

NPTEL DOMAIN CERTIFICATION



<https://nptel.ac.in/noc/Domain/>



NPTELTM

Want to **Specialize**
in an area of Study?

Complete an **NPTEL Domain**



52 Domains
across 13 Disciplines

DISCIPLINES

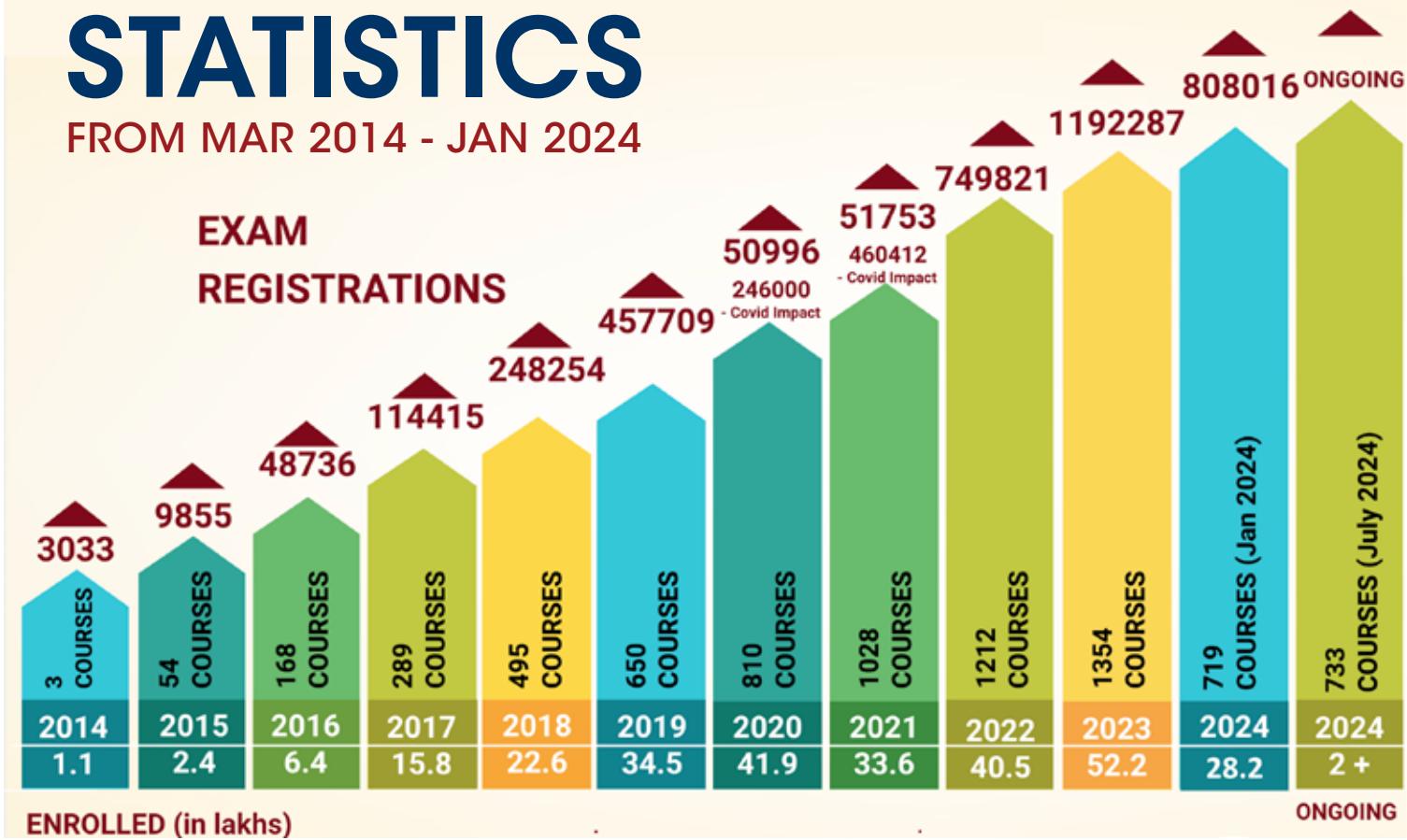
1. Aerospace Engineering, 2. Biotechnology and Bioscience / Bioengineering
3. Chemical Engineering, 4. Civil Engineering, 5. Computer Science
6. Electrical Engineering, 7. Management, 8. Mechanical Engineering
9. Metallurgical & Materials Engineering
10. Faculty Development, 11. Humanities, 12. Mathematics 13. Sports Science

About NPTEL

The National Programme on Technology Enhanced Learning (NPTEL) is a project funded by the Ministry of Human Resources Development, Govt. of India and carried out by seven IITs (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras, and Roorkee) along with IISc, Bangalore. Since 2014 NPTEL has been focusing on offering online courses for certification, with a unique, in person - at center, proctored final exam currently conducted in 160+ cities across India, that lends strong credibility to this process.

STATISTICS

FROM MAR 2014 - JAN 2024



Engaging with Indian Authorities

UGC and AICTE have approved that colleges can take these MOOC courses for credit in their Gazette notification of August 2016. These courses are being used by students to avail internship opportunities and prepare for the GATE exam too. About 15-20% of the total exam certified participants are faculty members from various colleges and hence these programmes are helping in faculty development and improvement. The advanced courses are recognized by AICTE as FDP.

Domain Certification

- ▶ Register for domain-specific NPTEL courses
- ▶ No separate registration; no separate fees



Possible Paths for students

Path - 1	
Sem 1	
Sem 2	1 Core
Sem 3	1 Core
Sem 4	1 Core
Sem 5	1 Core
Sem 6	1 Elective
Sem 7	1 Elective
Sem 8	1 Elective

Path - 2	
Sem 1	
Sem 2	1 Core
Sem 3	1 Core
Sem 4	1 Core
Sem 5	1 Core + 1 Elective
Sem 6	2 Elective
Sem 7	
Sem 8	

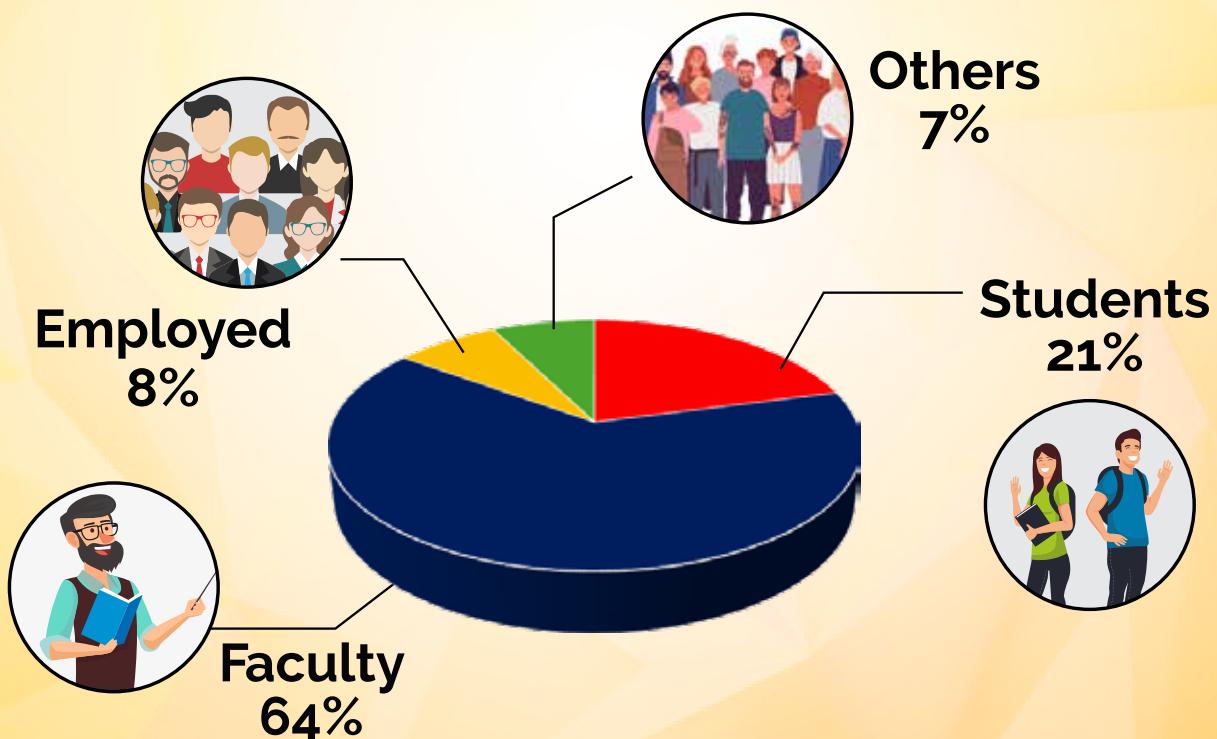
Path - 3	
Sem 1	
Sem 2	
Sem 3	2 Core
Sem 4	2 Core
Sem 5	3 Electives
Sem 6	
Sem 7	
Sem 8	

Based on the capability of the student, they can space out the completion of the courses of a domain and ensure they do so before the placement season or before they appear for competitive exams.



LEARNERS WHO HAVE COMPLETED DOMAIN COURSES

Discipline	Students	Faculty	Employed	Others
Aerospace Engineering	11	3	2	1
Biotechnology and Bioscience / Bioengineering	28	29	1	4
Chemical Engineering	3	11	2	0
Civil Engineering	3	20	10	4
Computer Science	106	216	26	39
Electrical Engineering	16	65	6	3
Faculty	2	164	2	4
Management	22	84	17	16
Mechanical Engineering	20	52	7	3
Metallurgical & Materials Engineering	3	22	6	1
Mathematics	1	2	0	0
Humanities and Social Science	7	13	1	4
Sports Science	0	0	0	0





NPTEL DOMAIN CERTIFICATE



What

- This is a Micro Certification where a learner can obtain expertise in an area by completing a group of related courses.
-



Why

- Gain expertise in a specific area
 - Demonstrates motivation and dedication
 - Can prepare for competitive exams like GATE, NET etc by doing the Minors defined in various disciplines.
-



How

- Complete all core and the selected electives in a domain within a period of 3 years
- Get Average score ≥ 60 across courses with minimum of ≥ 55 in each course
- Complete the minimum number of weeks of study specified

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Discipline

Aerospace Engineering

Domains

1. Flight Mechanics

Flight Mechanics

(4 Core + 2 Elective) Minimum 50 Weeks

Flight mechanics are relevant to fixed wing and rotary wing aircraft. An aeroplane, is defined in ICAO Document 9110 as, "a power-driven heavier than air aircraft, deriving its lift chiefly from aerodynamic reactions on surface which remain fixed under given conditions of flight". Intended audience: BTech and MTech Aerospace engineering.

Application: Design and Development and maintenance of Flight Vehicles

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Introduction to Airplane Performance	8 Weeks	Prof. A K Ghosh Prof. Deepu Philip	IIT Kanpur	101104061
Core 2	Aircraft Stability and Control	12 Weeks	Prof. A.K. Ghosh	IIT Kanpur	101104062
Core 3	Aircraft Design	12 Weeks	Prof. A.K.Ghosh	IIT Kanpur	101104069
	Introduction to Aircraft Design	12 Weeks	Prof. Rajkumar Pant	IIT Bombay	101101083
Core 4	Introduction to Experiments in Flight	4 Weeks	Prof. A.K. Ghosh	IIT Kanpur	101104066
	Introduction to Aerospace Engineering-Flight	12 Weeks	Prof. Rajkumar Pant	IIT Bombay	101101079
Core 5	Aerodynamic Design Of Axial Flow Compressors & Fans	12 Weeks	Prof. Chetankumar Sureshbhai Mistry	IIT Kharagpur	101105089
Core 6	Introduction to Aircraft Control System	12 Weeks	Prof. Dipak Kumar Giri	IIT Kanpur	101104330
Elective 1	Combustion in Air Breathing Aero Engines	12 Weeks	Prof. Swetaprovo Chaudhuri	IISc Bangalore	101108068
Elective 2	Optimal Control, Guidance and Estimation	To be Developed	-		-
Elective 3	Space Flight Mechanics	12 Weeks	Prof. Manoranjan Sinha	IIT Kharagpur	101105083
Elective 4	UAV Design - Part II	8 Weeks	Prof. Saderla Subrahmanyam	IIT Kanpur	101104083
Elective 5	Introduction to Airbreathing Propulsion	12 Weeks	Prof. Ashoke De	IIT Kanpur	101104084
Elective 6	Introduction to Launch Vehicle Analysis and Design	8 Weeks	Prof. Ashok Joshi	IIT Bombay	101101086
Elective 7	Intelligent Feedback and Control	4 Weeks	Prof. Leena Vachhani	IIT Bombay	127101530
Elective 8	Nonlinear Dynamical Systems and Control	12 Weeks	Prof. Vijaysekhar Chellaboina	IIT Madras	117106483



Discipline

Biotechnology and Bioscience / Bioengineering

Domains

1. Bioprocesses
2. Bioengineering
3. Biosciences
4. Computational Biology

Bioprocesses

(3 Core + 2 Elective) Minimum of 50 Weeks

Bioprocess Engineering is an interdisciplinary area that looks at applying engineering principles to biological systems for large-scale manufacture of valuable products. The Bioprocess Engineering domain specialization from NPTEL seeks to provide a fundamental understanding of core engineering principles. Advances in bioenergy, biofuels, production of pharmaceuticals and fine chemicals, commodity and specialty chemicals, recombinant proteins, and vaccines are all contingent on a trained workforce of engineers in the 'bio' industries. In recent years, the Biotechnology Industry Research Assistance Council (BIRAC), Government of India, has also been aggressively pushing for innovation in many of these areas. In addition to industries, the development of skilled bioprocess engineers in higher education and research is also very much needed. This domain specialization from NPTEL will train the students in various aspects of Bioprocess Engineering and present many exciting opportunities. This domain is recommended for students whose educational background is in biotechnology/biochemical engineering or chemical engineering. Students from the basic biosciences background who have strong mathematical skills can also pursue this. Professionals who are working in the 'bio' space and looking to build their profile for career advancement will find this domain to be quite helpful.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Aspects of Biochemical Engineering	12 weeks	Prof. Debabrata Das	IIT Kharagpur	102105064
	Bioreactor Design and Analysis	8 weeks	Prof. Smita Srivastava	IIT Madras	102106086
Core 2	Principles Of Downstream Techniques In Bioprocess	12 weeks	Prof. Mukesh Doble	IIT Madras	102106022
Core 3	Material and Energy Balances	12 weeks	Prof. Vignesh Muthuvijayan	IIT Madras	102106069
Core 4	Transport Phenomena in Biological Systems	12 weeks	Prof. G. K. Suraishkumar	IIT Madras	102106083
Elective 1	Plant Cell Bioprocessing	8 weeks	Prof. Smita Srivastava	IIT Madras	102106080
Elective 2	Bio Energy	8 weeks	Prof. Mainak Das	IIT Kanpur	102104057
Elective 3	Bioprocess Control	To be Developed	-	-	-
Elective 4	Bioprocess Modeling and Simulation	To be Developed	-	-	-
Elective 5	Metabolic Engineering	8 weeks	Prof. Pinaki Sar Prof. Amit Ghosh	IIT Kharagpur	102105086
Elective 6	Genetic Engineering: Theory and Application	12 weeks	Prof. Vishal Trivedi	IIT Guwahati	102103074
Elective 7	Thermodynamics for Biological Systems : Classical and Statistical Aspect	12 weeks	Prof. Suraishkumar G K Prof. Sanjib Senapati	IIT Madras	102106082
Elective 8	Experimental Biotechnology	12 weeks	Prof. Vishal Trivedi	IIT Guwahati	102103083
Elective 9	Fundamental of Fluid Mechanics for Chemical and Biomedical Engineers	12 weeks	Prof. Raghvendra Gupta	IIT Guwahati	127103225
Elective 10	Environmental Biotechnology	12 weeks	Prof. Pinaki Sar	IIT Kharagpur	102105088
Elective 11	Pharmacognosy & Metabolic Engineering	12 weeks	Prof. Adinpunya Mitra	IIT Kharagpur	102105342
Elective 12	Basics of Crop Breeding and Plant Biotechnology	12 weeks	Prof. Joydeep Banerjee	IIT Kharagpur	126105337

Bioengineering

(3 Core + 3 Elective) Minimum of 50 Weeks

Bioengineering is a highly interdisciplinary area that aims at applying principles from mathematics, physical sciences, and engineering to biological systems for solving problems in medicine and healthcare. Engineers with varied backgrounds such as electrical, mechanical, chemical, materials, etc. can contribute towards developing innovative engineering solutions to long-standing biomedical challenges. From developing sensors and devices for healthcare applications to creating artificial tissues and organs, bioengineering provides a wide array of opportunities for research and entrepreneurship. Here, our NPTEL domain introduces the fundamentals of biology and materials for biomedical applications through the prescribed core courses. The electives provide comprehensive options ranging from mechanobiology to nanotechnology and microfluidics to tissue engineering. As more and more courses are added to NPTEL, we expect the basket of electives to grow and provide an opportunity to learn the cutting edge technologies and applications of bioengineering. This domain is recommended for all engineering students. Faculty who teach related courses, and professionals and entrepreneurs working in this domain will significantly benefit from the understanding that can be gained by pursuing this specialization.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Bioengineering: An Interface with Biology and Medicine	8 weeks	Prof. Sanjeeda Srivastava	IIT Bombay	102101068
Core 2	Cell Culture Technologies	8 weeks	Prof. Mainak Das	IIT Kanpur	102104059
Core 3	Medical Biomaterials	8 weeks	Prof. Mukesh Doble	IIT Madras	102106057
Core 4	Biomaterials for Bioengineering Applications	To Be Developed			
Core 5	Human Physiology	12 weeks	Prof. Nishikant Subhedar	IISER Pune	102106340
Elective 1	Tissue engineering	8 weeks	Prof. Vignesh Muthuvijayan	IIT Madras	102106081
Elective 2	Drug Delivery: Principles and Engineering	12 weeks	Prof. Rachit Agarwal	IISc Bangalore	102108077
Elective 3	Biomicrofluidics	4 weeks	Prof. Tapas Kumar Maiti Prof. Suman Chakraborty	IIT Kharagpur	102105068
Elective 4	Introduction to Mechanobiology	8 weeks	Prof. Shamik Sen	IIT Bombay	102101058
Elective 5	Biomedical Nanotechnology	4 weeks	Prof. P. Gopinath	IIT Roorkee	102107058
Elective 6	Applications of Interactomics using Genomics and Proteomics Technologies	8 weeks	Prof. Sanjeeda Srivastav	IIT Bombay	102101072
Elective 7	Transport Phenomena in Biological Systems	12 weeks	Prof. G. K. Suraishkumar	IIT Madras	102106083
Elective 8	Biofabrication	To Be Developed	-	-	-
Elective 9	Biointerface Engineering	8 Weeks	Prof. Lalit M. Pandey	IIT Guwahati	102103086
Elective 10	Fundamental of Fluid Mechanics for Chemical and Biomedical Engineers	12 weeks	Prof. Raghvendra Gupta	IIT Guwahati	127103225



Bioengineering

(3 Core + 3 Elective) Minimum of 50 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 11	Neural Science for Engineers	12 weeks	Prof. Vikas V	IISc & Nimhans	117108148
Elective 12	Organ Printing	8 weeks	Prof. Falguni Pati	IIT Hyderabad	102106095
Elective 13	Cellular Biophysics: a Framework for Quantitative Biology	8 weeks	Prof. Chaitanya A.athale	IISER pune	102106093
Elective 14	Biomechanics	12 weeks	Prof. Varadhan	IIT Madras	102106098
Elective 15	Enzyme Sciences and Technology	12 weeks	Prof. Vishal Trivedi	IIT Guwahati	102103097
Elective 16	Microsensors, Implantable Devices and Rodent Surgeries for Biomedical Applications	12 weeks	Prof. Shabari Girishan KV Prof. Hardik Jeetendra Pandya	RUAS IISc	102108344
Elective 17	Classics in Neuroscience	8 weeks	Prof. Varadhan SKM	IIT Madras	102106345
Elective 18	Comprehensive Molecular Diagnostics and Advanced Gene Expression Analysis	12 weeks	Prof. Aritri Bir Prof. Arindam Ghosh	IIT Kharagpur	127105391
Elective 19	Design for Biosecurity	12 Weeks	Prof. Mainak Das	IIT Kanpur	102104459
Elective 20	Thin Film Technology	12 Weeks	Prof. Samit K Ray	IIT Kharagpur	127105531
Elective 21	Biomedical Ultrasound: Fundamentals of Imaging and Micromachined Transducers	12 Weeks	Prof. Karla P. Mercado Shekhar Prof. Himanshu Shekhar Prof. Hardik Jeetendra Pandya	IIT Gandhinagar and IISc Bangalore	121108458
Elective 22	Statistics for Biomedical Engineers	12 Weeks	Prof. Babji Srinivasan	IIT Madras	102106457

Biosciences

(3 Core + 2 Elective) Minimum of 50 Weeks

Expand Your Knowledge of Life with NPTEL's Biosciences Courses - Are you interested in the fascinating world of living organisms? NPTEL offers a comprehensive range of Biosciences courses designed to equip you with a strong foundation in this dynamic field. Deep within the heart of every living thing lies a fascinating story waiting to be unraveled. NPTEL's Biosciences courses equip you with the tools to become a scientific detective, delving into the world of cells, DNA, and the intricate chemical dances that fuel life. Explore the vast tapestry of organisms on Earth, from the tiniest microbe to the towering redwood. This journey of discovery empowers you to not only understand the natural world but also tackle pressing challenges in health, agriculture, and environmental sustainability.

