

# TERI SCHOOL OF ADVANCED STUDIES

PLACEMENT BROCHURE

# 2023

M. Tech Renewable Energy Engineering and Management  
(REEM)



# Chancellor's Message

Established as an institution of higher learning, TERI School of Advanced Studies aims at creating knowledge and human capacity that enables transition towards a more sustainable world.

The foundation of the institute was laid by the Energy and Resources Institute a not-for-profit, independent research organization globally known for its contribution to scientific and policy research in the realm of energy, environment and sustainable development.

As a leader in sustainability education in India and abroad, TERI School of Advanced Studies (TERI SAS) has been transforming students into sustainability professionals who bring sustainable solutions to the problems that hinder growth in rapidly developing countries like ours.

With the help of an interdisciplinary curriculum taught by a multi-disciplinary faculty, the institute imparts world-class education in domains such as climate change, energy, environment, urban development, policy, water resources, biotechnology, geoinformatics and sustainability management among others.

A series of niche programmes offered by the institute that cater to the demands of the industry and are subjected to constant amendments which enable our students to face and resolve issues with ease.

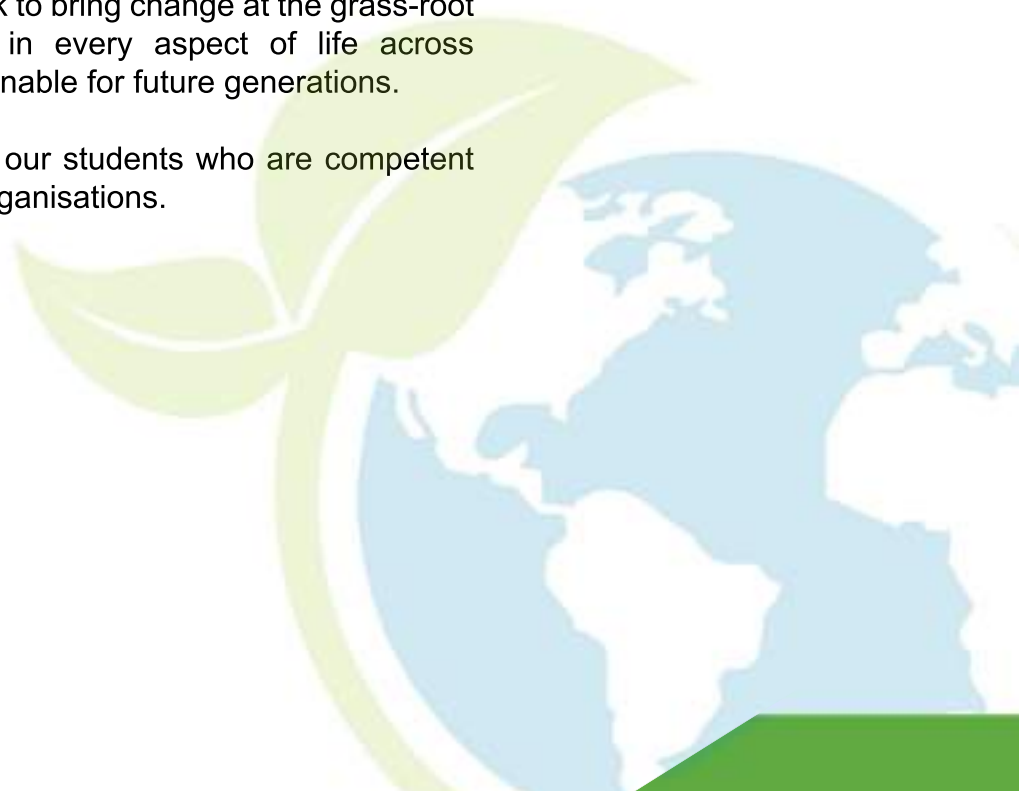
The feedback from the academic peers, employers and other stakeholders always motivate us to work towards improving our teaching methodology and curriculum.

Whether it's the organizations of global relevance such as the United Nations or the organizations that work to bring change at the grass-root level, our alumni are contributing in every aspect of life across continents to make earth more sustainable for future generations.

Therefore, I welcome you all to hire our students who are competent leaders and will be great assets to organisations.



**Dr Shailesh Nayak,**  
Chancellor, TERI SAS



# Vice-Chancellor's Message

Dear Development and Industry Partners,

With an aim to create empowered professionals and thought leaders that better aligns the sustainability considerations in pursuit of economic growth and human welfare, TERI School of Advanced Studies (TERI SAS) is a unique institution of higher learning and cutting edge research.

The academic programmes at the TERI SAS have been designed by keeping in mind the challenges of rising population, already depleting and over-exploited natural resources, and opportunities for sustainable development. Over the years, our alumni engaged in diverse domains of various national and international organizations have been the ambassadors of our vision of creating knowledge for sustainable development in both public and private sectors.

The state-of-the-art research by our faculty members helps us to keep our programme curriculum cutting edge, interdisciplinary and solution-oriented. TERI SAS has been a pioneer in sustainability education and it's the unique combination of our multidisciplinary faculty and interdisciplinary curriculum that separates us from the rest of the institutes.

The curriculum ensures that the students inculcate and imbibe the problem-solving attitude through regular engagement with research projects, industry exposure and field visits.

TERI SAS believes in continuously adapting to the change taking place around the world. The feedback from the academic peers at the domestic and international levels, from employers of our alumni and other stakeholders including our students help us to make key amendments in our curriculum and teaching pedagogy.

The multicultural setting comes naturally to TERI SAS as we have students from the diverse regions across India with international students who continuously exchange ideas and experiences, making the institute truly global.

We are certain that you will find our graduates to be competent leaders who adhere to constructive engagements with analytical skills, well versed with contemporary developments in their domains and have solution-oriented approaches. Our graduates will be assets to organizations acclaiming on sustainability.

I welcome you all for the campus recruitment.

Thanking you and best regards,



**Prof. Prateek Sharma**  
Vice-Chancellor(Acting), TERI SAS

# About TERI SAS

TERI SAS (earlier TERI University) was established to disseminate knowledge arising from research and development undertaken by The Energy and Resources Institute (TERI), a not-for-profit, independent research institute recognized globally for its contribution to scientific and policy research in the realms of energy, environment, and sustainable development.

In 1999, the University was granted the 'Deemed to be University' status by the University Grants Commission (UGC) and notified vide the Ministry of Human Resources Development, Department of Education, Government of India, notification no. F.9/19/95-U-3, dated October 5, 1999. TERI SAS is also accredited by National Assessment and Accreditation Council (NAAC) with grade "A".

