacher training, and modern agricultural technologies were also conducted in collaboration with VTU, District Science Centre, and ICAR-KVK.

Digital Learning, Webinars and Conferences

- **'Vidwath – AURA' Project:** The 'Vidwath–AURA' project was implemented in two Karnataka Residential Educational Institutions Society (KREIS) schools in Bengaluru Rural district using VR headsets and interactive 3D science learning modules for 9th standard students.
- **Golden Jubilee Webinar Series:** KSCST organised the "One Month, One Theme" Golden Jubilee webinar series covering themes related to science, technology, sustainability, climate change, and innovation, benefiting around 800 participants.
- **Golden Jubilee Celebrations:** KSCST celebrated its Golden Jubilee on 03 December 2025 at IISc, Bengaluru, marking 50 years of contribution to Science, Technology, and Innovation in Karnataka. The programme included the release of the commemorative compendium titled "KSCST: 50 Years of *Excellence – Celebrating the Past, Shaping the Future"* and screening of a documentary showcasing KSCST's achievements. The event brought together scientists, academicians, former officials, and Government representatives, reaffirming KSCST's commitment to research, innovation, and societal development.
- **Participation in National Events:** KSCST participated in the 38th Kerala Science Congress 2026 held at Kochi and received the "Second Best Award" at the National Science Expo for its technical exhibition and outreach initiatives.

Energy Cell Activities

The KSCST Energy and Bioenergy Cell promoted renewable energy and biofuel activities through

technical support, training programmes, and coordination of 32 Biofuel Research Information and Demonstration Centres (BRIDCs) and four Biofuel Parks in Karnataka.

During 2025–26, KSCST and the Karnataka State Bioenergy Development Board (KSBDB) organized the "Biofuels for Tomorrow" conclave and several technical programmes to strengthen bioenergy activities and entrepreneurship.

Under the Student Project Programme, 53 bioenergy-related projects were supported, of which 16 projects were selected for State-level exhibition and two projects received the "Best Project of the Year" award.

SC/ST Cell Activities

The KSCST SC/ST Cell continued implementing science and technology programmes for the socio-economic development of marginalised communities during 2025-26.

Training programmes on livestock farming, medicinal plants, tissue culture, and bamboo handicrafts were conducted to promote skills, entrepreneurship, and sustainable livelihoods among SC/ST communities.

KSCST also installed Solar PV Home Lighting Kits in 50 tribal households in Kodagu and Uttara Kannada districts to support clean energy access and sustainable rural development.

Environmental Sustainability Initiatives

- **Wallscape to Wildscape** – Urban Sapling Rescue and Rewilding Initiative: This initiative focuses on rescuing ecologically important saplings growing on urban structures and replanting them in suitable ecological locations. During 2025-26, an Android mobile application and GIS-based web dashboard were developed for citizen reporting, sapling tracking, and monitoring. Nursery facilities, hanging garden structures, plumbing systems, and automated drip irrigation systems were also established to support sustainable sapling conservation and rewilding activities.

Special Recognition

- **State Scientists and Engineers Awards:** The Government of Karnataka, through KSCST, continued implementing the State Scientists and Engineers Awards to recognise outstanding contributions to Science and Technology. During 2025-26, KSCST received 213 nominations for the 2024 and 2025 awards across engineering, physical sciences, life sciences, and women scientist categories. The Selection Committee chaired by Prof. Govindan Rangarajan recommended 28 Scientists and Engineers for the awards, and KSCST is in the process of organising the award presentation ceremony.



3.7.15

AI and Robotics Technology Park

34 startups built and invested in · ₹1,500+ Cr combined valuation
40+ startups supported across the ecosystem · 77+ technologies developed
72 patents filed · 7 award-winning social ventures

Executive Director: Bharadwaj Amrutur



Seven new investments

AlgoBotix
Drone swarm air traffic control over 5G

EdgeVerse India
AI-powered rider assistance for Indian roads

Strider Robotics
Autonomous quadrupeds for hazardous industrial inspection

Bodh Robotics
GPS-denied navigation for drones

Zenteiq Altech
Physics-native AI for engineering simulations, up to 400x faster

SciVision
AI structural health monitoring for bridges, aircraft, and pipelines

Braille UDOT
Tactile displays for visually impaired students

Highlight: ZenteiQ.ai awarded ₹75 Crore by the IndiaAI Mission to build India's Scientific Foundation Model.

Partnerships and MoUs
Three institutional agreements of national significance were signed.

A tripartite MoU with the Integrated Defence Staff and IISc established the foundation for India's first Defence AI Foundry, DefAIy.

An MoU with ICMR-NIRDHDS advanced digital health and responsible AI as open public goods.

An MoU with the Central Warehousing Corporation opened pathways for ARTPARK startups to deploy AI, AMRs, 5G, and digital twins across one of India's largest public-sector logistics networks.

CodeBot Hackathon 2025
ARTPARK @ IISc · Co-hosted with TIH, IIT Bombay · Sponsored by ISSS and the Derby Foundation

CodeBot was an innovation hackathon, which was open to developers, innovators, and tech enthusiasts across India. Teams built solutions in Agriculture, Healthcare, and Smart City/ Village using Robotics and AI, IoT and 5G, and AR/VR. Unlike a typical hackathon, CodeBot began with a three-month virtual mentoring programme — offering 1:1 sessions, workshops, and peer collaboration — before culminating in an in-person finale at ARTGarage, Bengaluru.

The Finale — 17 July 2025
24 finalist teams from across

India gathered at ARTGarage for the grand finale. A poster round opened the day, with eight teams advancing to deliver solution-oriented pitches backed by working prototypes. Standout solutions included Chotta Kissan — a grassroots farm labour reduction tool, Code Titans — an educational tool for autistic individuals, Prakashrekha — a 5G-based railway safety system, and Watch Tower-X — an AI tool for prioritising CCTV footage for forensic analysis.

India Mobile Congress 2025
India Mobile Congress 2025 was a strong showing for ARTPARK and its ecosystem. At the event, ARTPARK showcased innovations from its Centre of Excellence for Wired and Wireless Technology alongside five startups from its portfolio, putting some of our most cutting-edge work in connectivity, autonomous systems, and deep tech in front of one of the country's largest technology audiences. The highlight of the event was ARTPARK winning the 5G Innovation Hackathon for LifeCircuit: a hyperconnected emergency-care ecosystem designed to close the gap in out-of-hospital cardiac and other emergencies in India. LifeCircuit brings together Revive360 for AR/VR CPR training, ResQ360 for geo-located rapid response, and Synk360 for real-time tele-support through smart devices, equipping citizens to act as first responders through an integrated 5G, IoT, and AR/VR platform. The team was felicitated by the Hon'ble Minister of State for Communications.

Bangalore Tech Summit 2025
Bengaluru Tech Summit 2025 was a landmark moment for ARTPARK - both in terms of impact and recognition. At the pavilion, ARTPARK showcased more than 20 innovations and startups, drawing leaders, international delegations, policymakers, industry partners, customers, students, and young innovators who engaged with some of India's most promising deep tech work. The summit also marked a significant announcement: BRAINZ, the Bengaluru Robotics and AI Innovation Zone, developed in partnership with the Government of Karnataka, was unveiled at BTS and subsequently formalised in the Karnataka Budget 2026–27. Designed as a dense, walkable, 24/7 innovation ecosystem, BRAINZ will co-locate government, academia, and industry to accelerate breakthroughs across AI, robotics, spacetech, defence, medtech, and Industry 5.0. ARTPARK also received the Best Innovative Display Award, its second consecutive year earning the honour.

ROSCon India 2025
ROSCon India 2025 was the third and most ambitious edition of India's premier Robot Operating System conference. Held over three days at COEP, Pune, this marked the first time the event moved beyond Bengaluru. Hosted in partnership with Rigbetel Labs and Acceleration Robotics, both part of the ARTPARK startup ecosystem, the event brought together over 1,000 members of India's robotics community across 20+ technical talks, keynotes, panels, and live demonstrations. Fourteen-plus robotics startups showcased their work, with highlights spanning humanoid and quadruped systems, autonomous systems, and the latest advances in ROS-based development. Each edition of ROSCon India has grown in scale and depth, and 2025 was no exception, cementing its place as the definitive gathering for India's robotics builders and researchers. Planning is already underway for ROSCon India 2026.

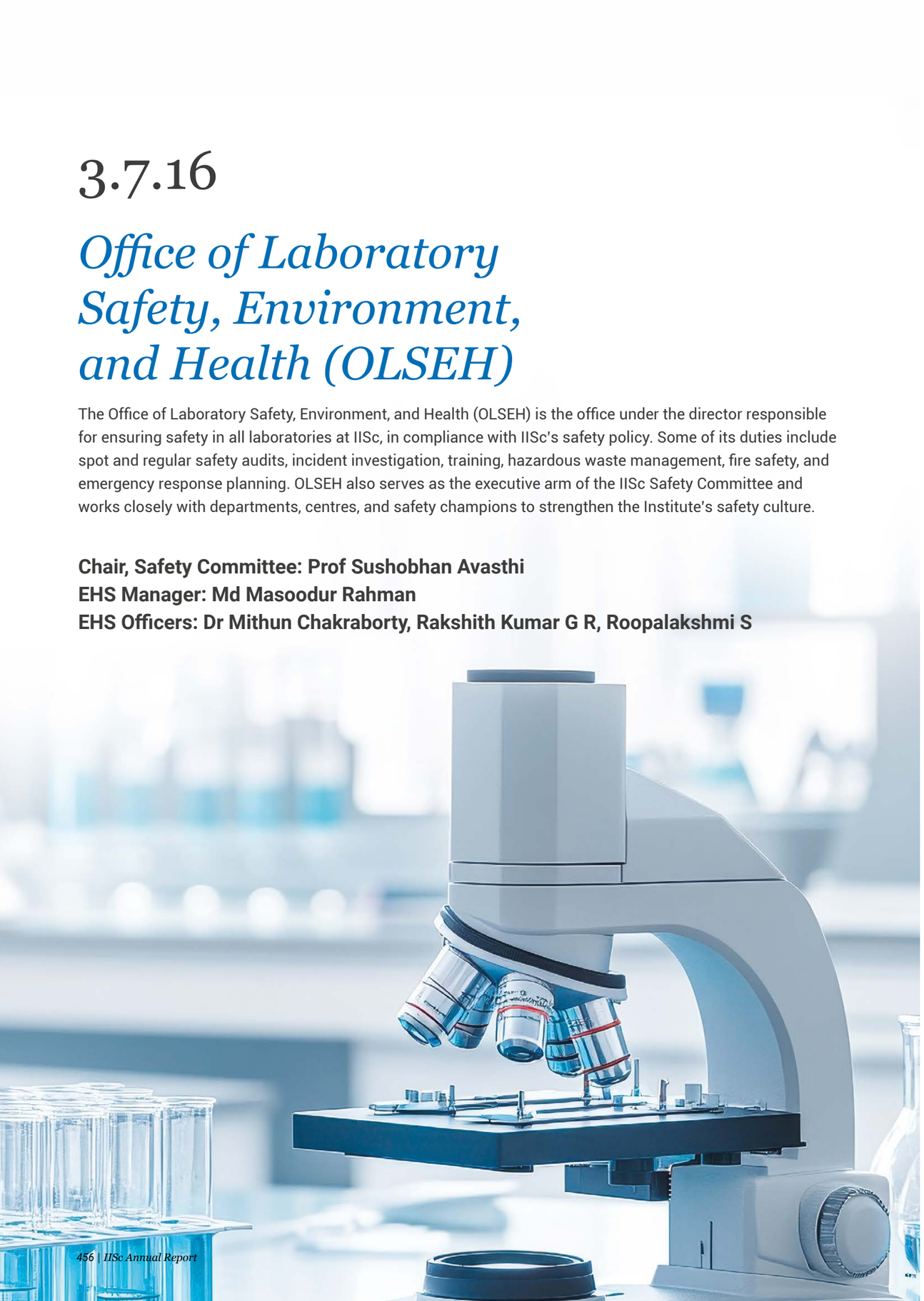


3.7.16

Office of Laboratory Safety, Environment, and Health (OLSEH)

The Office of Laboratory Safety, Environment, and Health (OLSEH) is the office under the director responsible for ensuring safety in all laboratories at IISc, in compliance with IISc's safety policy. Some of its duties include spot and regular safety audits, incident investigation, training, hazardous waste management, fire safety, and emergency response planning. OLSEH also serves as the executive arm of the IISc Safety Committee and works closely with departments, centres, and safety champions to strengthen the Institute's safety culture.

Chair, Safety Committee: Prof Sushobhan Avasthi
EHS Manager: Md Masoodur Rahman
EHS Officers: Dr Mithun Chakraborty, Rakshith Kumar G R, Roopalakshmi S



1. Laboratory Safety and Audits
OLSEH conducts regular safety Inspections/audits of all labs on campus. OLSEH implemented a risk-based laboratory audit program across the Institute. Specialised laboratories involving chemical, biological, laser, radiation, cryogenic, compressed gas, and other high-hazard operations were audited every three months, while non-specialised laboratories were audited once every eight months. Offices and facilities at the Challakere campus were audited on a nine-month cycle.

Audit activities focused on compliance with Institute safety standards, laboratory infrastructure, emergency preparedness, hazardous material management, waste handling, personal protective equipment, and safe operating practices. Follow-up inspections were conducted to monitor implementation of corrective actions and promote continuous improvement in laboratory safety and regulatory compliance. Most of the labs comply with all safety regulations. Safety compliance is continually improving.

2. Safety Notices and Compliance Monitoring
OLSEH enforces compliance through a safety notice and follow-up system. The notices addressed deficiencies related to laboratory infrastructure, hazardous material management, engineering controls, emergency preparedness, electrical safety, waste management, and safe operating practices. All notices were tracked, and follow-up inspections were conducted to verify implementation of corrective actions. The notice management process contributed significantly to improving laboratory compliance and reducing institutional risk.

3. Incident Reporting and Investigation
OLSEH maintained a centralised incident reporting system to identify hazards, prevent recurrence, and continuously improve safety performance across the Institute.
The system includes self-reporting, investigation, and corrective action.

During the year, a range of safety incidents and near-miss events reported from various Institute facilities were reviewed and investigated. Each reported event was systematically investigated to identify immediate and underlying causes, assess associated risks, and recommend appropriate corrective and preventive actions. The findings from these investigations were used to strengthen safety practices, enhance awareness, improve risk controls, and support the Institute's ongoing commitment to maintaining a safe working environment.