NPTEL's Biosciences curriculum covers a wide range of topics, potentially including:

- **Cellular and Molecular Biology:** Delve into the building blocks of life, exploring cells, DNA, and the processes that drive biological functions.
- **Biochemistry:** Understand the chemical reactions that underpin life, from energy production to metabolism.
- **Genetics:** Unravel the mysteries of heredity and how traits are passed down through generations.
- **Microbiology:** Discover the world of microbes, their impact on human health and the environment.
- **Biotechnology:** Explore the application of biological processes in various fields, such as medicine and agriculture.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Biochemistry	12 weeks	Prof. Swagata Dasgupta	IIT Kharagpur	104105076
	Biochemistry - IITM	12 weeks	Prof. Swagata Dasgupta	IIT Kharagpur	104105076
Core 2	Structural Biology	12 weeks	Prof. Subramaniam K	IIT Madras	104105076
Core 3	Molecular Biology	To Be Developed	Prof. Saugata Hazra	IIT Roorkee	102107086
Core 4	Cell Biology: Cellular Organization, Division and Processes	8 weeks	Prof. Shikha Laloraya	IISc Bangalore	102108086
	Introduction to Cell Biology	8 weeks	Prof. Nagaraj Balasubramanian Prof. Girish Ratnaparkhi	IISER Pune	102106096
Core 5	Basics of Biology	12 weeks	Prof. Vishal Trivedi	IIT Guwahati	102103091
	I Think Biology	12 weeks	Prof. Kaustubh Rau Prof. Sravanti Uppaluri Prof. Divya Uma Prof. Jayanti Ray Mukherjee Prof. Prachi Gupta	Azim Premji University	102106343
Core 6	Advances in Omics	8 Weeks	Prof. Nagarjun Vijay	IISER Bhopal	102106456
Elective 1	Plant Developmental Biology	4 weeks	Prof. Shri Ram Yadav	IIT Roorkee	102107075
Elective 2	Cell Culture Technologies	8 weeks	Prof. Mainak Das	IIT Kanpur	102104059
Elective 3	Human Molecular Genetics	4 weeks	Prof. S. Ganesh	IIT Kanpur	102104052
Elective 4	Experimental Biochemistry	12 weeks	Prof. Swagata Dasgupta Prof. Soumya De	IIT Kharagpur	104105102
Elective 5	Genetic Engineering: Theory and Application	12 weeks	Prof. Vishal Trivedi	IIT Guwahati	102103074
Elective 6	Interactomics : Basics & Applications	12 weeks	Prof. Sanjeeva Srivastava	IIT Bombay	102101082
Elective 7	Introduction to Proteomics	8 weeks	Prof. Sanjeeva Srivastava	IIT Bombay	102101055
Elective 8	Experimental Biotechnology	12 Weeks	Prof. Vishal Trivedi	IIT Guwahati	102103083



Biosciences

(3 Core + 2 Elective) Minimum of 50 Weeks

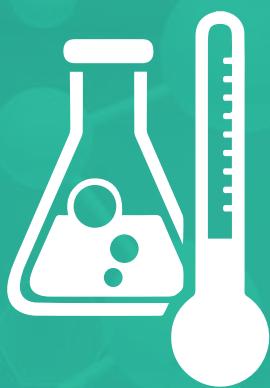
Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 9	Introduction to Developmental Biology	12 weeks	Prof. Subramaniam K	IIT Madras	102106084
Elective 10	Immunology	12 weeks	Prof. Sudip Kumar Ghosh Prof. Agneyo Ganguly	IIT Kharagpur	102105083
Elective 11	Fundamentals of Protein Chemistry	12 weeks	Prof. Swagata Dasgupta	IIT Kharagpur	102105089
Elective 12	Neural Science for Engineers	12 weeks	Prof. Vikas V	IISc & NIMHANS	117108148
Elective 13	Genome Editing and Engineering	12 weeks	Prof. Utpal Bora	IIT Guwahati	102103093
Elective 14	RNA Biology	12 weeks	Prof. Rajesh Ramachandran	IISER Mohali	102106097
Elective 15	Enzyme Sciences and Technology	12 weeks	Prof. Vishal Trivedi	IIT Guwahati	102103097
Elective 16	Host-Pathogen Interaction (Immunology)	12 weeks	Prof. Himanshu Kumar	IISER Bhopal	109106198
Elective 17	Neurobiology	4 weeks	Prof. Nitin Gupta	IIT Kanpur	102104099
Elective 18	Classics in Neuroscience	8 weeks	Prof. Varadhan Skm	IIT Madras	102106345

Computational Biology

(3 Core + 2 Elective) Minimum of 50 Weeks

Heralded by the human genome project in 2000, and the advent of large-scale genome sequencing, computational biology has become a very important discipline, transforming biology in many ways. The development of mathematical modelling techniques, computationally efficient algorithms, simulations, as well as data analytics and machine learning methods has impacted biology in numerous ways. Many popular tools of computation find direct applications in biology, as will be illustrated by the courses that make up this domain specialisation in computational biology. Beginning with a firm foundation in bioinformatics algorithms, programming and functional genomics, the domain also offers an array of electives in cutting-edge topics such as dynamic modelling, drug design, computational neuroscience, and systems biology. Such tools are being widely adopted in biochemical/bioprocess as well as pharmaceutical industries. These techniques also find many applications in the medical and healthcare domains as well.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Bioinformatics: Algorithms and Applications	12 weeks	Prof. Michael Gromiha	IIT Madras	102106065
Core 2	Programming, Data Structures and Algorithms in Python	8 weeks	Prof. Madhavan Mukund	Chennai Mathematical Institute	106106145
	MATLAB Programming for Numerical Computation	8 weeks	Prof. Niket Kaisare	IIT Madras	103106118
	Introduction to R Software	8 weeks	Prof. Shalab	IIT Kanpur	111104100
Core 3	Next Generation Sequencing Technologies : Data Analysis And Applications	12 weeks	Prof. Riddhiman Dhar	IIT Kharagpur	102105099
	Computational Genomics	12 weeks	Prof. Vineet Kumar Sharma	IISER Bhopal	102106339
Core 4	Advances in Omics	8 weeks	Prof. Nagarjun Vijay	IISER Bhopal	102106456
Elective 1	Computational Systems Biology	12 weeks	Prof. Karthik Raman	IIT Madras	102106068
Elective 2	Computer Aided Drug Design	8 weeks	Prof. Mukesh Doble	IIT Madras	102106070
Elective 3	Introduction to Dynamical Models in Biology	4 weeks	Prof. Biplab Bose	IIT Guwahati	102103056
Elective 4	Introduction to Proteogenomics	12 weeks	Prof. Sanjeeva Srivastava	IIT Bombay	102101076
Elective 5	Algorithms for Protein mModelling and Engineering	12 Weeks	Prof. Pralay Mitra	IIT Kharagpur	106105230
Elective 6	Computational Neuroscience	12 Weeks	Prof. Sharba Bahdyopadhyay	IIT Kharagpur	102105100
Elective 7	Computational Ecology	To Be Developed	-	-	-
Elective 8	Data Analysis for Biologists	8 weeks	Prof. Biplab Bose	IIT Guwahati	102103092
Elective 9	Comprehensive Molecular Diagnostics and Advanced Gene Expression Analysis	12 weeks	Prof. Aritri Bir Prof. Arindam Ghosh	IIT Kharagpur	127105391
Elective 10	Statistics for Biomedical Engineers	12 Weeks	Prof. Babji Srinivasan	IIT Madras	102106457
Elective 11	Functional Genomics	4 weeks	Prof. S. Ganesh	IIT Kanpur	102104056



Discipline

Chemical Engineering

Domains

1. Minor 1
2. Computational Chemical Engineering
3. Energy and Environment
4. Minor 2
5. Minor 3

Minor 1

(3 Core + 2 Elective) Minimum of 50 Weeks

Industrial processing of personal care products, foodstuffs, pharmaceuticals, agri-chemicals and transportation fuels are some examples of Chemical Engineering applications. In these industries chemical transformations (reactions from reactants to products) and separations (products from remaining reactants and by-products) are key operations. This minor provides an overall view of basic concepts and design challenges in these operations. The courses involve following areas: Preliminary formulation of a process, and carrying out material and energy balances for a given set of operations Basics of reaction engineering and phase equilibria Basics of heat transfer, and separations.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Basic Principles and Calculations in Chemical Engineering	12 weeks	Prof. Subrata Kumar Majumdar	IIT Guwahati	103103165
	Material & Energy Balance Computations	12 Weeks	Prof. Arnab Atta Prof. Rabibrata Mukherjee	IIT Kharagpur	103105209
Core 2	Chemical Reaction Engineering-I	12 weeks	Prof. Bishnupada Mandal	IIT Guwahati	103103153
Core 3	Chemical Engineering Thermodynamics	12 weeks	Prof. Jayant K Singh	IIT Kanpur	103104151
	Chemical Engineering Thermodynamics	12 weeks	Prof. Sasidhar Gumma	IIT Guwahati	103103144
	Chemical Engineering Thermodynamics - IITKGP	12 weeks	Prof. Gargi Das	IIT Kharagpur	103105127
Elective 1	Mass Transfer Operations - I	12 weeks	Prof. Bishnupada Mandal	IIT Guwahati	103103145
	Mass Transfer Operations II	12 weeks	Prof. Chandan Das	IIT Guwahati	103103154
	Mechanical Unit Operations	12 weeks	Prof. Nanda Kishore	IIT Guwahati	103103155
Elective 2	Heat Transfer	12 weeks	Prof. Ganesh Viswanathan	IIT Bombay	103101137
	Heat Transfer	12 weeks	Prof. Sunando Dasgupta	IIT Kharagpur	103105140
Elective 3	Solid-Fluid Operations	12 weeks	Prof. Subrata Kumar Majumder	IIT Guwahati	103103221
Elective 4	Adsorption Science and Technology: Fundamentals and Applications	8 weeks	Prof. Sourav Mondal	IIT Kharagpur	103105461
Elective 5	Thin Film Technology	12 weeks	Prof. Samit K Ray	IIT Kharagpur	127105531

Computational Chemical Engineering

(2 Core + 3 Elective) Minimum of 50 Weeks

Computational Chemical Engineering deals with the development and application of mathematical models and computational methods for analysis, design, control and optimization of chemical processes. We harness the power of computers to solve complex problems that were previously difficult or impossible to solve. The two core courses lay the foundation for this domain, whereas the electives allow learners to explore its applications.

Intended Audience: Senior undergraduate students in chemical engineering or allied fields will benefit from Post-graduate students in engineering and sciences will also benefit, since the fundamentals are applicable across multiple disciplines. This domain is especially relevant to industrial audience looking to reskill or upskill, across all disciplines

Certification: Domain certification in Computational Chemical Engineering requires students to successfully complete at least 50 credits, which are earned from at least five courses. Two of these courses must be core courses, whereas the remaining three (or more) could be chosen from a basket of electives. All other rules of NPTEL domain certification are applicable as well..

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Numerical Methods for Engineers	12 weeks	Prof. Niket S Kaisare	IIT Madras	127106019
Core 2	Process Control - Design, Analysis and Assessment	12 weeks	Prof. Ragunathan Rengasamy	IIT Madras	103106148
	Chemical Process Control	8 weeks	Prof. Sujit Jogwar	IIT Bombay	103101142
Elective 1	Optimization in Chemical Engineering	12 weeks	Prof. Debasis Sarkar	IIT Kharagpur	103105139
Elective 2	Computational Fluid Dynamics	12 weeks	Prof. Sreenivas Jayanti	IIT Madras	103106119
Elective 3	Computational Process Design	8 weeks	Prof. Hariprasad Kodamana Prof. Manojkumar Ramteke	IIT Delhi	103102352
Elective 4	Model Predictive Control: Theory and Applications	12 weeks	Prof. Niket Kaisare	IIT Madras	127106225
Elective 5	Aspen	To Be Developed	-	-	-
Elective 6	Computer Aided Applied Single Objective Optimization	12 weeks	Prof. Prakash Kotecha	IIT Guwahati	103103164
Elective 7	Aspen Plus® Simulation Software - a Basic Course for Beginners	12 Weeks	Prof. Prabirkumar Saha	IIT Guwahati	103103209
Elective 8	Mathematical Modelling and Simulation of Chemical Engineering Process	12 weeks	Prof. Sourav Mondal	IIT Kharagpur	103105215
Elective 9	Matlab-Based Programming Lab In Chemical Engineering	12 weeks	Prof. Parag A. Deshpande	IIT Kharagpur	103105220

Energy and Environment

(3 Core + 2 Elective) Minimum of 50 Weeks

The domain of energy and environment is a key challenge in the current society especially from the perspective of environmental sustainability. Increasingly, corporations and governments are required to follow all procedures and designs on the basis of a sound sustainability policy. Professionals in this area are necessary to design energy and environmental solutions keeping in mind the principles of sustainability. Individual courses in this domain address a few specific key aspects of this domain. The courses will equip engineers with tools and the background to approach sustainable design.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Environmental Quality Monitoring & Analysis	12 weeks	Prof. Ravi Krishna R	IIT Madras	103106162
Core 2	Non-Conventional Energy Resources	12 weeks	Prof. Prathap Haridoss	IIT Madras	121106014
	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems	12 Weeks	Prof. Vaibhav Vasant Goud Prof. R. Anandalakshmi	IIT Guwahati	103103206
Core 3	Basic Environmental Engineering and Pollution Abatement	12 weeks	Prof. P. Mondal	IIT Roorkee	103107215
Elective 1	Waste to Energy Conversion	8 weeks	Prof. P. Mondal	IIT Roorkee	103107125
Elective 2	Technologies for Clean and Renewable Energy Production	8 weeks	Prof. P. Mondal	IIT Roorkee	103107157
Elective 3	Energy Conservation and Waste Heat Recovery	12 weeks	Prof. Prasanta Kumar Das Prof. A Bhattacharya	IIT Kharagpur	112105221
Elective 4	Energy Economics and Policy	8 weeks	Prof. Shyamasree Dasgupta	IIT Mandi	109106161
Elective 5	Electrochemical Technology in Pollution Control	8 weeks	Prof. J. R. Mudakavi	IISc Bangalore	103108162
Elective 6	Biomass Conversion and Biorefinery	12 weeks	Prof. Kaustubha Mohanty	IIT Guwahati	103103207
Elective 7	Electrochemical Energy Storage	12 Weeks	Prof. Subhasish Basu Majumder	IIT Kharagpur	113105102
Elective 8	Physics of Renewable Energy Systems	12 Weeks	Prof. Amreesh Chandra	IIT Kharagpur	115105127
Elective 9	Physico-Chemical Processes for Wastewater Treatment	12 weeks	Prof. Vimal Chandra Srivastava	IIT Roorkee	103107212
Elective 10	Hydrogen Energy: Production, Storage, Transportation and Safety	12 weeks	Prof. Pratibha Sharma	IIT Bombay	103101215
Elective 11	Ecology and Environment	8 weeks	Prof. Abhijit Deshpande Prof. R. Ravi Krishna	IIT Madras	127106004
Elective 12	Energy Conversion Technologies (Biomass And Coal)	8 weeks	Prof. Vaibhav V. Goud	IIT Guwahati	103103222
Elective 13	Sustainable Power Generation Systems	12 weeks	Prof. Pankaj Kalita	IIT Guwahati	127103236
Elective 14	Sustainable Energy Technology	12 weeks	Prof. Sayak Banerjee	IIT Hyderabad	112106318
Elective 15	Energy Resources, Economics, and Sustainability	8 weeks	Prof. Pratham Arora	IIT Roorkee	109107397
Elective 16	Enhanced Oil Recovery Techniques	12 Weeks	Prof. Ajay Mandal	IIT (ISM) Dhanbad	103105460

Minor 2

(3 Core + 2 Elective) Minimum of 50 Weeks

Industrial processing of personal care products, foodstuffs, pharmaceuticals, agri-chemicals and transportation fuels are some examples of Chemical Engineering applications. Each of these applications involves a process, batch or continuous, encompassing several unit operations. This minor provides learnings related to design and control of the individual unit operations and the overall process.

The courses involve following areas:

Preliminary formulation of a process, and carrying out material and energy balances for a given set of operations

Basics of reaction engineering and phase equilibria

Process design, process control, and safety

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Basic Principles and Calculations in Chemical Engineering	12 weeks	Prof. Subrata Kumar Majumdar	IIT Guwahati	103103165
	Material & Energy Balance Computations	12 Weeks	Prof. Arnab Atta Prof. Rabibrata Mukherjee	IIT Kharagpur	103105209
Core 2	Chemical Reaction Engineering-I	12 weeks	Prof. Bishnupada Mandal	IIT Guwahati	103103153
Core 3	Chemical Engineering Thermodynamics	12 weeks	Prof. Jayant K Singh	IIT Kanpur	103104151
	Chemical Engineering Thermodynamics	12 weeks	Prof. Sasidhar Gumma	IIT Guwahati	103103144
	Chemical Engineering Thermodynamics - IITKGP	12 weeks	Prof. Gargi Das	IIT Kharagpur	103105127
Elective 1	Process Control - Design, Analysis and Assessment	12 weeks	Prof. Ragunathan Rengasamy	IIT Madras	103106148
Elective 2	Plant design and Economics	12 weeks	Prof. Debasis Sarkar	IIT Kharagpur	103105166
Elective 3	Chemical Process Safety	12 weeks	Prof. Shishir Sinha	IIT Roorkee	103107156
Elective 4	Process Equipment Design	12 weeks	Prof. Shabina Khanam	IIT Roorkee	103107207
Elective 5	Principles and Practices of Process Equipment and Plant Design	12 Weeks	Prof. Gargi Das Prof. S Ray	IIT Kharagpur	103105210
Elective 6	Chemical Process Utilities	12 weeks	Prof. Shishir Sinha	IIT Roorkee	103107211
Elective 7	Advanced Process Dynamics	12 weeks	Prof. Parag A. Deshpande	IIT Kharagpur	103105216
Elective 8	Chemical Process Technology	12 weeks	Prof. Tamal Banerjee	IIT Guwahati	103103217
Elective 9	Intelligent Feedback and Control	4 Weeks	Prof. Leena Vachhani	IIT Bombay	127101530

Minor 3

(3 Core + 2 Elective) Minimum of 50 Weeks

Industrial processing of personal care products, foodstuffs, pharmaceuticals, agri-chemicals and transportation fuels are some examples of Chemical Engineering applications. A generic process in these applications involves raw material handling, molecular transformations in the form of reactions and separations to obtain products and by-products. Each step in the process can be understood by analyzing equilibrium states, and transport phenomena associated with non-equilibrium states. This course provides an overview of thermodynamics and transport phenomena as the central aspects of Chemical Engineering Science.

