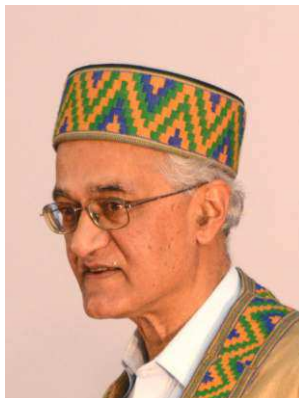


DIRECTOR'S REPORT



PROFESSOR TIMOTHY A. GONSALVES
DIRECTOR, IIT MANDI

Shri Baba Kalyani, Chairman and Managing Director, Bharat Forge; Mr. Subodh Bhargava, Chairman of the Board of Governors; Members of the Board of Governors, IIT Mandi; Members of the Academic Senate; Faculty and Staff Members of the Institute; graduating students and their family members; and distinguished guests: I welcome you all on the occasion of the 7th Convocation of the Indian Institute of Technology Mandi. I offer my congratulations to all graduating students on successful completion of their degrees. I am sure this would be a memorable day for you and your families.

Today, we are delighted to have with us Shri Baba Kalyani as the Chief Guest of the 7th Convocation of IIT Mandi. Shri Baba Kalyani was conferred with the Padma Bhushan for his contributions in Trade and Industry and was made Commander First Class of the Royal Order of the Polar Star by the Swedish government in recognition of his contribution in furthering trade and business cooperation between Sweden and India. Other awards include Global Economy Prize, 2009 for Business by Kiel Institute; German Businessman of the Year, 2006 by Business India Magazine; Entrepreneur of the Year 2005 for Manufacturing by Ernst & Young; and CEO of the Year 2004 by the Business Standard group. In June 2018, the Government of India constituted a task force under the chairmanship of Baba Kalyani to study policies related to special economic zone (SEZ). It is an honour for us to have him visit our campus for this august occasion.

GRADUATING STUDENTS

On the occasion of 7th Convocation ceremony, 5th October 2019, IIT Mandi is graduating **276** students; B.Tech. (**130**) including the first batch of B.Tech. Civil Engineering (**20**), B.Tech. in Computer Science and Engineering (**59**), B.Tech. in Electrical Engineering (**26**); and B.Tech. in Mechanical Engineering (**25**); M.Tech. (**60**) including first batches of M.Tech. in Power Electronics and Drives (**09**) and M.Tech. in Communications and Signal Processing (**13**), M.Tech. in Mechanical Engineering with specialisation in Energy Systems (**09**), M.Tech. in Energy Engineering with specialisation in Materials (**10**); M.Tech. in Electrical Engineering with specialisation in VLSI (**09**), M.Tech. in Biotechnology (**10**); M.Sc.(**54**) including first batch of M.Sc. Physics (**17**), M.Sc. Chemistry (**22**); M.Sc. Applied Mathematics (**15**). Of the **32** research scholars, (**10**) are being awarded M.S. (by Research) degrees and (**22**) are being awarded Ph.D degrees.

The 7th Convocation is also an important day as we have crossed another milestone and total degrees awarded since its 1st Convocation is **1135** which includes **89** Ph.D. scholars; **50** M.S. (by Research); **87** M.Tech.; **121** M.Sc. and **788** B.Tech.

GRADUATING RESEARCH SCHOLARS

This year IIT Mandi is graduating **22 Ph.D.** and **10 M.S. (by Research)**. Following are the candidates that also details their thesis work:

1. **Anna Varughese (D10002)**

Guide: Dr. Prashanth Jose

Thesis title: *A Molecular Dynamics Study of Glass Transition under Phase Separation in Pure and Glass Forming Binary Lennard-Jones Liquid*

This thesis provides new insights on the nature of glass transition in phase separated models' systems suggesting local density as new order parameter to describe glass transition.

2. **Jitendra Kumar Verma (D10017)**

Guide: Dr. Pradyumna Kumar Pathak

Thesis Title: *Resonant Nonlinear Interaction of Light in Photonic Crystal Cavity-Quantum Dot Systems*

This thesis is theoretical study about multi-photon processes in quantum dots interacting in photonic crystal cavity.

3. **Anand Kumar (D11042)**

Guide: Dr. Manoj Thakur

Thesis Title: *A New ACO Framework for Optimization with Application in Power System*

Problems

This thesis developed and implemented novel optimization techniques for solving complex problems related to power systems such as Economic Load Dispatch, Power System Protection, and Model Order Reduction.

4. **Amit Kumar (D12080)**

Guide: Dr. Vishal S Chauhan: Co-guide: Dr. Rajeev Kumar

Thesis Title: *Study of Electromagnetic Radiation from Cement and Cement Based Composites Under Impact Loading*

This thesis presents a theoretical model for radiation from hydrated cement paste under impact.

5. **Somnath Acharya (D13005)**

Guide: Dr. Ajay Soni

Thesis Title: *Investigation of Physical Properties of Bulk Metal Chalcogenide Materials for Thermoelectric Applications*

This thesis studies crystalline chalcogenides for harvesting electricity from waste heat and understood the insightful mechanism for thermoelectric application.