4. Hazardous Waste Management
Hazardous waste must be managed in accordance with KSPCB regulations. OLSEH follows a structured disposal schedule for various waste streams. The waste is safely accumulated at two centralised sheds. The waste is disposed of on campus through a KSCPB-recognised hazardous waste vendor. The disposal frequency is determined based on the nature of the waste, storage limitations, regulatory requirements, and operational considerations. The current disposal timelines are provided below:

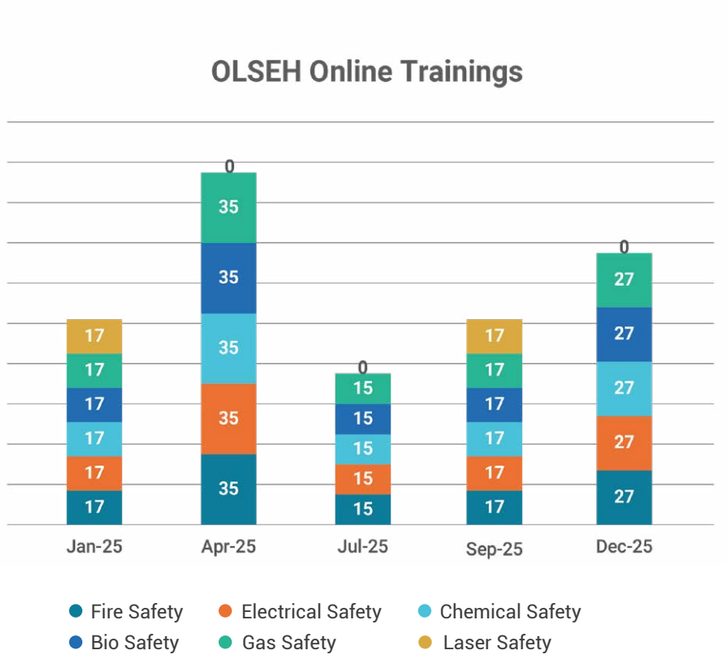
Waste Type	Disposal Frequency
Bio-hazardous Waste	Weekly
Liquid Waste	Monthly
Solid Waste	Monthly
Toxic Waste	Monthly
Waste Oil	Bi-annually
Radioactive Waste	Monthly
Unknown Chemicals	Every 2 Months
Empty Chemical Bottles	Every 2 Months
Old/Empty Compressed Gas Cylinders	Once Every 6 Months
Lithium/Small Consumer Batteries	Once Every 6 Months
Lead Acid Batteries	Once Every 6 Months
Toxic and Flammable Gas Cylinders	On Request from PI/ Department

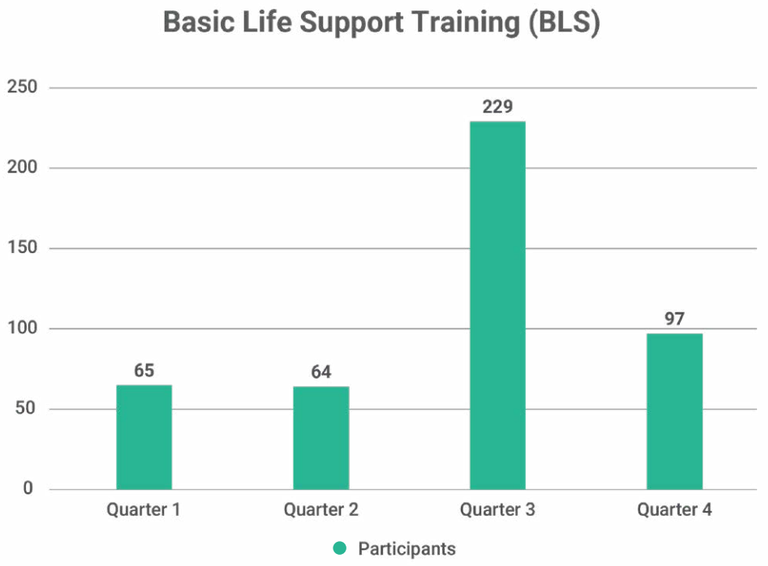
5. Fire Infrastructure Update: OLSEH has installed the fire alarm systems, fire extinguishers and fire alarm systems. Standard equipment includes extinguishers, hydrants, alarms, and fire control panels. OLSEH has spent 5.0 Cr in 2025 on upgrades, enhancements, and new purchases across departments to ensure all departments have access to the essential firefighting and fire detection equipment.

i. **Fire hydrants:** All hydrant systems are under AMC. A total of 14 systems is under management. Last year, OLSEH installed a new hydrant system at JN Tata Auditorium.
ii. **Fire extinguishers:** OLSEH has installed 4,800 fire extinguishers on campus over the last 5 years. IISc has a purchase and maintenance contract for the procurement, monitoring, refilling, and HPT test of fire extinguishers.
iii. **New fire alarm systems (FAS):** OLSEH installed FAS systems at Digits, SERC-CDS, MTE Main, MTE Annex, MTE B Wing, Earth Science and Chemical Engineering.
iv. **Existing fire alarm system (FAS):** OLSEH has an annual maintenance and monitoring contract for 44 fire alarm systems installed on campus. OLSEH has recently taken over the fire infrastructures of newly constructed buildings from CPWD and TCE. OLSEH is monitoring systems under the Defect Liability Period (DLP), e. g., fire hydrant systems at Tungabhadra, Aryabhata, and TCS Smart hub.
v. **Safety Signages:** LED Safety signage installation work has been completed for various departments. The system is also under a monitoring and maintenance contract. Other safety signage work is being done in many departments. Work is now underway in the hostels. Installation of the emergency contact list board has been completed in each laboratory on campus. The installation work for the fire extinguishers usage guide board has been completed in the departments. Work is now underway in the hostels.

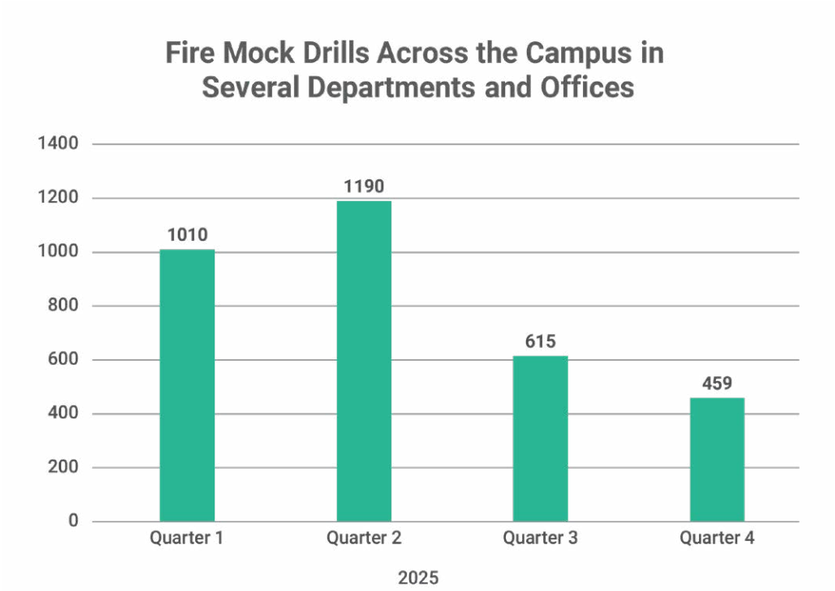
6. Training and Safety Awareness OLSEH continued to strengthen safety awareness and competency across the Institute through a comprehensive program of training, emergency preparedness exercises, and specialised safety workshops.

i. Every quarter, OLSEH conducts online safety training programs covering major laboratory hazards, including Chemical Safety, Gas and Cryogenic Safety, Biosafety, Laser Safety, Electrical Safety, and Fire Safety.
ii. Once every six months, OLSEH conducts fire mock drills at academic departments, research centres, hostels, and campus buildings. The mock drill enhances emergency preparedness, enabling building occupants to practice evacuation procedures and emergency response. We simultaneously organise fire extinguisher training.
iii. Every month, OLSEH organises fire safety and firefighting training programs for security personnel and emergency response teams. OLSEH trains all newly joined security guards and security assistants. These training programs includes Fire extinguisher operation, Fire hydrant system operation, Fire alarm and detection systems, Self-Contained Breathing Apparatus (SCBA) usage, Laboratory emergency response, Fire mock drills, Roles and responsibilities during emergencies, and Practical firefighting techniques
iv. To strengthen medical emergency response capability on campus, OLSEH coordinated Basic Life Support (BLS) training programmes through qualified external agencies at regular intervals, providing participants with hands-on training in CPR and emergency first response
v. Radiation Safety Training programmes were conducted every six months for researchers, students, and staff working with radioactive materials. The training focused on radiation protection principles, regulatory requirements, safe handling practices, contamination control, and emergency procedures






Firefighting Training
05-12-25 SERC 21
23-10-25 Security Office 130
23-09-25 New Chemical Science Building 32
09-09-25 Challakere Campus 45
22-08-25 Security Office 130
29-07-25 Divecha Center 27
26-06-25 New Chemical Science Building 25
30-05-25 Security Office 120
19-05-25 Challakere Campus 10
28-04-25 Physical Science 12
25-03-25 CGPL 25
24-02-25 Security Office 115
24-01-25 HE Quarters 20
0 20 40 60 80 100 120


Fire Mock Drills Across the Campus in Several Departments and Offices
1400
1200
1000
800
600
400
200
0
1010
1190
615
459
Quarter 1
Quarter 2
Quarter 3
Quarter 4
2025



4. *Undergraduate Programme*

4.0

Bachelor of Science (Research) and BTech (Mathematics and Computing)

Dean: Prabal Kumar Maiti | Professor, Physics
Associate Dean: Dipshikha Chakravorty | Professor, Microbiology and Cell Biology
Associate Dean: Srikanth K Iyer | Professor, Mathematics



The Undergraduate Science Programme, launched in 2011, has seen 11 batches of students graduate with a four-year Bachelor of Science (Research) degree and 10 batches with a Master of Science degree.

The academic year 2025-26 marked the 14th anniversary of the Bachelor of Science (Research) programme and the third anniversary of the BTech (Mathematics and Computing) programme. In July 2025, the 11th batch graduated with a four-year Bachelor's degree and the 10th batch with a Master's degree. About 50-60% of students in each batch opted to continue for a fifth year to pursue a Master of Science degree.

Since its inception, the UG programme has gained increasing popularity and has become one of the most sought-after undergraduate programmes among scientifically inclined, bright, and energetic students across the country. Admission cut-off ranks in qualifying examinations continue to remain high, reflecting the programme's growing reputation.

In the academic year 2025-26, 111 students were admitted to the Bachelor of Science (Research) programme and 49 to the BTech (Mathematics and Computing) programme. The 20% supernumerary quota for women in the Bachelor of Science (Research) programme and 20% in the BTech (Mathematics and Computing) programme significantly contributed to the improvement of gender diversity. The percentage of women admitted was 21% in the Bachelor of Science (Research) programme and 18% in the BTech (Mathematics and Computing) programme. The gender ratio is expected to improve further in future years. Several fellowships were also instituted exclusively for women students through private donors.

CAREER PATHS OF OUTGOING STUDENTS

In each batch, around 50-60% of students opt to continue for the Master's programme. Of the remaining, a large proportion pursue PhD or Master's programmes at top universities and institutes both in India and abroad. Students graduating in the upcoming convocation have already received admission offers from leading institutions, underscoring the strong reputation that the UG programme has built over just 13 years. A small number of students have secured employment in reputed multinational companies, while a few others have gained admission to top management programmes in India.

CO-CURRICULAR ACTIVITIES

UG students actively participate in several co-curricular activities alongside academics. PRAVEGA, the annual national science, technology, and cultural fest organised by UG students, showcases their talents and leadership. The UG iGEM team won the gold medal at the international Genetically Engineered Machine (iGEM) 2025 competition held in Paris and was nominated for Best Sustainable Development Impact, Undergrad.

The UG PLANCKS 2025 team secured the sixth place globally at the PLANCKS 2025 competition held in Barcelona, Spain. The team had earlier ranked first in the national preliminaries (IYPL) and has achieved the best-ever international ranking by any Indian team in PLANCKS so far.

Other highlights include the UG magazine, QUARKS, which displays their literary creativity; SAMANWAY, the Institute's industry outreach initiative where UG students play a major organisational role; and cultural events such as RANGMANCH and RHYTHMICA, which showcase dramatic and dance talents, respectively. The annual UG sports meet, Eclipse, also witnessed enthusiastic participation and was a resounding success.





5. *Awards and Distinctions*

Division of Biological Sciences

Name	Department	Awards
Debabrata Laha	BC	Invited and Nominated for Tansley Review by the *New Phytologist*
Debabrata Laha	BC	Elected Member of Guha Research Conference, 2025
Sandeep M Eswarappa	BC	INSA Associate Fellowship
Sandeep M Eswarappa	BC	Joined the Editorial Board of the IUBMB journal, *BioFactors*
Patrick D'Silva	BC	Fellow of National Academy of Science (FNA), New Delhi
Utpal Tatu	BC	NASI Fellow 2025
Utpal Tatu	BC	IISc Award for Excellence in Teaching 2025
Samay Pande	MCB	Member of scientific advisory group: ASM Global Research Symposium, India
Samay Pande	MCB	Keynote lead speaker for a symposium at the International Ethological Congress, Behaviour 2025
Dipshikha Chakravortty	MCB	TWAS Fellowship
Dipshikha Chakravortty	MCB	ASM CAC Chair
Dipshikha Chakravortty	MCB	JV Bhat Award
SP Arun	CNS	Fellow, Indian Academy of Sciences
Somnath Dutta	MBU	Fellow of Electron Microscopy Society of India Award for the Year 2024, Life Science category
Balasubramanian Gopal	MBU	Indian Crystallography Association – Professor M Vijayan Memorial Lecture Award
Balasubramanian Gopal	MBU	Tata Transformation Prize 2025
Meetali Singh	DBG	Prof Avadhesha Surolia Research and Innovation Award 2024
Meetali Singh	DBG	Distinguished Alumni Award, Bhaskaracharya College of Applied Sciences, University of Delhi

Division of Chemical Sciences

Name	Department	Awards
Sujit Das	MRC	Guest editorship in *Small*
Prabeer Barpanda	MRC	Fellow, The Royal Society of Chemistry
Prabeer Barpanda	MRC	Fellow, Indian Chemical Society
Prabeer Barpanda	MRC	*Fellow, The Institute of Engineers (India)*
Rajamalli P	MRC	Indo German Science and Technology Centre – Women Involvement in Science and Engineering Research (IGSTC-WISER award)
Rajamalli P	MRC	Highlighted in Women in Materials Science on the occasion of
Partha Sarathi Mukherjee	IPC	Rigaku International Prize in Chemistry 2025
Partha Sarathi Mukherjee	IPC	Fellow of the Indian National Science Academy
Abhishek Sirohiwal	IPC	Head of Max Planck Partner Group
Abhishek Sirohiwal	IPC	Infosys Young Investigator
Anoop Thomas	IPC	IISc Excellence in Teaching Award
Santanu Mukherjee	OC	Associate Editor, *Chemical Communications* (RSC)
Satish Patil	SSCU	Sir CV Raman Young Scientist State Award
Satish Patil	SSCU	Professor Suresh C Ameta Award

Division of Electrical, Electronics and Computer Sciences

Name	Department	Awards
Sumit Kumar Mandal	CSA	*INAE Young Engineer Award*
Sumit Kumar Mandal	CSA	ACM India Eminent Speaker Award
Siddharth Barman	CSA	Mindtree Chair
Govindarajan Ramaswamy	CSA	*Dr APJ Abdul Kalam HPC Lifetime Achievement award*
Chaya Ganesh	CSA	IITB Trust Lab Early Career Award 2024
Chaya Ganesh	CSA	INAE Young Engineer and Young Associate
Vijay Natarajan	CSA	Dr APJ Abdul Kalam HPC Award
Samir Hazra	EE	Top Paper of 2015 Award in IEEE Power Electronics Magazine
Vishnu Mahadeva Iyer	EE	INAE Young Associate
Vishnu Mahadeva Iyer	EE	INAE Young Engineer Award
Vishnu Mahadeva Iyer	EE	IEEE Transactions on Industry Applications Second Prize Paper Award
Vishnu Mahadeva Iyer	EE	Multiport EV charger technology selected for exhibition at Vigyan Bhawan, New Delhi organised by DST
Vinod John	EE	Power Foundation of India Chair Professorship
Velpula Balaswamy	ECE	INAE Young Associate
Varun Raghunathan	ECE	IISc Research Award 2025
Gaurab Banerjee	ECE	Best paper award at the 2025 IEEE 9th International Test Conference India (ITC India)
Neelesh B Mehta	ECE	JC Bose Fellowship

Division of Interdisciplinary Sciences

Name	Department	Awards
Pavan Nukala	CeNSE	*Excellence in microscopy award, EMSI*
Pavan Nukala	CeNSE	Young Achiever Award, DAE-Solid State Physics Symposium
Venkatesh Babu Radhakrishnan	CDS	Recognised in Stanford/Elsevier Top 2% Scientists List from 2020 to 2025
Venkatesh Babu Radhakrishnan	CDS	*2024 ACM Distinguished Member*
Venkatesh Babu Radhakrishnan	CDS	Fellow of the Indian National Academy of Engineering (INAE)
Venkatesh Babu Radhakrishnan	CDS	Area Chair for ICML, ICLR, NeurIPS, CVPR, ICCV, AAAI, AISTATS
Jayant R Haritsa	CDS	Co-chair, ACM Presidential Task Force on Regional Offices
Rajarshi Das Bhowmik	ICWaR	Editorial Board Member, Communications Earth & Environment
Rajarshi Das Bhowmik	ICWaR	Associate Editor, Vadose Zone Journal
Vaibhav Katewa	RBCCPS	IISc Award for Excellence in Teaching 2025
Vaibhav Katewa	RBCCPS	Sony Faculty Innovation Research Award