TERI SAS academic programmes are envisioned to provide students with a holistic perspective of the subjects offered and encourage interdisciplinary learning. The University aspires to be an institution of advanced learning which meets the needs of a rapidly growing nation. The University uses modern pedagogical tools, richly supplemented by comprehensive field trips, live industry projects, and hands-on applications.

## Administration

The University's Board of Management is responsible for its overall administration and control. All aspects of academic policy are under the purview of the Academic Council, chaired by the Vice Chancellor, which approves curricula, courses and examination results.

## ACADEMICS

Since its inception, the wide array of academic programmes offered by TERI SAS have been related to sustainable development and structured around four thematic areas—biotechnology, regulatory and policy aspects, energy and environment, and natural resources.

The University is a first-of-its-kind university in India to dedicate itself to the study of environment, energy, law, water resources, business sustainability and natural sciences for sustainable development.

## INFRASTRUCTURE

TERI SAS provides well-equipped laboratories, advanced computer hardware and software, video-conferencing facilities and access to South Asia's most comprehensive library on energy and environment.

## Green Campus

Spread over two acres, TERI SAS Green campus comprises of an administrative block, an office block, a convergence and a hostel block. The green campus provides a setting that enhances learning while simultaneously showcasing the concept of modern green buildings including insulation of external walls, terrace insulation, Hunter Douglas louvers, solar water heating system, waste water recycling, rainwater harvesting, solar rooftop system, LED lights and a windmill.



# The Academic Council

## Chairperson

**Prof. Prateek Sharma**

Professor & Vice Chancellor (Acting), TERI SAS

## Deans

**Prof. Ramakrishnan Sitaraman**

Professor & Dean(Academic)

**Prof. Shaleen Singhal**

Professor & Dean(Research & Partnerships)

**Prof. Anandita Singh**

Professor & Dean(Student's Welfare)

## Heads of the Departments

**Dr Sudipta Chatterjee**

**Prof. Vinay Shankar Prasad Sinha**

**Prof. Naqui Anwer**

**Dr Sukanya Das**

**Dr Chaithanya Madhurantakam**

## Professors

**Prof. Arun Kansal**

## Two Associate Professors from Departments

**Dr Chander Kumar Singh**

**Dr Smriti Das**

## Two Assistant Professors from the department by rotation of seniority

**Dr. Shruti Sharma Rana**

**Dr Anu Rani Sharma**

## Nominee by the Vice Chancellor

**Prof. Shreekant Gupta**

Professor, Delhi School of Economics, University of Delhi

**Prof. P.S.N. Rao**

Director, School of Planning and Architecture

**Prof. Sagnik Dey**

Institute Chair Professor, Centre for Atmospheric Sciences, Indian Institute of Technology Delhi

**Prof. T C Kandpal**

Professor, Centre for Energy Studies, Indian Institute of Technology Delhi

**Dr. Vivek Suneja**

Faculty of Management Studies, University of Delhi

**Prof. Suresh Jain**

Professor, IITD

## Co-opted Members

**Mr. Manoj Chugh**

President – Group Public Affairs & Member of the Group Executive Board Mahindra & Mahindra Ltd

**Mr. Rahul Mittal**

Director, International Tractors Ltd.

**Dr Sabhyata Bhatia**

Staff Scientist VII, National Institute of Plant Genome Research, New Delhi

**Mr. Shubhashis Dey**

Director – Climate Policy Program, (Low Carbon Development, Air Quality & Climate Finance), Shakti Foundation

**Mr. Niraj Sharma**

Chief Scientist, TPE Division, CSIR-Central Road Research Institute

**Dr Bidyut Kumar Bhadra**

Dy. General Manager, Regional Remote Sensing Centre-North, National Remote Sensing Centre, Indian Space Research Organisation

**Dr Madhusudan Sau**

Executive Director, R&D Centre, Indian Oil Corporation Limited

**Mr. Sudhir Vadehra**

Ex-Advisor, Ministry of Power; and Executive Director, REC (Retd)

## Controller of Exams

**Prof. Shashi Bhushan Tripathi**

## Secretary

**Mr. Kamal Sharma**

Registrar (Officiating), TERI SAS

# Board of Management

## Chairman

**Prof. Prateek Sharma**  
Professor & Vice Chancellor (Acting),  
TERI SAS

## Deans

**Prof. Ramakrishnan Sitaraman**  
Professor & Dean (Academic), TERI  
SAS

**Prof. Shaleen Singhal**  
Professor & Dean (Research &  
Partnerships), TERI SAS

## Three eminent Academicians nominated by Chancellor

**Prof Basabi Bhaumik**  
Former Professor, IIT Delhi

**Dr Sachin Chaturvedi**  
Director General, Research and  
Information System for Developing  
Countries (RIS)

**Dr Swati Basu**  
Former Director, National Centre for  
Medium Range Weather Forecasting  
and Former Scientific Secretary, PSA's  
Office, Government of India

## Nominee of Sponsoring Society

**Dr V.P. Singh**  
Regional Rep for South Asia,  
International Centre for Tropical  
Agriculture

**Prof. Nitya Nanda**  
Director, Council for Social  
Development

**Mr. O P Agarwal**  
Former IAS and former CEO of WRI

## Two teachers (from Prof and Associate Prof)

**Prof. Anandita Singh**  
Professor, TERI SAS

**Dr Sukanya Das**  
Associate Professor, TERI SAS

## Secretary

**Mr. Kamal Sharma**  
Registrar (Officiating), TERI SAS

# ACADEMICS

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## Department of Natural and Applied Sciences

Quality of life depends on the quality and quantity of natural resources available for use in equitable ways. The world today faces an unprecedented challenge of sustainability. Finding a balance between meeting the needs of human population and maintaining integrity of nature around us is the foremost question of our times. It is imperative to understand how natural processes and systems work around us and how to best use them in pursuit of this balance. The Department of Natural and Applied Sciences (DNAS) at TERI SAS is established to impart training for engaging with the questions of natural resource management in a scientifically rigorous manner. It houses faculty members from a diverse academic disciplines with a focus on applied research for informed decision making.

DNAS offers four distinct interdisciplinary masters programs in Biotechnology, Climate Science and Policy, Environmental Science and Resource Management, and Geoinformatics; and two transdisciplinary Ph.D. Programs in Bioresources and Biotechnology, and Natural Resource Management.

Students pursuing their Master's / Doctoral programme at DNAS are exposed to an academically rigorous and interdisciplinary learning environment with a significant emphasis on laboratory work and engagement with contemporary debates, emphasizing exploration and creative thinking and application as essential ingredients of originality in research and learning.