6. **Ashish Bahuguna (D13007)**

Guide: Dr. Venkata Krishnan

Thesis Title: *Carbon Support Based Heterogeneous Catalysts for Sustainable Synthesis of Indole Alkaloids and Chromenes*

This thesis designs, develops and utilises a range of carbon support-based nanocomposites for the synthesis of several indole alkaloids and chromenes.

7. **Mohit Kumar Sharma (D13013)**

Guide: Dr. Kaustav Mukherjee

Thesis Title: *Investigation of Physical Properties of Rare Earth and Transition Metal Based Oxides and Intermetallics Showing Significant Magnetocaloric Effect*

This thesis has investigated the exotic magnetic phases exhibited by the compounds which showed significant magnetocaloric effect.

8. **Ashwani Kumar (D13017)**

Guide: Dr. Pradeep C Parameswaran

Thesis Title: *Aromatic Sulfonium Polyoxometalates as Photochromic Materials and Self-separating Catalysts*

This research work developed a new class of photochromic material and self-separating

catalysts with tunable properties.

9. Mandeep Kumar (D13019)

Guide: Dr. C.S.Yadav

Thesis Title: *Study of Electronic Transport Properties of Transition Metal Tellurides: Cu_xPdTe_2 ($x=0,0.04$), $ZrTe_3$ and $ZrTe_5$*

The thesis unravels exotic electronic properties of transition metal tellurides of contemporary interest.

10. Preeti Gulia (D15006)

Guide: Dr. Arpan Gupta

Thesis Title: *Experimental and Numerical Investigation of Sonic Crystal and Acoustic Panel*

This thesis studies sonic Crystal along with Acoustic Panels to address the problem of noise pollution, especially when it pertains to a specific frequency.

11. Mahesh Soni (D13023)

Guide: Dr. Satinder K Sharma; Co-guide: Dr. Ajay Soni

Thesis Title: *Graphene and Derivatives Based Scaled Electronic and Memory Devices for Next Generation Technology*

This thesis unravels the fabrication and characterization of flexible electronic and non-volatile flash memory devices, utilizing graphene and derivatives.

12. Mohammad Saquib (D14008)

Guide: Dr. Aditi Halder

Thesis Title: *Rational Design of Carbon Supported Noble Metal Based Electrocatalysts for Renewable Energy Applications*

This thesis investigates rational design of carbon supported noble metal based electrocatalysts for renewable energy applications.

13. Suneel Kumar (D14013)

Guide: Dr. Venkata Krishnan

Thesis Title: *Zinc Oxide Supported on Two Dimensional Materials as Heterogeneous Photocatalysts for Energy Conversion and Environmental Remediation Applications*

This thesis utilizes ZnO based nanomaterials as wide spectrum photocatalysts for energy conversion and environmental applications.

14. Davinder Singh (D14014)

Guide: Dr. Viswanath Balakrishnan

Thesis Title: *Vapour Phase Growth and Nanomechanical Behaviour of VO_2 Microcrystals*

Across Phase Transition

This thesis investigates vapour phase growth, nanomechanical behavior and actuation of VO₂ microcrystals.

15. Palvi Aggarwal (D14028)

Guide: Dr. Varun Dutt

Thesis Title: *A Behavioral Game-Theoretic Analysis of Cyber- Security Scenarios Involving Deception and Intrusion Detection Systems*

This thesis understands decisions of people performing as hackers and analysts in cyber-security games using both lab-based experiments and computational cognitive models.

16. Atendra Kumar (D14033)

Guide: Dr. Rajendra K Ray

Thesis Title: *Unsteady Flow Separation from the Surface of Solid Cylinders in Laminar Shear Flow: A Structural Bifurcation Analysis*

This thesis understands unsteady flow separation from cylinders surface in shear flows using theoretical structural bifurcation analysis.

17. Anuruddh Kumar (D14032)

Guide: Dr. Rajeev Kumar; Co-guide: Prof. S.C. Jain

Thesis Title: *Performance Enhancement of Piezoelectric Energy Harvesting*

This thesis provides a synthesis of different strategies to enhance the power output for piezoelectric energy harvesting.

18. Supriya Ghosh (D15034)

Guide: Dr. Suman K Pal

Thesis Title: *Photoinduced Processes in Organo Lead Halide Perovskite Bulk Crystals, Nanocrystals and Thin Films*

This thesis describes the interrelation between electronic structure and carrier dynamics, carrier transport, and other photophysical processes.

19. Thirumurugan C (D11045)

Guide: Dr. Ganesh Kumbhar (IIT Roorkee); Co-guide: Prof. Ramesh Oruganti

Thesis Title: *Experimental Investigations of Surface Discharge Phenomena at Solid-Liquid Interface of Power Transformer Insulation System*

This thesis studies the surface Partial Discharge (PD) patterns in various combinations of oil-Pressboard insulation materials.

20. Shivendra Sangar (D13012)

Guide: Dr. Ramna Thakur; Co-guide: Dr. Varun Dutt

Thesis Title: *Economic burden, impoverishment and coping measures related to out-of-pocket health expenditure in India: A disaggregated analysis*

This thesis investigates issues pertaining to out-of-pocket (OOP) health expenditure and its implication on households in India.