The courses involve following areas:

Preliminary formulation of a process, and carrying out material and energy balances for a given set of operations
 Basics of reaction engineering and phase equilibria
 Transport phenomena, continuum mechanics and particle mechanics

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core1	Basic Principles and Calculations in Chemical Engineering	12 weeks	Prof. Subrata Kumar Majumdar	IIT Guwahati	103103165
	Material & Energy Balance Computations	12 Weeks	Prof. Arnab Atta Prof. Rabibrata Mukherjee	IIT Kharagpur	103105209
Core 2	Chemical Reaction Engineering-I	12 weeks	Prof. Bishnupada Mandal	IIT Guwahati	103103153
Core 3	Chemical Engineering Thermodynamics	12 weeks	Prof. Jayant K Singh	IIT Kanpur	103104151
	Chemical Engineering Thermodynamics	12 weeks	Prof. Sasidhar Gumma	IIT Guwahati	103103144
	Chemical Engineering Thermodynamics - IITKGP	12 weeks	Prof. Gargi Das	IIT Kharagpur	103105127
Elective 1	Transport Phenomena	12 weeks	Prof. Sunando DasGupta	IIT Kharagpur	103105128
	Continuum Mechanics and Transport Phenomena	12 weeks	Prof. T. Renganathan	IIT Madras	103106159
	Transport Processes	12 weeks	Prof. V Kumaran	IISc Bangalore	103108220
Elective 2	Fluid and Particle Mechanics	12 weeks	Prof. Madivala G. Basavaraj Prof. Sumesh P Thampi	IIT Madras	103106158
	Fundamental of Fluid Mechanics for Chemical and Biomedical Engineers	12 weeks	Prof. Raghvendra Gupta	IIT Guwahati	127103225
	Momentum Transfer in Fluids	12 weeks	Prof. Somenath Ganguly Prof. Sunando Dasgupta	IIT Kharagpur	103105353
Elective 3	Advanced Thermodynamics and Molecular Simulations	12 weeks	Prof. Prateek Kumar Jha	IIT Roorkee	103107208
Elective 4	Introduction to Interfacial Waves	12 Weeks	Prof. Ratul Dasgupta	IIT Bombay	103101209
Elective 5	Advanced process dynamics	12 weeks	Prof. Parag A. Deshpande	IIT Kharagpur	103105216
Elective 6	Advanced Reaction Engineering	12 weeks	Prof. Taraknath Das	IIT Roorkee	103107220
Elective 7	Fundamentals Of Statistical Thermodynamics	12 weeks	Prof. Nand Kishore	IIT Bombay	104101139
	Applied Statistical Thermodynamics	12 weeks	Prof. Tamal Banerjee	IIT Guwahati	103103355



Discipline

Civil Engineering

Domains

1. Construction Materials Technology
2. Structural Analysis
3. Structural Design
4. Environment

Construction Materials Technology

(4 Core + 2 Elective) Minimum of 60 Weeks

The application of materials science and chemistry to the understanding of construction materials has brought about a sea change in the way that such materials are processed and utilized. It is essential for a construction engineer to explore the fundamentals of material structure and properties, and understand the deterioration mechanisms that would affect the long term service life with such materials. The courses in this domain attempt to bring out these aspects at different levels - starting from a preliminary understanding of material characteristics, and developing into a closer look at the microstructure - chemistry - property relationships that control the behaviour of these materials. The emphasis is on concrete, which is the most widely used construction material. The course contents also explore the aspect of life cycle assessment, which has become central to the judicious selection of future technologies. The courses are aimed at preparing specialists in concrete technology, who can go on to make a major difference in the construction industry, which at present lacks such personnel. Thus, the domain is applicable to post graduate students as well as practicing engineers who have an interest in exploring material technology.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Concrete Technology	12 weeks	Prof. B. Bhattacharjee	IIT Delhi	105102012
Core 2	Advanced Concrete Technology	12 weeks	Prof. Manu Santhanam	IIT Madras	105106176
Core 3	Modern Construction Materials	12 weeks	Prof. Ravindra Gettu Prof. Piyush Chaunsali	IIT Madras	105106053
Core 4	Basic construction Materials	12 weeks	Prof. Manu Santhanam Prof. Radhakrishna G. Pillai	IIT Madras	105106206
Elective 1	Hydration, Porosity and Strength of Cementitious Materials	8 weeks	Prof. Sudhir Misra Prof. K. V. Harish	IIT Kanpur	105104157
Elective 2	Advanced Topics in the Science and Technology of Concrete	4 weeks	Prof. Ravindra Gettu Prof. Manu Santhanam	IIT Madras	105106187
Elective 3	Characterization of Construction Materials	12 weeks	Prof. Manu Santhanam Prof. Piyush Chaunsali	IIT Madras	105106200
Elective 4	Maintenance and Repair of Concrete Structures	12 weeks	Prof. Radhakrishna G. Pillai	IIT Madras	105106202
Elective 5	Sustainable Materials and Green Buildings	12 weeks	Prof. B Bhattacharjee	IIT Delhi	105102195
Elective 6	Building Materials and Composites	8 weeks	Prof. Sumana Gupta	IIT Kharagpur	124105013
Elective 7	Development and Applications of Special Concretes	8 weeks	Prof. Sudhir Misra	IIT Kanpur	105104206
Elective 8	Environmental Impact Assessment	12 weeks	Prof. Harshit Sosan Lakra	IIT Roorkee	124107160
Elective 9	Admixtures And Special Concretes	12 weeks	Prof. Manu Santhanam	IIT Madras	105106225
Elective 10	Building Materials as a Cornerstone to Sustainability	12 weeks	Prof. Iyer Vijayalaxmi Kasinath	School of Planning and Architecture Vijayawada	124106455

Structural Analysis

(4 Core + 2 Elective) Minimum of 60 Weeks

Structural analysis is a fundamental domain within civil engineering, focusing on understanding and predicting how structures respond to various loads and forces. This knowledge is critical for designing safe, stable, and efficient infrastructures such as buildings, bridges, and dams.

Key Concepts:

Loads and Forces: Study of different types of loads, including dead loads, live loads, wind loads, and seismic loads.

Stress and Strain: Analysis of how materials deform and respond under applied forces.

Structural Components: Examination of beams, columns, trusses, frames, and other elements.

Analytical Methods: Utilization of techniques like finite element analysis and matrix methods to predict structural behavior.

By completing these courses, candidates can earn a domain certificate in structural analysis from NPTEL. This certification not only validates their expertise but also enhances their professional credentials, opening up opportunities in civil engineering design, consulting, and project management.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Engineering Mechanics - Statics and Dynamics	8 weeks	Prof. Anubhab Roy	IIT Madras	112106180
Core 2	Mechanics of Solids	12 weeks	Prof. Priyanka Ghosh	IIT Kanpur	105104160
Core 3	Structural Analysis - I	12 weeks	Prof. Amit Shaw	IIT Kharagpur	105105166
Core 4	Matrix Method of Structural Analysis	8 weeks	Prof. Amit Shaw Prof. Biswanath Banerjee	IIT Kharagpur	105105180
Core 5	Structural Dynamics	12 weeks	Prof. Ramancharala Pradeep Kumar	IIT Hyderabad	105106151
	Dynamics of Structures	12 Weeks	Prof. Manish Kumar	IIT Bombay	105101209
Core 6	Strength Of Materials - IITM	12 weeks	Prof. K. Ramesh	IIT Madras	112106319
Elective 1	Mechanics of Materials	12 weeks	Prof. U. Saravanan	IIT Madras	105106172
	Theory of Elasticity	12 weeks	Prof. Amit Shaw Prof. Biswanath Banerjee	IIT Kharagpur	105105177
Elective 2	Stability of Structures	To Be Developed	-	-	-
Elective 3	Finite Element Method and Computational Structural Dynamics	12 weeks	Prof. Manish Shrikhande	IIT Roorkee	105107209
Elective 4	Soil Structure Interaction	12 weeks	Prof. Koushik Deb	IIT Kharagpur	105105200
Elective 5	Advanced Soil Mechanics	12 weeks	Prof. Sreedeep S	IIT Guwahati	105103207
Elective 6	Elastic Stability of Structures	12 weeks	Prof. Sarat Kumar Panda	IIT-ISM	105105217
Elective 7	Geotechnical Earthquake Engineering	12 weeks	Prof. Kousik Deb	IIT Kharagpur	105105224

Structural Design

(4 Core + 2 Elective) Minimum of 60 Weeks

Structural design is a critical domain within civil engineering that involves creating safe, efficient, and resilient structures. It encompasses the principles and methodologies required to design buildings, bridges, towers, and other infrastructures that can withstand various loads and environmental conditions.

Key Concepts

Load Analysis: Determining the forces and loads that structures must support, including dead loads, live loads, wind loads, and seismic loads.

Material Selection: Choosing appropriate materials (e.g., concrete, steel, timber) based on strength, durability, and cost-effectiveness.

Design Principles: Applying engineering principles to create designs that ensure safety, stability, and functionality.

Code Compliance: Adhering to local and international building codes and standards.

Candidates can earn a domain certificate in structural design from NPTEL by completing these courses. This certification not only demonstrates their expertise but also enhances their professional profile, making them more competitive in the job market.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Engineering Mechanics - Statics and Dynamics	8 weeks	Prof. Anubhab Roy	IIT Madras	112106180
Core 2	Mechanics of Solids	12 weeks	Prof. Priyanka Ghosh	IIT Kanpur	105104160
Core 3	Structural Analysis - I	12 weeks	Prof. Amit Shaw	IIT Kharagpur	105105166
Core 4	Design of reinforced concrete structures	12 weeks	Prof. Nirjhar Dhang	IIT Kharagpur	105105105
Core 5	Design of Steel Structures	12 weeks	Prof. Damodar Maiti	IIT Kharagpur	105105162
Elective 1	Design of Masonry Structures	12 weeks	Prof. Arun Menon	IIT Madras	105106197
Elective 2	Wind and earthquake analysis and design	To Be Developed	-	-	-
Elective 3	Prestressed concrete	To Be Developed	-	-	-
Elective 4	Bridge Engineering	12 weeks	Prof. Piyali Sengupta	IIT-ISM	105105216
Elective 5	Retrofitting and Rehabilitation of Civil Infrastructure	12 weeks	Prof. Swati Maitra prof. Sriram Kumar Bhattacharyya	IIT Kharagpur	105105213
Elective 6	Design of connections in steel structures	4 weeks	Prof. Anil Agarwal	IIT Hyderabad	105106216
Elective 7	Geotechnical Earthquake Engineering	12 weeks	Prof. Kousik Deb	IIT Kharagpur	105105224
Elective 8	Earth Sciences for Civil Engineering (Hindi)	8 weeks	Prof. Javed N Malik	IIT Kanpur	105104224
Elective 9	Advanced Reinforced Concrete Design	12 weeks	Prof. S. Suriya Prakash	IIT Hyderabad	105106224

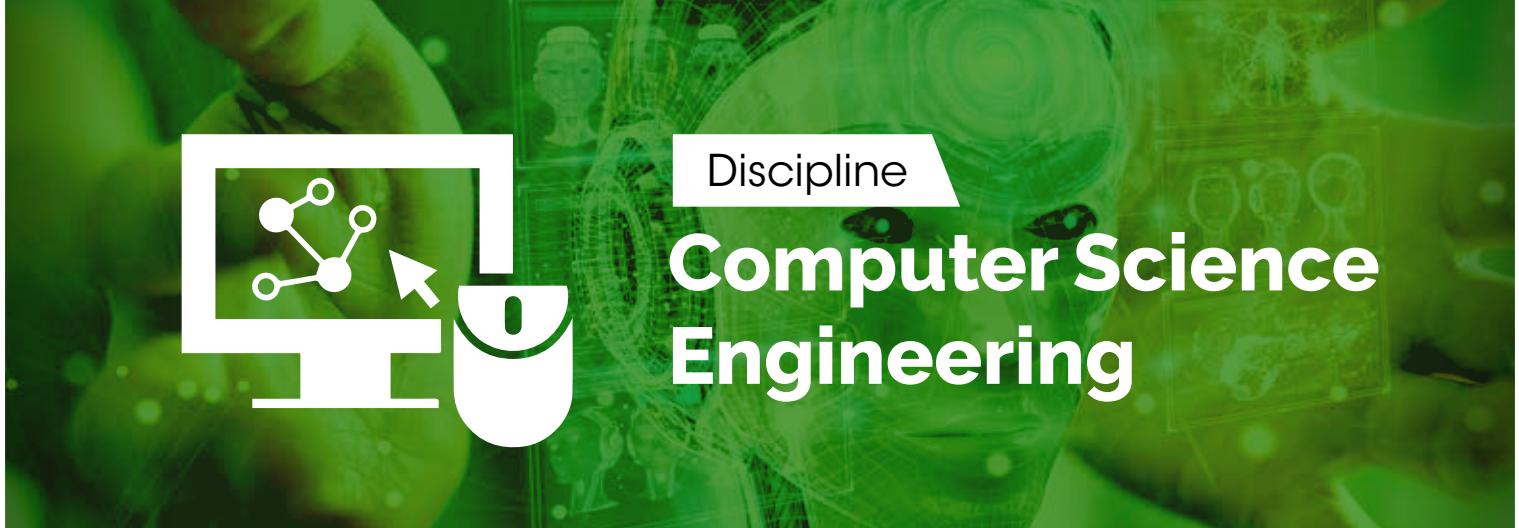
Environment

(5 Core + 1 Elective) Minimum of 60 Weeks

Environmental science and engineering is rapidly expanding in scale and in professional scope. Professionals in this field still have primary responsibility for air pollution controls and water and wastewater treatment, however the field now encompasses tremendous workforce aspects in water resource management, remediation and environmental protection; solid waste management; industrial/institutional environmental management; and even overall 'sustainability' aspects of our greater society. Some of the newer specific topics of this field include environmental risk assessments (including fate and transport) of new generation of pollutants and industrial products, sustainable remediation technologies, including Bio-Remediation techniques, greenhouse gases and climate change issues, resource recovery, life cycle analysis, energy and environment among others.

Through the list of courses being offered as part of this domain, a student can enrich their knowledge and skills in the emerging areas of environmental management. The set of courses included will help the participant to acquire all the tools for the betterment of their career in this subject area, whether they are looking for a job in industry as a consultant, regulator, city/municipal engineers or pursuing further research and academic career. Based on present global conditions, there is a good demand of environmental professional and this certification program will be helpful to a student in this regard.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Applied Environmental Microbiology	12 weeks	Prof. Gargi Singh	IIT Roorkee	105107173
Core 2	Environmental Engineering- Chemical Processes	12 weeks	Prof. Bhanu Prakash Vellanki	IIT Roorkee	105107176
Core 3	Integrated Waste Management for a Smart City	12 weeks	Prof. Brajesh Kumar Dubey	IIT Kharagpur	105105160
Core 4	Sustainable Engineering Concepts And Life Cycle Analysis	8 weeks	Prof. Brajesh Kumar Dubey	IIT Kharagpur	105105157
Core 5	Wastewater Treatment and Recycling	12 weeks	Prof. Manoj Kumar Tiwari	IIT Kharagpur	105105178
	Water and Waste Water Treatment	12 weeks	Prof. Bhanu Prakash Vellanki	IIT Roorkee	105107207
Core 6	Air pollution and Control	12 weeks	Prof. Bhola Ram Gurjar	IIT Roorkee	105107213
Elective 1	Electronic Waste Management - Issues And Challenges	4 weeks	Prof. Brajesh Kumar Dubey	IIT Kharagpur	105105169
Elective 2	Energy Efficiency, Acoustics and Daylighting in Building	12 weeks	Prof. B. Bhattacharjee	IIT Delhi	105102175
Elective 3	Environmental Remediation of Contaminated Sites	12 weeks	Prof. Bhanu Prakash Vellanki	IIT Roorkee	105107181
Elective 4	Sustainable River Basin Management	8 weeks	Prof. Franziska Steinbruch	IIT Madras	105106145
Elective 5	Plastic Waste Management	8 weeks	Prof. Brajesh Kumar Dubey	IIT Kharagpur	105105184
Elective 6	Geographic Information Systems	12 weeks	Prof. Arun K. Saraf	IIT Roorkee	105107206
Elective 7	Remote Sensing: Principles and Applications	12 weeks	Prof. Eswar Rajasekaran	IIT Bombay	105101206
Elective 8	Environmental Impact Assessment	12 weeks	Prof. Harshit Sosan Lakra	IIT Roorkee	124107160
Elective 9	Microwave Remote Sensing in Hydrology	12 weeks	Prof. J. Indu	IIT Bombay	105101213
Elective 10	Groundwater Hydrology and Management	12 weeks	Prof. Pennan Chinnasamy	IIT Bombay	105101214
Elective 11	Rural Water Resources Management	12 weeks	Prof. Pennan Chinnasamy	IIT Bombay	105101215
Elective 12	Environmental Science	12 weeks	Prof. Samik Chowdhury Prof. Sudha Goel	IIT Kharagpur	109105203



Domains

1. Artificial Intelligence
2. Data Science
3. Programming
4. Foundations of Computing
5. Systems

Artificial Intelligence

(4 Core + 2 Elective) Minimum of 60 Weeks

The AI domain includes courses in artificial intelligence and machine learning. This set of courses introduce the learner to tools that would go into building intelligent agents, including the ability to solve problems, represent and reason about the agent's environment, learning from data, implementing neural networks, and being able to handle text and images.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Artificial Intelligence : Search Methods For Problem solving	12 weeks	Prof. Deepak Khemani	IIT Madras	106106226
	An Introduction to Artificial Intelligence	12 weeks	Prof. Mausam	IIT Delhi	106102220
Core 2	Artificial Intelligence: Knowledge Representation and Reasoning	12 weeks	Prof. Deepak Khemani	IIT Madras	106106140
Core 3	Programming, Data Structures and Algorithms in Python	8 weeks	Prof. Madhavan Mukund	Chennai Mathematical Institute	106106145
	Python for Data Science	4 weeks	Prof. Ragunathan Rengasamy	IIT Madras	106106212
Core 4	Introduction to Machine Learning- IIT KGP	8 weeks	Prof. Sudeshna Sarkar	IIT Kharagpur	106105152
	Introduction to Machine Learning	12 weeks	Prof. Balaraman Ravindran	IIT Madras	106106139
Elective 1	Deep Learning	12 weeks	Prof. Sudarshan Iyengar	IIT Ropar	106106184
	Deep Learning	12 weeks	Prof. Prabir Kumar Biswas	IIT Kharagpur	106105215
	Deep Learning for Computer Vision	12 weeks	Prof. Vineeth N Balasubramanian	IIT Hyderabad	106106224
Elective 2	Reinforcement Learning	12 weeks	Prof. Balaraman Ravindran	IIT Madras	106106143
Elective 3	AI:Constraint Satisfaction	8 weeks	Prof. Deepak Khemani	IIT Madras	106106158
Elective 4	Computer Vision	12 weeks	Prof. Jayanta Mukhopadhyay	IIT Kharagpur	106105216
Elective 5	Natural Language Processing	12 weeks	Prof. Pawan Goyal	IIT Kharagpur	106105158
	Applied Natural Language Processing	12 weeks	Prof. Ramaseshan R	Chennai Mathematical Institute	106106211
Elective 6	Practical Machine Learning with Tensorflow	8 weeks	Prof. Ashish Tendulkar Prof. Balaraman Ravindran	IIT Madras & Google	106106213
Elective 7	Affective Computing	12 weeks	Prof. Jainendra Shukla Prof. Abhinav Dhall	IIT Delhi	106106244
Elective 8	Games and Information	12 weeks	Prof. Ankur A. Kulkarni	IIT Bombay	106101360
Elective 9	Responsible & Safe AI Systems	12 Weeks	Prof. Ponnurangam Kumaraguru Prof. Balaraman Ravindran Prof. Arun Rajkumar	IIIT Hyderabad IIT Madras	106106472

Data Science

(3 Core + 3 Elective) Minimum of 60 Weeks

The Data Science domain includes courses that contribute to implementing programs that can handle and make sense of large amounts of data. The focus is on machine learning techniques to help make sense of data, often dealing with text and images, but there is also possible exposure to symbolic artificial intelligence methods.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Python for Data Science	4 weeks	Prof. Ragunathan Rengasamy	IIT Madras	106106212
	Programming, Data Structures and Algorithms in Python	8 weeks	Prof. Madhavan Mukund	Chennai Mathematical Institute	106106145
Core 2	Introduction to Data Analytics	8 weeks	Prof. Nandan Sudarsanam Prof. Balaraman Ravindran	IIT Madras	110106072
	Data Science for Engineers	8 weeks	Prof. Ragunathan Rengasamy Prof. Shankar Narasimhan	IIT Madras	106106179
	Data Analytics with Python	12 weeks	Prof. A. Ramesh	IIT Roorkee	106107220
Core 3	Introduction to Machine Learning - IIT KGP	8 weeks	Prof. Sudeshna Sarkar	IIT Kharagpur	106105152
	Introduction to Machine Learning	12 weeks	Prof. Balaraman Ravindran	IIT Madras	106106139
Elective 1	Deep Learning	12 weeks	Prof. Sudarshan Iyengar	IIT Ropar	106106184
	Deep Learning	12 weeks	Prof. Prabir Kumar Biswas	IIT Kharagpur	106105215
	Deep Learning for Computer Vision	12 weeks	Prof. Vineeth N Balasubramanian	IIT Hyderabad	106106224
Elective 2	Reinforcement Learning	12 weeks	Prof. Balaraman Ravindran	IIT Madras	106106143
Elective 3	Artificial Intelligence : Search Methods For Problem Solving	12 weeks	Prof. Deepak Khemani	IIT Madras	106106226
	An Introduction to Artificial Intelligence	12 weeks	Prof. Mausam	IIT Delhi	106102220
Elective 4	Artificial Intelligence: Knowledge Representation and Reasoning	12 weeks	Prof. Deepak Khemani	IIT Madras	106106140
Elective 5	Computer Vision	12 weeks	Prof. Jayanta Mukhopadhyay	IIT Kharagpur	106105216
Elective 6	Natural Language Processing	12 weeks	Prof. Pawan Goyal	IIT Kharagpur	106105158
	Applied Natural Language Processing	12 weeks	Prof. Ramaseshan R	Chennai Mathematical Institute	106106211
Elective 7	Practical Machine Learning with Tensorflow	8 weeks	Prof. Ashish Tendulkar Prof. Balaraman Ravindran	IIT Madras & Google	106106213
Elective 8	Learning Analytics Tools	12 weeks	Prof. Ramkumar Rajendran	IIT Bombay	106101224
Elective 9	Probability for Computer Science	8 Weeks	Prof. Nitin Saxena	IIT Kanpur	106104233
Elective 10	Linear Programming and its Applications to Computer Science	8 weeks	Prof. Rajat Mittal	IIT Kanpur	106104356
Elective 11	Games and Information	12 weeks	Prof. Ankur A. Kulkarni	IIT Bombay	106101360
Elective 12	Business Intelligence & Analytics	12 weeks	Prof. Saji K Mathew	IIT Madras	106106361
Elective 13	Advanced R Programming for Data Analytics in Business	12 Weeks	Prof. Abhinava Tripathi	IIT Kanpur	110104513