Division of Mechanical Sciences

Name	Department	Awards
Kandagal Siddanagouda	AE	*Fellow, Council of Vibration Specialists (CVS)*
Ananth Govind Rajan	CE	Guest Editor, Advanced Theory and Simulations, Wiley
Ananth Govind Rajan	CE	Paired Early Career Fellowship for Applied Research, Indo-German Science and Technology Council
Ananth Govind Rajan	CE	*Prof Priti Shankar Teaching Award for Assistant Professors in Engineering, IISc*
Ananth Govind Rajan	CE	Early Career Board, Nano Letters, American Chemical Society
Narendra Dixit	CE	Fellow, Indian Academy of Sciences
Narendra Dixit	CE	Fellow, Indian National Academy of Engineering
Shubhadeep Mandal	ME	Saroj Poddar Young Investigator (Aug 2025 - Jul 2027), Division of Mechanical Sciences, IISc
Saptarshi Basu	ME	Fellow, Indian Academy of Sciences
Saptarshi Basu	ME	JC Bose Grant
Sai Gautam Gopalakrishnan	MTE	Manohar Parrikar Yuva Scientist Award by Government of Goa
Sai Gautam Gopalakrishnan	MTE	Young Engineer Award by the Indian National Academy of Engineering
Sai Gautam Gopalakrishnan	MTE	Early Career Scholar by Journal of Materials Research (Materials Research Society)
Sai Gautam Gopalakrishnan	MTE	Young Associate of the Indian National Academy of Engineering
Subodh Kumar	MTE	Member of International Committee of the International Conference on Aluminum Alloys
Govind S Gupta	MTE	Member of Executive Council of Waste-to-Wealth Materials Research Society
Govind S Gupta	MTE	Member of the editorial board, Carbon Neutrality Frontiers (CNF)
Govind S Gupta	MTE	Member of MTD-06 Technical Committee of Bureau of Indian Standards
Govind S Gupta	MTE	Member of editorial board, International Journal of Engineering Systems Modelling and Simulation (IJESMS)
Nagesh Kumar Dasika	CiE	Edward M Curtis Visiting Professorship, Lyles School of Civil and Construction Engineering, Purdue University, West Lafayette, USA, (Aug 2024 to May 2025)
Chandra Kishen	CiE	Outstanding Concrete Engineer of Karnataka Award 2025 by the Indian Concrete Institute and Ultratech Cements
Anbazhagan P	CiE	Editorial Board Member of the year 2024 award for the Indian Geotechnical Journal by Springer

Division of Physical and Mathematical Sciences

Name	Department	Awards
Sai Siva Gorthi	IAP	*Modi Prix Galien India Award 2025*
Vamsi Pritham Pingali	MA	Fellow of the Indian Academy of Sciences
Tirthankar Bhattacharyya	MA	Eminent supervisor award of the Dr KV Rao Scientific Society
Arvind Ayyer	MA	*Fellow of Indian Academy of Sciences*
Arka Mallick	MA	Associate of the Indian Academy of Sciences
Jyothsna Komaragiri	CHEP	Breakthrough Prize in Fundamental Physics 2025
Aninda Sinha	CHEP	Fellow, INSA
Aninda Sinha	CHEP	Wolfram Innovator Award
Ranjan Laha	CHEP	ICTP Simons Associate





6. *Students*

6.1
Admissions 2025-26

1. AUGUST 2025-26 ADMISSIONS (PG/ RESEARCH PROGRAMMES)

In the August 2025-26 admission cycle, **1,505** students were admitted under various programmes.

- Regular PhD: 345
- PhD/MTech (Res) under External Registration Programme (ERP): 19
- PhD under Quality Improvement Programme (QIP): 0
- Continuation/Upgradation/ Transfer: 29
- Integrated PhD: 62
- Regular MTech (Res): 74
- Regular MTech (GATE & CFTI)/MDes/MMgt: 704
- 1-Year MEngg: 10
- Joint MTech: 2
- MTech Sponsored Category: 27
- MSc Programmes: 59
- MTech (Online): 174

SC/ST Category Distribution (Postgraduate/Research Programmes):
245 students. 73 in Research Programmes (PhD and MTech (Res)), 12 in Integrated PhD, 148 in Master's Programmes (MTech/ MDes/MMgt/MEngg) and 12 in MSc programme.

2. UNDERGRADUATE ADMISSIONS (2025-26):

A total of 160 students were admitted to undergraduate programmes:

- Four-Year Bachelor of Science (Research): 111
- BTech: 49

SC/ST Category Distribution (Undergraduate):

- 33 students. 27 for BSc (Research), and 6 for BTech

3. MID-YEAR 2025-26 ADMISSIONS (RESEARCH PROGRAMME)

In the Mid-Year admission cycle of 2025-26, 120 students were admitted:

- Regular PhD: 117
- PhD under External Registration Programme (ERP): 3

SC/ST Category Distribution (Mid-Year Admissions):

- SC/ST: 26 students



6.2
Students On Roll

The total number of students on roll at the institution is 5,687.
The breakdown of students by programme is as follows:

Programme	Number of Students
BSc (Research)	415
BTech	221
MDes	44
MMgt	28
MTech	1261
MTech (Research)	153
MS	84

Programme	Number of Students
PhD	2544
MTech (Online)	370
MEngg	25
MSc	134
Integrated PhD	404
MTech (Joint)	4

6.3
Scholarships/Fellowships

Students participating in research and course programmes are granted scholarships at the Institute ranging from Rs 5,000/- to Rs 1,00,000/- depending on the programme/agency. Those students who are granted fellowships by agencies like UGC/CSIR and other bodies are not eligible for scholarships awarded by the Institute.



6.4
Students Assistance Programme

Needy students have offered their services in selected Institute activities and have secured additional finances under the "earn-while-you-learn" scheme.

6.5
Students Council

The Students Council (an elected body from among the student community) provides an effective channel of communication between the Director, faculty members, and students. Through dialogue and discussion on various student matters, problems relating to the students are resolved by initiating appropriate action. The Students Council is also responsible for certain welfare measures initiated by the student community.

6.6
Hostels

The Students Hostel consists of 18 men and 5 women hostel blocks. Accommodation is provided for 4,758 students (3,379 men and 1,379 women) in the hostel blocks. Five dining halls (3 vegetarian and 2 composite) provide a variety of food items in clean and hygienic conditions for all the boarders. The hostels and dining halls are managed by the Council of Wardens/Hostel Office.



6.7
Award of Medals

Medals list for the year 2023-24

Sl no.	Name of the medal	Frequency	Department	Discipline	Name & SR No	Remarks
Name of the Medal: MTech						
1	Mrs Sabita Chaudhuri Memorial Medal	Alternate Year	AE	AE	PARTHA AJIT SURVE	-
2	Dr N Narayanamurti Medal	Alternate Year	AE	AE	05-01-00-37-51-23-1-23645	Will be awarded in the next AY
3	Motorola Medal	Yearly	CDS	CDS	-	-
4	Prof NS Lakshmana Rao Medal	Yearly	CE	CE	PAWAR RUSHIKESH GAJANANSA	-
5	The Institute Medal	Yearly	ME	MObE	06-18-01-10-51-23-1-22581	No Recommendation. Number of students is less than 5
6	The Computer Society of India (Bangalore Chapter) Medal	Yearly	CSA	CS	GAUTAM SANDESH YAN VARMAN	-
7	Prof Sargur N Srihari Medal	Yearly	Div- EECS	AI	05-05-00-10-42-23-1-22996	-
8	Prof SVC Aiya Medal	Yearly	ECE	EC	-	-
9	The Alumni Medal	Yearly	ECE	MV	ANUBHAB GHOSH	-
10	The NR Khambhati Memorial Medal	Yearly	EE	EE	04-04-00-10-51-23-1-22803	-
11	Prof ISN Murthy Medal	Yearly	EE/ECE	SP	PRABHAV VERMA	-
12	JC Roy & Mukti Roy Memorial Medal	Yearly	IAP	QT	04-03-06-10-51-23-1-22968	-
13	The DESE Design Medal	Yearly	ESE	ESE	-	Awarded for the AY 2024-25

Sl no.	Name of the medal	Frequency	Department	Discipline	Name & SR No	Remarks
14	Dr Bhailalbhai P Suthar and Narmadaben B Suthar Memorial Medal	Yearly	ESE	EPD	-	Awarded for the AY 2024-25
15	HR Babu Seetharam Medal	Yearly	IAP	IN	-	Awarded for the AY 2024-25
16	SV Sastry Memorial Medal	Yearly	ME	ME	-	Awarded for the AY 2024-25
17	The Institute Medal	Yearly	BE	BE	-	Awarded for the AY 2024-25
18	Nikhil Memorial Medal	Alternate year	CAOS/ CEaS	CL	-	Awarded for the AY 2024-25
19	Prof KN Krishnaswamy Medal	Alternate year	CAOS/ CEaS	CL	-	Will be awarded in the next AY
20	Prof R Vasudevan Medal	Yearly	CeNSE	SemT	-	Awarded for the AY 2024-25
21	Prof NR Kuloor Memorial Medal	Yearly	CH	CH	-	Awarded for the AY 2024-25
22	The NR Khambhati Memorial Medal	Yearly	RBCCPS	RAS	-	Awarded for the AY 2024-25
23	Mr Dheeshijith V G Medal	Yearly	DM	SM	-	Awarded for the AY 2024-25
24	The KK Malik Medal	Yearly	MTE	MT	-	Awarded for the AY 2024-25
MDes						
25	The Institute Medal	Yearly	DM	MDes	-	Awarded for the AY 2024-25
MMgt						
26	Prof BG Raghavendra Memorial Medal	Yearly	MG	MMgt	DUBEY DEVVRAT ANILKUMAR 05-10-04-10-81-23-1-22382	-
MEngg						
27	The Institute Medal	Yearly	CeNSE	SemT	-	Awarded for the AY 2024-25
MSc						
28	Prof Krothapalli Ravindranath Medal	Yearly	Biological Sciences	Life Sciences	-	Awarded for the AY 2024-25
29	Rajarshi Bhattacharya Memorial Medal	Yearly	Chemical Sciences	Chemical Sciences	-	Awarded for the AY 2024-25
MSc						
30	NASAS Medal	Alternate year	AE	AE	AGNIVO GHOSH	-
31	Mrs Sabita Chaudhuri Memorial Medal (Research)	Alternate year	AE	AE	-	Will be awarded in the next AY
32	The Institute Medal	Yearly	CAOS	AS	-	No Recommendation. Number of students is less than 5
33	Subramanian Rajalakshmi Medal	Alternate year	CDS	CDS	-	Will be awarded in the next AY
34	NetApp Medal	Alternate year	CDS	CDS	DIBYA JYOTI NAYAK	
35	The PS Narayana Medal	Yearly	CE	CE	06-18-01-10-22-21-1-19747	
36	The Institute Medal	Yearly	CEaS	ER	-	No Recommendation. Number of students is less than 5
37	The Institute Medal	Yearly	CH	CH	-	No Recommendation. Number of students is less than 5
38	The Institute medal	Yearly	RBCCPS	CPS	-	No Recommendation. Number of students is less than 5
39	Dr MNS Swamy Medal	Yearly	CSA	CS	AYUSH SAWARNI 04-04-00-10-22-21-1-19776	
40	The Institute medal	Yearly	CST	ST	-	No Recommendation. Number of students is less than 5

Sl no.	Name of the medal	Frequency	Department	Discipline	Name & SR No	Remarks
41	The Institute Medal	Yearly	DM	DM	-	No Recommendation. Number of students is less than 5
42	Prof FM Mowdawalla Medal	Yearly	ECE	EC	-	No Recommendation. Number of students is less than 6
43	The Hay Medal	Yearly	EE	EE	-	No Recommendation. Number of students is less than 5
44	The Institute Medal	Yearly	ESE	ESE	-	No Recommendation. Number of students is less than 5
45	The Institute Medal	Yearly	IAP	IN	-	No Recommendation. Number of students is less than 5
46	ME Department Alumni Medal	Yearly	ME	ME	-	No Recommendation. Number of students is less than 5
47	Dr Karra Narasimhamurthy Memorial Medal	Yearly	MTE	MT	-	No Recommendation. Number of students is less than 5
PhD						
48	Prof Chintakindi V Joga Rao Medal	Alternate Year	AE	AE	PREMIKA T S 05-01-01-10-12-18-2-16453	-
49	Prof AK Rao Medal	Alternate Year	AE	AE	-	Will be awarded in the next AY
50	Thippur Family Medal	Yearly	BCD	BCD	-	No Recommendation. Number of students is less than 5
51	Prof Giri Memorial Medal	Yearly	BC	BC	KSHITIZA MOHAN DHYANI 03-01-00-10-11-18-1-15760	-
52	The Institute Medal	Yearly	BE	BE	SASWAT CHOUDHURY 10-10-00-10-12-19-1-17582	-
53	The Roddam Family Medal	Yearly	CAOS	AS	JAYAKRISHNAN K U 05-03-00-10-12-19-1-17214	-
54	Sir Vithal N Chandavarkar Memorial Medal	Yearly	CDS	CDS	SRAVANTI ADDEPALLI 06-18-02-17-12-18-1-15587	-
55	Prof NS Govinda Rao Medal	Alternate Year	CE	CE	-	Will be awarded in the next AY
56	Prof KTS Iyengar Medal	Alternate Year	CE	CE	SOUGATA MUKHERJEE 05-05-00-10-12-18-1-15545	-
57	The Institute Medal	Yearly	CEaS	ER	-	No Recommendation. Number of students is less than 5
58	Revati and Satya Nadham Atluri Medal	Yearly	CeNSE	NE	DEEPAK SHARMA 05-16-00-10-12-19-1-16770	-
59	The Shamrao Kaikini Medal	Yearly	CES	CES	SENJI LAXME RAJINI RAGHUNATH 03-03-00-10-11-19-1-16660	-
60	Prof NR Kuloor Memorial Medal	Yearly	CH	CH	ANSHAJ RONGHE 05-04-00-10-12-18-2-16450	-
61	The Institute medal	Yearly	CHEP	HE	SREEMAYEE ADITYA 01-05-00-10-11-19-1-17438	-

Sl no.	Name of the medal	Frequency	Department	Discipline	Name & SR No	Remarks
62	Lt Col Balan Krishnan Memorial Medal	Yearly	CNS	NS	-	No Recommendation. Number of students is less than 5
63	Durgam and Subha Chakrapani Family Trust Gold Medal	Yearly	RBCCPS	CPS	SIDDARTH ASOKAN 10-01-01-10-12-17-1-14480	-
64	The Alumni Medal (Research)	Yearly	CSA	CS	GORANTLA SRUTHI 04-04-00-10-12-20-1-18636	-
65	Amulya and Vimala Reddy Medal	Yearly	CST	ST	SUCHI PRIYADARSHANI 05-11-00-10-12-19-1-17292	-
66	Mrs. C V Hanumantha Rao Medal	Yearly	DBG	DBG	SIDDHARTH R VENKATESH 03-07-00-10-11-19-1-17392	-
67	Kudli Srinivasa Murthy Memorial Medal	Yearly	DCCC	CC	-	No Recommendation. Number of students is less than 5
68	MAA Communications Medal	Yearly	DM	DM	ANUBHAB MAJUMDER 05-08-00-10-12-18-1-16020	-
69	The Seshagiri Kaikini Medal	Yearly	ECE	EC	KRISHNAN NAMBOODIRI K K 04-02-00-10-12-19-1-16919	-
70	Prof DJ Badkas Medal	Yearly	EE	EE	DEEPAK KAUSHIK 04-03-00-10-12-18-1-16278	-
71	Tag Corporation Medal	Yearly	ESE	ESE	SIRSHA GUHA 04-01-00-10-12-19-2-17738	-
72	Dr Srinivasa Rao Krishnamurthy Medal	Yearly	IAP	IN	PRAGYA PRASAD 01-02-00-10-12-17-2-15424	-

Sl no.	Name of the medal	Frequency	Department	Discipline	Name & SR No	Remarks
73	The Institute Medal	Yearly	ICER	EN	BIDISHA NATH 06-15-00-10-12-18-2-16469	-
74	The Institute Medal	Yearly	ICWaR	WR	TRESA MARY THOMAS 0-01-01-10-12-17-1-14945	-
75	Dr JC Ghosh Medal (Physical Chemistry)	Yearly	IPC	PC	SEKAR KUMAR BISWAL 02-01-02-10-11-18-2-16468	-
76	Prof S Soundarajan Medal (Inorganic Chemistry)	Yearly	IPC	IC	TABISH IQBAL 02-01-01-10-11-18-2-16507	-
77	The Martin Forster Medal	Yearly	MA	MA	ABHAY JINDAL 10-06-00-10-31-17-1-15227	-
78	Prof Pandurangan Medal	Yearly	MS (IMI)	IMI	R. KRISHNA-KUMARAN 10-12-00-10-12-18-1-15854	-
79	Prof B H Iyer Medal	Yearly	MBU	MB	MADHURIMA KULKARNI MAHESH 03-05-02-10-11-18-1-16159	-
80	The M Sreenivasaya Medal	Yearly	MCB	MC	ABHILASH VIJAY NAIR 03-04-00-10-11-18-1-16168	-
81	Prof BK Subba Rao Medal	Yearly	ME	ME	NAVIN KUMAR CHANDRA 05-07-00-10-12-18-1-15980	-
82	The Indian Economic Association Medal	Yearly	MG	MG	BITA AFSHARINIA 05-10-00-91-12-18-2-16515	-
83	The Sudborough Medal	Yearly	MRC	MR	MANJU SOLRA 02-02-00-10-11-18-1-16214	-
84	Prof KP Abraham Medal	Yearly	MTE	MT	MADHAVI TRIPATHI 05-09-00-10-12-18-1-16127	-