21. Khyati (D15016)

Guide: Dr. Prosenjit Mondal

Thesis Title: *Design, Synthesis and biological evaluation of small molecule agonist of the Glucagon-Like Peptide-1 receptor (GLP-1R) as an anti-diabetic agent*

This thesis designs, synthesis biological evaluation of small molecule agonist of the Glucagon-Like Peptide-1 Receptor (GLP-1R) as an anti-diabetic agent.

22. Vikas Sharma (D12090)

Guide: Dr. Tulika Srivastava

Thesis Title: *Comparative Genomics Analyses of Selected Microbes with Open Pan-genomes Highlight Their Evolutionary Dynamics at Functional Level*

This thesis aims at determining the pan-genome and exploring the phylogeny and functional evolution of the microbial taxonomic groups and their isolates using *in silico* approaches.

M. S. (BY RESEARCH)

Following are the 10 candidates who are graduating with M.S. (by Research)

1. Sharey Deep Guleria (S16003)

Guide: Dr. Atul Dhar; Co-guide: Dr. Dhiraj V Patil

Thesis Title: *Visualization-Based Fluid Dynamics Experiments on Fluid-Particle Interactions*

This thesis is an attempt to develop a new strategy and compound as a GLP-1 R agonist for the treatment of metabolic diseases like diabetes, fatty liver, and obesity.

2. Abhay (S15004)

Guide: Dr. Deepak Swami; Co-guide: Dr. Dericks P Shukla

Thesis Title: *Solute Transport Modelling through Saturated Porous Media with Time-Dependent Dispersion*

This thesis provides numerical solution to mobile and immobile model with time dependent dispersion coupled with parameter estimation algorithm to predict and simulate solute transport through heterogeneous porous medium.

3. **Ankur Kaundal (S15008)**

Guide: Dr. Satvasheel Powar; Co-guide: Dr. Atul Dhar

Thesis Title: *Improvement in Thermal Efficiency and Emission Control of Domestic Cook Stoves*

This thesis presents efficient and clean cooking solutions for the Bottom-of-Pyramid through its advanced cook stoves.

4. **Abhilash Awasthi (S15013)**

Guide: Dr. Rajneesh Sharma; Co-guide: Dr. Rajesh Ghosh

Thesis Title: *Mechanical Characterization of Mineralized Collagen Fibril using Multiscale Asymptotic Homogenization*

This thesis has studied the influence of the nano-scale characteristics of the collagen fibril on the micro-scale mechanical properties of mineralized collagen fibril using multi-scale asymptotic homogenization approach.

5. **Gaurav Sharma (S15001)**

Guide: Prof. Ramesh Oruganti; Co-guide: Dr. Bhakti Joshi

Thesis Title: *Studies on HERIC (Highly Efficient Reliable Inverter Concept) Photovoltaic Inverter*

This work deals with improving the performance of a popular solar photo-voltaic inverter known as HERIC converter.

6. **Gaurav Sharma (S16006)**

Guide: Dr. Arpan Gupta; Co-guide: Dr. Aniruddha Chakraborty

Thesis Title: *Analytical Solution and Experiments in Wave Propagation Problems*

The thesis developed an analytical solution to wave propagation which is validated using other computational methods including experiments on impedance tube to evaluate acoustic material properties of test samples.

7. **Sivarathri Ashok Kumar (S16010)**

Guide: Dr. Vishal Singh Chauhan; Co-guide: Dr. Rajeev Kumar

Thesis Title: *Piezoelectricity Induced Electromagnetic Radiation: Probable Phenomenon for Wireless Sensing*

This thesis studies near field electromagnetic radiation from the dynamic deformation of the piezoelectric bulk samples.

8. **Ragini Sinha (S16013)**

Guide: Dr. Padmanabhan Rajan

Thesis Title: *Signal Enhancement and Source Characterization for Processing Birdcalls*

This thesis investigates approaches to process bird calls from audio recordings. It proposed methods to denoise birdcalls and also to determine if the recording had one bird calling or had multiple birds calling.

9. **Raj Kiran (S17011)**

Guide: Dr. Rahul Vaish

Thesis Title: *Poling Tuning: A plausible solution to enhance the performance of piezoelectric materials*

This thesis has reported a novel technique for improving piezoelectric materials performance

10. **Bindu (S16008)**

Guide: Dr. Tushar Jain

Thesis Title: *Actuator and Sensor Fault Diagnosis for Wind Energy Conversion Systems*

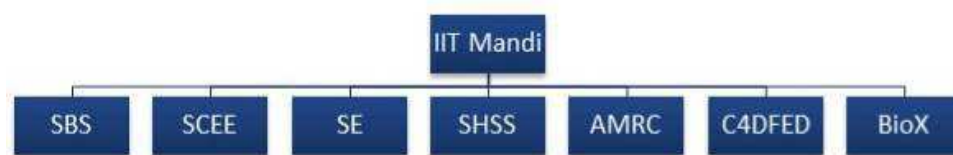
This thesis develops a novel spectral analysis-based fault diagnosis method for a 3-phase uncontrolled bridge rectifier

SCALING THE HEIGHTS – ACADEMIC USPs

The Institute has the vision: “To be a leader in science and technology education, knowledge creation and innovation, in India marching towards a just, inclusive and sustainable society”. IIT Mandi's strategy towards excellence and high impact locally and globally has been to work on major challenges of the Himalayan region and of India. Over the past 10 years, IIT Mandi has grown at all fronts, setting and crossing milestones set for each year, and further setting new goals and standards. We are proud to announce that we are moving consistently and incessantly ‘Scaling the Heights’ in all the fields of responsibilities and engagements.