Programming

(4 Core + 2 Elective) Minimum of 60 Weeks

The Programming domain lays emphasis on the tools needed to implement application software systems. Starting with programming fundamentals one moves on to databases, and then there options to study cloud computing, internet of things, machine learning and data science.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Programming, Data Structures and Algorithms in Python	8 weeks	Prof. Madhavan Mukund	Chennai Mathematical Institute	106106145
	Data Structure and Algorithms using Java	12 Weeks	Prof. Debasis Samanta	IIT Kharagpur	106105225
Core 2	Programming in C++	8 weeks	Prof. Partha Pratim Das	IIT Kharagpur	106105151
	Programming in Modern C++	12 weeks	Prof. Partha Pratim Das	IIT Kharagpur	106105234
	An Introduction to Programming through C++	12 weeks	Prof. Abhiram G Ranade	IIT Bombay	106101208
Core 3	Programming in Java	12 weeks	Prof. Debasis Samanta	IIT Kharagpur	106105191
	Object Oriented System Development using UML, Java and Patterns	12 weeks	Prof. Rajib Mall	IIT Kharagpur	106105224
Core 4	Database Management System	8 weeks	Prof. Partha Pratim Das Prof. Samiran Chattopadhyay	IIT Kharagpur	106105175
	Introduction to Database Systems	12 weeks	Prof. Sreenivasa Kumar	IIT Madras	106106220
Elective 1	Data Science for Engineers	8 weeks	Prof. Ragunathan Rengasamy, Prof. Shankar Narasimhan	IIT Madras	106106179
Elective 2	Cloud Computing	12 weeks	Prof. Sourya Kanti Ghosh	IIT Kharagpur	106105167
Elective 3	Introduction to Internet of Things	12 weeks	Prof. Sudip Misra	IIT Kharagpur	106105166
Elective 4	Introduction to Machine Learning - IIT KGP	8 weeks	Prof. Sudeshna Sarkar	IIT Kharagpur	106105152
	Introduction to Machine Learning	12 weeks	Prof. Balaraman Ravindran	IIT Madras	106106139
Elective 5	Modern Application Development	12 weeks	Prof. Aamod Sane Prof. Abhijat Vichare Prof. Madhavan Mukund	Persistent Computing Systems & CMI	106106222



Foundations of Computing

(4 Core + 2 Elective) Minimum of 60 Weeks

The Foundations domain looks at the theoretical foundations of computing. Starting with the mathematics related to computing, one moves on to the study of algorithms and their associated complexity. One has options to further study graphs formally, parallel algorithms, logic and computational geometry.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Discrete Mathematics	12 weeks	Prof.Sourav Chakraborty	Chennai Mathematical Institute	111106086
	Discrete Mathematics	12 weeks	Prof. Sudarshan Iyengar	IIT Ropar	106106183
	Discrete Mathematics	12 weeks	Prof. Sajith Gopalan Prof. Benny George K	IIT Guwahati	106103205
	Discrete Mathematics - IIITB	12 weeks	Prof. Ashish Choudhury	IIIT Bangalore	106108227
Core 2	Design and Analysis of Algorithms	8 weeks	Prof. Madhavan Mukund	Chennai Mathematical Institute	106106131
Core 3	Programming, Data Structures and Algorithms in Python	8 weeks	Prof. Madhavan Mukund	Chennai Mathematical Institute	106106145
Core 4	Theory of Computation	8 weeks	Prof. Raghunath Tewari	IIT Kanpur	106104148
Core 5	Introduction to Graph Algorithms	8 Weeks	Prof. C Pandu Rangan	IISc Bangalore	106108468
Elective 1	Randomized Algorithms	12 weeks	Prof. Benny George K	IIT Guwahati	106103187
Elective 2	Parallel Algorithms	12 weeks	Prof. Sajith Gopalan	IIT Guwahati	106103188
Elective 3	Modern Algebra	8 weeks	Prof. Manindra Agrawal	IIT Kanpur	106104149
Elective 4	Graph Theory	8 weeks	Prof. Soumen Maity	IISER PUNE	111106102
Elective 5	Computational Geometry	12 weeks	Prof. Amit Kumar	IIT Delhi	106102011
Elective 6	Arithmetic Circuit Complexity	12 weeks	Prof. Nitin Saxena	IIT Kanpur	106104221
Elective 7	Foundations of Cryptography	12 weeks	Prof. Ashish Choudhury	IIIT Bangalore	106106221
Elective 8	Computer Graphics	8 weeks	Prof. Samit Bhattacharya	IIT Guwahati	106103224
Elective 9	Computational Complexity Theory	12 weeks	Prof. Raghunath Tewari	IIT Kanpur	106104227
	Computational Complexity	12 Weeks	Prof. Subrahmanyam Kalyanasundaram	IIT Hyderabad	106106229
Elective 10	Mathematical Logic	To Be Developed	-	-	-
Elective 11	Secure Computation: Part I	12 Weeks	Prof. Ashish Choudhury	IIIT Bangalore	106108229
Elective 12	Parameterized Algorithms	12 Weeks	Prof. Neeldhara Misra Prof. Saket Saurabh	IIT Gandhinagar IMSC	106106230
Elective 13	Probability for Computer Science	8 Weeks	Prof. Nitin Saxena	IIT Kanpur	106104233
Elective 14	Computational Arithmetic - Geometry for Algebraic Curves	12 Weeks	Prof. Nitin Saxena	IIT Kanpur	106104469
Elective 15	Approximation Algorithm	12 weeks	Prof. Palash Dey	IIT Kharagpur	106105471
Elective 16	Linear Algebra Through Geometry	12 Weeks	Prof. M Krishna Kumar Prof. Ashok Rao Prof. Arulalan M R	IISc Bangalore and NITK	106104233

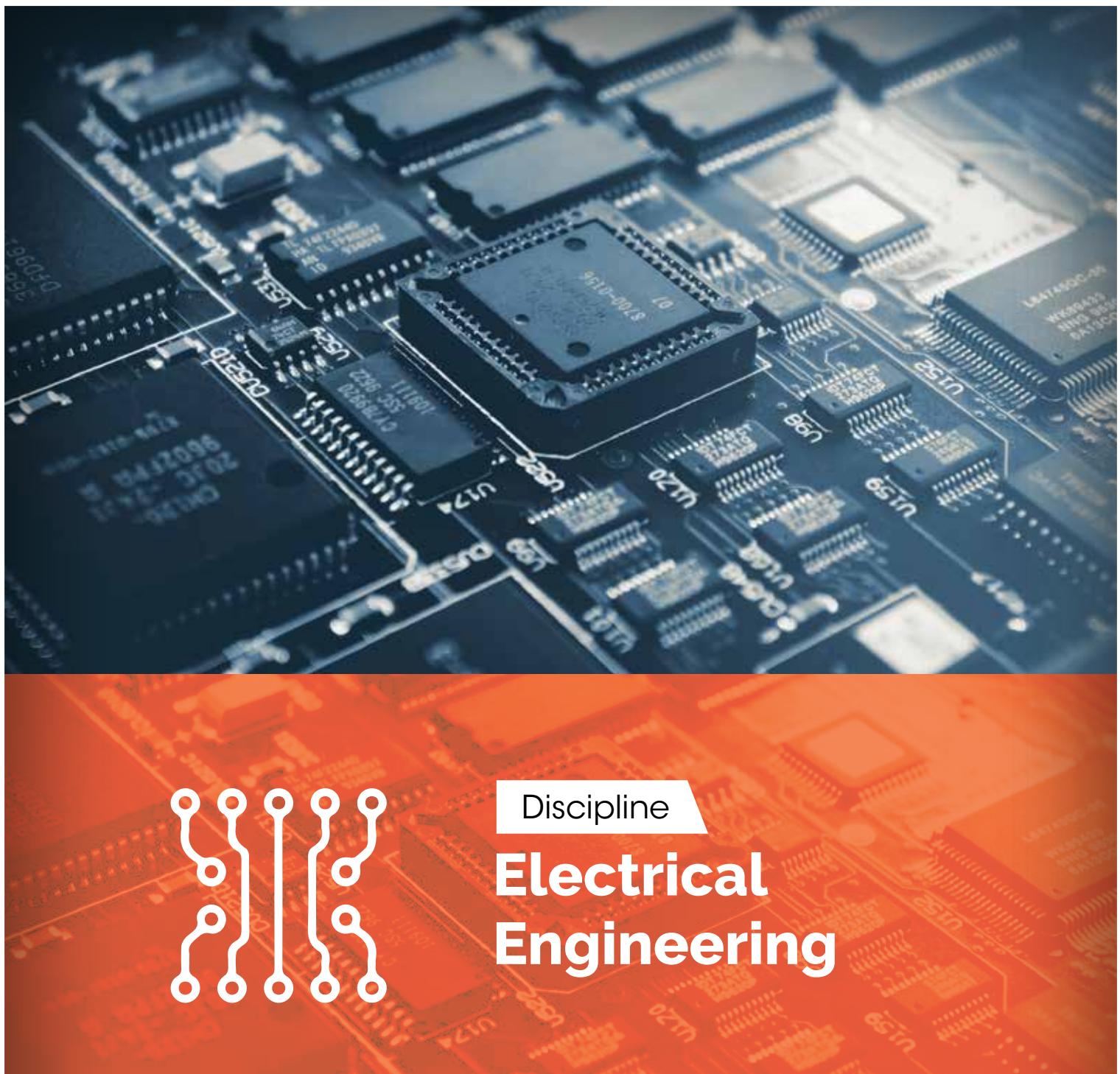


Systems

(4 Core + 2 Elective) Minimum of 60 Weeks

The Systems domain is concerned with innerware, that makes the application software relate to the hardware. The core subjects are compilers, operating systems, databases and networks. There are opportunities to learn cryptography and security, internet of things, cloud computing, and multicore systems.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Compiler Design	12 weeks	Prof. Santanu Chattopadhyay	IIT Kharagpur	106105190
Core 2	Introduction to Operating Systems	8 weeks	Prof. Chester Rebeiro	IIT Madras	106106144
	Operating System	12 weeks	Prof. Sorav Bansal	IIT Delhi	106102132
	Operating System Fundamentals	12 weeks	Prof. Santanu Chattopadhyay	IIT Kharagpur	106105214
Core 3	Computer Networks and Internet Protocol	12 weeks	Prof. Soumya Kanti Ghosh Prof. Sandip Chakraborty	IIT Kharagpur	106105183
Core 4	Introduction to Database Systems	12 weeks	Prof. Sreenivasa Kumar	IIT Madras	106106220
Elective 1	Cloud Computing	12 weeks	Prof. Soumya Kanti Ghosh	IIT Kharagpur	106105167
Elective 2	Information Security - 5 - Secure Systems Engineering	8 weeks	Prof. Chester Robeiro	IIT Madras	106106199
Elective 3	Introduction to Parallel Programming in OpenMP	4 weeks	Prof. Yogish Sabharwal	IIT Delhi	106102163
Elective 4	Introduction to Internet of Things	12 weeks	Prof. Sudip Misra	IIT Kharagpur	106105166
Elective 5	Multi-Core Computer Architecture-Storage and Interconnects	8 weeks	Prof. John Jose	IIT Guwahati	106103183
Elective 6	Cryptography and Network Security	12 weeks	Prof. Sourav Mukhopadhyay	IIT Kharagpur	106105162
Elective 7	Advanced Computer Architecture	8 weeks	Prof. John Jose	IIT Guwahati	106103206
	Advanced Computer Architecture	12 Weeks	Prof. Smruti R. Sarangi	IIT Delhi	106102229
Elective 8	Ethical Hacking	12 weeks	Prof. Indranil Sengupta	IIT Kharagpur	106105217
Elective 9	Introduction to Blockchain Technology and Applications	8 weeks	Prof. Sandeep Shukla	IIT Kanpur	106104220
	Blockchain Architecture Design and Use Cases	12 weeks	Prof. Sandip Chakraborty Prof. Praveen Jayachandran	IIT Kharagpur IBM	106105184
Elective 10	GPU Architectures and Programming	12 weeks	Prof. Soumyajit Dey	IIT Kharagpur	106105220
Elective 11	C-Based VLSI Design	12 Weeks	Prof. Chandan Karfa	IIT Guwahati	106103229
Elective 12	Real-Time Systems	12 Weeks	Prof. Rajib Mall Prof. Durga Prasad Mohapatra	IIT Kharagpur	106105229
Elective 13	Introduction to Computer and Network Performance Analysis using Queuing Systems	4 weeks	Prof. Varsha Apte	IIT Bombay	106101238
Elective 14	Foundation of Cloud IoT Edge ML	8 weeks	Prof. Rajiv Misra	IIT Patna	106104242
Elective 15	Design and Engineering of Computer Systems	8 weeks	Prof. Mythili Vutukuru	IIT Bombay	106101234
Elective 16	Practical Cyber Security for Cyber Security Practitioners	12 Weeks	Prof. Sandeep K. Shukla	IIT Kanpur	106104467



Discipline

Electrical Engineering

Domains

1. VLSI design
 2. Communication and Signal Processing
 3. Power Systems and Power Electronics
 4. Control and Instrumentation
 5. Photonics

VLSI design

(4 Core + 2 Elective) Minimum of 60 Weeks

VLSI Design: There is little that one can do with just device physics and semiconductor models in order to build a full-fledged microprocessor. Various levels of abstraction are necessary to ensure quick design and turn around time. A Register Transfer Logic (RTL) level abstraction allows large designs to be written in a behavioral manner through Hardware Description Languages (HDL) such as Verilog and VHDL. Translating this to a design that can be manufactured in a semiconductor foundry requires a lot of automation that is covered under the umbrella of Electronic Design Automation (EDA), where a behavioral model is synthesized, placed, and routed to obtain a layout that can be manufactured. This is the only way a microprocessor with 8 billion transistors can be manufactured! A high level of automation comes with the caveat of not being as efficient in terms of performance and area. A VLSI design engineer is expected to understand the caveats of such an automation flow and identify performance-critical blocks that can be handcrafted to meet the specifications. This requires knowledge of how a CMOS transistor responds to the applied terminal voltages and what kind of current flows through it. Dealing with extreme voltage levels (0 and VDD)

Application: Most cool electronic gadgets that you see today have a significant amount of VLSI in them.

Intended Audience: Any curious Engineer who has done basic courses on Basic Circuit Theory, Signals and Systems, Network Analysis, and Control Systems can take up this domain.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Basic Electrical Circuits	12 weeks	Prof. Gajendranath Chowdary	IIT Madras	117106108
	Basic Electric Circuits	12 weeks	Prof. Ankush Sharma	IIT Kanpur	108104139
	Network Analysis	12 weeks	Prof. Tapas Kumar Bhattacharya	IIT Kharagpur	108105159
Core 2	Analog Circuits	12 weeks	Prof. Nagendra Krishnapura	IIT Madras	108106084
	Analog Electronic Circuit	12 weeks	Prof. Shouribrata Chatterjee	IIT Delhi	108102112
	Analog Circuits	8 weeks	Prof. Jayanta Mukherjee	IIT Bombay	108101094
	Analog Electronic Circuits	12 weeks	Prof. Pradip Mandal	IIT Kharagpur	108105158
	Microelectronics: Devices to Circuits	12 weeks	Prof. Sudeb Dasgupta	IIT Roorkee	108107142
Core 3	Digital Electronic Circuits	12 weeks	Prof. Goutam Saha	IIT Kharagpur	108105132
	Digital Circuits	12 weeks	Prof. Santanu Chattopadhyay	IIT Kharagpur	108105113
Core 4	Fundamentals of Semiconductor Devices	12 weeks	Prof. Digbijoy N. Nath	IISc Bangalore	108108122
	Semiconductor Devices and Circuits	12 weeks	Prof. Sanjiv Sambandan	IISc Bangalore	108108112
	Introduction to Semiconductor Devices	12 Weeks	Prof. Naresh Kumar Emani	IIT Hyderabad	108106181
Core 5	Microprocessors and Microcontrollers	12 weeks	Prof. Santanu Chattopadhyay	IIT Kharagpur	108105102
Core 6	Analog Electronic Circuits - IITM	12 weeks	Prof. Shanthi Pavan	IIT Madras	108106188
Core 7	Analog VLSI Design	12 weeks	Prof. Imon Mondal	IIT Kanpur	108104193
Core 8	Power Electronics with Wide Band Gap Devices	12 Weeks	Prof. Moumita Das	IIT Mandi	108106480
Core 9	Analog Circuits and Systems	8 Weeks	Prof. K Radhakrishna Rao	IITM/ TI/ Freelancer	117108486
Elective 1	Hardware Modeling using Verilog	8 weeks	Prof. Indranil Sengupta	IIT Kharagpur	106105165
Elective 2	VLSI Physical Design	12 weeks	Prof. Indranil Sengupta	IIT Kharagpur	106105161
Elective 3	Mapping Signal Processing Algorithms to Architectures	12 weeks	Prof. Nitin Chandrachoodan	IIT Madras	108106149
Elective 4	Digital IC Design	12 weeks	Prof. Janakiraman	IIT Madras	108106158
Elective 5	Power Management Integrated Circuits	12 weeks	Prof. Qadeer Ahmad Khan	IIT Madras	108106159

VLSI design

(4 Core + 2 Elective) Minimum of 60 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 6	Microprocessors and Interfacing	12 weeks	Prof. Shaik Rafi Ahamed	IIT Guwahati	108103157
Elective 7	Introduction to Time - Varying Electrical Networks	12 weeks	Prof. Shanthi Pavan	IIT Madras	108106174
Elective 8	System Design Through VERILOG	8 weeks	Prof. Shaik Rafi Ahamed	IIT Guwahati	108103179
Elective 9	Circuit Analysis for Analog Designers	12 weeks	Prof. Shanthi Pavan	IIT Madras	117106148
Elective 10	Design and Analysis of VLSI Subsystems	12 weeks	Prof. Madhav Rao	IIT Bangalore	117106149
Elective 11	Physics of Nanoscale Devices	12 weeks	Prof. Vishvendra Singh Poonia	IIT Roorkee	117107149
Elective 12	Phase-Locked Loops	12 weeks	Prof. Saurabh Saxena	IIT Madras	108106184
Elective 13	VLSI Interconnects	8 weeks	Prof. Sarang Pendharker	IIT Kharagpur	108105187
Elective 14	Semiconductor Device Modeling and Simulation	12 weeks	Prof. Vivek Dixit	IIT Kharagpur	108105188
Elective 15	VLSI Design Flow: RTL to GDS	12 weeks	Prof. Sneh Saurabh	IIT Delhi	108106191
Elective 16	Integrated Circuits and Applications	12 weeks	Prof. Shaik Rafi Ahamed	IIT Guwahati	108103378
Elective 17	RF Transceiver Design	12 weeks	Prof. Darshak Bhatt	IIT Roorkee	108107379
Elective 18	VLSI Physical Design with Timing Analysis	12 weeks	Prof. Bishnu Prasad Das	IIT Roorkee	108107380
Elective 19	Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software	12 Weeks	Prof. Ankur Gupta	IIT Delhi	108102481
Elective 20	Low Voltage CMOS Circuit Operation	8 Weeks	Prof. Anand Bulusu	IIT Roorkee	117107485
Elective 21	Thin Film Technology	12 Weeks	Prof. Samit K Ray	IIT Kharagpur	127105531