## Department of Policy and Management Studies

The primary challenge of the human being is to improve quality of life across generations, an objective now widely recognized as Sustainable Development. This challenge necessitates numerous interventions concerning each of its components: environmental, social and economic. These interventions range from eradication of hunger and poverty to reduction in inequality; from the provision of quality education, good health, decent work environment, water, sanitation, affordable and clean energy to fostering gender equality; from economic growth to effective institutions; from responsible consumption and production to taking urgent actions to combat climate change.

The Department of Policy and Management Studies (DoPMS) at TERI School of Advanced Studies (TERI SAS) aims to contribute to theoretical and empirical enquiry towards informed prescriptions, implementable policies, sustainable practices and management through research, teaching and training. The continued research in sustainability for the business is also one of the key concerns of the Department.

Faculty of the Department have disciplinary backgrounds in Anthropology, Economics, Population Studies, Sociology, Finance & Accounting, Corporate and Commercial Laws, Public Health, Strategy, Business Sustainability, Circular Economy Finance, Climate Finance, Development Studies and Public Policy. Such disciplinary enables the promotion of multi-disciplinary research and learning at the economy-society-ecology interface. The faculties are engaged in active research in their disciplines as well as within the broad theme of sustainable development. This is reflected in their publications, sponsored projects, consultancies and training programmes and supervised research. The faculty regularly engage with the scientific community through seminars and conferences, participate in different forums as experts or resource persons, and engage with the general public through their lectures, print and digital media.

## Department of Sustainable Engineering

Over the past half century, the global community has been debating the mode of economic growth, amid challenges of environmental degradation, energy transition and climate change. India among the several emerging economies, though at crossroads, it has chosen a trajectory of sustainable development for ensuring inter-generational equity and inclusiveness in its growth journey. As India is growing economically amid an increased pace of urbanization, the burden on resource utilization and management has increased Substantially. Two prominent sectors such as energy and urban development facing challenges which are bound to increase due to climate change. Addressing these challenges will require trained professionals who can assess the problems, think critically by integrating multiple sectors and create evidence-based solutions. The focus of Department of Sustainable Engineering (DSE) at the TERI SAS is to develop a cadre of professionals having requisite knowledge and skillsets towards addressing the current and envisaged challenges faced by humanity by promoting scientific, technological and policy innovations for strengthening local, regional, and global development agendas.

DSE offers MTech and doctoral programmes in areas of Renewable Energy Engineering & Management (REEM), and Urban Development Management (UDM). The Department is cognizant of the complex environmental, socio-economic, and political challenges that require an integrative approach towards engineering and sustainability. The DSE encourages collaboration with relevant stakeholders including industry, government, academic & research institutions, and multi-lateral organizations to deliver practice-informed research and teaching.

The curriculum of programmes offered by DSE is an eclectic mix of foundational and advanced courses which promotes both critical and creative thinking. The students at DSE are drawn from diverse branches of engineering, science, architecture, and planning which cultivates robust peer learning. The faculty at the DSE has wide experience and expertise across multiple domains, touching upon the two main themes of the Department – renewable energy and urban development.



## Coca-Cola Department of Regional Water Studies

The Coca Cola Department of Regional Studies was created in 2014 with a mission to create a cadre of water professionals who can provide systematic solutions to enhance water security. The water science and governance programme aims to prepare regional water champions who can address water problems in a holistic manner that encompasses both the science of water management and the governance and an enabling policy environment with a healthy blend of theory and practice. The teaching programme focuses on cross-cutting issues of water resources through science, engineering, legal, socio-economic and institutional dimensions.

The Department offers two Master's level programmes and Ph.D. programme. The M.Sc. programme in Water Science and Governance is an interdisciplinary program with emphasis on development of social, economic, institutional and governance perspectives. The water professionals graduating from TERI SAS are equipped to examine water issues in a trans-boundary and cross-cultural framework transcending environmental science, social, economic and legal discourses. The M. Tech programme in Water Resources Engineering and Management integrates engineering and technological theories with socio-economic principles. The courses address the technical, social, economic, legal and political dimensions of water. Interdisciplinary in its scope and objectives, the programme prepares students for a rewarding and challenging career in water resources management.



# COLLABORATIONS

Stressing the importance of the international perspective in its programmes, TERI SAS has entered into Memorandums of Understanding (MoUs) with several international universities aimed at facilitating a mutually beneficial exchange of students, faculty, knowledge, resources, and ideas.

## Organisation with which MoU is signed

Freie University, Berlin

The Heller School for Social Policy and Management,  
Brandeis University

Himalayan University Consortium Charter University of  
Iceland

Sambhram Institute of Technology, Bangalore & TERI,  
Bangalore

The University of the West Indies, Kingston, Jamaica

Environment Protection Training and Research Institute,  
Telangana, India

Karl-Franzens-University, Graz; Ca'Foscari University,  
Venice; Leipzig University, Germany; Utrecht University,  
Netherlands; Basel University, Switzerland; Hiroshima  
University, Japan; Stellenbosch University, South Africa

Gurugram Metropolitan Development Authority, Haryana

Institute for Future Cities, University of Strathclyde,  
Glasgow, United Kingdom

Kwame Nkrumah University of Science and Technology,  
Kumasi, Ghana

Future Himalaya Institute (FHI), Kathmandu, Nepal

Faculty of Graduate Studies, University of Sri  
Jayewardenapura, Sri Lanka

National Institute of Disaster Management (NIDM), India

Purbanchal University, Nepal

The University of Victoria, B.C., Canada  
Deakin University, Australia

SM Sehgal Foundation, Gurugram

CPWD, New Delhi

University of Science, Engineering and Technology,  
Gambia

Lomonosov Moscow State University

Linnaeus University, Sweden

Mahindra & Mahindra Ltd.

Humboldt University, Berlin

EKI-Energy Services Limited

Canvest Infracapital Inc., Canada

DHAN Academy, Tamil Nadu

Centre for Public Policy Research, Kerala

Emerson Electric Co (I) Pvt. Ltd, Pune, Maharashtra

National Bureau of Plant Genetic Resources

University of Rhode Island, USA



# INFRASTRUCTURE

TERI SAS provides the best equipment and instruments, which includes a state of the art computer hardware and software, well-equipped laboratories, video-conferencing facilities and access to South Asia's most comprehensive library on energy and environment.

## Green Campus

Spread over two acres, TERI SAS Green campus comprises of an administrative block, an academic block, a convergence and a hostel block. The green campus provides a landscape that enhances learning while simultaneously showcasing the concept of modern green buildings including insulation of external walls, terrace insulation, Hunter Douglas louvers, solar water heating system, waste water recycling, rainwater harvesting, solar rooftop system, LED lights and Wind turbines.