IIT Mandi nurtures inter-disciplinary research environment that develops innovative technologies for widespread use. Obviously, this requires convergences between Science, Engineering and Social Sciences faculty. Driven by the needs of the region and the nation, the thrust areas have been identified and organised in four schools and multiple research centres.

1.1 Schools and Thrust-area Research Centres



The Centres are characterised by:

1. Specific goals based on regional or national needs and the achievement of the same in time-bound manner.
2. At least 10 faculties from diverse disciplines each having major research involvement is the goal of the School/Centre.
3. To assist it, the Institute contributes generously towards capacity building.

1.2 Centres

AMRC: The Advanced Materials Research Centre (AMRC) provides state-of-the-art instrumentation and ancillary equipment, and expertise with applications for materials research. All the instruments in Advanced Material Research Center are broadly divided into two categories: General Characterization Instruments and Sophisticated Instruments.

BioX: The vision of the BioX centre is to advance the frontiers of technology development and engineering towards applications in disease prevention and affordable healthcare, agricultural

practices with respect to the Himalayan region, Himalayan biodiversity, and exploration in biotechnology. The aim, consistent with the IIT Mandi motto of interdisciplinary R&D, is to bridge the gap between life sciences and engineering.

C4DFED: The Center for Design and Fabrication of Electronic Devices is a centralized state-of-the-art infrastructure facility for next generation integrated circuits (ICs)/electronic device design and fabrication and also futuristic materials research for semiconductor industries. It also aims to develop and sustain educational resources and skilled workforce for semiconductor industries through team efforts, and fosters collaboration with industries, and facilitates transfer of new technologies into products for commercial and public benefits. This is within the ambit of the Make in India Advanced Manufacturing National and State policies.

Other Centres are in the formative stages and may emerge in the next 1-3 years to focus on Energy, Machine-learning for various applications, and high-performance computing for scientific and engineering applications.

1. 3 Interdisciplinary and Project-Based Learning

In current times, when the technologies are changing so fast, we cannot limit our focus only to research. In this context, we translate interdisciplinary research into teaching, and enable students to appreciate and develop abilities beyond the horizons of specific field of study.

The B. Tech. programs have been designed from scratch considering current and future changes in society and the nature of technological requirements. Our B. Tech. program gives students a broad base, the ability to tackle real-world problems, to work in teams across disciplines and to deliver value to society. Our emphasis is also on **Project-based learning** which pervades curriculum from 1st year to 4th year.

The **Foundations** for all B.Tech. students includes a unique design and innovation sequence: *Reverse Engineering* in 1st year; *Design Practicum* in 2nd year; *Interactive Socio-Technical Practicum* in 3rd year; and *Major Technical Project* in 4th year. This imparts a good understanding of common scientific and engineering principles and methods; strong foundations in the range of engineering knowledge; and breadth of knowledge in the humanities, social sciences and management.

Deep **specialisation** is reserved for the Master's and Ph.D. level. The Master's programs also follow the project-based learning approach of the B. Tech., albeit to a lesser extent.

Further, to instill imaginative powers in engineering, communicative skills along with ethical and moral values of academics is imparted to students through intensive 5-Week Induction Program.

The data science courses in our curriculum stress on cutting-edge Python-based machine-learning for all the B.Tech. students, irrespective of their branch. The core of knowledge in the student's chosen branch is kept to the essential such that it gives freedom to explore students' interests through electives.

1. 4 A 10-year Journey

Our major activity is to contribute towards knowledge creation, knowledge dissemination and preparing graduates who contribute towards our larger goal of academics with ethics and values. As we all know, IITs are among the best institutes of technology, known globally for its graduates. IIT Mandi is now fulfilling the desires and expectations enshrined by the people, government and parents.

The **teaching** for the first batch of B. Tech. students started off at IIT Roorkee, the mentoring institute, in July 2009. From August 2010, IIT Mandi started 3 B. Tech. Programs (Computer Science and Engineering; Electrical Engineering and Mechanical Engineering) and operated from a transit campus in Mandi with 25 young faculty, 215 B.Tech. students and 25 Ph.D. and M.S. scholars. Since then, the Institute has grown by leaps and bounds, currently 125 faculty, around 275 non-teaching staff; and over 1600 students are enrolled in various programs of studies in undergraduate, postgraduate and research programmes.