Communication and Signal Processing

(4 Core + 2 Elective) Minimum of 60 Weeks

Modern signal processing techniques have wide-ranging applications in diverse areas such as Telecommunications, Audio/Speech processing, Medical, Defense and Power systems. On the other hand, the recent revolution in Telecommunication that has led to the development of 4G/ 5G cellular networks, Wi-Fi, Bluetooth and other technologies, has been possible only due to advances in the theory of communication. This domain of communication and signal processing aims to systematically introduce learners to the various theoretical and practical aspects of these technologies. It comprises of several courses beginning with the fundamental principles pertaining to signal processing and communication, and progressively covering more advanced and latest breakthrough technologies in these areas. The domain is self-contained and includes dedicated courses on linear algebra and probability, which are prerequisites for the advanced level courses. Furthermore, students will also find the various courses and domain knowledge helpful in their preparation for competitive exams and interviews.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Principles of Signals and Systems	12 weeks	Prof. Aditya K Jagannathan	IIT Kanpur	108104100
	Signals and Systems	12 weeks	Prof. Hitesh Shrimali Prof. Kushal K. Shah	IIT Mandi	108106163
Core 2	Digital Signal Processing	12 weeks	Prof. C. S. Ramalingam	IIT Madras	108106151
	Discrete Time Signal Processing	8 weeks	Prof. Mrityunjoy Chakraborty	IIT Kharagpur	117105134
	Digital Signal Processing and its Applications	12 weeks	Prof. V. M. Gadre	IIT Bombay	108101174
Core 3	Probability Foundations for Electrical Engineers	12 weeks	Prof. Andrew Thangaraj Prof. R. Aravind E E	IIT Madras	108106106
Core 4	Principles of Communication Systems - I	12 weeks	Prof. Aditya K Jagannatham	IIT Kanpur	108104091
Core 5	Principles of Communication Systems: Part - II	8 weeks	Prof. Aditya K. Jagannatham	IIT Kanpur	108104098
	Principles of Digital Communications	12 weeks	Prof. Abhishek Dixit	IIT Delhi	108102120
	Principles of Digital Communications	12 weeks	Prof. S. N. Merchant	IIT Bombay	108101113
Core 6	Applied Linear Algebra	12 weeks	Prof. Andrew Thangaraj	IIT Madras	108106171
Core 7	Communication Networks	12 weeks	Prof. Gautam Das	IIT Kharagpur	117105148
Core 8	Signal Processing Techniques and its Applications	12 weeks	Prof. Shyamal Das Mandal	IIT Kharagpur	117105149
Elective 1	An Introduction to Information Theory	8 weeks	Prof. Adrish Banerjee	IIT Kanpur	117104129
	An Introduction to Coding Theory	8 weeks	Prof. Adrish Banerjee	IIT Kanpur	108104092
	Information Theory	12 weeks	Prof. Himanshu Tyagi	IISc Bangalore	108108168
Elective 2	Introduction to Wireless and Cellular Communications	12 weeks	Prof. David Koilpillai	IIT Madras	106106167
Elective 3	Digital Image Processing	12 weeks	Prof. Prabir Kumar Biswas	IIT Kharagpur	117105135
	Image Signal Processing	12 weeks	Prof. A. N. Rajagopalan	IIT Madras	108106168
Elective 4	Multirate DSP	12 weeks	Prof. David Koilpillai	IIT Madras	108106136
Elective 5	Principles and Techniques of Modern Radar Systems	12 weeks	Prof. Amitabha Bhattacharya	IIT Kharagpur	108105154
Elective 6	Statistical Signal Processing	12 weeks	Prof. Prabin Kumar Bora	IIT Guwahati	108103158
Elective 7	Stochastic Modeling and the Theory of Queues	12 weeks	Prof. Krishna Jagannathan	IIT Madras	108106179
Elective 8	Signal Processing for mm Wave communication for 5G and beyond	12 weeks	Prof. Amit Kumar Dutta	IIT Kharagpur	108105179

Communication and Signal Processing

(4 Core + 2 Elective) Minimum of 60 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 9	Concentration Inequalities	8 weeks	Prof. Aditya Gopalan Prof. Himanshu Tyagi	IISc Bangalore	108108181
Elective 10	Stochastic Control and Communication	12 weeks	Prof. Ankur A. Kulkarni	IIT Bombay	108101185
Elective 11	Real-Time Digital Signal Processing	12 weeks	Prof. Rathna G N	IISc Bangalore	108108185
Elective 12	Modern Computer Vision	12 weeks	Prof. A. N. Rajagopalan	IIT Madras	108106189
Elective 13	डिजिटल सूचियाँ (Digital Switching)	8 weeks	Prof. Yatindra N Singh	IIT Kanpur	108104192
Elective 14	Simulation of Communication Systems Using Matlab	12 weeks	Prof. Ribhu	IIT Guwahati	108103191
Elective 15	Introduction to Adaptive Signal Processing	8 weeks	Prof. Mrityunjoy Chakraborty	IIT Kharagpur	108105191
Elective 16	Machine Learning and Deep Learning - Fundamentals and Applications	12 weeks	Prof. M.K. Bhuyan	IIT Guwahati	108103192
Elective 17	Applied Linear Algebra	12 weeks	Prof. Dwaipayan Mukherjee	IIT Bombay	108101371
Elective 18	Digital Communication using GNU Radio	12 weeks	Prof. Kumar Appaiah	IIT Bombay	108101373
Elective 19	Distributed Optimization and Machine Learning	12 weeks	Prof. Mayank Baranwal	IIT Bombay	106101466
Elective 20	Linear Algebra Through Geometry	12 weeks	Prof. M Krishna Kumar Prof. Ashok Rao Prof. Arulalan M R	IISc Bangalore and NITK	106108482
Elective 21	Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software	12 weeks	Prof. Ankur Gupta	IIT Delhi	108102481
Elective 22	Optimization Theory and Algorithms	12 weeks	Prof. Uday K Khankhoje	IIT Madras	108106478
Elective 23	5G Wireless Standard Design	12 weeks	Prof. Rohit Budhiraja	IIT Kanpur	117104484

Power Systems and Power Electronics

(4 Core + 2 Elective) Minimum of 60 Weeks

The area of power systems has seen a renewed interest with most generation wanting to shift to renewables, and also with the advent of smart and micro grids. This offers new challenges in terms of grid integration of renewables, load forecasting, unit commitment, demand response, to name a few.

Power electronics contributes significantly in power generation, power transmission, power quality, energy storage as well as the integration of distributed and renewable energy sources into the grid. Power electronics and drives is a contemporary subject which focuses application of solid-state electronics to the control and conversion of electric power and more recently in electric vehicle technologies.

These set of course will serve as a treatise into the area of power systems and power electronics and also serve as an excellent platform to pursue research in future technologies like smart grids and electric vehicles.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Basic Electrical Circuits	12 weeks	Prof. Gajendranath Chowdary	IIT Madras	117106108
	Basic Electric Circuits	12 weeks	Prof. Ankush Sharma	IIT Kanpur	108104139
	Network Analysis	12 weeks	Prof. Tapas Kumar Bhattacharya	IIT Kharagpur	108105159
Core 2	Electrical Machines - I	12 weeks	Prof. D Kastha Prof. Suman Maiti	IIT Kharagpur	108105017
	Electrical Machines	12 weeks	Prof. G. Bhuvaneswari	IIT Delhi	108102146
	Electrical Machines - I	12 weeks	Prof. Tapas Kumar Bhattacharya	IIT Kharagpur	108105155
	Electrical Machines - II	12 weeks	Prof. Tapas Kumar Bhattacharya	IIT Kharagpur	108105131
Core 3	Power System Engineering	12 weeks	Prof. Debapriya Das	IIT Kharagpur	108105104
	Power System Analysis	12 weeks	Prof. Debapriya Das	IIT Kharagpur	117105140
Core 4	Fundamental of Power Electronics	12 weeks	Prof. Vivek Agarwal Prof. L Umanand	IISc Bangalore	108101126
	Power Electronics	12 weeks	Prof. G. Bhuvaneshwari	IIT Delhi	108102145
Core 5	Power Electronics with Wide Band Gap Devices	12 weeks	Prof. Moumita Das	IIT Mandi	108106480
Elective 1	Control Engineering	12 weeks	Prof. Ramkrishna Pasumarthy	IIT Madras	108106098
Elective 2	Electrical Measurement and Electronic Instruments	12 weeks	Prof. Avishek Chatterjee	IIT Kharagpur	108105153
Elective 3	Computer Aided Power System Analysis	12 weeks	Prof. Biswarup Das	IIT Roorkee	108107127
Elective 4	Fundamentals of Electric Drives	8 weeks	Prof. Shyama Prasad Das	IIT Kanpur	108104140
Elective 5	High Power Multilevel Converters-Analysis, Design and Operational Issues	12 weeks	Prof. Anandarup Das	IIT Delhi	108102157
Elective 6	Power Management Integrated Circuits	12 weeks	Prof. Qadeer Ahmad Khan	IIT Madras	108106159
Elective 7	DC Power Transmission Systems	12 weeks	Prof. Krishna S	IIT Madras	108106160
Elective 8	Design of Power Electronic Converters	To Be Developed	-	-	-
Elective 9	Power System Protection and Switchgear	8 Weeks	Prof. Bhaveshkumar R. Bhalja	IIT Roorkee	108107167
Elective 10	Power System Protection	12 weeks	Prof. Ashok Kumar Pradhan	IIT Kharagpur	108105167

Power Systems and Power Electronics

(4 Core + 2 Elective) Minimum of 60 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 11	Smart Grid: Basics to Advanced Technologies	12 weeks	Prof. N. P. Padhy Prof. Premlata Jena	IIT Roorkee	108107113
Elective 12	Power Quality	12 weeks	Prof. Bhim Singh	IIT Delhi	108102179
Elective 13	Control and Tuning Methods in Switched Mode Power Converters	12 weeks	Prof. Santanu Kapat	IIT Kharagpur	108105180
Elective 14	Operation and Planning of Power Distribution Systems	12 weeks	Prof. Sanjib Ganguly	IIT Guwahati	117103149
Elective 15	Digital Protection of Power System	8 weeks	Prof. Bhaveshkumar R. Bhalja	IIT Roorkee	117107148
Elective 16	Digital Control in Switched Mode Power Converters and FPGA-based Prototyping	12 weeks	Prof. Santanu Kapat	IIT Kharagpur	108105186
Elective 17	Economic Operations And Control Of Power Systems	12 weeks	Prof. Gururaj Mirle Vishwanath, Prof. Narayana Prasad Padhy	IIT Kanpur	108104191
Elective 18	Design Of Electric Motors	12 weeks	Prof. Prathap Reddy	IISc Bangalore	108108191
Elective 19	Sustainable Power Generation Systems	12 weeks	Prof. Pankaj Kalita	IIT Guwahati	127103236
Elective 20	Computer-Aided Design of Electrical Machines	12 weeks	Prof. Bhim Singh	IIT Delhi	108102372
Elective 21	Modeling, Analysis and Estimation of Three Phase Unbalanced Power Network	12 weeks	Prof. Biswarup Das	IIT Roorkee	108107477
Elective 22	A Basic Course on Electric and Magnetic Circuits	12 weeks	Prof. Ashok Kumar Pradhan	IIT Kharagpur	108105479
Elective 23	Power Electronics Applications in Power Systems	12 weeks	Prof. Sanjib Ganguly	IIT Guwahati	117103488

Control and Instrumentation

(4 Core + 2 Elective) Minimum of 60 Weeks

The area of Control and Instrumentation has been an integral part of any process industry and industrial automation related companies, in addition to defense and aerospace domains. This domain gets all the more important in the current context where the aim is to make everything around us "smart". The control and instrumentation domain offers courses with a flavor of courses related basic concepts electrical engineering and advanced courses in control theory and advanced sensing and instrumentation techniques, offering learners a unique opportunity to be Industry ready or pursue core academic research. Furthermore, as new frontiers continue to emerge, the domain specific courses serve as a platform to pursue career or research in application based areas (such as Internet of Things), conceptual directions (such as Cyber Physical systems and date driven control).

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Principles of Signals and Systems	12 weeks	Prof. Aditya K Jagannathan	IIT Kanpur	108104100
	Signals and Systems	12 weeks	Prof. Hitesh Shrimali Prof. Kushal K. Shah	IIT Mandi	108106163
Core 2	Basic Electrical Circuits	12 weeks	Prof. Gajendranath Chowdary	IIT Madras	117106108
	Basic Electric Circuits	12 weeks	Prof. Ankush Sharma	IIT Kanpur	108104139
Core 3	Network Analysis	12 weeks	Prof. Tapas Kumar Bhattacharya	IIT Kharagpur	108105159
	Control Engineering	12 weeks	Prof. Ramkrishna Pasumarthy	IIT Madras	108106098
Core 4	Control Systems	12 weeks	Prof. C. S. Shankar Ram	IIT Madras	107106081
	Electrical Measurement and Electronic Instruments	12 weeks	Prof. Avishek Chatterjee	IIT Kharagpur	108105153
Core 5	Analog Circuits	12 weeks	Prof. Nagendra Krishnapura	IIT Madras	108106084
	Analog Electronic Circuit	12 weeks	Prof. Shouribrata Chatterjee	IIT Delhi	108102112
	Analog Circuits	8 weeks	Prof. Jayanta Mukherjee	IIT Bombay	108101094
	Analog Electronic Circuits	12 weeks	Prof. Pradip Mandal	IIT Kharagpur	108105158
	Microelectronics: Devices to Circuits	12 weeks	Prof. Suddeb Dasgupta	IIT Roorkee	108107142
Core 6	Microprocessors and Microcontrollers	12 weeks	Prof. Santanu Chattopadhyay	IIT Kharagpur	108105102
Core 7	Applied Linear Algebra	12 weeks	Prof. Andrew Thangaraj	IIT Madras	108106171
Core 8	Transducers For Instrumentation	12 weeks	Prof. Ankur Gupta	IIT Delhi	108102191
Core 9	Power Electronics with Wide Band Gap Devices	12 Weeks	Prof. Moumita Das	IIT Mandi	108106480
Elective 1	Linear System Theory	12 weeks	Prof. Ramkrishna Pasumarthy	IIT Madras	108106150
	Linear Dynamical Systems	8 weeks	Prof. Tushar Jain	IIT Mandi	108106164
Elective 2	Control System Design	12 weeks	Prof. G R Jayanth	IISc Bangalore	115108104
Elective 3	Industrial Instrumentation	12 weeks	Prof. Alok Barua	IIT Kharagpur	108105064
Elective 4	Design for Internet of Things	8 weeks	Prof. T V Prabhakar	IISc Bangalore	108108098
	Design for Internet of Things	8 Weeks	Prof. T V Prabhakar	IISc Bangalore	108108179
Elective 5	Advanced IOT Applications	8 weeks	Prof. T V Prabhakar	IISc Bangalore	108108123
Elective 6	Sensors and Actuators	12 weeks	Prof. Hardik Jeetendra Pandya	IISc Bangalore	108108147
Elective 7	Statistical Signal Processing	12 weeks	Prof. Prabin Kumar Bora	IIT Guwahati	108103158
Elective 8	Nonlinear System Analysis	12 weeks	Prof. Ramkrishna Pasumarthy, Prof. Arunkumar D Mahindrakar	IIT Madras	108106162

Control and Instrumentation

(4 Core + 2 Elective) Minimum of 60 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 9	Biomedical Electronic Systems	To Be Developed	-	-	-
Elective 10	Mathematical Aspects of Biomedical Electronic System Design	12 weeks	Prof. Chandramani Singh	IISc Bangalore	108108180
Elective 11	Introduction to Biomedical Imaging Systems	12 weeks	Prof. Arun K. Thittai	IIT Madras	102105090
Elective 12	Applied Linear Algebra	12 weeks	Prof. Dwaipayan Mukherjee	IIT Bombay	108101371
Elective 13	State space Approach to Control System Analysis and Design	12 weeks	Prof. A P Tiwari	IIT Mandi	108106374
Elective 14	Embedded Sensing, Actuation and Interfacing Systems	12 weeks	Prof. Banibrata Mukherjee	IIT Kharagpur	108105376
Elective 15	Biomedical Ultrasound: Fundamentals of Imaging and Micromachined Transducers	12 Weeks	Prof. Karla P. Mercado Shekhar Prof. Himanshu Shekhar Prof. Hardik Jeetendra Pandya	IIT Gandhinagar and IISc Bangalore	121108458
Elective 16	Intelligent Feedback and Control	4 Weeks	Prof. Leena Vachhani	IIT Bombay	127101530
Elective 17	Nonlinear Dynamical Systems and Control	12 Weeks	Prof. Vijaysekhar Chellaboina	IIT Madras	117106483
Elective 18	Distributed Optimization and Machine Learning	12 Weeks	Prof. Mayank Baranwal	IIT Bombay	106101466
Elective 19	Linear Algebra Through Geometry	12 weeks	Prof. M Krishna Kumar Prof. Ashok Rao Prof. Arulalan M R	IISc Bangalore and NITK	106108482
Elective 20	Optimization Theory and Algorithms	12 Weeks	Prof. Uday K Khankhoje	IIT Madras	108106478
Elective 21	Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software	12 Weeks	Prof. Ankur Gupta	IIT Delhi	108102481

Photonics

(3 Core + 2 Elective) Minimum of 60 Weeks

Photonics is at the forefront of a technology revolution in several key areas of cyber-physical systems including telecommunications, sensing, lithography, displays, photovoltaics, data storage, computing and material processing. There is a growing need globally for highly skilled personnel trained in photonics to cater to an ever-rising demand in the above industries.

In India, such a trend has only recently gained momentum - as evidenced by the setting up of dedicated teams in some of the Indian IT/ITES major companies due to heavy demand from their global Engineering Services clients. It is expected to be only a matter of time before this trend spreads around in the IT industry, creating a need for highly skilled manpower. In addition, there have been several small scale companies that have been started in the past few years in India as part of the Make in India program, and Digital India program, which are also anticipated to grow over the next 5-10 years. Yet another aspect is the anticipated need for such manpower by Government laboratories such as DRDO, CSIR and ISRO as they push ahead for indigenous development of photonics-related technologies/equipment as part of the recent Atmanirbhar Bharat drive.

In order to cater to the above demand, several faculty carrying out photonics-related research in the premier institutes in India have been offering a wide variety of photonics-related courses under the NPTEL/Swayam umbrella. It is envisaged that students specializing in photonics through basic courses such as Introduction to Photonics, Electromagnetic Waves, and Optical Engineering followed by advanced courses such as Optical Communications, Fiber Optic Communication Technology, Optical Sensors, Integrated Photonic Circuits, and Biophotonics will have adequate knowledge to meet the above industry requirements.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Introduction to Photonics	12 weeks	Prof. Balaji Srinivasan	IIT Madras	108106135
Core 2	Optical Engineering	12 weeks	Prof. Shanti Bhattacharya	IIT Madras	108106161
Core 3	Applied Electromagnetics For Engineers	12 weeks	Prof. Pradeep Kumar K	IIT Kanpur	108104099
	Transmission Lines and Electromagnetic Waves	12 weeks	Prof. Ananth Krishnan	IIT Madras	108106157
Elective 1	Optical Sensors	4 weeks	Prof. Sachin Kumar Srivastava	IIT Roorkee	115107122
Elective 2	Optical Communications	12 weeks	Prof. Pradeep Kumar K	IIT Kanpur	117104127
Elective 3	Computational Electromagnetics	12 weeks	Prof. Uday Khankhoje	IIT Madras	108106152
Elective 4	Fiber Optics	8 weeks	Prof. Vipul Rastogi	IIT Roorkee	115107095
Elective 5	Microwave Engineering	12 weeks	Prof. Ratnajit Bhattacharjee	IIT Guwahati	108103141
Elective 6	Photonic integrated Circuit	12 Weeks	Prof. Shankar Kumar Selvaraja	IISc Bangalore	108108174
Elective 7	Biophotonics	To Be Developed	-	-	-
Elective 8	Fiber Optic Communication Technology	12 weeks	Prof. Deepa Venkitesh	IIT Madras	108106167
Elective 9	Semiconductor Opto-electronics	12 Weeks	Prof. M.R. Shenoy	IIT Delhi	115102103
Elective 10	Ultrafast Optics and Spectroscopy	12 Weeks	Prof. Atanu Bhattacharya	IISc Bangalore	104108118
Elective 11	LASER fundamentals and application	8 weeks	Prof. Manabendra Chandra	IIT Kanpur	104104085
Elective 12	Optical Spectroscopy and Microscopy : Fundamentals of Optical Measurements and Instrumentation	12 Weeks	Prof. Balaji Jayaprakash	IISc Bangalore	102108082
Elective 13	Optical Fiber Sensors	12 Weeks	Prof. Balaji Srinivasan	IIT Madras	108106173
Elective 14	Integrated Photonics Devices and Circuits	12 Weeks	Prof. Bijoy Krishna Das	IIT Madras	108106180
Elective 15	Advanced Microwave Guided-Structures and Analysis	12 Weeks	Prof. Bratin Ghosh	IIT Kharagpur	108105181

Photonics

(3 Core + 2 Elective) Minimum of 60 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 16	Fundamentals Of Nano And Quantum Photonics	12 weeks	Prof. Naresh Kumar Emani	IIT Hyderabad	108106186
Elective 17	RF and Microwave Networks	12 weeks	Prof. Bratin Ghosh	IIT Kharagpur	108105189
Elective 18	Optical Wireless Communications for Beyond 5G Networks and IoT	12 weeks	Prof. Anand Srivastava	IIT Delhi	108106190
Elective 19	Nanobiophotonics: Touching Our Daily Life	12 weeks	Prof. Basudev Lahiri	IIT Kharagpur	108105192
Elective 20	Nanophotonics, Plasmonics, And Metamaterials	12 weeks	Prof. Debabrata Sikdar	IIT Guwahati	117103150
Elective 21	EMI /EMC and Signal Integrity: Principles, Techniques and Applications	12 weeks	Prof. Amitabha Bhattacharya	IIT Kharagpur	108105375
Elective 22	Photonic Crystals: Fundamentals & Applications	12 Weeks	Prof. Debabrata Sikdar	IIT Guwahati	108103487



Discipline **Development**

Domains

1. Faculty Domain - Fundamental
2. Faculty Domain - Advanced

Faculty Domain - Fundamental

(5 Core + 2 Elective) Minimum of 40 Weeks

Apart from subject matter expertise, today's faculty need to acquire skills of pedagogic expertise, organizational management, change management, ethical practice, documentation and communication skills. While some amount of these skills may come from the choice of electives that the faculty candidate had taken during their post graduation or doctorate studies, there is a need for a more focussed learning related to these areas based on the experience and aspirations of the faculty. The courses in the 'Faculty' domain will help existing faculty and future teachers to equip themselves in skill sets that are aligned both to their personal aspirations and organizational needs. At present, we are looking at two broad categories of courses in the Faculty domain based on their experience - Newly Joined and Experienced. The courses under the 'Newly Joined' is ideal for faculty with less than 3 years of teaching experience. We suggest that the more experienced faculty look at courses coming under the 'Experienced Faculty Domain'

The courses under the 'Newly Joined' faculty have an explicit focus on the pedagogical perspective of teaching. There are core courses related to student-centered teaching-learning practices, ethical dimensions and effective professional communication, which are important for a newly inducted faculty to understand. The electives in this domain allow the newly joined faculty to explore aspects related teaching-learning with technology, learning analytics, learning sciences and disciplinary research.