Sl no.	Name of the medal	Frequency	Department	Discipline	Name & SR No	Remarks
85	The Guha Research Medal	Yearly	OC	OC	SAYAN RAY 02-03-00-10-11-18-1-16048	-
86	Prof Anil Kumar Memorial Medal (Experimental Physics)	Yearly	PH	EP	SIMRANDEEP KAUR 01-03-03-10-11-18-1-15523	-
87	Kumari L A Meera Memorial Medal (Theoretical Physics)	Yearly	PH	TP	ALANKAR DUTTA 10-07-00-10-31-17-1-14817	-
88	The Toulouse Medal	Yearly	SSCU	SS	AYAN BANERJEE 02-05-02-10-11-19-1-17045	-
Int PhD (MS Level)						
89	Kumari L A Meera Memorial Medal	Yearly	Physical Sciences	-	PHANINDRA DEWAN 10-07-00-10-31-22-1-21769	-
90	Dr RK Maller Memorial Medal	Yearly	Biological Sciences	-	AYUSHI SRIVASTAVA 10-09-00-10-31-22-1-21607	-
91	Dr A Nagaraja Rao Medal	Yearly	Chemical Sciences	-	RUDRA PRATAP SINGH 10-08-00-10-31-23-1-23410	-
92	Prof PL Bhatnagar Medal	Yearly	Mathematical Sciences	-	-	No Recommendation. Number of students is less than 5
MTech (Online)						
93	The Institute Medal	Yearly	IKEN	AI	SAI KRISHNA B V 13-19-01-19-52-22-1-21824	-
94	The Institute Medal	Yearly	IKEN	DSBA	AMOGH HASSIJA 13-19-02-19-52-22-1-21656	-
95	The Institute Medal	Yearly	IKEN	ECE	R PARTHA-SARATHY 04-02-06-19-52-21-1-20083	-

Medals list for the year 2024-25

Sl no.	Name of the medal	Department	Discipline	Name	SR No
MTech Programmes					
1	Prof NR Kuloor Memorial Medal	CH	CH	R RAGHAVENDRA	05-04-00-10-42-23-1-22435
2	The KK Malik Medal	MTE	MT	SUBRAMANIAN R S	05-09-00-10-42-23-1-23047
3	SV Sastry Memorial Medal	ME	ME	AYANPANJA	05-07-00-10-51-23-1-23012
4	The NR Khambhati Memorial Medal	RBCCPS	RAS	ISHITA GANJOO	10-01-02-37-51-23-1-23609
5	The DESE Design Medal	ESE	ESE	ELIZABETH KURUVILLA	04-01-00-10-51-23-1-22929
6	Dr Bhailalbhai P Sutharand Narmadaben B Suthar Memorial Medal	ESE	EPD	BHARATH S	04-01-04-10-51-23-1-22995
7	Nikhil Memorial Medal	CAOS/ CEaS	EaCS	RAJARSHI BHATTACHARJEE	05- 03-02-10-51-23-1-22769
8	The Institute Medal	BE	BE	SAIVISHAK SAIKUMAR	10-10-01-10-51-23-1-22575
9	Mr Dheeshijith V G Medal	DM	SM	KARTIK SHEKHAR SAHASRABUDHE	05-08-02-10-51-23-1-22451
10	HR Babu Seetharam Medal	IAP	IN	SHASHI KANT GIRI	01-02-03-10-51-23-1-22681
11	Prof R Vasudevan Medal	CeNSE	SemT	MEENAKSHI S	05-16-02-10-51-23-1-22619
MDes Programme					
12	The Institute Medal	DM	M.Des	NAVIN KUMAR P	05-08-00-10-61-23-1-88918
MEngg Programme					
13	The Institute Medal	CeNSE	SemT	MANU ROCKEY	05-16-02-10-54-24-1-25529
MSc Programme					
14	Prof Krothapalli Ravindranath Medal	Life Sciences		PRIYANKA S	10-09-01-10-15-23-1-22358
15	Rajarshi Bhattacharya Memorial Medal	Chemical Sciences		ARJUN BURAGOHAIN	10-08-02-10-13-23-1-22380

Recommendation for the award of Medals for the Academic Year 2023-24

MTech programmes					
16	Nikhil Memorial Medal	CAOS		REDDI NAVEEN	05-03-01-10-51-22-1-21069

6.8

External Registration Programme

i) AUGUST 2025-26 ADMISSIONS

Sl No	Name of the Organisation (Selected Applicants)	Dept	No. Joined
	Government Organisation		
1	Indian Army Command Hospital Air Force Bangalore, Karnataka - 560007	BE	1
2	Indian Space Research Organisation Human Space Flight Centre (HSFC) ISRO Road, New BEL Road, Bengaluru, Karnataka - 560094	ME	1
3	Space Applications Centre ISRO Jodhpur Tekra, Satellite Road, Gujarat - 380015	CSA	1
4	Space Applications Centre Jodhpur Tekra, Ambawadi Vistar PO, Gujarat - 380015	EE	1
5	Naval Physical Oceanographic Laboratory Defence Research and Development Organisation, Thrikkakara, Kerala - 682021	ECE	1
6	Bharat Electronics Limited Jalahalli Post, Karnataka - 560013	MatE	1
7	Defence Research and Development Organisation Office of DG (ECS), LRDE campus, CV Raman Nagar Karnataka - 560093	IAP	1
8	STARC A Unit of SITAR Doorvaninagar, Karnataka - 560016	CENSE	1
9	Indian Air Force Chief Operations Officer, Air Force Station Kalaikunda, West Bengal - 721303	CPS	1
	TOTAL		**9**
	Private Organisation		
10	Mynvax Private Limited 3rd floor, Brigade MLR centre, No 50, Vani Vilas Road, Basavanagudi Karnataka - 560004	MBU	1
11	ITW India Pvt Ltd - Instron Division 497E, 14th Cross Road, Maruthi Nagar, Peenya, Karnataka - 560068	MatE	1
12	nference 4th & 5th Floor, Indiqube, Golf View Campus Tower-2, 22, 3rd Cross Road, Murugeshpalya, Karnataka - 560017	IAP	1
13	ARTPARK Ground floor, SID Entrepreneurship building, Indian Institute of Science, CV Raman Road, Karnataka - 560012	CPS	1
14	Triveni Turbines Limited 12th A, Peenya, Phase 1, Karnataka - 560058	ICER	1
15	Samsung R and D Institute India - Bangalore Private Limited 2870 Phoenix Building, Bagmane Constellation Business Park, Outer Ring Road, Doddanekundi Circle, Marathahalli Post, Karnataka - 560037	CPS	1
16	Astra Microwave Products Ltd Pahadisareef, Ranga Reddy, Telangana - 501218	ECE	1
17	Samsung Semiconductor India Research Bagmane Goldstone Campus, Adjacent to Bagmane world technology centre, Outer ring road, Bengaluru, Karnataka - 560048	ECE	1
	TOTAL		**8**
	Educational Institution		
18	Prayoga Institute of Education Research Off Ravgodlu Post, Kanakapura Road, Karnataka - 560082	CeNSE	1
19	NITTE MEENAKSHI INSTITUTE OF TECHNOLOGY PB No 6429, Nitte Meenakshi Institute of Technology, Yelahanka, Karnataka - 560064	MTE	1
	TOTAL		**2**
	GRAND TOTAL		**19**

ii) MID-YEAR 2024-25 ADMISSIONS

Sl No	Name of the Organisation (Selected Applicants)	Dept	No. Joined
	Government R&D Organisation		
1	Central Manufacturing Technology Institute (CMTI) TUMKUR ROAD, Karnataka-560022	ME	1
2	UR RAO SATELLITE CENTRE HAL Old Airport Road, Vimanapura Post, Karnataka-560017	EE	1
	TOTAL	**2**	**2**
	Educational Institution		
1	Global Academy of Technology Rajarajeswari Nagar, Karnataka-560098	AE	1
	TOTAL	**1**	**1**
	GRAND TOTAL	**3**	**3**

6.9
Placements

The Office of Career Counseling and Placement (OCCaP) coordinated campus placements for full time and internship opportunities for the year 2025-26. A wide range of placement activities, industry interaction events, and student development programmes were conducted to support students across different programmes.

Placement Preparation and Pre-Placement Activities
Placement activities commenced in August 2024 with a series of interactive sessions with students to:

- Placement activities for the 2025-26 full-time and internship cycle commenced in June 2025 with interactive sessions conducted for students to communicate placement policies, timelines, and process guidelines.
- The registration process for placements was subsequently completed across all student categories, including undergraduate, Master's, PhD students, and postdoctoral fellows.

A. Conclusion of Final Placements: Batch of 2024-25 (Graduating in 2025)
Final placement activities for the batch of 2024-25 began in August 2024 and concluded in July 2025. 29 students secured a six-month internship. 458 Master's students, 1 UG student, and 39 PhD students secured full-time jobs. A total of 498 students received full-time jobs.

B. Ongoing Full-Time Placements: Batch of 2025-26 (Graduating in 2026)
Full-time placement activities began in August 2025 with pre-placement talks, followed by assessments and interviews. Interviews commenced from November 2025 and will continue until July 2026. 15 students secured a six-month internship. 417 Master's students, 22 UG students, and 32 PhD students secured full-time jobs. A total of 471 students secured full-time jobs so far, and the process is still ongoing.

C. UG Summer Internship Placements: Batch Graduating in 2027 (Only UG)
Registration for UG students commenced in June 2025. PPTs started from the month of July with interviews scheduled in August 2025. 29 UG students were placed during this session.

D. Summer Internship Placements: Batch Graduating in 2027 (All Programmes)
Internship placement activities for students across all programmes commenced with the registration process in December 2025, followed by Pre-Placement Talks and interviews conducted from February 2026. A total of 202 students (including 36 BTech students), secured three-month internship offers. The internship hiring process is ongoing and will continue until the end of May 2026.

E. Student Support Events and Industry Engagement
To enhance student preparedness and industry connectivity, OCCaP conducted the following programs.



Placement statistics

Campus Placements			
Full Time Placements			
Batch	**2025-26***	**2024-25**	**2023-24**
Total Offers	498	526	434
Total Students	471	498	413
Highest CTC (in LPA)	68	87.7	65.4
Median CTC (in LPA)	24.9	25	24.6

Summer Internship			
Batch	**2025-26**	**2024-25**	**2023-24**
Total Offers	206	204	148
Total Students	202	202	143
Highest stipend (monthly)	2.5 L	2.5 L	2 L
Median stipend (monthly)	50 K	60 K	50 K

**Full-time Placement for 2025-26 season is ongoing and will continue till July.*

(a) Industry Sessions

- **Health X Conversations** in collaboration between CNBC-TV18 and Optum: Discussion on how AI and technology are revolutionising healthcare. The session was open to students from all programmes.
- **Japan Career Seminar Event:** 7 Japanese companies along with JETRO visited the campus and interacted with students and visited different departments. Eventually, 1 PhD and 4 Master's students secured internships in Japan, and the 1 PhD student eventually received a full-time job offer.
- **Google PhD Networking Session:** A networking and interaction session of Google leaders with faculty members and PhD students was held to discuss collaboration opportunities for student development and hiring perspectives.

(b) Career Readiness Programme

- **Career Preparedness Session:** Training session for students to develop effective communication skills (verbal, non-verbal, and written), self-awareness, adaptability, professional etiquette, and interview preparation for workplace success.
- **Resume Writing Session:** Conducted for students to create impactful content and resumes.

(c) OCCaP Committee and Student Meetings

- **OCCaP – Student Placement Connect Session:** OCCaP Faculty Committee and staff connect sessions were organised for students participating in internships and final placements to provide information on placement activities and to create an open forum for students to directly address placement-related queries.

6.10
Awards and Distinction Conferred on Students

Student Name	Department	Award
Priyanshi	BC	TR Bhaskaran Award for excellence in academic research
Priyanshi	BC	Prof Joseph D Padayatty Memorial Award 2025 for best publication of the year
Swati Ghosh	BC	RK Maller Memorial Gold Medal
Debanjali Bhattacharya	BC	Neelam Roy Award
Muskan Agarwal	BC	Perumal Award
Saheli Saha	MCB	Travel grant from Alma Dal Co School on Collective Behaviour
Saheli Saha	MCB	ANRF International travel grant
Saheli Saha	MCB	Financial support from Gordon Research Conference for Microbial Population Biology
Debapriya Mukherjee	MCB	Best poster award at IISc-ASM Symposium on the One Health Approach to AMR
Anmol Singh	MCB	EMBO-EMBL travel grant
Anmol Singh	MCB	Cold Spring Harbor Grant
Rishi Kumar Mishra	DBG	Hanumanth Rao Best Thesis Award
Vaishally	DBG	Carl Storm Fellowship to attend the Gordon Research Conference on Animal-Microbe Symbioses
Rajameenakshi M	DBG	Gold medal at the IICM event at IISER-Kolkata
Dipanwita Mandal	MBU	Best Micrograph Award at the International Conference on Electron Microscopy and XLIII Annual Meeting of the Electron Microscopy Society of India (EMSI-2025), IISc
Sainath Polepalli	MBU	Best Oral Presentation Award at the International Conference on Electron Microscopy and XLIII Annual Meeting of the Electron Microscopy Society of India (EMSI-2025), IISc
Sainath Polepalli	MBU	Best Poster Award at the ASM Global Research Symposium, ASM-IISc Symposium on the One Health Approach to AMR
Sainath Polepalli	MBU	Australian Microscopy and Microanalysis Society (AMMS) Travel Award for Oral Presentation at the CRYOZ 2025, University of Wollongong, Australia
Arnab Chatterjee	MBU	Best Poster Award at the International Conference on Electron Microscopy and XLIII Annual Meeting of the Electron Microscopy Society of India (EMSI-2025), IISc
Arnab Chatterjee	MBU	Carl Strom International Diversity Award to attend the Three-Dimensional Electron Microscopy, Gordon Research Conferences in Maine, USA
Arnab Chatterjee	MBU	Best Question Award in the Three-Dimensional Electron Microscopy, Gordon Research Conferences in Maine, USA
Haradhan Ruidas	CES	Travel Grant from DBT to attend ICCB
Haradhan Ruidas	CES	Travel Grant from ANRF to attend ICCB
Haradhan Ruidas	CES	Best student talk at ICCB, Brisbane, Australia
Haradhan Ruidas	CES	SCB graduate student award
Pranav Datar	CES	Grant for attending EMPSEB 30, Milovy, Czech Republic
Gayathri Gopal	CES	DBT-Biocare Research Associateship
Lipika Pradeepkumar Taneja	CNS	Best poster award at the 12th Annual Conference of Cognitive Science (ACCS-12)
Navneet Shahi	CNS	IBRO-APRC Travel Award and talk selected for oral presentation at the Annual Korean Neuroscience Meeting
Monmita Bhar	CNS	Travel Award and Best Poster Award for an EMBO meeting in Greece
Monmita Bhar	CNS	Abstract selected for Oral presentation at the Japanese Neuroscience Meeting (unable to attend)
Anusha Rastogi	CNS	Awarded full scholarship including airfare to attend the QBio summer research course on sensing in motion, held at University of California, Santa Barbara
Siddhant Pandey	CNS	Selected to attend the Computational Approaches to Memory and Plasticity (CAMP) 2025 course at IISER Pune, India
Surya SP	CNS	Lt Col Balan Krishnan Memorial Medal (Institute Medal for best thesis at CNS)
Ragini Agrawal	CIDR	EMBO Travel Award, September 2025
Hussain Beig	CIDR	Global Health Travel Award, Keystone Conferences, Cape town
Sumandeep Kaur and Shachee Swaraj	CIDR	EMBO Travel Awards and Best Poster Awards in EMBO Meeting on Cell Death and Innate Immunity, CCMB
Sumandeep Kaur and Mansi Sharma	CIDR	Best posters awards in the EMBO Meeting on RNA Viruses, RCB/THSTI
Rajesh Thangavel Yadav	CIDR	Best Poster/Oral presentation awards, Immunocon 2025, MNNIT, Prayagraj.
Rishad Shiraz	CIDR	Travel grant to attend Vaccinology Course in Pasteur Institute, Paris, France
Shibu Meher	MRC	Poster commendation award in PSIK, 2025, EPFL, Switzerland