The first batch **graduated** from the permanent campus in Kamand in 2013 when we awarded degrees to 94 B.Tech., 2 M.S. (by Research) and one Ph.D. scholar. In 2015, all academic activities had shifted to our permanent campus at Kamand in its vibrant fully-residential campus. Currently, IIT Mandi offers 7 B. Tech. programs; 7 M. Tech. programs; 3 M.Sc. programs; one M. A. program and one Integrated-Ph.D. program in addition to M. S. (Research) and Ph.D. programs in all disciplines. From August 2019, IIT Mandi started **3 new and unique B. Tech. programs in Data Science and Engineering; Engineering Physics; and Dual Degree in Bioengineering.**

On the **research** front, my young faculty colleagues, published 31 research papers and brought 4 research projects worth Rs. 65 lakhs in the year 2011. The collective strength has gone phenomenally up now with currently 225 projects worth more than Rs. 110 crores. In the academic year 2018-2019, we received 45 projects of value more than Rs. 15.5 crores. IIT Mandi received \$315,000 funding from Intel, USA, in 2012 for VLSI resist materials: state-of-the-art in 2012 was 22 nm; IIT Mandi achieved 20 nm in 2014, 10 nm in 2018; indigenised 11 out of 34 chemicals used in SCL Mohali's lab. **Publication** of research is the most important work for knowledge creation and dissemination. Our faculty during the past 10 years have published over 1400 research publication including several books published by internationally recognised publishers. In terms of per faculty publication, IIT

Mandi ranks higher compared to many other IITs. *Scopus Index* 2018: IIT Mandi ranked 6th among all IITs.

1.5 Major Achievements during 2018-19

During the last year, our faculty and students added more feathers in our cap. Few achievements are:

- Dr. Shubhajit Roy Chowdhury has been appointment as Associate Editor of the IEEE *Journal of Translational Engineering in Health and Medicine*.
- Dr. Varun Dutt has been appointed as Associate Editor of the journal *Frontiers in Cognitive Science*.
- Dr. Anil Sao and Dr. Arnav Bhavsar have developed Artificial Intelligence-powered point-of-care device to screen for cervical cancer by analyzing microscopy images with high accuracy. This project has been taken up in collaboration with Aindra Systems Pvt. Ltd., Bengaluru and the device prototypes are currently undergoing clinical testing.
- Dr. Sumit Sinha Ray was awarded the Best Presentation Award (2019) at 3rd Young Researchers' Symposium, held at IIT Delhi in May 2019.
- Dr. Bharat Singh Rajpurohit and Prof. Ravindra Arora published a textbook entitled *Fundamentals of High Voltage Engineering*, Wiley India.
- Dr. Rajeshwari Dutt published a book entitled *Maya Caciques in Early National Yucatan*, University of Oklahoma Press.
- Dr. Devika Sethi published a book entitled *War over Words: Censorship in India, 1930-0*, Cambridge University Press.
- Dr. Chayan Kanti Nandi was Chemical Research Society of India Bronze Medal 2019.
- Mr. Navneet Verma and Mr. Aditya Yadav, PhD students in SBS, received the best poster award at CRSI (Chemical Research Society of India) conference, IIT Kanpur.
- Dr. Shyamasree Dasgupta, in collaboration with IIT Guwahati and IISc, developed the first common methodological framework for vulnerability assessment. The team trains in disaster management officials in use of this framework for vulnerability assessment of all districts of the 12 Himalayan States of India.
- Ms. Supriya Ghosh, finished her PhD with Dr. Suman Kalyan Pal, received Humboldt research fellowship for postdoctoral research.
- Mr. Ankur Kumar, a Ph.D. student working with Dr. Rajanish Giri, is awarded with Fulbright

Doctoral Fellowship 2019-20.

- Mr. Navneet Kumar, a Ph.D. student working with Dr. Rajanish Giri, was awarded with Newton-Bhabha Fellowship to visit University of Leeds.
- IIT Mandi continued at the forefront of all IITs by admitting 20.1% females to the B.Tech. 2019 class.
- Mr. Nitesh Kumar won Silver Medal in BWF World Para Badminton Championship held in Basel, Switzerland, in August 2019.

1.6 New Conference Centres

IIT Mandi has created spaces for the organisation of conferences and workshops around the Village Square area of the Campus. The large auditorium can accommodate 800 people. C.V. Raman Guest House, located in the North Campus, has 88 rooms which accommodates participants attending the conferences and workshops. Similarly, 4 new conference rooms and 3 existing conference rooms are available for organising conferences and workshops. Utilising these spaces, the faculty members organised a number of conferences and workshops inviting national and international researchers and professionals to disseminate the best practices in various focus areas of IIT Mandi. Just before the last Convocation, IIT Mandi organised 3rd Himachal Pradesh Science Congress and we took off from there and organised following workshops and conferences:

1. Winter School on Cognitive Modelling, from 4-10 February 2019.
2. Workshop on Water Filtration Techniques Based on Solar Energy under National Mission for Himalayan Studies, between 11-13 February 2019.
3. International Workshop on Climate Change and Extreme Events in the Himalayan Region between 18-20 April 2019
4. International Conference on Differential Equations and Control Problems: Modelling, Analysis and Computations (ICDECP19) during 17-19 June, 2019
5. Short term course on Finite Element Method for Engineers and Researchers from 24-28 June 2019
6. Workshop on Applied Deep Learning was organised by the MANAS group, SCEE, IIT Mandi and BITS Pilani, during July 1-5, 2019.
7. Workshop on 'Learning and Control' from 22-26 July 2019 in collaboration with Control Society.