## Laboratories

TERI SAS laboratories are equipped with advanced equipment and facilities to aid and stimulate research.

The different laboratories at TERI SAS are:

### Environmental Monitoring Laboratory

The laboratory has been created with the objective of providing a facility with all the basic equipment required for the analysis of environmental samples (soil, waste, water, and air). It caters to the interdisciplinary application of research to all the master's students (science-based) of the Deemed university. This laboratory facility is common for M.Sc./M.Tech. (ESRM, CSP and WSG) programs

### Combustion Lab

The combustion lab was established in 2009 with the initial funding received from DST project and MNRE projects. It is a small lab however equipped with instruments used for emission and thermal efficiency testing. Primarily, we conduct experiments based on internationally accepted protocols viz, water boiling test (WBT) and kitchen performance test (KPT) in the above-mentioned lab. The hood methodology is used to capture and quantify the various products of incomplete combustion.

### Environment Lab

The laboratory supports master's level experiments pertinent to the laid curriculum. The lab is equipped with instruments required for environmental analysis (soil, water, and air). The laboratory is capable to perform analysis on drinking water, wastewater, surface and groundwater, soil, and sediments, including air quality monitoring, and basic microbial analysis. Laboratory also supports various training programs offered by the university in the associated fields. This laboratory facility is common for M.Sc. (ES, WSG, and CSP) programs.

## Centre of Excellence in Thermal Energy Storage

The laboratory is equipped for research on new thermal storage system development for sub-ambient, low, and medium temperature applications and characterizing storage material properties for optimal system design.



## Heat transfer laboratory

The laboratory provides hands-on training to students to understand various heat transfer modes, devices and to quantify their characteristics parameters or properties.



## Power Systems laboratory

The lab provides fundamental experimental knowledge on different equipments used in electrical power system at various loading conditions and to measure their characteristics.

## Hybrid Micro Grid (HMG) laboratory

The lab houses solar PV system, wind turbine, battery energy storage and connected together to develop a hybrid micro grid. The research facility is used for carrying out power flow experiments.

## Energy Simulation Laboratory

The lab is equipped with the state of the art software used in Renewable Energy industry. The lab provides in-depth understanding on design, simulation, financial analysis and optimization of various renewable energy technologies for plant/system design and other applications.

## Biofuel and Waste Utilization Laboratory

The lab is used to conduct research experiments on the combustion process, fuel properties, biomass conversion, and pyrolysis.

## Solar Energy Laboratory

The lab is equipped with outdoor and indoor experimental facilities to conduct experiments on the characterization of solar photovoltaics modules, radiation measurement, and performance analysis of various solar thermal devices/systems.





## Geoinformatics Laboratory

The TERI SAS geoinformatics laboratory is well equipped with state-of-the-art equipment such as state-of-the-art computers (workstations), a scanner, printer, plotter, navigation devices, infrared thermometers, etc. It has license for high -end commercial software's like ERDAS Imagine, LPS, ArcGIS, MIKE, GMS, and WEAP along with other advanced support system's mechanism. The laboratory is also equipped with web publishing tools like ArcGIS Advance and ArcIMS Servers. The laboratory is **also fitted with various open-source** geospatial softwares to expose our students to the powerful open-source environment.

The laboratory holds a good repository of geospatial information in both digital and hard formats. The Geoinformatics laboratory of the Department of Natural and Applied Sciences of TERI SAS has a solid network with several research establishments and Universities working in Geoinformatics and other associated fields both within and outside the country. We also support R&D activities of various centres of The Energy Resources Institute (TERI) branches located across the country.



## Analytical and Geochemistry Laboratory



The analytical and geochemistry lab caters the needs for research in understanding the earth sciences problems and providing solutions to these problems. The researchers in the laboratory are currently engaged in understanding the natural occurrence of Arsenic, Fluoride and Uranium in groundwater. The lab also has developed prototype nano-materials to remove such geogenic contaminants from groundwater to provide safe drinking water. The lab has established linkages to Lamont Doherty Earth Observatory, Columbia University; Dept. of Engineering,

Massachusetts Institute of Technology, Stanford University. The lab also has developed linkages with institutions in India such as IIT Kharagpur, IIT Guwahati, Jawaharlal Nehru University, SPCB Bihar, Drinking Water Supply and Sanitation, Punjab, Board of Research in Nuclear Sciences etc. The laboratory houses several water field testing kits, flame photometer, double beam spectrophotometer, LED-Fluorimeter, Radiation Survey Meter, Air-dry Oven, Sonicator, pH meter, Muffle furnace, Ion selective Electrodes, Conductivity meter etc.

## Biotechnology Laboratory

The Biotechnology Laboratories at TERI SAS are equipped for teaching and research in Biotechnology. The laboratories harbor both basic as well as sophisticated equipment used the modern biotechnology research. In addition to these, the Bioinformatics laboratory is equipped with a high capacity server, workstations and dedicated computers with advanced software such as MATLAB, GCK, PAUP and MacVector. There are two laboratories for M.Sc. teaching and two research laboratories. Furthermore, the students also have access to TERI's research laboratories at Gwal Pahari.



Some of the major equipment installed in the laboratories are listed below:

- |                          |                             |  |
|--------------------------|-----------------------------|--|
| ●Real time PCR           | ●Centrifuges                | ●Spectrophotometer                           |
| ●Zeta Potential Analyzer | ●Incubator Shakers          | ●SE 600 Ruby complete, 2D, Vertical Gel unit |
| ●Refrigerators           | ●Thermal cyclers            | ●2D Gel Electro power supply, EPS 601, GE    |
| ●Microscopes             | ●EVOX-XL Microscope         | ●Gel Doc system XR                           |
| ●Laminar Flows           | ●Nanodrop Spectrophotometer | ●Ice Franking Machine                        |
| ●Power Pack/Power supply | ●Gene Pulser X Cell         | ●Growth Chamber GC - 100                     |
| ●BOD Incubator           | ●HB-1000 Hybridization Oven | ●Electronic Balances                         |
| ●Deep freezers -20°C     | ●Stereo Zoom Microscope     | ●Deep Freezer -80°C                          |
|                          |                             | ●Solar PV Simulator                          |

## Library

One of the key infrastructures of TERI SAS is its well developed and centrally organised library. The library has a number of electronic services and an ever-wider range of resources in order to support teaching, learning and research. The Library also engages in partnership initiatives with academic colleagues and national and international universities. The services are offered electronically through a web-enabled integrated digital information system.