Student Name	Department	Award
Subhendu Mishra	MRC	Best Presentation Award during the MRC Open Day
Shibu Meher	MRC	Best Poster Presentation award on MRC Day
Mohit Tanwani	MRC	IEEE ferroelectrics
Shana Shirin M A	MRC	Nanoscale Best poster award in RSC symposium, MRC, IISc
Shana Shirin M A	MRC	Best poster award from ICAMST 2025
Shibu Meher	MRC	Poster commendation Award at Psi-K 2025 conference, held at Lausanne, Switzerland
Subhendu Mishra	MRC	Best oral presentation award on MRC day at IISc, Bangalore
Arpan Chakraborty	MRC	Travel grant through SPARC International Fellowship Program for visit to GEEDAI group, UFABC, Santo Andre, Sao Paulo, Brazil
Dorothy Sachdeva	MRC	Fulbright Fellowship to spend 6 months at Pennsylvania State University
Aryan Keshri	MRC	International visit under Indo-France collaborative project
Dhrmendra Sablaniya	MRC	Bajpai–Saha Student Award for best student paper oral presentation at the Bio-Monthan Conference 2025, Ropar
Shruthi G	MRC	First prize in oral presentation at the International Symposium on Regenarative Orthopedics 2026 organised at IIT Madras, and best presentation award at MRC Day, IISc
Rahul	MRC	Best poster presentation award in iP3-2026: International Conference on Photochemistry, Photophysics and Photodynamics, and Lotus visiting fellowship
Subha Biswas	IPC	Nature Photonics Best Poster Award at the Surface Plasmon Phonics conference, Tokyo, Japan
Kavya S Mony	IPC	ACS Journal of Physical Chemistry Letters best poster prize at the Asian Photochemistry Conference, Kochi, India
Pooja Singh	IPC	ACS Best Poster Award at the 10th Asian Conference on Coordination Chemistry (ACCC10) held in Hanoi, Vietnam
Pooja Singh	IPC	Royal Society of Chemistry best poster award at the 17th International Conference on Organic Electronics (ICOE 2025) at Coimbra, Portugal
Soham Raychowdhury	IPC	Best open presentation award at the SustainX - ACE 2025 & 4th CO2 India Meet held at IIT Madras
Raul Kusaji Pundlik	IPC	1st International Younger Chemists Network (IYCN) Enhancement Grant 2025

Student Name	Department	Award
Subha Biswas	IPC	Nature Photonics Best Paper Award at the 11th International Conference on Surface Plasmon Photonics - SPP11 held in Tokyo, Japan
Sayan Ray	OC	NOST-Anthem Biosciences Best Thesis Award 2025
Priyotosh Das	OC	Best Oral Presentation Awards at J-NOST Conference at IIT (ISM) Dhanbad
Aditya Chakrabarty	OC	Humboldt Research Fellowship for Postdocs
Vishali S	CSA	Axis Bank PhD Fellowship
Vishali S	CSA	Best Poster Award, Powders and Grains 2025
Amritendu Dhar Shekhar	CSA	Prime Minister's Research Fellowship
Ayush Sawarni	CSA	Dr MNS Swamy Medal for Best MTech (Research) Thesis
Ullas A.	CSA	Best Lightning Talk Award at HiPC 2025
Suraj Kumar Sahoo	CSA	Prabakar Family Foundation Annual PhD Scholarship 2025
Anupam Verma	EE	Grid-India Power System Award (GIPSA) 2025-2026 for PhD thesis
Samrat Das	EE	Best paper award at IEEE STPEC 2025, NIT Goa
Samrat Das	EE	Best paper award at National Power Electronics Conference (NPEC), NIT Calicut, 2025
Anfas Rahman N	EE	Best paper award at National Power Electronics Conference (NPEC), NIT Calicut, 2025
Aditya Raj	EE	Best paper award at National Power Electronics Conference (NPEC), NIT Calicut, 2025
Anirban Chatterjee	EE	Gird-India Power System Award (GIPSA) 2024-25
Sudip Sarkar	EE	Best Paper Award: 12th National Power Electronics Conference 2025 (NPEC 2025), NIT Calicut
Himanshu Bhushan Sandhibigraha	EE	Outstanding Teaching Assistant Recognition from the Department of Electrical Engineering, IISc
Himanshu Bhushan Sandhibigraha	EE	Best Poster Award for the Electrical and Electronics Cluster in the 2025 PMRF Symposium
Himanshu Bhushan Sandhibigraha	EE	Best Presentation Award for the Power Engineering Cluster at the 16th EECS Research Students Symposium, IISc
Himanshu Bhushan Sandhibigraha	EE	Multiport EV charger technology selected for exhibition at Vigyan Bhawan, New Delhi, during an event organised by DST
Himanshu Bhushan Sandhibigraha	EE	Gandhian Young Technological Innovation (GYTI) Award for developing a reconfigurable EV charger
Neha Rajput	EE	WiE Travel Award to attend the 2025 IEEE Energy Conversion Conference and Expo (ECCE)

Student Name	Department	Award
Vishwabandhu Uttam	EE	IEEE Transactions on Industry Applications Second Prize Paper Award
Aabid Ahmd Dar	EE	Student Attendance Support (SAS) for attending IEEE Applied Power Electronics Conference (APEC) 2026
Anwesha Mukhopadhyay	EE	Prof DJ Badkas Medal for Best PhD Thesis
Anwesha Mukhopadhyay	EE	Grid India Power Systems Award (GIPSA) Best thesis award
Vihan Shahu	EE	Murthy Govindaraju Research Endowment Award in Power Electronics
Saradha Devi, Sugoto Maulik, Vinod John	EE	NPEC 2025, Best paper award
Soumya Dutta	EE	Qualcomm Innovation Fellowship
S Arthi	ECE	Qualcomm Innovation Fellowship
Yashvanth L	ECE	Prof Satish Dhawan Research Award for 2025
Saurav Roy	ECE	Second prize at the MAPCON 2025 Student best paper awards
Malika Somanath	ECE	Young Professional Best Paper Award for the Female category
Atli Lemma Gebretsadik	ECE	Overall Best Paper Award (All Tracks) in IEEE WAMS (Wireless, Antennas and Microwave Symposium), 2025
Raju Malleboina	ECE	International Travel Grant (ITS) from SERB for EuCAP 2025
Shivam Shinde	ECE	Overall Best Paper Award (Academia) in the IEEE CONECCT 2025
Debanurag Chakraborty	ECE	Second Prize in the Student Design Contest, IEEE MAPCON 2025
Keerthipriya Sathish	ECE	Satish K Sharma Best Paper Award for Female Doctoral Students, IEEE MAPCON 2025
Debaprasad Barad	ECE	Keysight Best Paper Award, IEEE MAPCON 2025
Anirban Chaudhuri	ECE	Industry Best Paper Award, IEEE MAPCON 2025
Shantnau Dambare	ECE	Best presentation Award in SCOPOSIS 2025
Kanad Sengupta	ESE	Best Poster Award, Quantum India Bengaluru (QIB 2025)
Samarth ST	ESE	Best Demo Recognition at IEEE ICEdge
Vivek Dey	CeNSE	Best oral presentation in International Conference on Emerging Electronics, IEEE
Shubham Parathe	CeNSE	Best oral presentation in South Asian Ferroelectrics Symposium (SAFS), IEEE; Electron microscopy meeting of IndiaEMSI 2025

Student Name	Department	Award
Gokul Krishna	CeNSE	Best poster award in International conference on functional materials (ICFM), IIT KGP
Suchitra P	CeNSE	Best oral presentation in ICFM, IIT KGP
Kartick Biswas	CeNSE	Best poster award in SAFS-2025, IEEE
Abhishek Kumar	CeNSE	Best poster award in EMSI-2025, IEEE
Badrinath Singhal	CDS	Qualcomm Innovation Fellowship India (QIF) award
Badrinath Singhal	CDS	TCS PhD Fellowship
Harsh Rangwani	CDS	IKDD Doctoral Dissertation in Data Science Award
Sravanti Addepalli	CDS	IISc PhD thesis Medal
Sai Vikas Kona	ICWaR	Runner Up, MIPA Conference 2025
Shairik Sengupta	ICWaR	Letter published in Science
Vaishnavi Vijaya V.	BSSE	Best poster award, BE Symposium 2025
Saksham Jain	BSSE	Best poster award, BE Symposium 2025
Ananta Kant Rai	RBCCPS	American Control Conference 2025 Student Travel Award
Archana Kulkarni	RBCCPS	CNI MTech Fellowship
Chidre Shravista Kashyap	RBCCPS	Best Experimental Abstract Award at ICC 2025
Ratnangshu Das	RBCCPS	IEEE-CDC Travel Support Award 2025
Ratnangshu Das	RBCCPS	ECC Student Travel Support Award 2025
Ahan Basu	RBCCPS	ECC Student Travel Support Award 2025
Prashil Wankhede	RBCCPS	CNI Fellowship
Chirag Patel	ICER	Best Thesis Award - Indian Membrane Society
Saini Jatin Rao	ME	Arkal S Shenoy Research Award
Shrutee Jalan	DCCC	Travel Support for ICTP 6th Summer School on Climate Dynamics, Italy
Mainak Bhowmik	MA	Research award Ganitam Runner Up 1 of the Dr KV Rao Scientific Society
Dayakrishn Purohit	PHY	Best Poster presentation
Srashti Vishvakarma	PHY	AFMD Best Poster Presentation Award at the International Conference on Advanced Functional Materials and Devices (AFMD-2024)
Nandana Bhattacharya	PHY	Best Poster Award at the MRS Spring meeting in Seattle, USA

Student Name	Department	Award
Nandana Bhattacharya	PHY	Second prize at the Young Physicists colloquium
Subha Dey	PHY	Best poster award at the Physics of Strongly Correlated Electron Systems (PSCES) conference held at IIT BHU
Subha Dey	PHY	Best poster award at The International Winter School-2025, "Frontiers in Material Science" conference held at JNCASR
Rhitaja Sengupta	CHEP	Institute Medal for the best PhD thesis in the Centre for High Energy Physics, 2024









7. *Events*

IISc Colloquiums

1. Institute Colloquium titled "The Himalayan task of connecting Jammu and Srinagar by train" delivered by Madhavi Latha Gali, Professor, Department of Civil Engineering and Chair, Centre for Sustainable Technologies, on 2 April 2025 at the Faculty Hall, Main Building.

2. Institute Colloquium titled "Adventures of a droplet: A multiscale journey to extreme flow conditions" delivered by Saptarshi Basu, Professor, Department of Mechanical Engineering, on 25 September 2025 at the Faculty Hall, Main Building.

3. Institute Colloquium titled "Power-Electronic-Controlled electromechanical systems" delivered by G Narayanan, Professor, Department of Electrical Engineering on 30 October 2025 at the Faculty Hall, Main Building.

4. Institute Colloquium titled "All over the place" delivered by Sanjiv Sambandan, Professor, Department of Instrumentation and Applied Physics, on 27 November 2025 at the Faculty Hall, Main Building.

5. Institute Colloquium titled "The science of small things" delivered by N Ravishankar, Professor, Materials Research Centre, on 29 January 2026 at the Faculty Hall, Main Building.

6. Institute Colloquium titled "A fantastic voyage with nanobots" delivered by Ambarish Ghosh, Professor, Centre for Nanoscience and Engineering (CeNSE), on 26 February 2026 at the Faculty Hall, Main Building.

Special Lectures

1. Amulya and Vimala Reddy award lecture on "Sustainability (Science) – philosophical and practical insights" delivered by Monto Mani, Professor, Centre for Sustainable Technologies and Department of Design and Manufacturing, IISc, on 1 April 2025 at Faculty Hall, Main Building.

2. Institute Lecture titled "ANRF Overview and Principles" delivered by Shivkumar Kalyanaraman, CEO, Anusandhan National, Research Foundation (ANRF) on 4 April 2025 at the Faculty Hall, Main building.

3. Institute Lecture titled "Understanding collective cell migration" delivered by Philip Maini, Professor, Department of Mathematics, University of Oxford on 8 April 2025 at the Faculty Hall, Main Building.

4. MJ Thirumalachar and MJ Narasimhan Endowment lecture titled "Indian Space Programme – Major accomplishments, challenges and future perspectives" delivered by V Narayanan, Secretary, Department of Space; Chairman, ISRO, and Chairman, Space Commission on 23 July 2025 at the Faculty Hall, Main Building.

5. Professor Roddam Narasimha Endowment Lecture 2025 titled "Navier & Stokes take the qubit train" delivered by KR Sreenivasan, Professor, New York University on 29 August 2025 at the Faculty Hall, Main Building.

6. Institute Lecture titled "From metamaterials to Mie-tronics and metasurfaces" delivered by Yuri Kivshar, ECE Distinguished visitor, Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University on 7 October 2025 at the Faculty Hall, Main Building.

7. IISc Centenary Lecture titled "Life and random algorithms" delivered by Bruce Hajek, Hoeft Chair in Engineering, University of Illinois, USA on 10 October 2025 at the Faculty Hall, Main building.

8. Prof S Ramaseshan Memorial Lecture 2025 titled "Advancing materials innovation through collaboration: The vision and activities of nims" delivered Kazuhiro Hono, President, National Institute for Materials Science (NIMS), Tsukuba, Japan on 13 November 2025 at the Faculty Hall, Main Building.

9. Institute Lecture titled "Equatic: The development of a seawater-based atmospheric carbon removal and hydrogen co-production platform" delivered Gaurav N Sant, Pritzker Professor of Sustainability, and Founding Director: Institute for Carbon Management on 15 December 2025 at the Faculty Hall, Main Building.

10. Prof CNR Rao Endowment Lecture titled "Semiconductor nanostructures for optoelectronics and energy applications" delivered by Chennupati Jagadish, Professor, Research School of Physics, The Australian National University, Canberra, Australia on 22 December 2025 at the Faculty Hall, Main Building.

11. Special Lecture titled "New scientific opportunities at the European X-ray Free Electron Laser" delivered Sakura Pascarelli, Scientific Director, European XFEL, Hamburg, Germany on 23 December 2025 at the Faculty Hall, Main Building.

12. MA Govinda Rau Memorial Lecture titled "Metal-Organic Frameworks as tunable platforms for gas storage and chemical separations" delivered by Randall Q Snurr, Department of Chemical and Biological Engineering, Northwestern University, Evanston, USA, on 22 January 2026 at the Faculty Hall, Main Building.

13. Fireside chat titled "Transforming discovery: AI's role in scientific progress", featuring Nobel Laureate Sir Demis Hassabis and IISc Director Govindan Rangarajan on 17 February 2026 at JN Tata Auditorium.

14. An Interactive session with Gp Capt Shubhanshu Shukla, Indian Air Force Group Captain and astronaut, serving as pilot on Axiom Mission 4 (Ax-4) in 2025 titled "Space through an astronaut's eyes" on 2 March 2026 at the JN Tata Auditorium.