8. Workshop on *Hydrus* from 9-11 September 2019.
9. Workshop on Landslide Mitigation and Training on DPR Preparation funded by National Disaster Management Authority between 23-27 September 2019.

In the coming months, following conferences and workshops are scheduled:

10. National Workshop On Writing Reproducible Workflows for Computational Material Sciences using AiiDA between 9 - 11 October, 2019.
11. 4th International and 19th National Conference on Machines and Mechanisms between 5 - 7 December 2019.
12. 17th Annual Conference on the Indian Association for Social Sciences and Health between 8-10 December 2019.

1.7 Career and Placement

The Career and Placement Cell took significant initiatives to conduct several career sessions throughout the year to make students aware of the many options open to them. These included sessions by inspiring academicians, motivation towards startups by successful entrepreneurs, information about various competitive exams by coaching institutes, interactive session with Alumni, and corporate pre-placement talks. In the 2018-19 placement seasons, 82% of registered students got placed, and 45 companies took part in our campus placement drive. Branch-wise placement ratios for B.Tech students were 93% in CS, 61% in ME, 63% in EE and **83% students of the 1st Batch of B.Tech. Civil Engineering are placed.** Beyond B.Tech. students, the majority of the graduate students got job in good companies and in their core areas. Some of the students decided to go for higher education in institutes like KTH Royal Institute of Technology, Sweden; Aalto University, Finland; University of Basel, Switzerland; University of Pennsylvania, USA; Indian Institute of Science, Bangalore; Raman Research Institute, Bangalore; Indian Institute of Technology Madras, India; Indian Institute of Technology Bombay, India etc. The remaining students have received either employment from off-campus placement or are self-employed, and also preparing for Civil Services and other competitive examinations.

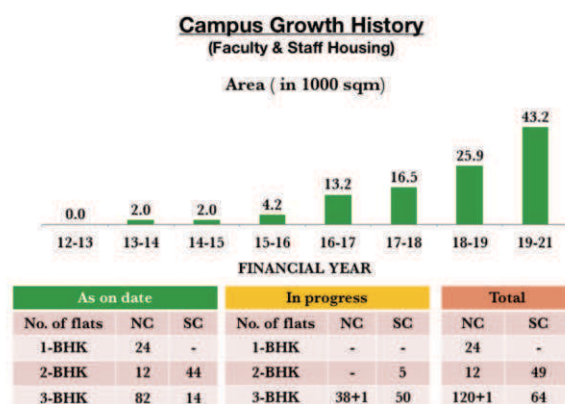
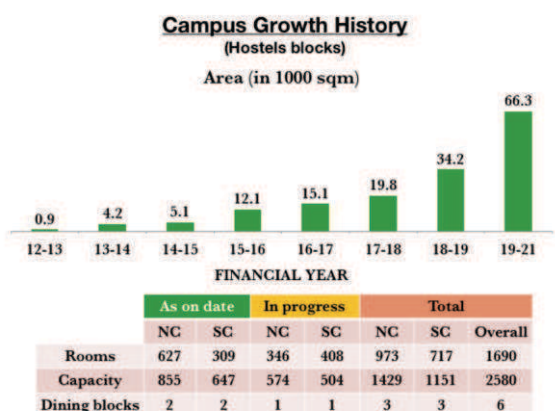
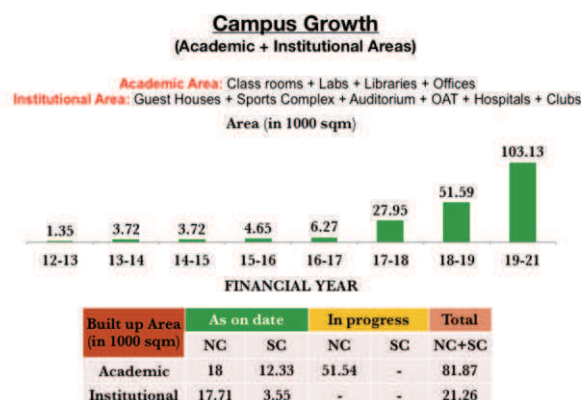
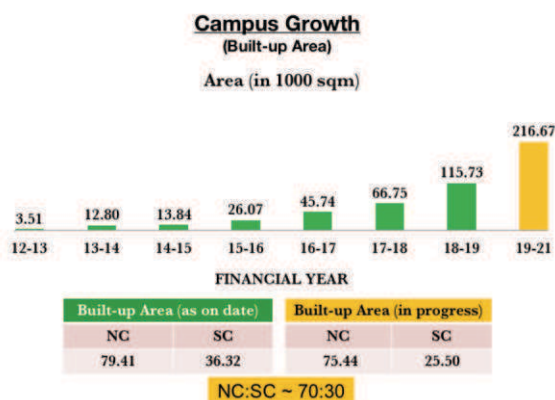
2. Green Campus with World-class Infrastructure Amenities