Intended Audience :Faculty with less than 3 years of experience or PhD scholars who have interest in pursuing teaching as a career

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Effective Engineering Teaching in Practice	4 weeks	Prof. G. K. Suraishkumar	IIT Madras	121106012
Core 2	Ethics in Engineering Practice	8 weeks	Prof. Susmita Mukhopadhyay	IIT Kharagpur	110105097
Core 3	Introduction to Professional Scientific Communication	4 weeks	Prof. S. Ganesh	IIT Kanpur	102104061
	Effective Writing	4 weeks	Prof. Binod Mishra	IIT Roorkee	109107172
	Technical Communication for Engineers	4 Weeks	Prof. Arun K. Saraf	IIT Roorkee	121107451
Core 4	Teaching And Learning in Engineering (TALE)	4 weeks	Prof. N J Rao	IISc Bangalore	127108005
	Teaching and Learning in General Programs: TALG	4 weeks	Prof. N J Rao	IISc Bangalore	127108015
Core 5	Accreditation and Outcome Based Learning	8 weeks	Prof. AK Ray (Retd.) Prof. SK Das Mandal	IIT Kharagpur	127105017
	Outcome Based Pedagogic Principles for Effective Teaching	4 weeks	Prof. Shyamal Kumar Das Mandal	IIT Kharagpur	121105010
	NBA Accreditation and Teaching - Learning in Engineering (NATE)	12 weeks	Prof. N J Rao Prof. K. Rajanikanth	IISc Bangalore	127108135
Elective 1	Introduction to Learning Analytics	4 weeks	Prof. Ramkumar Rajendran	IIT Bombay	127101012
	Learning Analytics Tools	12 weeks	Prof. Ramkumar Rajendran	IIT Bombay	106101224
Elective 2	Research Methodology	8 weeks	Prof. Prathap Haridoss Prof. Edamana Prasad	IIT Madras	121106007
Elective 3	Introduction to Basic Cognitive Processes	8 weeks	Prof. Ark Verma	IIT Kanpur	109104123
Elective 4	Basics of E-Learning Design	To Be Developed	-	-	-
Elective 5	Foundations of Learning Sciences	To Be Developed	-	-	-
Elective 6	Designing Learner-Centric E-Learning in STEM Disciplines	4 weeks	Prof. Sahana Murthy	IIT Bombay	127101013
Elective 7	Handling Large-Scale Unit Level Data Using STATA	8 Weeks	Prof. Pratap C. Mohanty	IIT Roorkee	109107182
Elective 8	Towards an Ethical Digital Society: From Theory to Practice	4 weeks	Prof. Bidisha Chaudhuri	IIT Bangalore	109106184
Elective 9	Research Methodology	12 weeks	Prof. Soumitro Banerjee	IISER Kolkata	127106227
Elective 10	Making Learning Engaging Through Interactive Games	4 Weeks	Prof. Kartic Vaidyanathan	IIT Madras	127106533

Faculty Domain - Advanced

(5 Core + 2 Elective) Minimum of 40 Weeks

Apart from subject matter expertise, today's faculty need to acquire skills of pedagogic expertise, organizational management, change management, ethical practice, documentation and communication skills. While some amount of these skills may come from the choice of electives that the faculty candidate had taken during their post graduation or doctorate studies, there is a need for a more focussed learning related to these areas based on the experience and aspirations of the faculty. The courses in the 'Faculty' domain will help existing faculty and future teachers to equip themselves in skill sets that are aligned both to their personal aspirations and organizational needs. At present, we are looking at two broad categories of courses in the Faculty domain based on their experience - Newly Joined and Experienced. The courses under the 'Newly Joined' is ideal for faculty with less than 3 years of teaching experience. We suggest that the more experienced faculty look at courses coming under the 'Experienced Faculty Domain'. The core courses for experienced faculty focus on student-centered pedagogic practices with the objective that they will be able to contextualize these in their settings more appropriately. The electives for experienced faculty provide them opportunity to explore dimensions like organizational management, intellectual property, MOOC creation, Educational leadership, etc.

Intended Audience: Faculty with more than 3 years of experience or People from industry with more than 10 years of experience and interested in shifting to academic positions.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Effective Engineering Teaching in Practice	4 weeks	Prof. G. K. Suraishkumar	IIT Madras	121106012
Core 2	Ethics in Engineering Practice	8 weeks	Prof. Susmita Mukhopadhyay	IIT Kharagpur	110105097
Core 3	Introduction to Professional Scientific Communication	4 weeks	Prof. S. Ganesh	IIT Kanpur	102104061
	Technical Communication for Engineers	4 Weeks	Prof. Arun K. Saraf	IIT Roorkee	121107451
Core 4	Teaching And Learning in Engineering (TALE)	4 weeks	Prof. N J Rao	IISc Bangalore	127108005
	Teaching and Learning in General Programs: TALG	4 weeks	Prof. N J Rao	IISc Bangalore	127108015
Core 5	Accreditation and Outcome based Learning	8 weeks	Prof. AK Ray (Retd.) Prof. SK Das Mandal	IIT Kharagpur	127105017
	Outcome Based Pedagogic Principles for Effective Teaching	4 weeks	Prof. Shyamal Kumar Das Mandal	IIT Kharagpur	121105010
	NBA Accreditation and Teaching - Learning in Engineering (NATE)	12 weeks	Prof. N J Rao Prof. K. Rajanikanth	IISc Bangalore	127108135
Elective 1	Designing Learner-Centric MOOCs	4 weeks	Prof. Sridhar Iyer Prof. Sahana Murthy Prof. Jayakrishnan M Prof. Sameer Sahasrabudhe	IIT Bombay	127101010
	Designing Learner-Centric E-Learning in STEM Disciplines	4 weeks	Prof. Sahana Murthy	IIT Bombay	127101013
Elective 2	Qualitative Research Methods and Research Writing	12 weeks	Prof. Aradhna Malik	IIT Kharagpur	109105115
	Learning Analytics Tools	12 weeks	Prof. Ramkumar Rajendran	IIT Bombay	106101224
Elective 3	Development Research Methods	8 weeks	Prof. Rajshree Bedamatta	IIT Guwahati	109103153
Elective 4	Educational Leadership	12 weeks	Prof. Atasi Mohanty	IIT Kharagpur	109105122
	Organization Development and Change in 21st Century	8 weeks	Prof. Ashish Pandey	IIT Bombay	110101146
Elective 5	Introduction on Intellectual Property to Engineers and Technologists	8 weeks	Prof. Tapas Kumar Bandyopadhyay	IIT Kharagpur	109105112
	Entrepreneurship and IP strategy	8 weeks	Prof. Gouri Gargate	IIT Kharagpur	109105176
	Intellectual Property Portfolio Management	8 Weeks	Prof. Rajat Agrawal	IIT Roorkee	127107502
Elective 6	Intellectual Property	12 weeks	Prof. Feroz Ali	IIT Madras	109106137
Elective 7	Patent Law for Engineers and Scientists	12 weeks	Prof. Feroz Ali	IIT Madras	110106081
Elective 8	Patent Drafting for Beginners	4 weeks	Prof. Feroz Ali	IIT Madras	109106128
Elective 9	Training of Trainers	12 weeks	Prof. Santosh Rangnekar	IIT Roorkee	110107126
Elective 10	Entrepreneurship	12 weeks	Prof. C Bhaktavatsala Rao	IIT Madras	110106141

Faculty Domain - Advanced

(5 Core + 2 Elective) Minimum of 40 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 11	Towards an Ethical Digital Society: From Theory to Practice	4 weeks	Prof. Bidisha Chaudhuri	IIT Bangalore	109106184
Elective 12	Education for Sustainable Development	12 weeks	Prof. Atasi Mohanty	IIT Kharagpur	109105190
	Economics of Health and Education	12 Weeks	Prof. Rajshree Bedamatta	IIT Guwahati	109103501
Elective 13	Training and Development	12 weeks	Prof. Susmita Mukhopadhyay Prof. S. Srinivasan	IIT Kharagpur	109105192
Elective 14	Leadership and Team Effectiveness	12 weeks	Prof. Santosh Rangnekar	IIT Roorkee	110107159



Discipline **Management**



Domains

1. Marketing
2. Operations
3. Minor
4. Patents and Intellectual Property Rights
5. Economics
6. Managerial Economics
7. Economics And Finance

Marketing

(4 Core + 3 Elective) Minimum of 50 Weeks

Marketing is one of the crucial activities in all businesses is viewed with enhanced importance in the current business scenario where the borders are blurred. The course will teach you core concepts and tools that will help you better understand the function of Marketing. The objective of the set of courses introduces students to the concepts and activities that comprise Marketing Management. The set of courses are foundation course for advanced electives in Marketing as well as in other business /social disciplines. The set of courses brings in a marketing lens to complex business and organization challenges and aid in holistic decision-making that aligns with customer and company goals.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Marketing Management-I	8 weeks	Prof. Jayanta Chatterjee Prof. Shashi Shekhar Mishra	IIT Kanpur	110104068
Core 2	Marketing Management - II	8 weeks	Prof. Jayanta Chatterjee Prof. Shashi Shekhar Mishra	IIT Kanpur	110104070
Core 3	Consumer Behaviour	8 weeks	Prof. Srabanti Mukherjee	IIT Kharagpur	110105074
Core 4	Marketing research and analysis	8 weeks	Prof. Jogendra Kumar Nayak	IIT Roorkee	110107080
Elective 1	Services Marketing: A Practical Approach	4 weeks	Prof. Biplab Datta	IIT Kharagpur	110105078
Elective 2	Sales and Distribution Management	8 weeks	Prof. Sangeeta Sahney	IIT Kharagpur	110105122
Elective 3	Management of Field Sales	4 weeks	Prof. Jayanta Chatterjee	IIT Kanpur	110104117
Elective 4	Global Marketing Management	12 weeks	Prof. Zillur Rahman	IIT Roorkee	110107112
Elective 5	Marketing Research and Analysis - II	12 weeks	Prof. Jogendra Kumar Nayak	IIT Roorkee	110107113
Elective 6	Managing Services	8 weeks	Prof. Jayanta Chatterjee	IIT Kanpur	110104065
Elective 7	Customer Relationship Management	8 weeks	Prof. Swagato Chatterjee	IIT Kharagpur	110105145
Elective 8	Retail Management	8 weeks	Prof. Swagato Chatterjee	IIT Kharagpur	110105158
Elective 9	Marketing and Innovation	To Be Developed	-	-	-
Elective 10	Introduction to Marketing Essentials	12 weeks	Prof. Zillur Rahman	IIT Roorkee	110107147
Elective 11	Integrated Marketing Communication	12 weeks	Prof. Vinay Sharma	IIT Roorkee	110107158
Elective 12	International Marketing	8 weeks	Prof. Biswarup Ghosh	IIT Kharagpur	110105157
Elective 12	Business Marketing - Technology Focus	8 Weeks	Prof. Jayanta Chatterjee	IIT Kanpur	110104507
Elective 12	Research for Marketing Decisions	8 Weeks	Prof. Vaibhav Chawla	IIT Madras	110106514

Operations

(4 Core + 2 Elective) Minimum of 50 Weeks

Operations Management aims at planning, controlling and implementing programmes that result in products and services with high quality to meet customer requirement. This module has several courses in tools such as Operations Research, data analytics, data and decision analysis as well as domain areas such as Quality, Supply Chain Management and manufacturing. This will help the student gain knowledge in specific problem solving tools as well as in the domain Operations function.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Introduction to Probability and Statistics	4 weeks	Prof. G. Srinivasan	IIT Madras	111106112
	Data Analysis and Decision Making - I	12 weeks	Prof. Raghunandan Sengupta	IIT Kanpur	110104094
Core 2	Introduction to Operations Research	8 weeks	Prof. G. Srinivasan	IIT Madras	110106062
Core 3	Operations and Supply Chain Management	12 weeks	Prof. G. Srinivasan	IIT Madras	110106045
Core 4	Introduction to Data Analytics	8 weeks	Prof. Nandan Sudarsanam, Prof. Balaraman Ravindran	IIT Madras	110106072
	Business Statistics	12 weeks	Prof. Mukesh Kumar Barua	IIT Roorkee	110107114
Core 5	Project Management	8 weeks	Prof. Ramesh Anbanandam	IIT Roorkee	110107430
Elective 1	Project Management	8 weeks	Prof. Raghunandan Sengupta	IIT Kanpur	110104073
	Project Management for Managers	12 weeks	Prof. Mukesh Kumar Barua	IIT Roorkee	110107081
Elective 2	Total Quality Management - I	8 weeks	Prof. Raghunandan Sengupta	IIT Kanpur	110104080
Elective 3	Total Quality Management - II	8 weeks	Prof. Raghunandan Sengupta	IIT Kanpur	110104085
Elective 4	Strategy: An Introduction to Game Theory	8 weeks	Prof. Aditya Jagannatham Prof. Vimal Kumar	IIT Kanpur	110104063
Elective 5	Six Sigma	12 weeks	Prof. Jitesh J. Thakkar	IIT Kharagpur	110105123
Elective 6	Quality Design and Control	12 weeks	Prof. Pradip Kumar Ray	IIT Kharagpur	110105088
Elective 7	Supply Chain Analytics	8 weeks	Prof. Rajat Agrawal	IIT Roorkee	110107074
Elective 8	Management of Inventory Systems	12 weeks	Prof. Pk Ray	IIT Kharagpur	110105095
Elective 9	Decision Modeling	8 weeks	Prof. Biswajit Mahanty	IIT Kharagpur	110105082
Elective 10	Decision-Making Under Uncertainty	4 weeks	Prof. N. Gautam	Syracuse University	110106134
Elective 11	Design and Analysis of Experiments	12 weeks	Prof. Jhareswar Maiti	IIT Kharagpur	110105087
Elective 12	Practitioners Course In Descriptive, Predictive And Prescriptive Analytics	8 weeks	Prof. Deepu Philip Prof. Amadeep Singh Prof. Sanjeev Newar	IIT Kanpur	110104086
Elective 13	Business Analytics for Management Decision	12 weeks	Prof. Rudra P Pradhan	IIT Kharagpur	110105089
Elective 14	Selected Topics in Decision Modeling	8 weeks	Prof. Biswajit Mahanty	IIT Kharagpur	110105096
Elective 15	Data Analysis & Decision Making - II	12 weeks	Prof. Raghunandan Sengupta	IIT Kanpur	110104118
Elective 16	Data Analysis & Decision Making - III	12 weeks	Prof. Raghunandan Sengupta	IIT Kanpur	110104125
Elective 17	MCDM Techniques Using R	4 weeks	Prof. Gaurav Dixit	IIT Roorkee	110107115
Elective 18	Manufacturing Strategy	8 weeks	Prof. Rajat Agrawal	IIT Roorkee	110107116
Elective 19	Advanced Green Manufacturing Systems	12 weeks	Prof. Deepu Philip Prof. Amadeep Singh	IIT Kanpur	110104119
Elective 20	Toyota Production System	8 weeks	Prof. Rajat Agrawal	IIT Roorkee	110107130

Operations

(4 Core + 2 Elective) Minimum of 50 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 21	The Future of Manufacturing Business: Role of Digital Technologies	8 weeks	Prof. R. K. Amit Prof. U. Chandrasekhar	IITM & Wipro 3D	110106146
Elective 22	Quality Control and Improvement with MINITAB	8 weeks	Prof. Indrajit Mukherjee	IIT Bombay	110101150
Elective 23	Automation in Production Systems and Management	12 weeks	Prof. Pradip Kumar Ray	IIT Kharagpur	110105155
Elective 24	Decision Making with Spreadsheet	12 weeks	Prof. Ramesh Anbanandam	IIT Roorkee	110107157
Elective 25	Strategic Sourcing	12 weeks	Prof. Arshinder Kaur	IIT Madras	110106435
Elective 26	Supply Chain Digitization	12 weeks	Prof. Priyanka Verma Prof. Sushmita Narayana Prof. Debabrata Das	Indian Institute of Management, Mumbai	110101436

Minor

(5 Core + 1 Elective)Minimum of 50 Weeks

Management is a set of theories and principles related to planning organizing and control of physical financial and information resources in an organization. This management minor has introductory courses in general management, finance, marketing and Operations that will prepare a student to specialize in any of these domains further.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Introduction to Operations Research	8 weeks	Prof. G. Srinivasan	IIT Madras	110106062
Core 2	Marketing Management-I	8 weeks	Prof. Jayanta Chatterjee Prof. Shashi Shekhar Mishra	IIT Kanpur	110104068
Core 3	Operations and Supply Chain Management	12 weeks	Prof. G. Srinivasan	IIT Madras	110106045
Core 4	Financial Accounting	8 weeks	Prof. Varadraj Bapat	IIT Bombay	110101131
	Decision making using financial accounting	8 weeks	Prof. G Arun Kumar	IIT Madras	110106135
	Financial Accounting	12 weeks	Prof. Puran Singh	IIT Mandi	110106147
Core 5	Principles of Management	12 weeks	Prof. Susmita Mukhopadhyay Prof. S. Srinivasan	IIT Kharagpur	110105146
	Principles of Management	12 weeks	Prof. Usha Lenka	IIT Roorkee	110107150
Elective 1	HR Analytics	12 Weeks	Prof. Santosh Rangnekar Prof. Abhishek Singh	IIT Roorkee	110107492

Patents and Intellectual Property Rights

(4 Core + 2 Elective) Minimum of 40 Weeks

Intellectual property deals with creations of the mind such as inventions, literary artistic works, symbols and images. The field of intellectual property rights tells us what the rights of the creator are and how they can be protected. Patent gives the right to the creator to exclude others from the use of creation for a specific period of time. This module discusses patent searching, creation and drafting that is useful to understand the intellectual property rights of the creator.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Patent Law for Engineers and Scientists	12 weeks	Prof. Feroz Ali	IIT Madras	110106081
Core 2	Patent Search for Engineers and Lawyers	8 weeks	Prof. M. Padmavati Prof. Shreya Matilal	IIT Kharagpur	110105140
Core 3	Patent Drafting for Beginners	4 weeks	Prof. Feroz Ali	IIT Madras	109106128
Core 4	Roadmap for Patent Creation	8 weeks	Prof. Gouri Gargate	IIT Kharagpur	127105008
Elective 1	Intellectual Property Rights and Competition Law	8 weeks	Prof. K. D. Raju Prof. Niharika Sahoo Bhattacharya	IIT Kharagpur	110105139
Elective 2	Innovation, Business Models and Entrepreneurship	8 weeks	Prof. Rajat Agrawal Prof. Vinay Sharma	IIT Roorkee	110107094
Elective 3	Innovation by Design	4 weeks	Prof. B. K. Chakravarthy	IIT Bombay	107101086
Elective 4	Managing Intellectual Property in Universities	4 weeks	Prof. Feroz Ali	IIT Madras	109106148

Economics

(3 Core + 3 Elective) Minimum of 60 Weeks

Economics is a vital domain within the field of management that focuses on understanding how resources are allocated, how markets function, and how economic policies impact businesses and societies. It provides the analytical tools and concepts necessary for making informed decisions in both public and private sectors.

Importance of Economics in Management

Informed Decision-Making: Helps managers and policymakers make strategic decisions based on economic principles and data analysis.

Resource Allocation: Guides the efficient distribution of resources to maximize productivity and profitability.

Market Understanding: Provides insights into market dynamics, consumer behavior, and competitive strategies.

Policy Impact: Assesses the implications of government policies on business operations and economic conditions.