# M. Tech Renewable Energy Engineering and Management (REEM)

## Programme Outline

The AICTE approved M. Tech in Renewable Energy Engineering and Management (REEM), offered by the Department of Sustainable Engineering since 2009, is designed to provide the much-needed knowledge and human resource capacity in renewable energy technology and its management. The programme is structured to train students not only in renewable energy technology and their implementation but also in equally important synergetic areas of energy efficiency and its infrastructure, energy economics and policies. The students not only gain classroom-based knowledge but also engage with industries through multiple site visits, minor project and major project along with special or guest lectures from industry leaders, academics and policymakers. Through specialized in-depth courses, laboratories and software tools in areas such as solar energy, wind energy, green building, energy policy, energy efficiency etc., the programme enables the students with state-of-art skills and practices in the domain of renewable energy.

Duration: 2 Years

First Year: Focus on building a strong technical base for renewable energy resources & technologies, energy conservation, policies & regulatory framework, project management and minor project.

Minor Project: 6-8 weeks

Second Year: Providing specialization through in-depth subject knowledge and major project in industries or research institutions.

Major Project: 16 - 20 Weeks

## Minor Project

After the completion of the first academic year, students are required to undergo a 6-8 weeks internship in an industry. Students obtain exposure to professional environment and work ethics, thus, gaining practical experience in handling ongoing live projects. Students can also pursue research under an organization to specialize in their respective areas of interest.

## Major Project

The importance of practical work experience cannot be undermined, and thus, the curriculum is designed to dedicate the entire fourth semester for a major project. It is mandatory for every student to carry out 16-20 weeks of internship in an industry or a research organization followed by submission of an academic thesis for evaluation. Prospective employers are invited to hire the students for major projects and assess them for a potential long-term engagement.

## Pedagogical Tools

The pedagogical tools comprise lectures, case studies, tutorials, laboratories, field visits, and industry exposure. Lectures and academic activities are supplemented by regular interactions with experts from industry, academia and policymakers.

## Course Details

### Semester I

- Fundamentals of Thermal and Electrical Engineering
- Renewable Energy Resource Characteristics
- Power System Engineering
- Heat Transfer
- Conventional Energy and Environmental Implications
- Communication Skills and Technical Writing
- Energy Conservation and Management
- Introduction to Management Techniques – I
- Energy Lab – I (Power System Lab and Heat Transfer Lab)

### Semester II

- Field Visits / Exposure to RE Plants
- Solar Technologies
- Wind, Small Hydro and RE Hybrid Systems
- Biomass and other Renewable Technologies
- Renewable Energy Policy and Regulations
- Optimization Techniques for Energy Management and Planning
- Renewable Energy Project Management
- Energy LAB – II
- Fluid Mechanics and Wind Turbine Models
- Applied Numerical Methods

### Semester III

- Energy Economics
- Energy Simulation Laboratory
- Summer Internship/Minor Project
- Introduction to Management Techniques – II
- Solar Photovoltaic Power Generation
- Solar Thermal Power Generation
- Wind Power Generation
- Biofuels and Decentralized Energy Systems
- Building Energy and Green Building
- Grid Integration of Renewable Energy
- Energy Audit and Management
- Waste to Energy
- Independent Study
- Smart Grid

### Semester IV

- Major Project



# Field Visits



**Class of M.Tech visited Godawari Green Energy Ltd's 50 MW Solar Thermal (CSP) Power Plant in Nokh (Pokhran), Rajasthan.**

Salient features of the plant :

- 157 Ha of land used to develop the project. 75% of land usage for the solar field and 25% of land for the power block area.
- 120 loops based on the DNI criteria of the location during initial planning. Each SCA (Solar Concentrator Array) is 150 m. 28 mirrors makes 1 box. 12 boxes make 1 SCA. 2 SCA's make 1 row. 2 rows make 1 loop. Each solar field has 30 loops in 4 different fields.
- Therminol VP-1 was the chosen heat transfer fluid with an oil temp. gain of 100-120 °C with an operating oil temperature of 290 °C.
- Schott's 2008 PTR70 Parabolic Trough Receiver tubes carry the heat transfer fluid at a speed of 2.5 m/s. Auto-focusing mechanism is incorporated to ensure oil does not exceed 400 °C.



**The Class also visited Dhirubhai Ambani Solar Park in Dhursar (Pokhran), Rajasthan.**

Salient features of the plant :

- The CSP Solar Thermal plant is based on the CLFR technology and has been in commercial operation since November 2014.
- AREVA Solar, a French Company was the CLFR technology provider of this plant. It worked as an EPC contractor of solar field under Reliance Infrastructure Limited.
- This solar thermal plant has a total mirror area of 1 400 000 sq.m and consists of 35 Solar Steam Generators (SSGs). Each SSG is 540 m long and has 33 mirrors, each having a width of 2.25 m. The receiver is 30 m above the plane of the mirrors.
- Nine receiver tubes are in the cavity. Eight tubes, called economizer-cum-evaporator tubes, travel from one end of the receiver to the other. The fluid carried by these eight tubes passes through a header at the end of the receiver and travels back the entire length of the receiver through a central tube called the superheater tube. In this once-through boiler, water enters at one end at around 70–150°C.
- The design outlet condition out of the superheater tube is superheated steam at 390°C and 90 bar pressure. The turbine requires 568 tons/h of steam of this quality to produce 125 MW.

# FACULTY PROFILE



**Dr. Sapan Thapar**  
(Ph.D. IIT Delhi)

**Associate Professor, Department of Sustainable Engineering**

Dr Sapan Thapar is Head and Associate Professor in the Department of Sustainable Engineering at the TERI School of Advanced Studies. He has completed his doctoral research as well as Masters from the Indian Institute of Technology, Delhi. Dr Thapar, a certified Energy Manager, has over two-decade long experience in the energy sector, with expertise in energy policy, project finance and energy efficiency. He has several research publications to his credit. In the past, Dr Thapar has been associated with IREDA, TERI and Tata Consultancy Services (Energy Division).