One of the visions of IIT Mandi is to build infrastructure that houses all the requirements and grow as a green campus without disturbing the nature and greenery around. As you may be aware, IIT Mandi has grown from a greenfield to what you could see around in this remote valley. The foundation stone of the Institute was laid on 24th February 2009 which has now been developed as an eco-friendly and sustainable infrastructure campus. Spread over 538 acres of which about 200 acres is flat land, the

permanent campus of the Institute started functioning since the beginning and has grown step-by-step during the last 10 years. This has really been an impressive journey though filled with challenges. Now, IIT Mandi in this serene and remote location is home to a buzzing community of students, academicians and staffs.

The **South Campus** is now fully developed and over 41,000 sq. mt. area stands constructed which has 58 faculty residential units with 2 and 3 bedroom apartments. The South Campus accommodates over 650 students in 3 boys hostels and 1 girls hostel. These students use dinning facility at 2 Dinning Mess. By 2020, 2 more hostels with the capacity for 500 students will be completed along with 1 Dining block and 20 units of 3-BHK flats.

During the past 5 years, the **North Campus** has grown quickly with about 84,000 sq. mt. area stands constructed. The 10 academic buildings that houses faculty offices, labs, and classrooms is constructed over 31000 sq. mt. For student residence, the North Campus has 3 boys hostel, 1 girls hostel, 45 apartments for married students. Presently in North Campus about 916 Students, 102 Faculty/Staff are residing.



IIT Mandi has almost all types of facilities available. It has 88 Rooms Guest House, 800-seater Auditorium, Mind-tree school, Sport Complex & Hospital are functional. Outdoor sports facilities having football ground, cricket ground, hockey field, tennis court, basketball court and volleyball court are currently being used.

2.1 Library

IIT Mandi has distributed facility with library buildings in the South Campus and the North Campus. The library now houses a rich collection of books and journals both in soft and print forms. Library operations are automated using RFID, KOHA LMS and digitized with DSpace OSS. The Library currently houses around 20 thousand print books; around 20 thousand e-books and provides access to more than 12 thousand e-journals and has also subscribed to e-books from several reputed publishers, such as AIAA, ASM, ASME, Cambridge University Press, Elsevier, IEEE, ICE, Pearson, SIAM, IOP, Taylor & Francis, World scientific, Tata McGraw Hill, Proquest and Wiley. It also has the access to Ebrary - ebooks database, Archive and Standards. The Library also has a very good collection of audio-video materials.

3. Sponsored Research and Industrial Consultancy

The faculty reaches out to various government departments and industrial houses and links them with the state-of-the-art researches that are beneficial for further improvements and upgradations of existing knowledge and technologies in various fields. As stated before the focus of the institute is to contribute towards new knowledge in various fields such as energy, communication, information technologies, agriculture, road and transportation, disaster management, water resources, sewage systems, environment that also helps in achieving sustainability, inclusive growth and creates livelihood for the people especially suitable for the Himalayan region.

Many of our research outputs have been translated into policy frameworks by the government e.g. a team at IIT Mandi studied issue of forest fire which was disseminated to the HP Forest Department which is now used for not only controlling forest fire but also helps entrepreneurs learn new techniques to generate livelihood. In 2018, Prof K. Vijay Raghavan, Secretary Department of Biotechnology, initiated an ambitious national project, FarmerZone. The goal of this project is to create a public repository of agricultural data and foster the use of this data to provide AI-based advisories to help small and medium farmers to make crop management decisions. This project has the potential to make farming a remunerative occupation for millions of farmers. IIT Mandi was selected by DBT to lead this project that includes a number of national and international partners.

4. Academic Outreach Programs and International Collaborations

IIT Mandi is part of an international academic community, and working towards increasing both the scope as well as depth of its international collaborations. As mentioned earlier, international students are pursuing graduate full-time degree programs at IIT Mandi. Bachelor's, Master's and Ph.D. students affiliated to institutes in other countries also spend up to a year at IIT Mandi under existing student exchange programmes with academic credit transfer.

During the past year, IIT Mandi hosted many international students for visits and for semester-exchange. In addition to 25 undergraduate students from WPI, USA, who stayed on campus for seven weeks to work on joint Interactive Socio-Technical Projects with 3rd year B.Tech. students; Four students joined IIT Mandi in February 2019 for full Masters and Ph. D Programs; 8 Students joined IIT Mandi for full time Ph.D. and Masters programs from Nepal and Bangladesh during last one year. IIT Mandi faculty delegation visited Bhutan and Kenya for attracting bright students at the graduate level. A total of 41 students applied for the M. Tech., M. S., and Ph.D. admissions at IIT Mandi in 2019. After interviewing candidates, IIT Mandi made 12 offers of admissions to students from Bangladesh, Nepal, Bhutan and Kenya.

In the last year, several IIT Mandi students visited different university partners abroad for semester-exchange. These include 4 students who visited TU Munich, Germany, and 1 student visited RWTH Aachen, Germany.