WORKSHOPS AND SEMINARS

Biological Sciences

- International Conference: One Sustainable Health Summit, October 2025 (BC)
- International Conference: Dynamics and Evolution of RNA Functions, September-October 2025 (BC, MCB, DBG)
- Online CCE Course: RNA-based therapeutics, November 2025 (BC)
- Conference: International Research Network on infectious diseases and antibiotic resistance (IRN MIRA) 2025 (MCB)
- Conference: Immunometabolism in Tissue Homeostasis, Infections, and Sterile Inflammation 2025 (MCB)
- ASM-IISc Symposium on One Health Approach to AMR, 2025 (MCB)
- Conference: RISE 2025, May 2025 (DBG, MCB, BE)
- Conference: Brain Computation and Learning, June-July 2025 (CNS)
- International Conference on Electron Microscopy and XLIII Annual Meeting of the Electron Microscope Society of India July 2025 (MBU)
- Workshop: Two-day pre-EMSI conference workshop on cryo-EM sample preparation and image processing, July 2025 (MBU)
- Conference: 2nd Neuroscience of Consciousness Workshop: Perspectives on Self and Agency, 2025 (CNS)
- Workshop: 5th Brain Computation and Learning Workshop, 2025 (CNS)
- 5th Workshop on Brain, Computation, and Learning (BCL5), June-July 2025 (CNS)

Electrical, Electronics, and Computer Sciences

- Workshop: IISc Fujitsu WorkShop on Quantum Computing, 2025 (CSA)
- Startup Talent Quest, 2025 (CSA)
- Workshop: Frontiers of Graph Algorithms, Dec 2025-Jan 2026 (CSA)
- Workshop: Computer Systems and Machine Learning, November 2025 (CSA)
- Seminar: Summer School on Approximation Algorithms, 2025 (CSA)
- Seminar: Econ CS Day, 2025 (CSA)
- Indian Control Conference, 2025 (CSA, ECE, CPS, EE)
- Seminar: Bangalore Crypto Day, November 2025 (CSA)
- Summer School on Approximation Algorithms 2025 (CSA)
- Conference: 23rd International Symposium on Automated Technology for Verification and Analysis (ATVA '25) 2025 (CSA)
- Post Graduate Certification Course Cohort 3: Space Technology, April-November 2025 (ECE)
- Conference: Theory of Quantum Computation, Communication and Cryptography (TQC) 2025 (ESE)



Chemical Sciences

- International Conference: EMSI, July 2025 (MRC)
- International Conference: IEEE:SAFS, August 2025 (MRC)
- 1st Indo-Japan meeting on advanced materials 2025: From synthesis to device, November 2025, (MRC)
- Workshop: Indo-Japan Meeting, November 2025 (MRC)

Interdisciplinary Sciences

- Conference: Annual meeting on electron microscopy, EMSI-2025, July 2025 (CeNSE)
- Conference: South Asian Ferroelectric Symposium, August 2025 (CeNSE)
- Workshop: Quantum phenomena in materials, December 2025 (CeNSE)
- Online Course: Fundamentals of electromagnetic compliance: Development to deployment for electrical product design, August 2025 – December 2026 (SERC)
- Online Course: Introduction to High Performance Computing (HPC) and Parallel Programming, August-December 2026 (SERC)
- Conference: CVIP, 2025 (CDS)
- Workshop: Dynamic Balancing and Vibration, October 2025 (ICER)
- Conference: Biosculpt: UK-India Summit on 3D Bioprinting and Engineering Biology, November 2025 (BE)
- Conference: Podocon 2025 (BE)
- Conference: 1st Indian Mechanobiology Meeting, October 2025 (BE)
- International Conference: Mechanobiology in Translational Research: Bioforces to Bedside, October 2025 (BE)
- Indian Control Conference, December 2025 (RBCCPS)

Mechanical Sciences

- Conference: CompFlu, December 2025-January 2026 (CE)
- Conference: Powders & Grains, December 2025 (CE)
- AICTE Faculty Development Programme: Machine Learning for Solving Challenging Engineering Problems, January 2026 (CE)
- Conference: International Meeting of the Battery Research Society, December 2025 (MTE)
- Conference: Science and Technology of Ironmaking and Steelmaking, December 2025 (MTE)
- Symposium: Ecosystem Summit: Building a resilient critical minerals supply chain, October 2025 (MTE)
- Workshop: Challenges and Oppourtunities in Human Space Flight, 2025 (DM)
- Workshop: AI for Accessibility and Inclusion, 2025 (DM)
- Commemorative activities and invited talks (distinguished academics and alumni, industry) marking 75 years of Civil Engineering at IISc, July 2025 (CiE)
- Workshop: Towards Carbon Neutral Infrastructure: Recent Innovations in Sustainable Building Materials, May 2025 (CiE)
- Continuing education programme: Durability of Reinforced Concrete, May 2025 (CiE)
- Seminar: Seismic Source Characterisation and Hazard Assessment for Northeast India and Chile: Implications for Dam Safety, 2025 (CiE)
- Workshop: Seismic Risk Assessment of Earth Dam by accounting for Dam Specific Seismicity and Analysis, 2025 (CiE)

Physical and Mathematical Sciences

- Workshop: Day 1 – Idea to market: Transforming Research into Products and Beyond. Day 2 – Bridging Innovation, Evidence and Policymaking through Health Technology Assessment, July 2025 (IAP)
- Workshop: NCM Instructional School for Teachers on Theory and Computation of PDEs NIT Warangal, September 2025 (MA)
- Third Meru Combinatorics Conference, 2025(MA)
- GIAN Course: Graphs, Spectra and Convex Geometry, 2025 (MA)
- Computational Methods in Lattice Field Theories, October-November 2025 (CHEP)
- Journeys in Particle Physics: Rohini Godbole Memorial Conference, 2025 (CHEP)
- Workshop: HSF-India Scientific Computing, June 2025 (CHEP)





8. *Other Units*

8.1

Centre for Campus Management and Development (CCMD)

Estate Management is done by the Centre for Campus Management and Development (CCMD), which looks after maintenance of all the buildings, infrastructural needs, electrical requirements, construction of new buildings, maintenance of water supply, sanitation, and maintenance of roads. The overall improvements in the campus maintenance also come under the purview of CCMD.

CCMD takes care of Main building, residential quarters, Departments, Guest House, Hostels, Mess, Gymkhana, Health Centre, Faculty club, Tata Memorial club, and all central amenities – such as restaurants, etc.

Electrical breakdown in generators, transformers, high tension wires, low tension wires, water supply, and sanitation are addressed within 24 hours. CCMD also looks after the Sewage Treatment Plant (STP), which recycles the sewage water to be used for gardens and flush tanks.

24 hours Maintenance and Service Centre is available along with staff to attend minor complaints.

During the year 2025-26, the works completed, work in progress and new initiatives are as follows-

Works completed from April 1st, 2025 to March 31,2026

Sl no	Description of Works	Cost (Rs. in lakhs)	Area in Sq. Mtrs.
1	Supply Installation Testing and Commissioning of Compact Substation for new buildings	535.23	
2	External Painting, laying of damaged plinth protection concrete water proofing treatment for arresting leakage from RCC Water tanks and roof of Old D Type Qtrs 40 Nos in IISc campus	43.30	
3	Construction Of UTM, CMM Labs And Alternation Of Existing Rooms and Labs At New CST Building IISc	78.58	
4	Providing Terrace Floor Puff sheet ahed additional water tank water supply from existing tank lab platform aluminium partitions waterproofing and other allied works at CAF Department at IISc	30.12	
5	Renovation and upgradation of newly alloted Left Wing of Ground Floor at ICWaR Department	29.92	
6	Proposed Second Floor For Annex Building Of CSA Department	250.69	
7	Re-surfacing the existing selected damaged bituminous roads at IISc	372.41	
8	The work of Replacing the Existing Asbestos Sheet roofing to puff sheet roofing, Painting and other ALLIED WORK AT MAIN High Voltage lab, IISc	56.07	

Works in-Progress during the year 2025-2026

Sl no	Description of Works	Cost (Rs. in lakhs)	Area in Sq. Mtrs.
1	Reconstruction of damaged boundary wall and Raising of boundary wall with Solid Block Masonry at different stretches: From NSSC Auditorium gate to CBR gate, from HMT road to Main gate, near KV school, from Post office gate to Maramma circle gate, Security office gate to TPS pump house near Sadashiv Nagar police station and Fabrication and Chain Link fencing at 66KV IISc.	195.79	
2	Construction of Modern Indoor Sports Complex at Gymkhana	11058.40	
3	Construction of 15 Passenger Lift and Associated RCC Deck slab and shaft work for IAP Annex Building	41.45	
4	Construction of Additional Wing at Chemical Engineering Department at IISc	395.70	
5	External Repairs and External painting for old E Type quarters 32 Nos in IISc campus	42.42	
6	Design, Supply, Installation of 12.5 MVA Power Transformer and associated works in 66 KV Main Receiving Station (MRS) at IISc	385.09	
7	Extension of existing Tennis court and provision of new acrylic cushion replacing old clay court in IISc	75.75	
8	Construction of New Toilet Block, Providing and Laying Granite Stone Flooring, Paver Blocks, False Ceiling, Waterproofing and Painting works etc at Centre for Cryogenic Technology (CCT) at IISc	44.85	
9	Setting up of OCCap -Placement cell in IPC leftwing and Right wing at IISc	51.78	
10	Renovation of Medium Voltage Power Electronics laboratory near High Voltage Building	110.58	
11	Providing 6 Nos Passengers Lift icluding all Civil and electrical works at Hoysala Guest House	30.13	
12	Renovating Conference hall in office of Communication at IISc	20.77	
13	Construction of drain and revamping of street light poles from Ooc to Biological Science Back side with Walk Way and other allied works at IISc	47.13	
14	Renovation of quarters DQ-2,DQ11,DQ18,HE-2111,NE-12,NE-23,NE-316, E-5,E-18,D-211,D-213,D-233,D-237,B-701,A-850,NSQ-35 incuding Electrical work in IISc campus	59.60	
15	The work of Internal ,External Painting and other allied works at EE&HV Department ,IISc	110.23	
16	Dismantling old VRF units, Supply,Installation, testing and Commissioning of new VRV/VRF system inclusive of 02 year of Comrehensive AMC of the Installed HAVC system at Department of Bilogical Science Indian Institue of Science	1155.38	
17	Dismantling and Replastering of the external wall Surface and repairs to expansion joints ,plumbing lines etc in Chemical Science Building IISc	264.34	
18	Providing Parking Area Road widenng,Landscaping and Horticulture including electrical works to TSC X HUB Building at IISc	377.83	

Sl no	Description of Works	Cost (Rs. in lakhs)	Area in Sq. Mtrs.
19	Renovation/Refurbishment wworks to IAP main building ,IAP Annex -01 and IAP Annexe -02's all common areas, IISc	32.79	
20	The work of External, Fencing common areas pianting to EV type ,Dv type,CV type and Av type Quarters at Vijananapura Quarters IISc	22.00	
21	Estimate for the Repairs Renovation and allied works required for the NQM activities space on the 2nd floor of the SSCU building	33.24	
22	Supply,Installation,Testing and Commissioning of 2X100 KVA Compact Substation for UG complex in IISc	189.43	
23	Construction of Ground +2storey building for drone testing at IISc	957.15	
24	Construction of Amenity Complex, IISc	180.19	
25	Renovation and repair of - NSQA16, NSQA22, NSQA49, NSQA56, NSQA58, NSQ61, NSQA67, NSQA69, NSQA73, NSQB20, NSQB25, NSQB28, NSQB44, NSQB72, NSQB621, B634, B635, B636, B644, B656, B658, B662, B664, B669, B672, B685, B696, B708, A855, A872, A873, A876, A881, D202, D222, D231, NNE-103, HE261 (Total -39) Including Electrical Works in IISc, Campus	30.58	
26	Civil repairs and painting works at Management studies Main building, Annex classroom and Annex Labs in IISc	19.17	
27	Renovation of hot furnace Lab and student seating area in Materials Engineering Department at IISc	32.80	
28	Repair and Renovation Mangalore tile roofing of AFMM nd OLU at IISc	39.00	
29	The work of sheltered including MS frame structure and puff sheet at Terrace floor CSA department IISc	174.92	
30	Transvahan Shed Construction, road access refurbishment including the supply and installation of an split Ac in the battery room of F&A department	16.03	
31	Providing and fixing locks and safety protection measures at water supply installations,sump and pumping stations at IISc	24.84	
32	Renovation of space alloted for Pair Network program in 2nd floor old SSCU(Annex) and OLD IPC Building (C001,C002,C003 and C004) at IISc	31.99	
33	Civil and electrical Modification works required for Aryabhata and Tunga Hostels (Dining Kitchen Area) at IISc	80.32	
34	Renovation (47 toilets) and refurbishment (17 toilets) work to the Gents Hostels at the P block, PD block, KRVH, R block, S block and U Block, IISc	187.65	
35	Construction, Supply, erection, testing and commissioning of 100 KLD capacity combined sewage/effluent treatment plant (CSETP) at Chemical science building, IISc, including Comprehensive operation and Maintenance.	184.15	
36	Water Supply System Rehabilitation works for Smart Pumping Station (Phase II).	914.66	
37	The Work Of Renovation And Upgradation Of Washrooms Including Electrical Work At Ground Floor And First Floor Of SERC Department at IISc,	29.74	

New Works Commenced during the year 2025-2026

Sl no	Description of Works	Cost (Rs. in lakhs)	Area in Sq. Mtrs.
1	Providing 6 Nos Passengers Lift icluding all Civil and electrical works at Hoysala Guest House	30.13	
2	Renovating Conference hall in Office of Communications at IISc	20.77	
3	Construction of drain and revamping of street light poles from Ooc to Biological Science Back side with Walk Way and other allied works at IISc	47.13	
4	Renovation of quarters DQ-2, DQ11, DQ18, HE-2111, NE-12, NE-23, NE-316, E-5, E-18, D-211, D-213, D-233, D-237, B-701, A-850, NSQ-35 Incuding Electrical work in IISc campus	59.60	
5	The work of Internal, External Painting and other allied works at EE&HV Department, IISc	110.23	
6	Dismantling old VRF units, Supply, Installation, testing and Commissioning of new VRV/VRF system inclusive of 02 year of Comrehensive AMC of the Installed HAVC system at Department of Bilogical Science, Indian Institue of Science	1155.38	
7	Dismantling and Replastering of the external wall Surface and repairs to expansion joints ,plumbing lines etc in Chemical Science Building IISc	264.34	
8	Providing Parking Area Road widenng, Landscaping and Horticulture including electrical works to TSC X HUB Building at IISc	377.83	
9	Renovation/Refurbishment wworks to IAP main building, IAP Annex - 01 and IAP Annexe - 02's all common areas, IISc	32.79	
10	The work of External, Fencing common areas pianting to EV type, Dv type, CV type and Av type Quarters at Vijananapura Quarters IISc	22.00	
11	Estimate for the Repairs Renovation and allied works required for the NQM activities space on the 2nd floor of the SSCU building	33.24	
12	Supply, Installation, Testing and Commissioning of 2X100 KVA Compact Substation for UG complex in IISc	189.43	
13	Construction of Ground +2storey building for drone testing at IISc	957.15	
14	Construction of Amenity Complex, IISc	180.19	
15	Renovation and repair works of - NSQA16, NSQA22, NSQA49, NSQA56, NSQA58, NSQ61, NSQA67, NSQA69, NSQA73, NSQB20, NSQB25, NSQB28, NSQB44, NSQB72, NSQB621, B634, B635, B636, B644, B656, B658, B662, B664, B669, B672, B685, B696, B708, A855, A872, A873, A876, A881, D202, D222, D231, NNE-103, HE261(Total - 39 Quarters) Including Electrical Works in IISc, Campus	30.58	
16	Civil repairs and painting works at Management studies Main building, Annex classroom and Annex Labs in IISc	19.17	
17	Renovation of hot furnace Lab and student seating area in Materials Engineering Department at IISc	32.80	
18	Repair and Renovation Mangalore tile roofing of AFMM and OLU at IISc	39.00	
19	The work of sheltered including MS frame structure and puff sheet at Terrace floor CSA Department IISc	174.92	

Sl no	Description of Works	Cost (Rs. in lakhs)	Area in Sq. Mtrs.
20	Transvahan Shed Construction, road access refurbishment including the supply and installation of an split Ac in the battery room of F&A department	16.03	
21	Providing and fixing locks and safety protection measures at water supply installations, sump and pumping stations at IISc	24.84	
22	Renovation of space alloted for Pair Network program in 2nd floor old SSCU(Annex) and OLD IPC Building (C001,C002,C003 and C004) at IISc	31.99	
23	Civil and electrical Modification works required for Aryabhata and Tunga Hostels (Dining Kitchen Area) at IISc	80.32	
24	Renovation (47 toilets) and refurbishment (17 toilets) work to the Gents Hostels at the P block, PD block, KRVH, R block, Sblock & U Block, IISc	187.65	
25	The work of Replacing the Existing Asbestos Sheet roofing to puff sheet roofing, Painting and other ALLIED WORK AT MAIN High Voltage lab, IISc	56.07	

8.2
Official Language Unit

Hindi Workshop:
The Institute regularly organises Hindi workshops on various aspects of the use of Hindi in Central Government Offices and conversation sessions for the benefit of the Institute staff. Staff members from different sections/units of the Institute take part in these workshops and utilise the learnings in their offices. This year's workshop and discussion was organised with Dr Mahendra Kumar Jain, Assistant Director, Hindi Teaching Scheme Bangalore, invited to the campus, to speak on the topic of "Addressing difficulties faced while working with the official language, Hindi." The workshop was highly appreciated by everyone.

Translation:
Hindi translation of administrative manuals, forms, and routine correspondence was carried out.