**Naqui Anwer**  
(Ph.D., Jamia Millia Islamia)

**Professor, Department of Sustainable Engineering**

Dr. Naqui Anwer is currently Professor and Faculty Placement Coordinator of M.Tech. Renewable Energy Engineering and Management (REEM). Prof Anwer is also coordinator of Internal Quality Assurance cell (IQAC) and steered the TERI SAS to get accredited with grade "A". Prof. Anwer has an experience of more than 19 years in academics and research. His academic and research activities are in the field of the application of power electronics in power systems, microgrid, smart grids, and issues related to grid integration of renewable energy sources etc. Dr Anwer is a member of Institute of Electrical and Electronics Engineers (IEEE) and reviewer of several IEEE, Elsevier and Springer Journals. He has published more than 40 research papers in conferences and journals of international repute and authored six books. He has been invited to deliver expert talks on the topics related to renewable energy in many Government and Non- Government organizations. He is an invited member at IIT, Bombay as a member of the committee to look after the policies related to research in energy education. He is a visiting faculty at Linnaeus University, Sweden, and steered a project jointly with Eindhoven University of Technology, Netherlands titled "Development & implementing smart grids in India" funded by Netherlands Organisation for Scientific Research. He is also the Principal Investigator of a DST-funded project on "Battery Storage and Mobile Substation".



**Aviruch Bhatia**  
(Ph.D., IIIT Hyderabad)

**Assistant Professor, Department of Sustainable Engineering**

Aviruch Bhatia is presently working with TERI SAS as an assistant professor. He has a PhD in IT in Building Science from IIIT-Hyderabad. He has nine years of research/ industry experience. His areas of research interest include building physics, building performance simulation and analysis, and green buildings. He is a certified GRIHA trainer and IGBC-AP.



# GUEST FACULTY

**Dr. S. C. Mullick**

Professor (Retd.)  
Centre for Energy Studies, IIT Delhi

**Dr. Lakshmi Raghupathy**

Former Director  
Ministry of Environment, Forest and Climate  
Change, Government of India;  
Consultant, Environment and Waste Management

**Dr. Biju Mani Rajbongshi**

Designation: Guest Faculty  
Previous Academic qualification:  
PostDoc from IIT Delhi, New Delhi  
PhD from Tezpur University, Assam

**Mr. Ankit Narula**

Designation: Guest Faculty

**Dr. Monika Agrawal**

Designation: Guest Faculty

**Dr. Suneel Deambi**

PhD, University of Kashmir





#### Salient Features of the Solar PV project :

- The 40MWp power plant is a combination of 10 units of 4MWp power unit. Each 4MWp power unit consists of 31 units of 131kWp PV system. Each 4MW PV system is connected to 5 Inverters of 800kW each. Total 55556 strings are planned for 40MW
- There is 300mm separation between two strings in a row. 2m separation is provided between two adjacent rows. A 5m wide continuous road connecting all the ten blocks runs across the plant. The location also facilitates routing of 33kV underground cable for exporting power without interfering with the PV array layout
- Each LT Control Building consist of 1 no of 5/3/2MVA, 33/0.415/0.415kV Transformer and 5 Inverters of 800 kW and one LT switchboard for combining the power of 5 inverters.
- HT Control Building consist of 1 no of 5/3/2MVA, 1 no. of 33/0.415/0.415kV Transformer, 1 250kVA, 33/0.415kV Auxiliary Transformer and 33kV Metal Clad switchgear consisting of 6 O/G Feeders and 1 I /C Feeder. 250kVA auxiliary transformer should be fed to the auxiliary load of the HT & LT Control Buildings. HT side of 5/3/2MVA inverter transformer is connected with the 33kV switchgear of HT Control Building through 33kV cable.
- The power output of the two 33kV Switchgear i.e. total 40 MW approx. is merged together in a 33kV Main Switchgear which is located in 33kV Main Switchgear Building. The main 33kV switchgear is connected with 2 no. of 18/24/30 MVA power transformer through 33kV cable for evacuating power to 220 kV switchyard through suitable rated overhead lines. Auxiliary load for 33kV Switchyard and HT Control Building is fed from 250kVA auxiliary transformer located at the HT Control Building.



**The Class visited Suzlon's Blade Manufacturing Facility in Rajasthan where they manufacture 65- metre Rotor Blades and this facility was the first in India to incorporate Carbon Fibre in blades.**



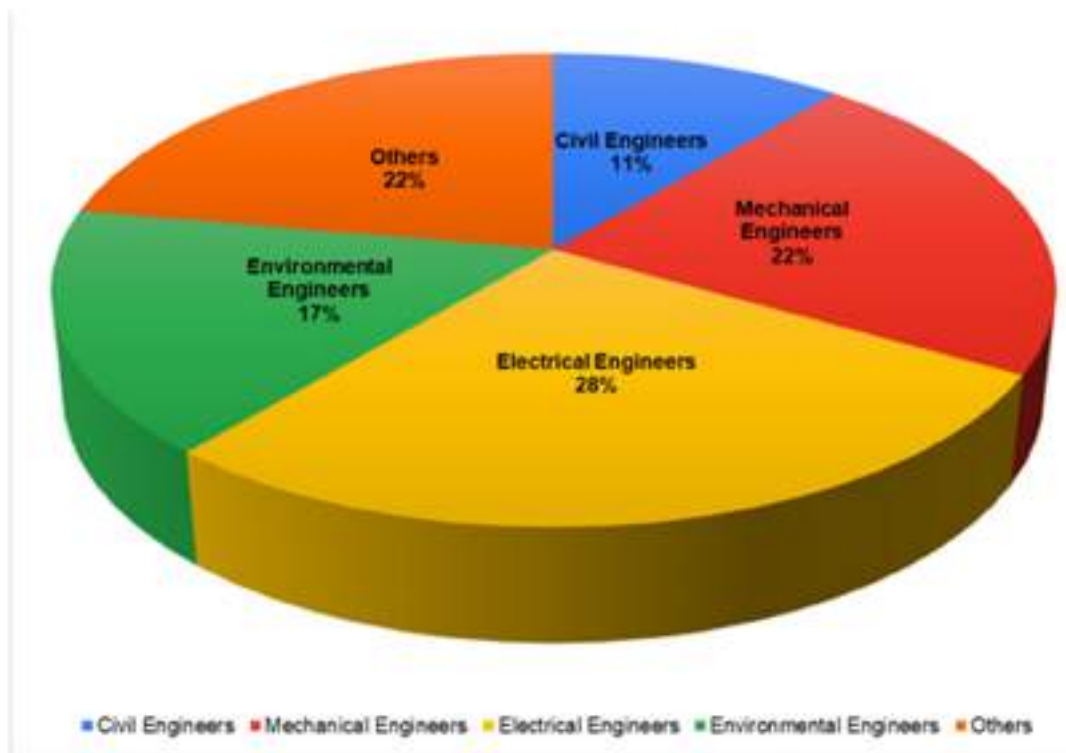
**The Class of M.Tech visited BSES Office in Nehru Place, New Delhi for expert talks on Demand Side Management (DSM) and Introduction to Power Purchase and Demand Forecast.**