By completing these courses, candidates can earn a domain certificate in economics from NPTEL. This certification validates their expertise and enhances their professional credentials, providing a competitive edge in the job market.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	An Introduction to Microeconomics	12 Weeks	Prof. Vimal Kumar	IIT Kanpur	109104125
	Microeconomics: Theory & Applications	12 Weeks	Prof. Deep Mukherjee	IIT Kanpur	110104093
Core 2	Engineering Econometrics	12 Weeks	Prof. Rudra P Pradhan	IIT Kharagpur	110105093
	Introduction to Econometrics	12 Weeks	Prof. Sabuj Kumar Mandal	IIT Madras	130106001
	Applied Statistics and Econometrics	12 Weeks	Prof. Deep Mukherjee	IIT Kanpur	109104182
	Applied Econometrics	12 Weeks	Prof. Tutan Ahmed	IIT Kharagpur	110105153
	Econometric Modelling	8 Weeks	Prof. Sujata Kar	IIT Roorkee	110107153
	Applied Econometrics	12 weeks	Prof. Sabuj Kumar Mandal	IIT Madras	110106165
Core 3	Economic Growth and Development	8 weeks	Prof. Rajshree Bedamatta	IIT Guwahati	110103093
Elective 1	Infrastructure Economics	8 weeks	Prof. Nalin Bharti	IIT Patna	109106089
Elective 2	Energy Economics and Policy	8 weeks	Prof. Shyamasree Dasgupta	IIT Mandi	109106161
	Energy Resources, Economics and Environment	12 Weeks	Prof. Rangan Banerjee	IIT Delhi	109101171
Elective 3	Introduction to Environmental Economics	12 Weeks	Prof. Diptimayee Nayak Prof. S. P. Singh	IIT Roorkee	109107171
	Environmental & Resource Economics	12 Weeks	Prof. Sabuj Kumar Mandal	IIT Madras	130106113
Elective 4	Economics of Health and Health Care	8 weeks	Prof. Angan Sengupta	IIT Kanpur	110104095
Elective 5	Game Theory	8 weeks	Prof. K. S. Mallikarjuna Rao	IIT Bombay	110101133
	Strategy: An Introduction to Game Theory	8 weeks	Prof. Aditya Jagannatham Prof. Vimal Kumar	IIT Kanpur	110104063
Elective 6	Economics of IPR	4 Weeks	Prof. Nalin Bharti	IIT Patna	109106100
Elective 7	Mathematics for Economics - I	12 Weeks	Prof. Debarshi Das	IIT Guwahati	109103188
Elective 8	Economics of Health and Education	12 Weeks	Prof. Rajshree Bedamatta	IIT Guwahati	109103501
Elective 9	Labour Economics-Theory and Practice	8 weeks	Prof. Falguni Pattanaik	IIT Roorkee	130107476

Managerial Economics

(2 Core + 4 Elective) Minimum of 60 Weeks

Managerial Economics is a crucial domain within management that combines economic theory with business practices to facilitate decision-making and strategy formulation. It involves applying microeconomic and macroeconomic principles to solve practical problems and make informed managerial decisions.

Key Concepts

Demand Analysis and Forecasting: Understanding market demand, consumer behavior, and predicting future demand to make informed production and marketing decisions.

Cost and Production Analysis: Examining cost structures, production processes, and economies of scale to optimize operational efficiency.

Pricing Strategies: Developing pricing models and strategies based on market conditions, competition, and cost analysis.

Profit Management: Analyzing profit maximization techniques and breakeven analysis to ensure financial health.

Capital Budgeting: Evaluating investment opportunities and making long-term financial decisions.

Managerial Economics is essential for making informed and strategic business decisions. NPTEL's courses provide comprehensive education in this domain, and obtaining a domain certificate will equip candidates with the analytical skills and economic knowledge needed to excel in management roles. This certification can open doors to various career opportunities in business, finance, consulting, and policy analysis.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Foundation Course in Managerial Economics	8 Weeks	Prof. Barnali Nag	IIT Kharagpur	110105075
	Managerial Economics	12 Weeks	Prof. Trupti Mishra	IIT Bombay	110101149
Core 2	An Introduction to Microeconomics	12 Weeks	Prof. Vimal Kumar	IIT Kanpur	109104125
	Microeconomics: Theory & Applications	12 Weeks	Prof. Deep Mukherjee	IIT Kanpur	110104093
Core 3	Strategic Management	12 Weeks	Prof. Vinay Sharma	IIT Roorkee	110107509
Elective 1	Engineering Econometrics	12 Weeks	Prof. Rudra P Pradhan	IIT Kharagpur	110105093
	Introduction to Econometrics	12 Weeks	Prof. Sabuj Kumar Mandal	IIT Madras	130106001
	Applied Statistics and Econometrics	12 Weeks	Prof. Deep Mukherjee	IIT Kanpur	109104182
	Applied Econometrics	12 Weeks	Prof. Tutan Ahmed	IIT Kharagpur	110105153
	Econometric Modelling	8 Weeks	Prof. Sujata Kar	IIT Roorkee	110107153
	Applied Econometrics	12 weeks	Prof. Sabuj Kumar Mandal	IIT Madras	110106165
Elective 2	Game Theory	8 weeks	Prof.K.S. Mallikarjuna Rao	IIT Bombay	110101133
	Strategy: An Introduction to Game Theory	8 weeks	Prof. Aditya Jagannatham Prof. Vimal Kumar	IIT Kanpur	110104063
Elective 3	Business Statistics	12 Weeks	Prof. Mukesh Kumar Barua	IIT Roorkee	110107114
Elective 4	Decision Making Using Financial Accounting	8 weeks	Prof. G Arun Kumar	IIT Madras	110106135
Elective 5	Financial Institutions and Markets	12 Weeks	Prof. Jitendra Mahakud	IIT Kharagpur	110105121
Elective 6	Introduction to Operations Research	8 weeks	Prof. G. Srinivasan	IIT Madras	110106062
Elective 7	Decision-Making Under Uncertainty	4 weeks	Prof. N. Gautam	Syracuse University	110106134
Elective 8	Economics of IPR	4 Weeks	Prof. Nalin Bharti	IIT Patna	109106100
Elective 9	Automation in Production Systems and Management	12 Weeks	Prof. Pradip Kumar Ray	IIT Kharagpur	110105155
Elective 10	Business and Sustainable Development	4 Weeks	Prof. Trupti Mishra	IIT Bombay	110101153

Managerial Economics

(2 Core + 4 Elective) Minimum of 60 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 11	Computer Aided Decision Systems - Industrial Practices using Big Analytics	12 weeks	Prof. Deepu Philip Prof. Amadeep Singh Oberoi	IIT Kanpur	109104198
Elective 12	Organizational Design Change and Transformation	12 weeks	Prof. Susmita Mukhopadhyay Prof. Sangeeta Sahney Prof. S. Srinivasan	IIT Kharagpur	110105164
Elective 13	Mergers, Acquisitions and Corporate Restructuring	8 weeks	Prof. Chandra Sekhar Mishra	IIT Kharagpur	110105165
Elective 14	Business Development: from Start to Scale	12 weeks	Prof. C Bhaktavatsala Rao	IIT Madras	110106164
Elective 15	Investment Management	8 weeks	Prof. Abhijeet Chandra	IIT Kharagpur	110105166
Elective 16	Artificial Intelligence (AI) for Investments	12 weeks	Prof. Abhinava Tripathi	IIT Kanpur	110104164

Economics And Finance

(3 Core + 3 Elective) Minimum of 60 Weeks

Economics and Finance are fundamental domains within management that focus on the allocation of resources, financial decision-making, market functioning, and economic policies. These fields provide essential insights and analytical tools for managing financial assets, assessing economic conditions, and making strategic business decisions.

Key Concepts

Microeconomics: Examines individual and firm behavior, market structures, and pricing mechanisms.

Macroeconomics: Studies overall economic performance, including inflation, unemployment, and economic growth.

Corporate Finance: Focuses on financial management within organizations, including capital structure, investment decisions, and risk management.

Financial Markets and Instruments: Analyzes the functioning of financial markets, instruments like stocks and bonds, and their role in the economy.

Investment Analysis: Involves evaluating investment opportunities and portfolio management to maximize returns. NPTEL's courses provide a thorough education in these domains, and obtaining a domain certificate will equip candidates with the essential skills and knowledge needed to excel in their careers. This certification can open doors to various opportunities in finance, consulting, policy analysis, and strategic management.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	An Introduction to Microeconomics	12 Weeks	Prof. Vimal Kumar	IIT Kanpur	109104125
	Microeconomics: Theory & Applications	12 Weeks	Prof. Deep Mukherjee	IIT Kanpur	110104093
Core 2	Financial Mathematics	12 Weeks	Prof. Pradeep Kumar Jha	IIT Roorkee	112107260
Core 3	Behavioral and Personal Finance	8 Weeks	Prof. Abhijeet Chandra	IIT Kharagpur	110105144
Core 4	Fundamentals of Cost Accounting	8 Weeks	Prof. Arindam Banerjee	Shiv Nadar University Chennai and The Institute of Cost Accountants of India (ICMAI)	110106511
Elective 1	Decision Making Using Financial Accounting	8 weeks	Prof. G Arun Kumar	IIT Madras	110106135
Elective 2	Financial Institutions and Markets	12 Weeks	Prof. Jitendra Mahakud	IIT Kharagpur	110105121
Elective 3	Probability and Stochastics for Finance	8 Weeks	Prof. Joydeep Dutta	IIT Kanpur	111104089
	Introduction to Probability Theory and Stochastic Processes	12 Weeks	Prof. S Dharmaraja	IIT Delhi	111102111
	Introduction to Stochastic Processes	12 Weeks	Prof. Manjesh hanawal	IIT Bombay	110101141
Elective 4	Corporate Finance	8 Weeks	Prof. Abhijeet Chandra	IIT Kharagpur	110105156
Elective 5	Security Analysis & Portfolio Management	12 Weeks	Prof. J. P. Singh	IIT Roorkee	110107154
Elective 6	Investment Management	8 weeks	Prof. Abhijeet Chandra	IIT Kharagpur	110105166
Elective 7	Artificial Intelligence (AI) for Investments	12 weeks	Prof. Abhinava Tripathi	IIT Kanpur	110104164
Elective 8	Introduction to GST	8 Weeks	Prof. Anil Sharma	The Institute of Cost Accountants of India (ICMAI)	110106512



Discipline

Mechanical Engineering

Domains

1. Computational Engineering
2. Computational Thermo Fluids
3. Advanced Mechanics
4. Propulsion
5. Energy Systems
6. Manufacturing Processes and Technology
7. Product Design
8. Advanced Dynamics and Vibration
9. Computational Mechanics
10. Robotics

Computational Engineering

(3 Core + 3 Elective) Minimum of 50 Weeks

The domain of Computational Engineering encompasses several fundamental courses which aim to provide a unique skill set to the participants. The courses are carefully chosen from several domains and are designed in such a way that a minimum prerequisite will suffice to understand the material. The assortment of courses are chosen from broad areas of mechanics, mathematics and materials science. At the end of the course, the participant will have gained significant expertise in writing codes to solve engineering problems and will also be exposed to a wide variety of existing software on many topics.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Engineering Mechanics	12 weeks	Prof. K. Ramesh	IIT Madras	112106286
Core 1	Numerical Methods for Engineers	12 weeks	Prof. Niket S Kaisare	IIT Madras	127106019
Core 3	Basics of Finite Element Analysis-I	8 weeks	Prof. Nachiketa Tiwari	IIT Kanpur	112104193
	Introduction to Finite Volume Methods I	8 weeks	Prof. Ashoke De	IIT Kanpur	101104074
Core 4	Finite Element Method: Variational Methods to Computer Programming	12 weeks	Prof. Atanu Banerjee Prof. Arup Nandy	IIT Guwahati	112103295
Elective 1	Foundations of Computational Materials Modelling	12 weeks	Prof. Narasimhan Swaminathan	IIT Madras	112106289
Elective 2	A short Lecture Series on Contour Integration in the Complex Plane	4 weeks	Prof. Venkata Sonti	IISc Bangalore	112108285
Elective 3	Ab-Initio Methods	To Be Developed	-	-	-
Elective 4	Molecular Dynamics Simulations	To Be Developed	-	-	-
Elective 5	Monte-Carlo Simulations	To Be Developed	-	-	-
Elective 6	Fundamentals of Compressible Flow	12 weeks	Prof. Niranjan Sahoo	IIT Guwahati	112103294
Elective 7	High Performance Computing for Scientists and Engineers	8 weeks	Prof. Somnath Roy	IIT Kharagpur	112105293
Elective 8	Fundamentals of Convective Heat Transfer	12 weeks	Prof. Amaresh Dalal	IIT Guwahati	112103297
Elective 9	Computational Fluid Dynamics using Finite Volume Method	12 weeks	Prof. Kameswararao Anupindi	IIT Madras	112106294
Elective 10	Optimization from Fundamentals	12 weeks	Prof. Ankur A. Kulkarni	IIT Bombay	112101298
Elective 11	Evolutionary Computation for Single and Multi-Objective Optimization	8 weeks	Prof. Deepak Sharma	IIT Guwahati	112103301
Elective 12	Tools in Scientific Computing	8 weeks	Prof. Aditya Bandopadhyay	IIT Kharagpur	112105299

Computational Thermo Fluids

(3 Core + 3 Elective) Minimum of 50 Weeks

Conservation equations governing the fluid flow are nonlinear, coupled, partial differential equations. What this implies is that, except in some very simplistic (usually unrealistically simplified) situations, the solution to these equations cannot be found analytically. The complexity of the equations is further increased by addition of chemical reactions and multiple-phases. The best engineering approach that is available today is to numerically solve these equations on computers. In this approach the differential equations are approximated into a set of algebraic equations, for which algorithms exist or can be developed. The computational thermo-fluids domain is aimed at students interested in learning the fundamentals as well as applied aspects of the numerical solution of fluid flow equations. One might wonder what is the point of learning the intricacies of the formulation and solution procedure for CFD when one can directly use open source (OpenFOAM) or commercial (ANSYS Fluent, Converge CFD, etc.) codes to solve problems. It is indeed a very good question. The short answer is that a lack of the knowledge of the fundamentals often leads to incorrect use of CFD and misinterpretation of the beautiful physics of fluid flow phenomena. Sign up to find out more!

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Introduction to Fluid Mechanics	12 weeks	Prof. Suman Chakraborty	IIT Kharagpur	112105269
	Advanced Fluid Mechanics	12 weeks	Prof. Suman Chakraborty	IIT Kharagpur	112105218
	Advanced Concepts in Fluid Mechanics	12 weeks	Prof. Suman Chakraborty Prof. Aditya Bandopadhyay	IIT Kharagpur	112105287
	Viscous Fluid Flow	12 weeks	Prof. Amaresh Dalal	IIT Guwahati	112103302
Core 2	Transport Processes I: Heat and Mass Transfer	12 weeks	Prof. V. Kumaran	IISc Bangalore	103108123
	Conduction And Convection: Fundamentals and Applications	12 weeks	Prof. Gautam Biswas Prof. Sameer Khandekar	IIT Kanpur	112104313
Core 3	Numerical Methods	8 weeks	Prof. Ameeya Kumar Nayak Prof. Sanjeev Kumar	IIT Roorkee	111107105
Core 4	Computational Fluid Dynamics	12 weeks	Prof. Sreenivas Jayanti	IIT Madras	103106119
	Foundation of Computational Fluid Dynamics	8 weeks	Prof. Vengadesan	IIT Madras	112106186
	Computational Fluid Dynamics for Incompressible Flows	12 weeks	Prof. Amaresh Dalal	IIT Guwahati	112103289
	Computational Fluid Dynamics using Finite Volume Method	12 weeks	Prof. Kameswararao Anupindi	IIT Madras	112106294
	Computational Fluid Dynamics and Heat Transfer	12 weeks	Prof. Gautam Biswas	IIT Kanpur	112104302
Elective 1	Turbulent Combustion: Theory and Modelling	12 weeks	Prof. Ashok De	IIT Kanpur	112104272
Elective 2	Optimization of Thermal Systems	To Be Developed	-	-	-
Elective 3	Computational Modeling of Reacting Flows	To Be Developed	-	-	-
Elective 4	Computational Modeling of Multiphase Flows	To Be Developed	-	-	-
Elective 5	Fundamentals of Compressible Flow	12 weeks	Prof. Niranjan Sahoo	IIT Guwahati	112103294
Elective 6	Fundamentals of Convective Heat Transfer	12 weeks	Prof. Amaresh Dalal	IIT Guwahati	112103297
Elective 7	Computational Continuum Mechanics	12 weeks	Prof. Sachin Singh Gautam	IIT Guwahati	112103296
Elective 8	Optimization from Fundamentals	12 weeks	Prof. Ankur A. Kulkarni	IIT Bombay	112101298
Elective 9	Evolutionary Computation for Single and Multi-Objective Optimization	8 weeks	Prof. Deepak Sharma	IIT Guwahati	112103301
Elective 10	Fundamentals of Combustion	12 weeks	Prof. V. Raghavan	IIT Madras	112106299
Elective 11	Interfacial Fluid Mechanics	12 weeks	Prof. Harsh Dixit	IIT Hyderabad	112106312

Advanced Mechanics

(3 Core + 3 Elective) Minimum of 50 Weeks

A thorough understanding of how deformable solids behave under a range of conditions is of great practical interest. The "Advanced Mechanics" domain is for learners interested in the ideas underlying solid mechanics and wave propagation. An essential computational tool namely the finite element technique is also included to complete the arc from theory to practice.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Engineering Mechanics	12 weeks	Prof. K. Ramesh	IIT Madras	112106286
Core 2	Solid Mechanics	12 weeks	Prof. Ajeet Kumar	IIT Delhi	112102284
Core 3	Vibrations of Structures	12 weeks	Prof. Anirvam Dasgupta	IIT Kharagpur	112105197
	Introduction to Mechanical Vibration	8 weeks	Prof. Anil Kumar	IIT Roorkee	112107212
	Vibration and Structural Dynamics	8 weeks	Prof. Mira Mitra	IIT Kharagpur	101105081
Core 4	Basics of Finite Element Analysis-I	8 weeks	Prof. Nachiketa Tiwari	IIT Kanpur	112104193
	Basics of Finite Element Analysis - II	8 weeks	Prof. Nachiketa Tiwari	IIT Kanpur	112104205
	Finite Element Method: Variational Methods to Computer Programming	12 weeks	Prof. Atanu Banerjee Prof. Arup Nandy	IIT Guwahati	112103295
Core 5	Basics of Materials Engineering	12 weeks	Prof. Ratna Kumar Annabattula	IIT Madras	112106293
Elective 1	Numerical Methods for Engineers	12 weeks	Prof. Niket S Kaisare	IIT Madras	127106019
Elective 2	Foundations of Computational Materials Modelling	12 weeks	Prof. Narasimhan Swaminathan	IIT Madras	112106289
Elective 3	A Short Lecture Series on Contour Integration in the Complex Plane	4 weeks	Prof. Venkata Sonti	IISc Bangalore	112108285
Elective 4	Dynamic Behaviour of Materials	12 weeks	Prof. Prasenjit Khanikar	IIT Guwahati	112103278
Elective 5	Theory of Elasticity	12 weeks	Prof. Amit Shaw Prof. Biswanath Banerjee	IIT Kharagpur	105105177
Elective 6	Non-Linear Elasticity	To Be Developed	-	-	-
Elective 7	Plasticity	To Be Developed	-	-	-
Elective 8	Computational Continuum Mechanics	12 weeks	Prof. Sachin Singh Gautam	IIT Guwahati	112103296
Elective 9	Theory of Composite Shells	8 weeks	Prof. Poonam Kumari	IIT Guwahati	112103298
Elective 10	Finite Element Method: Variational Methods to Computer Programming	12 weeks	Prof. Atanu Banerjee Prof. Arup Nandy	IIT Guwahati	112103295

Advanced Mechanics

(3 Core + 3 Elective) Minimum of 50 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 11	Advanced Dynamics	12 weeks	Prof. Anirvan Dasgupta	IIT Kharagpur	112105304
Elective 12	Mechanics and Control of Robotic Manipulators	8 weeks	Prof. Santhakumar Mohan	IIT Palakkad	112106304
Elective 13	Engineering Fracture Mechanics	12 weeks	Prof. K. Ramesh	IIT Madras	112106065
Elective 14	Experimental Stress Analysis	12 weeks	Prof. K. Ramesh	IIT Madras	112106247
Elective 15	Vibrations of Plates and Shells	12 weeks	Prof. Venkata Sonti	IISc Bangalore	112108312
Elective 16	Dynamics and Control of Mechanical Systems	12 weeks	Prof. Ashitava Ghosal	IISc Bangalore	112108313
Elective 17	Nonlinear Adaptive Control	12 weeks	Prof. Srikant Sukumar	IIT Bombay	112101312