Chair: Rajeev Ranjan

8.3
Public Information Office

Right to Information Act, 2005:
The Institute adopted the Right to Information Act, 2005 in the year 2006. The Institute disseminates information through its website, which is accessible to the public. During this year, the public has made around 449 requests seeking information; prompt action has been taken and the applicants have been informed accordingly.





9. *Campus Facilities*

9.1
Health Centre

Health Centre Overview

The Health Centre of the Indian Institute of Science (IISc), provides comprehensive healthcare services to the Institute community, including staff, students, pensioners, and their dependents. A significant number of employees and their families reside on campus, making accessible healthcare an essential service.

The Health Centre is well-equipped to provide outpatient, inpatient, and emergency medical care, supported by modern diagnostic and treatment facilities. Medical services are available round the clock to ensure timely healthcare support to all beneficiaries.

Beneficiaries

The Health Centre provides primary healthcare services to:

- Staff and their dependents
- Students
- Pensioners and their spouses
- Family pensioners

Clinical Services

The Health Centre offers 24×7 outpatient, inpatient, and emergency medical services. Specialist consultation services are available through visiting consultants in the following disciplines:

- General Medicine
- Gynaecology
- Dermatology
- Ophthalmology
- Cardiology
- Endocrinologist
- ENT
- Paediatrics
  Psychiatry (Wellness Centre)

Consultants attend patients referred by Medical Officers and Area Medical Officers on scheduled appointment days.

Facilities and Services

- **Dental Unit:** Provides preventive and curative dental care under the supervision of a qualified dental surgeon.
- **Physiotherapy Unit:** Offers physiotherapy and rehabilitation services through a fully equipped facility managed by a qualified physiotherapist.
- **Pharmacy:** The pharmacy maintains adequate stocks of essential medicines and dispenses prescribed medications through a computerised system.
- **Clinical Laboratory:** The computerised laboratory performs routine and specialised diagnostic investigations
- **Operating Hours**
  Monday to Friday: 8:00 AM – 5:30 PM
  Saturdays, Sundays and Holidays: 8:00 AM – 4:00 PM

Radiology Services

- Routine X-ray services
- Ultrasound scanning facility
- Daily ultrasound services by Consultant Radiologist

Operating Hours X-Ray Services: 8:00 AM – 8:00 PM

Emergency and Inpatient Care

- Two eme rgency observation beds
- Ten inpatient beds
- 24-hour ambulance service for referrals
- Dedicated night-duty doctor for emergency care.

Medical Personnel Available at Health Centre

- Permanent Experienced Doctors
- Authorised Medical Officers handling outpatient, inpatient, and emergency care services
- Area Medical Officers providing medical services to staff and their families residing outside the campus

Medicines and Prescriptions

- Most prescribed medicines are dispensed directly through the Health Centre Pharmacy.
- Medicines not available in stock for pensioners are prescribed for external purchase and reimbursement as per rules.
- Medicines for serving employees are procured through approved vendors and dispensed through the pharmacy.
- Ayurvedic healthcare services are available through recognised Ayurvedic practitioners on referral.

Student Medical Coverage

Students are covered under the Student Medical Care Scheme.

- Reimbursement of eligible medical expenses up to the prescribed limit.
- Inpatient treatment for major illnesses is covered under the Group Medical Insurance Scheme.

Staff and Pensioner Health Scheme

Permanent employees and pensioners are covered under the Contributory Health Service Scheme (CHSS).

- Staff and their dependents
- Pensioners and their spouses
- Family pensioners are covered under the Group Medical Insurance Scheme.

Insurance Coverage

- Inpatient treatment for major illnesses is covered under the Group Medical Insurance Scheme.
- Cashless treatment facilities are available at empanelled hospitals across India.

Administration

The Health Centre Office manages administrative functions, patient records, insurance-related activities, procurement, and correspondence associated with healthcare services.

Health Centre Services – Round-the-Clock Availability

- Morning Shift: 8:00 AM – 2:00 PM
- Afternoon Shift: 2:00 PM – 8:00 PM
- Night Shift: 8:00 PM – 8:00 AM

Important Contact Numbers

Ambulance / Nursing Services (24×7)
080-2293 4444 / 8217046014 / 080-2293 2390 / 080-2293 2006

Reception
080-2293 2227

Health Centre Office
080-2293 2234

Conclusion

The Health Centre continued to provide accessible, efficient, and quality healthcare services to the IISc community while strengthening patient care and healthcare infrastructure.



9.2
Recreational Facilities

9.2.1 Gymkhana at IISc

The Gymkhana serves as the vibrant central hub for students and officials, fostering excellence in both sports and cultural activities. With approximately **35 sports and cultural clubs** operating under its wing, it remains a cornerstone of campus life.

Facilities

The Gymkhana provides a comprehensive suite of facilities designed for elite performance and recreation.

1) Indoor Excellence:

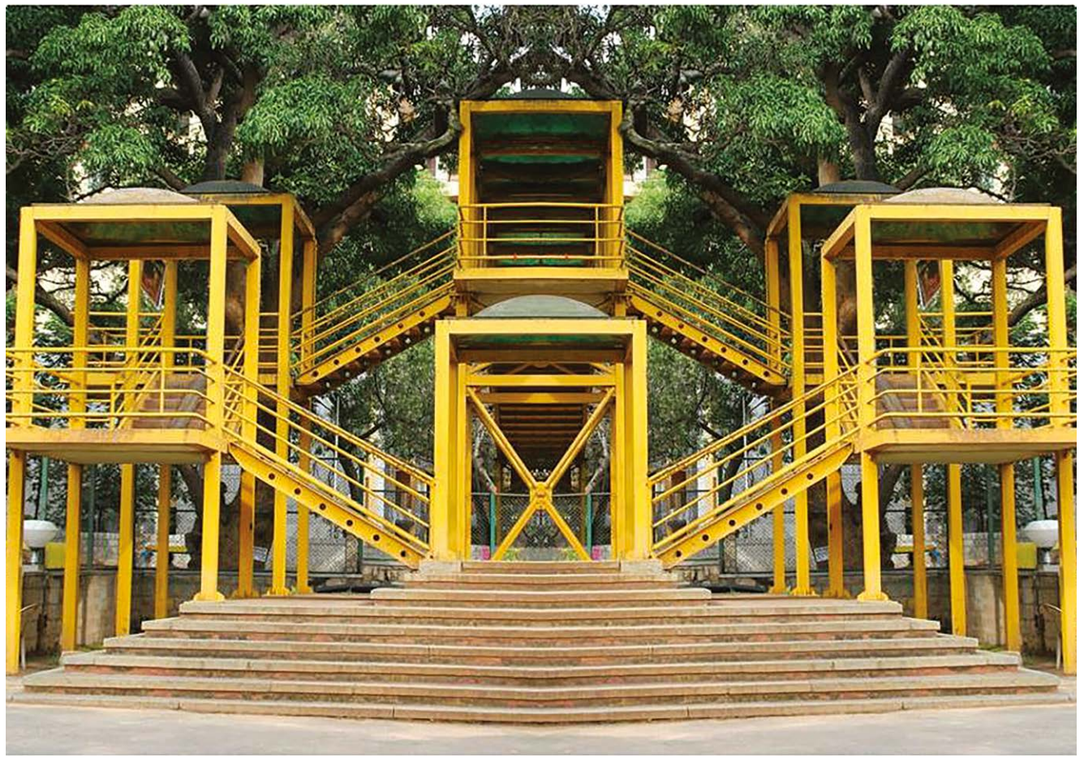
- Well-equipped modern gymnasium
- Indoor badminton complex featuring newly installed **HOVA mats**
- Dedicated spaces for Billiards, Carrom, and Table Tennis

2) Outdoor and Field Sports:

- Dedicated Football and Hockey turf grounds
- Synthetic Tennis courts (upgraded from clay with new fencing and lighting)
- Swimming pool and courts for Volleyball and Basketball
- Floodlight Accessibility: All sports grounds are equipped with floodlights for evening use

3) Satellite Grounds:

- **KV IISc Ground:** Available for outdoor games from **4:00 PM to 10:30 PM.**
- **SBI Bank Ground:** Features cricket practice nets and box cricket.



Clubs and Student Interests

Beyond traditional athletics, the Gymkhana supports a diverse array of specialised clubs.

Athletic and Combat Clubs	Arts and Lifestyle Clubs
Frisbee, Kung Fu, Kalaripayattu	Nature, Photography, Fine Arts
Kho-kho, Kabaddi, Throwball	Music, Dance, Fashion
Handball	Literary, Dramatic, Aerobics

Activities and Achievements

The 2025-26 period was marked by high engagement and competitive success:

- **Major Events:** Hosting annual meets including **SPECTRUM, ECLIPSE, IDCC**, Champions League, and the Freedom Run
- **Cultural Highlights:** The Raja Ramanna Student's Activity Centre (SAC) remains the primary venue for cultural events hosted by clubs like RHYTHMICA and RANGMANCH
- **Notable Success:** IISc students secured second position in both the Inter-Institute Cultural and Sports Meets in 2025
- **Skill Development:** Coaching is facilitated through external experts across disciplines including swimming, tennis, Zumba, and martial arts
- **Community & Leadership:** Workshops conducted on yoga and self-defense for women, alongside the annual GSAC election to appoint student leaders

Future Developments

The following projects are currently under progress:

- **New Indoor Sports Complex:** Ongoing construction within the Gymkhana premises
- **Outdoor Gym Area:** Installation of equipment beside the Hockey turf

9.2.2 Faculty Club

The Faculty Club serves as a hub for various recreational, social, and cultural activities exclusive to the club members at the Institute. It is a designated space where members can engage in leisurely pursuits and foster connections with fellow colleagues. Within the club, there is a library housing a collection of books and magazines carefully curated to provide a tranquil reading experience for members. To enhance the reading options available, new books have been added to captivate and stimulate the interests of avid readers among the club's members. This allows individuals to indulge in intellectual exploration and personal enrichment within the cozy lounge setting.

Recognising the importance of physical well-being, the Faculty Club offers a range of amenities to cater to the diverse interests of its members. These include recreational activities such as Caroms, new Billiards, and table tennis, which provide opportunities for friendly competition and leisurely enjoyment. Additionally, there are television facilities for entertainment and relaxation. For those seeking a more active lifestyle, the club also provides a gym with various exercise equipment, encouraging members to maintain their fitness levels while enjoying the convenience and comfort of the club's premises.

Catering to the dietary needs and preferences of its members, the Faculty Club offers dining facilities that serve fresh and wholesome vegetarian meals on a daily basis. These meals are carefully prepared to provide nourishment and ensure a balanced diet for the faculty and club members. During working hours, the club also offers tea, coffee, and different snacks, creating a pleasant and inviting environment for conversations and discussions. This not only

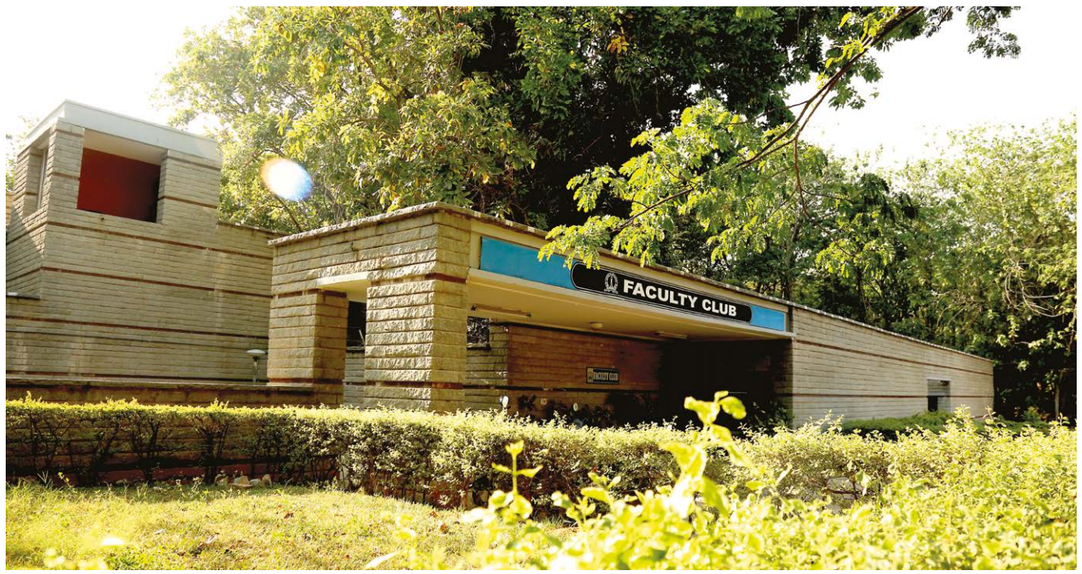
fosters a peaceful atmosphere but also provides an opportunity for club members to engage in scholarly exchanges and share their research ideas, contributing to a collaborative and intellectually stimulating environment.

As part of its commitment to fostering a sense of community and celebration, the Faculty Club organises several annual events. One such event is the New Year Lunch, a cherished tradition that brings together all IISc Club members and their families. This festive occasion allows families and children to gather, enjoy a meal, and celebrate the beginning of a new year together. Additionally, retiring club members are regularly honoured and recognised for their contributions through a special high-tea event. This gathering, often graced by the presence of the Institute Director, provides an opportunity to express gratitude and appreciation for the valuable service and dedication of the retiring members. This year, the Faculty Club started a summer camp for the children of the members. The camp was conducted for a month-long activity in the summer holidays, which gave ample opportunities for the children to learn many skills, including dance, music, arts and crafts, exploring nature, watching birds and plants, visiting the library, gymkhana, etc. The camp was concluded with a valedictory function showcasing the talents of the children and the campus community.

In order to ensure transparency and accountability, the Faculty Club's financial accounts undergo a rigorous audit process. An external auditor from an agency is entrusted with reviewing the club's financial records for the 2024-2025 period. This comprehensive audit serves to ensure that the club's finances are properly managed and adhere to established accounting practices, instilling confidence among club members and promoting responsible financial stewardship.

Recognising the need for improved facilities and infrastructure, the Faculty Club has put forth a proposal to the Institute administration. The proposal seeks to create a new building equipped with ultra-modern kitchen facilities and enhanced amenities that will benefit the club's members. This year, the entire faculty club building got a facelift with major maintenance works and painting. By providing better facilities, the club aims to offer an elevated experience and meet the evolving needs and expectations of its discerning membership. This endeavour underscores the commitment of the Faculty Club to continuously improve and provide a conducive environment that promotes the well-being and satisfaction of its members.

- Veeranna Kammar
General Secretary,
Faculty Club, IISc



9.2.3 Tata Memorial Club

The Tata Memorial Club (TMC) serves as a vibrant hub for recreational, cultural, and educational activities for the staff and community of the Institute. The Club provides space and facilities for a variety of indoor and outdoor games, and regularly organises training in various dance forms, musical instruments, yoga, meditation, and sloka chanting for faculty and staff members, students, and their dependents.

- Tuition classes are conducted with the support of student volunteers for the children of needy families, and the Club also provides essential engineering and medical textbooks for such children.
- TMC maintains a well-stocked library and offers a gym facility to the TMC Institute community.
- Regular blood donation camps are organised in collaboration with the Students Council, the Lions Club, and the Red Cross Society.
- Sports tournaments such as Cricket, Carrom, Badminton, and Table Tennis were organised for staff members, encouraging participation, teamwork, and healthy competition
- TMC also served as a venue for fun games and engagement activities organised jointly with the Women's Forum
- World Meditation Day was observed on 21 December 2025 in collaboration with the i-Meditate Club, IISc, through a guided meditation session conducted by experienced practitioners, promoting mindfulness and mental well-being among members
- Carnatic Music classes have been running successfully for over a year and continue to attract enthusiastic learners
- TMC successfully organised the Retirement Felicitation Function in July to honour retiring staff members for their valuable service to the Institute
- TMC organised the live streaming of the Men's T20 World Cup Final, bringing members together to enjoy the match in a community setting
- TMC successfully conducted the Annual Sports Meet, followed by a cultural evening, and distributed prizes to winners, runners-up, and participants across various sports and activities
- Violin classes were introduced this year and have been well received by young music enthusiasts in the Institute community.



9.3
Auditoria

9.3.1 National Science Seminar Complex

The magnificent National Science Seminar Complex, situated in the IISc Campus, is the first of its kind in India. The complex is open for seminars, symposia, workshops and conferences organised by recognised scientific societies, educational institutions and professional bodies. The total built up area measures around 5750 sq. metres.