A large number of IIT Mandi faculty also visited institutions in UK, US, Australia, South Asia, Japan, Africa, Germany, Singapore, Russia, Italy, Switzerland, UAE, Bangkok, Belgium, Mozambique, Sweden, Shenzhen, Poland, Spain, France, Bhutan, Kenya, Ireland, China, Greece and Jerusalem in 2018-19 for attending conferences and for industry and academic collaborations. IIT Mandi faculty members also visited TU9 institutions in Germany in 2018 and 2019.

Besides the international students, more than 40 international faculty members visited IIT Mandi for teaching, research, and for presenting their research at different workshops and conference events held at IIT Mandi campus. There were several meetings and events held at IIT Mandi campus involving visitors from universities abroad. The Interactive Socio-Technical Practicum course (ISTP) 2018 had 10 projects involving 38 IIT Mandi students, 22 WPI (Worcester Polytechnic Institute, USA) students, 2 WPI faculty mentors and 16 IIT Mandi faculty mentors. The winning project titled 'Developing Drowsy Driving Mitigation Strategies in Himachal Pradesh' created prototypes including a portable and comfortable seat cover, a facial recognition device to detect drowsiness, a blue-light system to inhibit melatonin production in drivers, and two taffy favors to keep drivers awake. The team's recommendations included suggestions for policy to prevent the overworking of drivers.

5. Incubation and Entrepreneurial Development

In May 2016, IIT Mandi began its Technology Business incubation centre named **IIT Mandi Catalyst** which is the leading incubator in the state, and among more active incubation centres in India. There is a significant and increasing contribution of faculty and a motivated execution team which helped Catalyst raise total fund of INR 19.37 Cr from various sources. The Catalyst organises mentoring sessions through speakers, mentors, investors and hosted about 60 sessions for 4 batches of startups involving over 30 startups. Of these, 32 have been organised in calendar year 2019 along with 2 major events viz. Himalayan Innovation Challenge in May 2019 and Himalayan Startup Trek in Sep 2019. From this month, and more precisely from 7th October 2019, Catalyst will host the fifth batch of startups that will have over 20 startups making it the largest batch so far. Employment for over 60 individuals has been created and over 10 national and international awards have been won by these startup teams. 3 startup teams supported by Catalyst have been able to raise further funding totalling up to INR 4 Cr.

In yet another outreach program, **EWOK: Enabling Women of Kamand**, the business incubator for rural women develops links with the women around the villages, hone their skills, add new technical and business acumen and help them start skill-based businesses. As a responsibility towards the society, our students, staffs and faculties organise classes for children of migrant labourers, prepare and help them get admitted in formal schools.

6. Life at IIT Mandi

Often it is thought outside the IIT campuses that our students are only engaged in academics. However, I would like to draw attention towards multiple talents that our students possess. IIT Mandi has a full-fledged Student Gymkhana composed of various societies and clubs ranging from academic, technical, cultural and sports. More importantly, these clubs induct freshers, maintain the club activities through the guidance of faculty members, organise festivals involving teams from other colleges and institutes, organise various types of competitions within the Institute, and participate in other inter-college festivals and competitions.

A few of the major achievements of IIT Mandi in its journey towards *Scaling the Heights* are listed here.

- Mr. Nitesh Kumar, B. Tech. (EE) student of IIT Mandi won Bronze medals in 2nd National Para Badminton Championship 2018.
- Mr. Pradeep Seervi, B. Tech. (EE): 1 rank in GATE(EE), 2015.
- Mr. Aathar Aamir Khan, B. Tech. (CSE): 2 rank in Civil Services, 2015.

- IIT Mandi hosted the 4th Inter-IIT Technical meet in January 2016.

The Space Technology and Astronomy Cell of IIT Mandi organised a two day, inter - college Astro-meet event, **AstraX'19**, which featured a panel of national and international speakers, on 30th and 31st March 2019.

Rann Neeti, the annual inter-collegiate sporting event organised by the students of IIT Mandi, saw its 6th edition last weekend (28-29 Sept 2019) where around 1000 students from around 100 colleges came to participate in various sporting events. Similarly, our students participate in Inter-IIT Sporting meet every year.

Exodia, the annual inter-collegiate technical and cultural festival, was organised in its 8th edition on 12-14 April 2019. It is one of the biggest and the most magnificent technical and cultural fest of the Himalayas.

These events, completely organised and managed by our students, display the abilities of students who live a life larger than the life itself.

Towards the end, I am happy to say that we are living and working beyond the expectations and responsibilities thrust on IIT Mandi. We are moving in a direction that would further contribute towards the inclusive and sustainable development. In this report, I have focused on our achievements in the recent past and I do hope this will inspire all of you to set the bar even higher next year. This occasion- the Convocation, is a perfect time to celebrate our achievements. I must thank Shri. Baba Kalyani for visiting and honouring us with his gracious presence on this occasion. I hope we would receive further guidance and support from Shri Subodh Bhargava in achieving our goals. On this solemn occasion, I congratulate all the graduating students and would urge them to carry the legacy of academic, ethical and moral values and contribute towards the larger goals that we have instilled in you.