- The class learned the nuances of Demand Side Management (DSM) and how the DISCOM caters to the total energy demand in South and West Delhi, 67-70% of which is domestic.
- BSES officials explained to the class how T&D and AT&C losses used to be 54% back in the day and how they have been successful in bringing them down to 7.1%.
- They also explained to the class how they are trying to incorporate more than 30% Renewable Energy in their portfolio and catering to intermittency issues at the same time. BESS will prove essential in the foreseeable future for DISCOMs to provide uninterrupted supply of electricity.
- Deviation Settlement Mechanism and Power Procurement are two other concepts that were touched upon. BSES officials also explained to the class the subtleties of :
  - i. Cost Effectiveness Index
  - ii. Total Resource Cost
  - iii. Average Purchase and Selling Cost
  - iv. Bilateral and Reverse Auction for Power
  - v. Banking, Payout and Exchange of Power
  - vi. Ramping Up and Ramping Down of Power Plants
  - vii. Unscheduled Interchange, Forecast and Demand
  - viii. Day Ahead Market, Day Ahead Contingency
  - ix. Real Time Market (RTM), Green Day Ahead Market (GDAM)
  - x. Transmission and Wheeling Charges



## BATCH PROFILE



The pie chart provides information on the educational background of M. Tech REEM batch of 2021-23. All students have an engineering background.



Pie-chart breakup about the experience (in years) the batch has prior to joining M. Tech REEM. 'Past experience' here means any and all forms of internships, project work, training, industrial jobs, etc.

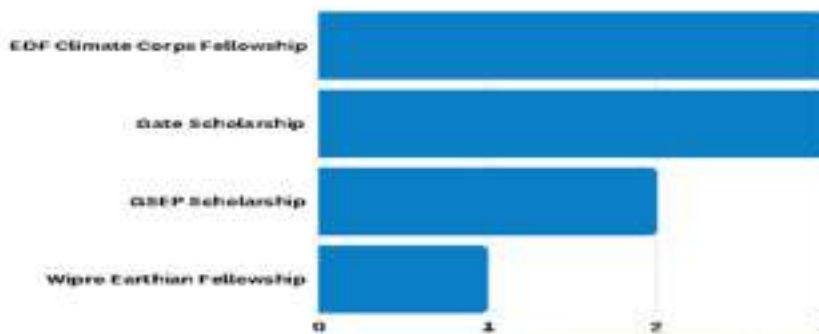




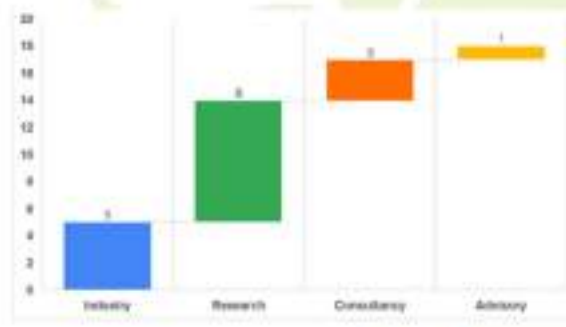
The chart shows the top 5 domains in which the class has experience of working and researching in prior to joining M. Tech REEM. Most of the students have industry-based experience, followed by Research, Academia, Consultancy, Finance and Advisory based job roles.



This map depicts the geographical diversity of the students of M. Tech REEM 2021-23.



This bar graph depicts the number of students who have won or have been awarded scholarships or fellowships under 4 main titles: EDF Climate Corps Fellowship, Gate Scholarship, GSEP Scholarship and Wipro Earthian Fellowship. The fellows also worked with various host organisations for Summer Internship Dissertation Project.



This chart depicts the domains students chose to work in during Summer Internship. Most of the students went for Research based roles, followed by Industry, Consultancy and Advisory

# Student's Profiles



Dwaipayan Chakraborty

**Qualifications:** B. Tech in Electrical Engineering; Post Graduate Diploma in Business Management

**Minor project title:** Energy Efficiency in Warehouse & Delivery Centres

**Minor project organization:** Amazon India

**Experience:** 12 years

**Areas of Interest:** Energy Efficiency, Renewable Energy, ESG, Green Finance, Consulting



Ganesh Deekshith  
Siragam

**Qualifications:** B.Tech. (Electrical Engineering), M.Sc. (Environmental Studies), PG Diploma (International Environmental Law)

**Minor project title:** Oxygen Balance and Metrics towards development of Oxygen Footprint Index

**Minor project organization:** Oxygen Positive (OH2 Life Foundation)

**Experience:** 16 months

**Areas of Interest:** 'Sustainable Energies and Hybrids', 'Energy and Environmental linkages – Policy, Research and Advocacy', 'ESG', 'Energy Use - Impact on Climate Change and Sustainable Development', 'Ecosystem level solutions for sectoral and domain specific challenges'.



Gargi Sablok

**Qualifications:** BTech (Petroleum Engineering), Post Graduate Program in Industrial Safety (Health, Safety and Environment)

**Minor project title:** Life Cycle Analysis of Hydrogen

**Minor project organization:** TERI, IHC, New Delhi

**Experience:** 14 months

**Areas of Interest:** ESG & CSR, Energy Auditing & Sustainability Standards, Industrial Safety & HSE Operations, Energy Computations, LCA for Hydrogen.



Haritha Rajesh

**Qualifications:** B. Tech in Mechanical Engineering

**Minor project title:** Analysis of Wind Speeds as a function of Surface Roughness

**Minor project organization:** National Institute of Wind Energy

**Experience:** 8 Months

**Areas of Interest:** Renewable Energy – Standalone + Hybrids, Energy Management, Technology and Policy Research, Project Management, Data Analytics & Modelling



Naman Kansal

**Qualifications:** B. Tech in Electrical and Electronics

**Minor project title:** Life cycle analysis of Hydrogen

**Minor project organization:** TERI, IHC, New Delhi

**Experience:** 2 months

**Areas of Interest:** Renewable Energy Project management, Project finance, EPC, O&M Alternate fuels (Hydrogen)



Nithin M Cherian

**Qualifications:** Bachelors of Engineering in Aeronautical Engineering, Executive MBA in Power Management (currently pursuing)

**Minor project title:** Roadmap to Powering Amazon India's Operations with 100% Adoption of Renewable Energy by 2025.

**Minor project organization:** Amazon India

**Experience:** 10 years

**Areas of Interest:** Decarbonization Strategies, Sustainable Energy Transition, Sustainable Aviation, Renewable Energy Consulting – Policy and Project Management, Corporate Renewable Energy Procurement