This is fully air-conditioned complex, houses the JN Tata Auditorium with a seating capacity of 750 and 3 mini seminar halls, Hall- A with 120 seating capacity, Hall- B with 90 and Hall- C with 60 seating capacity. It is having an Exhibition ground to conduct poster sessions and exhibitions. Interactive concourses at the basement and ground level with excellent light and sound facilities are part of the seminar complex. The dining area at basement is available for catering.



9.3.2 Prof Satish Dhawan Auditorium

Located on the first floor of the Centre for Scientific and Industrial Consultancy (CSIC), this is a medium sized auditorium, which is having a seating capacity of 250. It is having fixed seats and a dais suitable for conferences and the complex is open for seminars, symposia, workshops and conferences organised by recognised scientific societies, educational institutions and professional bodies. It is fully air-conditioned and is adequately equipped with sound, lighting and projection equipment.



9.3.3 Faculty and Reception Hall

The Faculty Hall with a seating capacity of 275 is located in the east wing, on the first floor of the tower building. The Reception Hall is in the west wing. These are used for formal events.

9.4
Amenities

The following amenities located in different parts of the campus make day-to-day life smoother and more comfortable. In fact, these facilities have made IISc a totally self-contained Campus.

- Beauty Parlour (1)
- Gents Hair Stylists (2)
- Diary outlet (1)
- Bakeries (2)
- Laundry and Dry Cleaners (2)
- Tailoring Shops (2)
- Food Courts (5)
- Fruit Stall an Juice Centre (1)
- Courier and Mobile Services shop (1)
- Photocopying and DTP Centers (2)
- General Stores (2)
- Student council (1)
- Campus Book Store (1)
- Photo Studio (1)
- Cable Network Providers (1)
- Internet Service Providers (1)
- Restaurants (1)
- Play School (1)
- Super Market (1)
- Cycle repair shops (2)
- Medical Shop (1)
- Creche (2)
- Mobile Food Van (1)
- Departmental Eateries (6)

Communications: Post Office (Science Institute, Bangalore – 560 012), Telecom Centre and STD booths. The Institute is connected by the Centrex Exchange from BSNL with **1775 extensions.**

In addition, there are nearly **350 direct lines** to different departments and centers. **IISc has set up a helpline extension 5555 for reporting any emergency.**

Centralised electronic franking takes care of outward postage. The CMC section maintains a fleet of service vehicles through approved travel agencies.

Bank: Canara Bank and State Bank of India have fully computerised branches with many facilities including foreign exchange transactions and ATM machines.





10. *Endowed Chairs*

10.1

Endowed Chairs for Faculty

A number of Endowed Chairs have been instituted in recent years to recognise the outstanding contribution of Institute faculty members.

Year	Name	Department
ABB CHAIR		
2012-15	PS Sastry	EE
2015-18	K Gopakumar	ESE
2018-21	L Umanand	ESE
2022-24	G Narayanan	EE
2025-27	Udaya Kumar	EE
AMRUT MODY CHAIR		
2015-18	Binny J Cherayil	IPC
2018-21	Aninda J Bhattacharyya	SSCU
2022-24	Balaji R Jagirdar	IPC
2025-27	Satish Amrutrao Patil	SSCU
ASTRA CHAIR		
2012-15	Sandhya S Visweswariah	DBG
2015-18	C Jayabaskaran	BC
2018-21	Dipshikha Chakravortty	MCB
2022-24	Aditya Murthy	CNS
2025-27	Pundi N Rangarajan	BC
HAL CHAIR		
2017-18	KPJ Reddy	AE
2018-21	Debasish Ghose	AE
2022-25	Radhakant Padhi	AE
2025-28	Debiprosad Roy Mahapatra	AE
J N TATA CHAIR		
2017-20	DD Sarma	SSCU
2020-23	Umesh Varshney	MCB
2023-26	Usha Vijayraghavan	MCB
JRD TATA CHAIR		
2017-20	V Kumaran	CE
2020-23	Pradeep Dutta	ME
2023-26	Arindam Ghosh	PHY
HOMI BHABHA CHAIR		
2017-20	Sriram Ramaswamy	PHY
2020-23	SK Satheesh	DCCC
2023-26	Mahesh Ramesh Kakde	Maths

Year	Name	Department
KSIIDC CHAIR		
2012-15	PP Mujumdar	CiE
2015-18	TG Sitharam	CiE
2018-21	S Gopalakrishnan	AE
2022-24	S Dasappa	CST
2025-27	Saptarshi Basu	ME
MSIL CHAIR		
2012-15	Chanda J Jog	PHY
2015-18	B Ananthanarayan	CHEP
2015-18	Vasant Natarajan	PHY
2018-21	S Asokan	IAP
2023-24	Apoorva D Patel	CHEP
2025-27	Jaydeep Kumar Basu	PHY
SATISH DHAWAN CHAIR		
2012–15	KPJ Reddy	AE
2015-18	Ranjan Ganguli	AE
2018-21	D Nagesh Kumar	CEaS/CiE
2022-24	Ashitava Ghosal	ME
2025-28	Radhakant Padhi	AE
TATACHEM CHAIR		
2012–15	P Vijay Kumar	ECE
2015-18	N Surya Prakash	NMRC
2018-21	Vinod Sharma	ECE
2022-24	Chiranjib Bhattacharyya	CSA
2025-27	Jayaraman N	OC
RAMAKRISHNA RAO CHAIR		
2014-17	Srinivasan Raghavan	CeNSE
2017-20	Ambarish Ghosh	CeNSE
2020-23	Shankar Kumar Selvaraja	CeNSE
2024-26	Akshay Naik	CeNSE
PRATT AND WHITNEY CHAIR		
2016-18	Gopalan Jagadeesh	AE
2018-21	R V Ravikrishna	ME
2022-23	Saptarshi Basu	ME
2025 -26	Ratnesh K Shukla	ME
REVATI AND SATYANADHAM ATLURI CHAIR		
2018-21	Rishikesh Narayanan	MBU
2021-24	Amit Singh	MCB
2025-27	Aravind Penmatsa	MBU
MINDTREE CHAIR		
2018-21	Vijay Natarajan	CSA
2022-24	Uday Kumar Reddy B	CSA
2025-27	Siddharth Barman	CSA

Year	Name	Department
DRDO CHAIR		
2018-21	D Roy Mahapatra	AE
2018-21	Saptarshi Basu	ME
GORE SUBRAYA BHAT CHAIR		
2021-24	Sai Siva Gorthi	IAP
2024-27	Sridharan Devarajan	CNS
ISAAC ENDOWED CHAIR PROFESSOR		
2024-29	Prabhdeep Kaur	Issac Centre for Public Health
ENDOWED CHAIR UNDER MEDICAL SCIENCES DIVISION		
2024-29	Swaminathan Sundararaman	Nephrology
PROF BS SONDE CHAIR		
2025-28	Shalabh Bhatnagar	CSA
SHRIRAM GROUP RT CHAIR		
2025-28	GK Ananthasuresh	ME
BIS STANDARDIZATION CHAIR		
2025-28	Ashok M Raichur	MTE
NOKIA CHAIR		
2025-28	Chandra R Murthy	ECE
PFI CHAIR		
2026-28	Vinod John	EE
DHRUV MANMOHAN SAWHNEY TURBOMACHINERY CHAIR		
2026-29	Gopalan Jagadeesh	AE

10.2

Endowed Visiting Chairs

A number of Endowed Visiting Chairs have been instituted to facilitate the visits of celebrated researchers from all over the world.

YEAR	NAME	DEPARTMENT
BRAHM PRAKASH VISITING CHAIR PROFESSOR		
2015	Tamas Ungar	Eotvos University, Budapest, Hungary
2015-16	Kannan M Krishnan	University of Washington, Seattle, USA
2016	Jiang-Zhong Jiang	Zhejiang University, Hangzhou, PR China,
2016	Tamas Ungar	Eotyos University, Budapest, Hungary
2016	David P Field	Washington State University, Pullman, USA
2016-17 2017-18	Surya R Kalidindi	George W Woodruff School of Mechanical Engineering, Atlanta, USA,
2017	Jerzy Antoni Szpunar	University of Saskatchewan, Saskatoon, Canada
2017	David P Field	Washington State University, Pullman, USA
2017-18	Sridhar Seetharaman	Colorado School of Mines Golden, USA
2018	Hamish L Fraser	Department of Materials Science & Engineering, The Ohio State University, Columbus
2018	Manoj Gupta	National University of Singapore
2019	Sergiy Divinskyi	University of Munster, Germany
2019	Werner Skrotzki	Dresden University of Technology, Germany
2019	Shervanthi Homer - Vanniasinkam	University College London, UK
2020	Maria Teresa Perez-Prado	IMDEA Materials Institute Madrid, Spain
2022	Apparao Mohan Rao	Clemson University Clemson, South Carolina
2022	Shigeru Ueda	Tohoku University, Institute of Japan
2024	Easo P George	University of Tennessee
2025	Maria Teresa Perez-Prado	IMDEA Materials Institute Madrid, Spain
2025	Charles-Andre Gandin	Centre de Mise en Forme des Materiaux Sophia Antipolis, France
SATISH DHAWAN VISITING CHAIR PROFESSOR		
2015	Tribikram Kundu	University of Arizona, Tucson, AZ
2016	P Guruswamy	Ames Research Center, California, USA
2016-17	DS Naidu	University of Minnesota, USA
2017	Garry L Brown	Princeton University, Princeton, NJ, USA
2017	Rama K Yedavalli	The Ohio State University, Columbus, USA
SATISH DHAWAN (IoE) VISTING CHAIR PROFESSOR		
2019	Siva Athreya	Indian Statistical Institute, Bangalore
2019	Arun Shukla	University of Rhode Island, USA
2019	Murugesu Sivapalan	University of Illinois at Urbana-Champaign, USA
2019	Prasad Tetali	Georgia Institute of Technology, USA
2019	Rajesh P N Rao	University of Washington, USA
2019	Rao R Tummala	Georgia Institute of Technology, USA
2019	Sajal K Das	Missouri University of Science and Technology, USA
2019	Ramachandra Guha	Historian and Sociologist
2019	Ravinder S Dahiya	University of Glasgow
2020	Sargur N Srihari	University of Buffalo, USA
2020	Daniel Wyler	University of Zurich, Switzerland
2020	Giancarlo D'Ambrosio	INFN Sezione di Napoli
2020	Sougato Bose	University College London
2020	Samir D Mathur	The Ohio State University
2020	Pavithra Prabhakar	Kansas State University
2020	V Parameswaran Nair	City College of the CUNY
2020	Nandini Trivedi	The Ohio State University
2020	Herbert Levine	Northeastern University
2020	Elisabeth Guazzelli	Universite de Paris
2020	Aparna Bhaskaran	Brandeis University
2020	Allan R Pinhas	University of Cincinnati
2021	Pranav Soman	Syracuse University

YEAR	NAME	DEPARTMENT
2021	Pandurangan C	Indian Institute of Technology Madras
2021	K V Venkatesh	Indian Institute of Technology Bombay
2021	Mukesh Jain	McMaster University
2021	Bharat Bhushan	The Ohio State University
2021	Srihari Keshavamurthy	Indian Institute of Technology Kanpur
2021	Ing. Lucienne Theresia Maria Blessing	Singapore University of Technology and Design (SUTD)
2022	Sridhar Kota	University of Michigan
2022	Shyni Varghese	Duke University
2022	Satish Nagarajaiah	Rice University
2022	A R Ravishankara	Colorado State University
2022	Latha Venkataraman	Columbia University
2022	Satyandra K Gupta	University of Southern California
2022	Andy Ruina	Cornell University
2022	Govindaraju S Rao	Purdue University
2022	Vinaya Simha	Mayo Clinic
2022	Ana Mijic	Imperial College London
2023	Sarthak Misra	University of Twente
2023	Gregory A Voth	University of Chicago
2023	Rajendra Kumar Bordia	Clemson University
2023	Carla V Rothlin	Yale University
2023	Prakash Narayan	University of Maryland
2024	K R Sreenivasan	New York University
2024	C M Chandrashekar	The Institute of Mathematical Sciences
2024	Chandra R Bhat	The University of Texas at Austin
2024	Arun Yethiraj	University of Wisconsin
2024	Jonathan Louis Bamber	University of Bristol
2024	Eung Jin Chun	Korea Institute for Advanced Study
2024	Aruna Sivakumar	Imperial College, UK
2024	Adimurthi Adi	Indian Institute of Technology, Kanpur
2024	Tracy Slatyer	Massachusetts Institute of Technology
2024	Murthy S Gudipati	California Institute of Technology
2024	Aravind Rao	University of Michigan Medical School
2024	Kasthuri Venkateswaran	Jet Propulsion Laboratory, U.S.A.
2024	V John Mathews	Oregon State University
2025	Venkataraman (Venkat) Lakshmi	University of Virginia
SUNDARARAJAN CHAIR		
2015	Uma Das Gupta	Kolkata
2019 - 2020	Chintan Vaishnav	MIT Sloan School of Management, Cambridge
2024 - 2025	Elisabeth Eppinge	University of Applied Sciences for Technology and Economics, Berlin
PRATT & WHITNEY VISITING CHAIR PROFESSOR		
2015	Ravi N Banavar	IIT Bombay
2018	A M Rajendran	University of Mississippi, USA
2023	S Chandrasekar	Purdue University

YEAR	NAME	DEPARTMENT
DST-IISC CENTENARY CHAIR		
2015	Ramesh Narayan	Harvard University, USA
2015	Jainendra K Jain	Pennsylvania State University, USA
2015	William A Goddard	Caltech, California, USA
2017	Allan Peter Young	University of California, USA
2017	Richard N Zare	Stanford University, Stanford, CA
BHARAT ELECTRONICS CHAIR		
2016	Goutam Chattopadhyay	Jet Propulsion Lab, USA
2024	Ram N Narayanan	Penn State University
2026	Kumar Vijay Mishra	United States DEVCOM Army Research Laboratory (ARL) Adelphi
SMT. RUKMINI – SHRI GOPALAKRISHNACHAR DISTINGUISHED CHAIR		
2015	Michael L Norman	University of California, San Diego, USA
2016	Rakesh Agrawal	Microsoft Research, Redmond, USA
2018	Sargur M Srihari	State University of New York, Buffalo, NY, USA
2022	Murali Annavaram	University of Southern California
2023	Chandra Chekuri	University of Illinois
2024	Laxmi Parida	IBM T J Watson Research Centre
2025	Mark de Berg	TU Eindhoven
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2023-2026	Barbara Shinn-Cunningham	Carnegie Mellon University
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	Aneesh V Manohar	University of California, USA
2018	Xerxes Tata	Department of Physics & Astronomy, University of Hawaii at Manoa, USA
2018	Harald Upmeier	Department of Mathematics and Computer Science, Philipps-Universitat Marburg, Germany
2019	Harald Upmeier	Department of Mathematics and Computer Science, Philipps-Universitat Marburg, Germany
2019	David Logan	Physical and Theoretical Chemistry Laboratory, University of Oxford, UK
2019	Guy Theraulaz	Centre de Recherches sur la Cognition Animale, Universite Paul Sabatier, France
2019	Vyjayanthi Chari	University of California, USA
2019	Girish S Agarwal	Texas A&M University, USA

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2019	Mohit Randeria	The Ohio State University
2019	Roland R Netz	Frie Universitat Berlin
2019	Ananth Grama	Purdue University
2019	James A D Connolly	Swiss Federal Institute of Technology
2019	Swapan Chattopadhyay	Fermi National Accelerator Laboratory
2020	Yuval Gefen	The Weizmann Institute of Science
2020	Ueli Grossniklaus	University of Zurich
2020	Ashoke Sen	Harish-Chandra Research Institute, Allahabad
2020	Ramanujan Hegde	MRC Laboratory of Molecular Biology, Cambridge, UK
2020	Venkatesh Kodur	Michigan State University
2022	A R Ravishankara	Colorado State University
2022	Je-Geun Park	Seoul National University
2022	Jean-Pascal Sutter	LCC-CNRS France
2023	Arif Babul	University of Victoria, Canada
2024	Pawan Kumar	University of Texas, Austin
2024	Sajal Das	Missouri University of Science and Technology, Rolla
2024	Eric Laenen	University of Amsterdam
2026	Pulickel Ajayan	Rice University, USA
2026	Chandra R Bhat	The University of Texas at Austin
MRS. URMILA AGRAWAL IISc DISTINGUISHED VISITING CHAIR PROFESSOR		
2022-23	Graca Raposo-Benedetti	Institut Curie
2023-24	Emina Soljanin	The State University of New Jersey
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2022-24	Ingrid Hotz	Linköping University
2024-25	Geert Leus	Delft University of Technology, Netherlands



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