Prafull Singh

**Qualifications:** : B.Tech Electronics & Communication Engineering

**Minor project title:** A Model Design of 40MW Renewable Energy Plant meeting RTC criteria

**Minor project organization:** POWER GRID CORPORATION OF INDIA LIMITED

**Experience:** 23 Months (Job/Industry Experience)

**Areas of Interest:** RE hybrid system, Energy Efficiency, RE Policy & Regulation, Energy modelling, Power/Energy Trading



Pranayak Sharma

**Qualifications:** BE Civil Engineering

**Minor project title:** Circular Economy Solutions: Preventing Marine Litter

**Minor project organization:** GIZ

**Experience:** 4 months

**Areas of Interest:** Green Hydrogen, Energy optimization, green buildings



Pratyaksh Sharma

**Qualifications:** B. Tech Environmental Engineering

**Minor project title:** Leveraging Opportunities in Solar O&M to enhance generation

**Minor project organization:** Jakson Engineers Ltd (2 Months)

**Experience:** 30 months

**Areas of Interest:** Areas: Renewable – Solar PV + Thermal – Generation and Storage, Wind, Waste to Energy, Analytics, EPC



Saptarshi Kar

**Qualifications:** B. Tech Mechanical Engineering

**Minor project title:** Technology Diffusion

**Minor project organization:** International Solar Alliance

**Experience:** 15-16 months

**Areas of Interest:** Renewable energy, data analytics, modelling and simulation, energy transition, energy efficiency and policy regulations.



S. Shruthi

**Qualifications:** : B. Tech in Solar and Alternate energy

**Minor project title:** Cost reduction opportunities in Solar O&M

**Minor project organization:** Jakson Engineers Ltd.

**Experience:** 4 months

**Areas of Interest:** Energy advisory, RE O&M & EPC, Project management, financial analyst, consultancy



Somya Katta

**Qualifications:** B.E. in Environmental Engineering

**Minor project title:** ESG Data Analyst

**Minor project organization:** ESG Book

**Experience:** 6 months

**Areas of Interest:** ESG, Decarbonizing Roadmap and strategy, Climate Risk and Policy making, Project Financial Management and Waste to Energy





Sonu Kumar

**Qualifications:** B. Tech in Mechanical Engineering  
**Minor project title:** Existing Agrivoltaic Green House Expansion  
**Minor project organization:** HIAL  
**Experience:** 2 months  
**Areas of Interest:** Solar PV



Siva Prasad V

**Qualifications:** B. Tech (Chemical Engineering)  
**Minor project title:** Pathway to Green Hydrogen  
**Minor project organization:** GIZ, India  
**Experience:** 3 months  
**Areas of Interest:** Green Hydrogen (Technology, Policy & Regulation, and Project Management), Waste to Energy/ Waste Management (Technology & Project Management), Renewable Energy - Resource Assessment and Financing.



Suparna Havelia

**Qualifications:** B. Tech Civil  
**Minor project title:** E, S & G Handbook and Carbon Abatement Roadmap  
Minor project organization: Zomato Ltd.  
**Experience:** 15 months  
**Areas of Interest:** ESG, Sustainability Standards Reporting, CSR, climate science & policy advisory, building energy & green buildings certification



Yash V Majithia

**Qualifications:** BE Mechanical Engineering  
**Minor project title:** Comparing 10 largest power generating companies in India based on their Total Emissions and Net Zero Strategy  
**Minor project organization:** ESGBook  
**Experience:** 2 months  
**Areas of Interest:** Renewable Energy Finance, Renewable Energy Project Management, Green Hydrogen, Climate Finance, Carbon Offsets.



Yuga Pramod Bele

**Qualifications:** B. E. in Environmental Engineering

**Minor project title:** Waste Management: How waste management turns waste into energy

**Minor project organization:** Sensing Local

**Experience:** 6 months

**Areas of Interest:** Energy Advisory, ESG, Power and Utility Policy making and Consultancy



R. VIDYESH

**Qualifications:** B. Tech in Electrical Engineering

**Minor project title:** "ENERGY-ENVIRONMENT-CLIMATE NEXUS"

**Minor project organization:** CSIR-National Environmental Engineering Research Institute (NEERI), Nagpur.

**Experience:** 2 months

**Areas of Interest:** Sustainability

# Key Recruiters

- 
- Alliance for an Energy Efficient Economy (Aeee)
  - Amplus Solar
  - Azure Power
  - Bridge to India Energy Private Limited
  - Canadian Solar
  - Center for Study of Science, Technology and Policy (CSTEP)
  - Customized Energy Solutions (CES)
  - Council on Energy, Environment and Water (CEEW)
  - Climate Connect
  - Cygni Energy
  - Environmental Design Solutions (EDS)
  - Emergent Ventures (EVI)
  - Enzen Global Solutions Private Limited
  - Genesis Ray Energy
  - Giz Deutsche Gesellschaft Für Internationale Zusammenarbeit
  - Gram Oorja
  - ICF Consulting
  - IDAM Infrastructure
  - India Infrastructure
  - Infosys
  - Infrastructure Leasing & Financial Services
  - Inox Wind
  - IT Power
  - Kapsarc
  - KPMG
  - Lahmeyer International
  - Larsen & Toubro
  - Manikaran Power
  - Mott Macdonald
  - Oorja Energy
  - Prayas
  - Schneider Electric
  - Shakti Sustainable Energy Foundation
  - Smart Joules
  - Social Alpha
  - Steamax
  - Sterling and Wilson
  - Sustain Plus
  - Tata Power-DDL
  - The Energy and Resources Institute (Teri)
  - Tractebel Engie
  - Renew Power
  - Reconnect
  - United Nations Development Programme
  - United Nations Educational Scientific and Cultural Organization

# PLACEMENT PROCEDURE

The campus recruitment activity for M.Tech. (Renewable Energy Engineering and Management) is conducted to serve a dual purpose:

- Master's Thesis Project Placement – fourth semester of the programme
- Formal job recruitment on completion of the programme

Master's Thesis Project | Recruitment Period | November – December 2022

Availability of Students | January – June 2023

Job Placement | Recruitment Period | November 2022 – June 2023

Availability of Students | June 2023 onwards

We welcome organizations/corporates/institutions/others to visit our campus for interviewing and selecting the students for fourth semester masters' thesis project and final placements. You may interact with our students through telephone, video conferencing, or in person.

Interested organizations may contact the Placement Cell, the details of which are mentioned at the back of the brochure.



# Placement Cell

## Student Placement Coordinators:

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Yash Vipul Majithia  
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## Faculty Placement Coordinator:

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