Propulsion

(4 Core + 2 Elective) Minimum of 50 Weeks

The science and engineering of propulsion enabled four revolutions in the 20 th century - (1) personal automobiles, (2) cheap air travel, (3) access to space and (4) missile defence. The challenges facing each one of these technologies in the 21 st century are formidable. The automobile and aviation technologies need a quantum leap in performance and emission control to meet the demands of the stringent environmental norms. Large scale access to space is needed at a fraction of the cost of the 20 th century to enable economic development. The ever increasing need for power and precision in missile defence systems is pushing the limits of stability of rockets. If you want to be a part of the solution to these challenges you have made the right choice. Sign up to learn the fundamentals of propulsion, the 20 th century challenges and solutions, and the way forward to facing the challenges of the 21 st century.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Thermodynamics	12 weeks	Prof. Anand T. N. C	IIT Palakkad	127106135
Core 2	Fundamentals of Combustion for Propulsion	8 weeks	Prof. S Varunkumar Prof. H S Mukunda	IIT Madras IISc Bangalore	112106290
	Fundamentals of Combustion - I	8 weeks	Prof. D. P. Mishra	IIT Kanpur	101104070
	Fundamentals of Combustion (Part 2)	8 weeks	Prof. D. P. Mishra	IIT Kanpur	101104072
	Fundamentals of Combustion	12 weeks	Prof. V. Raghavan	IIT Madras	112106299
	Advanced Thermodynamics and Combustion	12 weeks	Prof. Niranjan Sahoo	IIT Guwahati	112103313
Core 3	Aircraft Propulsion	12 weeks	Prof. Vinayak N. Kulkarni	IIT Guwahati	112103281
Core 4	Rocket Propulsion	12 weeks	Prof. K. Ramamurthy Prof. S. Varunkumar	IIT Madras	101106082
Core 5	Applied Thermodynamics for Engineers	12 weeks	Prof. Dipankar N. Basu	IIT Guwahati	112103275
	Applied Thermodynamics	12 Weeks	Prof. Niranjan Sahoo Prof. Pranab Kumar Mondal	IIT Guwahati	112103307
Core 6	Fluid Mechanics	12 weeks	Prof. Subashis Dutta	IIT Guwahati	105103192
Elective 1	Alternate Fuels	To Be Developed	-	-	-
Elective 2	CFD for IC Engines	To Be Developed	-	-	-
Elective 3	Laser Diagnostics for Engines	To Be Developed	-	-	-
Elective 4	Simulation of IC Engine Processes	To Be Developed	-	-	-

Energy Systems

(4 Core + 2 Elective) Minimum of 50 Weeks

Currently, on an average, 60% of all the electricity we receive at our homes, offices and factories is from coal power plants. In the coming times, the fraction of electric power from other sources like micro-hydro, wind, solar etc., will increase. Similarly, almost all of the heat and/or reductants needed in manufacturing of cement, steel and other metals, hydrogen needed for fertilizer synthesis and in other process industries, are derived from fossil fuels. This will undergo change in the coming days. We will see an increased use of alternative fuels in these industries as well. These alternatives could be relatively cleaner fossil fuels (natural gas instead of coal) and/or locally available biomass, refuse derived fuels, etc. Use of these alternative sources present different kinds of challenges in the electric power sector and process industries. In the electric power sector, storage and load management using smart-grids is the key challenge in integrating alternative sources with the existing systems. In the process industries, it will be in developing the know-how for using alternative fuels in existing or retrofitted reactors, to ensure comparable or enhanced productivity. Understanding the emissions associated with new fuels is another key issue to be addressed. The mere scale of these industries makes even marginal improvements in performance substantial in terms of environmental and economic benefits. Principles of thermal engineering played a key role in the development of the existing technologies and will be the foundation for the emerging technologies. Courses in this domain are aimed at providing a foundation in thermal engineering, with focus on conventional and emerging energy systems.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Thermodynamics	12 weeks	Prof. Anand T. N. C	IIT Palakkad	127106135
Core 2	Applied Thermodynamics for Engineers	12 weeks	Prof. Dipankar N. Basu	IIT Guwahati	112103275
Core 3	Applied Thermodynamics	12 weeks	Prof. Niranjan Sahoo Prof. Pranab Kumar Mondal	IIT Guwahati	112103307
Core 4	Fluid Dynamics and Turbomachines	8 weeks	Prof. Dhiman Chatterjee Prof. Shamit Bakshi	IIT Madras	112106200
Core 4	Heat Transfer	12 weeks	Prof. Sunando Dasgupta	IIT Kharagpur	103105140
	Heat Transfer	12 weeks	Prof. Ganesh Viswanathan	IIT Bombay	103101137
	Conduction and Convection Heat Transfer	12 weeks	Prof. Sankar Kumar Som Prof. Suman Chakraborty	IIT Kharagpur	112105271
	Transport Processes I: Heat and Mass Transfer	12 weeks	Prof. V. Kumaran	IISc Bangalore	103108123
	Fundamentals of Conduction and Radiation	12 weeks	Prof. Amaresh Dalal Prof. Dipankar N. Basu	IIT Guwahati	112103276
	Conduction And Convection: Fundamentals and Applications	12 weeks	Prof. Gautam Biswas Prof. Sameer Khandekar	IIT Kanpur	112104313
Core 5	Power Plant Engineering	8 weeks	Prof. Ravi Kumar	IIT Roorkee	112107291
Elective 1	Energy Conservation and Waste Heat Recovery	12 weeks	Prof. Prasanta Kumar Das Prof. A Bhattacharya	IIT Kharagpur	112105221
Elective 2	Bioenergy	8 weeks	Prof. Mainak Das	IIT Kanpur	102104057
Elective 2	Waste to Energy Conversion	8 weeks	Prof. P. Mondal	IIT Roorkee	103107125
Elective 3	Energy Economics and Policy	8 weeks	Prof. Shyamasree Dasgupta	IIT Mandi	109106161
Elective 4	Non-Conventional Energy Resources	12 weeks	Prof. Prathap Haridoss	IIT Madras	121106014
Elective 4	Technologies for Clean and Renewable Energy Production	8 weeks	Prof. P. Mondal	IIT Roorkee	103107157
Elective 5	Aircraft Propulsion	12 weeks	Prof. Vinayak N. Kulkarni	IIT Guwahati	112103281
Elective 6	Selection of Nanomaterials for Energy Harvesting and Storage Application	4 weeks	Prof. Kaushik Pal	IIT Roorkee	112107283
Elective 7	Steam Power Engineering	8 weeks	Prof. Vinayak N. Kulkarni	IIT Guwahati	112103277
Elective 8	Elements of Solar Energy Conversion	12 weeks	Prof. Jishnu Bhattacharya	IIT Kanpur	112104300
Elective 9	Fundamentals of Convective Heat Transfer	12 weeks	Prof. Amaresh Dalal	IIT Guwahati	112103297
Elective 10	Advanced Thermodynamics and Combustion	12 weeks	Prof. Niranjan Sahoo	IIT Guwahati	112103313

Manufacturing Processes and Technology

(4 Core + 2 Elective) Minimum of 50 Weeks

Manufacturing Processes and Technology is a vital domain within mechanical engineering that focuses on the methods and technologies used to transform raw materials into finished products. This field encompasses a wide range of processes, from traditional methods like casting and machining to advanced techniques such as additive manufacturing and automation.

Casting and Forming: Methods of shaping materials by melting and pouring into molds (casting) or applying force to shape (forming).

Machining and Fabrication: Processes involving cutting, drilling, and shaping materials using various tools and machines.

Welding and Joining: Techniques for combining materials to form a single entity.

Additive Manufacturing: Advanced techniques such as 3D printing that build products layer by layer.

Automation and Robotics: Use of automated systems and robots to enhance precision, efficiency, and consistency in manufacturing.

Quality Control and Assurance: Methods to ensure products meet required specifications and standards.

Manufacturing Processes and Technology are essential for the development and production of high-quality products. NPTEL's courses provide comprehensive education in this domain, and obtaining a domain certificate will equip candidates with the knowledge and skills needed to excel in their careers. This certification can open doors to various opportunities in industries such as automotive, aerospace, consumer goods, and more.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Manufacturing Process Technology I & II	12 weeks	Prof. Shantanu Bhattacharya	IIT Kanpur	112104195
	Manufacturing Process Technology - II	8 weeks	Prof. Shantanu Bhattacharya	IIT Kanpur	112104204
	Theory of Production Processes	12 weeks	Prof. Pradeep K. Jha	IIT Roorkee	112107239
	Production Technology: Theory and Practice	12 Weeks	Prof. Sounak Kumar Choudhury	IIT Kanpur	112104304
Core 2	Manufacturing Systems Technology I & II	12 weeks	Prof. Shantanu Bhattacharya	IIT Kanpur	112104188
Core 3	Mechanics of Machining	8 weeks	Prof. Uday S. Dixit	IIT Guwahati	112103248
Core 4	Industrial Automation and Control	12 weeks	Prof. Alokkanti Deb	IIT Kharagpur	108105088
	Automation in Manufacturing	12 weeks	Prof. Shrikrishna N. Joshi	IIT Guwahati	112103293
Elective 1	Introduction to Mechanical Micro Machining	12 weeks	Prof. Ajay M Sidpara	IIT Kharagpur	112105231
Elective 2	Metal Cutting and Machine Tools	4 weeks	Prof. Asimava Roy Choudhury	IIT Kharagpur	112105233
Elective 3	Machinery Fault Diagnosis and Signal Processing	12 weeks	Prof. Amiya Ranjan Mohanty	IIT Kharagpur	112105232
Elective 4	Non Traditional Abrasive Machining Processes-Ultrasonic, Abrasive Jet and Abrasive Water Jet Machining	4 weeks	Prof. Asimava Roy Choudhury	IIT Kharagpur	112105212
Elective 5	Sustainability through Green Manufacturing Systems: An Applied Approach	8 weeks	Prof. Deepu Philip Prof. Amandeep Singh	IIT Kanpur	112104225
Elective 6	Rapid Manufacturing	12 weeks	Prof. J. Ramkumar Prof. Amandeep Singh	IIT Kanpur	112104265
Elective 7	Theory and Practice of Non Destructive Testing	8 weeks	Prof. Ranjit Bauri	IIT Madras	113106070
Elective 8	Operations Management	12 weeks	Prof. Inderdeep Singh	IIT Roorkee	112107238
Elective 9	Mathematical Modeling Of Manufacturing Processes	12 weeks	Prof. Swarup Bag	IIT Guwahati	112103273
Elective 10	Design for Quality, Manufacturing and Assembly	8 weeks	Prof. Palaniappaan Ramu	IIT Madras	112106249
Elective 11	Principles of Industrial Engineering	12 weeks	Prof. D K Dwivedi	IIT Roorkee	112107292
Elective 12	Computer Integrated Manufacturing	12 weeks	Prof. J. Ramkumar Prof. Amandeep Singh	IIT Kanpur	112104289
Elective 13	Machining Science	4 weeks	Prof. Sounak Kumar Choudhury	IIT Kanpur	112104290
Elective 14	Plastic Working of Metallic Materials	12 weeks	Prof. P. S. Robi	IIT Guwahati	112103279
Elective 15	Engineering Drawing and Computer Graphics	12 weeks	Prof. Rajaram Lakkaraju	IIT Kharagpur	112105294

Manufacturing Processes and Technology

(4 Core + 2 Elective) Minimum of 50 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 16	Mechatronics	8 weeks	Prof. Pushparaj Mani Pathak	IIT Roorkee	112107298
Elective 17	Finite Element Modeling of Welding Processes	12 weeks	Prof. Swarup Bag	IIT Guwahati	112103299
Elective 18	Manufacturing Processes - Casting and Joining	4 weeks	Prof. Sounak Kumar Choudhury	IIT Kanpur	112104301
Elective 19	Wheeled Mobile Robots	8 weeks	Prof. Asokan Thondiyath Prof. Santhakumar Mohan	IIT Madras IIT Palakkad	112106298
Elective 20	Oil Hydraulics and Pneumatics	12 weeks	Prof. Somashekhar S	IIT Madras	112106300
Elective 21	Robotics: Basics and Selected Advanced Concepts	12 weeks	Prof. Ashitava Ghosal	IISc Bangalore	112108298
	Introduction to Robotics	12 weeks	Prof. Ashish Dutta	IIT Kanpur	112104298
Elective 22	Welding Application Technology	8 weeks	Prof. Pankaj Biswas	IIT Guwahati	112103305
Elective 23	Fundamentals of Additive Manufacturing Technologies	12 weeks	Prof. Sajan Kapil	IIT Guwahati	112103306
Elective 24	Design of Mechatronic Systems	12 weeks	Prof. Prasanna Gandhi	IIT Bombay	112101304
Elective 25	Laser Based Manufacturing	8 weeks	Prof. Shrikrishna N. Joshi	IIT Guwahati	112103312
Elective 26	Metal Additive Manufacturing	12 weeks	Prof. Janakranjan Ramkumar Prof. Amandeep Singh Oberoi	IIT Kanpur	112104312

Product Design

(4 Core + 3 Elective) Minimum of 50 Weeks

Product Design is a crucial domain within mechanical engineering that focuses on creating innovative and functional products that meet consumer needs and industry standards. It involves a multidisciplinary approach, integrating aesthetics, functionality, and manufacturability to develop products from concept to market.

Key Concepts

Design Principles: Fundamental guidelines that drive the aesthetics, ergonomics, and usability of a product.

CAD and Modelling: Use of computer-aided design (CAD) software to create detailed 3D models and simulations.

Materials Selection: Choosing appropriate materials based on product requirements, including strength, durability, and cost.

Prototyping and Testing: Building and testing prototypes to evaluate design concepts and make necessary adjustments.

Manufacturability: Ensuring the product design is optimized for manufacturing processes to reduce costs and increase efficiency.

Sustainability: Incorporating eco-friendly materials and processes to minimize environmental impact.

Product Design is essential for developing innovative, user-friendly, and manufacturable products. NPTEL's courses provide comprehensive education in this domain, and obtaining a domain certificate will equip candidates with the skills and knowledge needed to excel in their careers. This certification opens up opportunities in various industries, including automotive, consumer electronics, medical devices, and more, empowering professionals to contribute significantly to product innovation and development.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Manufacturing Guidelines for Product Design	8 weeks	Prof. Inderdeep Singh	IIT Roorkee	112107258
Core 2	Product Design and Development	4 weeks	Prof. Inderdeep Singh	IIT Roorkee	112107217
Core 3	Product Design and Manufacturing	12 weeks	Prof. J. Ramkumar Prof. Amadeep Singh	IIT Kanpur	112104230
Core 4	Design Practice	8 weeks	Prof. Shantanu Bhattacharya	IIT Kanpur	112104228
Core 5	Basics of Materials Engineering	12 weeks	Prof. Ratna Kumar Annabattula	IIT Madras	112106293
Core 6	Production Technology: Theory and Practice	12 Weeks	Prof. Sounak Kumar Choudhury	IIT Kanpur	112104304
Elective 1	Design Practice - II	8 weeks	Prof. Shantanu Bhattacharya	IIT Kanpur	112104252
Elective 2	Ergonomics in Automotive Design	4 weeks	Prof. Sougata Karmakar	IIT Guwahati	107103084
	Ergonomics Workplace Analysis	4 weeks	Prof. Urmi R. Salve	IIT Guwahati	107103085
Elective 3	System Design for Sustainability	12 weeks	Prof. Sharmistha Banerjee	IIT Guwahati	107103081
Elective 4	Digital Human Modeling and Simulation for Virtual Ergonomics Evaluation	8 weeks	Prof. Sougata Karmakar	IIT Guwahati	109103101
Elective 5	Gear and Gear Unit Design : Theory and Practice	8 weeks	Prof. Rathindranath Maiti	IIT Kharagpur	112105234
Elective 6	Design for Quality, Manufacturing and Assembly	8 weeks	Prof. Palaniappaan Ramu	IIT Madras	112106249
Elective 7	Robotics and Control : Theory and Practice	8 weeks	Prof. N. Sukavanam Prof. M. Felix Orlando	IIT Roorkee	112107289
	Robotics: Basics and Selected Advanced Concepts	12 weeks	Prof. Ashitava Ghosal	IISc Bangalore	112108298
	Introduction to Robotics	12 weeks	Prof. Ashish Dutta	IIT Kanpur	112104298

Product Design

(4 Core + 3 Elective) Minimum of 50 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 8	Turbulent Combustion: Theory and Modelling	12 weeks	Prof. Ashok De	IIT Kanpur	112104272
Elective 9	Engineering Drawing and Computer Graphics	12 weeks	Prof. Rajaram Lakkaraju	IIT Kharagpur	112105294
Elective 10	Mechatronics	8 weeks	Prof. Pushparaj Mani Pathak	IIT Roorkee	112107298
Elective 11	Manufacturing Processes - Casting and Joining	4 weeks	Prof. Sounak Kumar Choudhury	IIT Kanpur	112104301
Elective 12	Wheeled Mobile Robots	8 weeks	Prof. Asokan Thondiyath Prof. Santhakumar Mohan	IIT Madras IIT Palakkad	112106298
Elective 13	Welding Application Technology	8 weeks	Prof. Pankaj Biswas	IIT Guwahati	112103305
Elective 14	Fundamentals of Additive Manufacturing Technologies	12 weeks	Prof. Sajan Kapil	IIT Guwahati	112103306
Elective 15	Design of Mechatronic Systems	12 weeks	Prof. Prasanna Gandhi	IIT Bombay	112101304

Advanced Dynamics and Vibration

(3 Core + 3 Elective) Minimum of 50 Weeks

Advanced Dynamics and Vibration is a specialized domain within mechanical engineering that delves into the study of complex motion and oscillatory behavior of mechanical systems. It explores the principles governing the dynamic behavior of machines, structures, and mechanical components, and provides the analytical tools to analyze and control vibrations in engineering systems.

Key Concepts

Kinematics and Kinetics: Analysis of motion and forces acting on mechanical systems, including translation, rotation, and acceleration.

Dynamics of Machinery: Study of the dynamic behavior of machines, including balancing, gyroscopic effects, and mechanisms.

Vibration Analysis: Examination of the oscillatory motion of mechanical systems, including free and forced vibrations, damping, and resonance.

Rotor Dynamics: Analysis of the behavior of rotating machinery, such as turbines, rotors, and engines.

Control of Vibrations: Techniques for mitigating and controlling vibrations in mechanical systems, including active and passive vibration control methods.

Advanced Dynamics and Vibration play a crucial role in ensuring the reliability, efficiency, and safety of mechanical systems.

NPTEL's courses offer a comprehensive education in this domain, equipping candidates with the theoretical knowledge and practical skills needed to excel in their careers. This certification opens up opportunities in various industries, including aerospace, automotive, power generation, and manufacturing, empowering professionals to contribute significantly to the design, analysis, and optimization of mechanical systems.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Engineering Mechanics	12 weeks	Prof. K. Ramesh	IIT Madras	112106286
Core 2	Vibrations of Structures	12 weeks	Prof. Anirvam Dasgupta	IIT Kharagpur	112105197
	Introduction to Mechanical Vibration	8 weeks	Prof. Anil Kumar	IIT Roorkee	112107212
Core 3	Advanced Dynamics	12 Weeks	Prof. Anirvan DasGupta	IIT Kharagpur	112105304
Core 4	To Be Developed	To Be Developed	-	-	-
Core 5	Nonlinear Vibration	12 weeks	Prof. S. K. Dwivedy	IIT Guwahati	112103300
Elective 1	Robotics and Control : Theory and Practice	8 weeks	Prof. N. Sukavanam Prof. M. Felix Orlando	IIT Roorkee	112107289
Elective 2	Fundamentals of Acoustics	12 weeks	Prof. Nachiketa Tiwari	IIT Kanpur	112104212
	Acoustic and Noise Control	12 weeks	Prof. Abijith Sarkar	IIT Madras	112106225
Elective 3	Acoustic Materials and Metamaterials	8 weeks	Prof. Sneha Singh	IIT Roorkee	112107290
Elective 4	A short lecture series on contour integration in the complex plane	4 weeks	Prof. Venkata Sonti	IISc Bangalore	112108285
Elective 5	Chaos theory	To Be Developed	-	-	-
Elective 6	Computational Continuum Mechanics	12 weeks	Prof. Sachin Singh Gautam	IIT Guwahati	112103296
Elective 7	Muffler Acoustics – Application to Automotive Exhaust Noise Control	12 weeks	Prof. Akhilesh Mimani	IIT Kanpur	112104299
Elective 8	Mechanics and Control of Robotic Manipulators	8 Weeks	Prof. Santhakumar Mohan	IIT Palakkad	112106304
Elective 9	Vibrations of Plates and Shells	12 weeks	Prof. Venkata Sonti	IISc Bangalore	112108312
Elective 10	Dynamics and Control of Mechanical Systems	12 weeks	Prof. Ashitava Ghosal	IISc Bangalore	112108313
Elective 11	Nonlinear Adaptive Control	12 weeks	Prof. Srikant Sukumar	IIT Bombay	112101312

Computational Mechanics

(3 Core + 3 Elective) Minimum of 50 Weeks

Computational techniques are a crucial component of the engineering toolkit. The theories of mechanics depend on numerical implementation to bridge the gap to practice. In the "Computational Mechanics" domain the focus is on applying such solution techniques to problems in mechanics with a strong focus on the finite element methods.

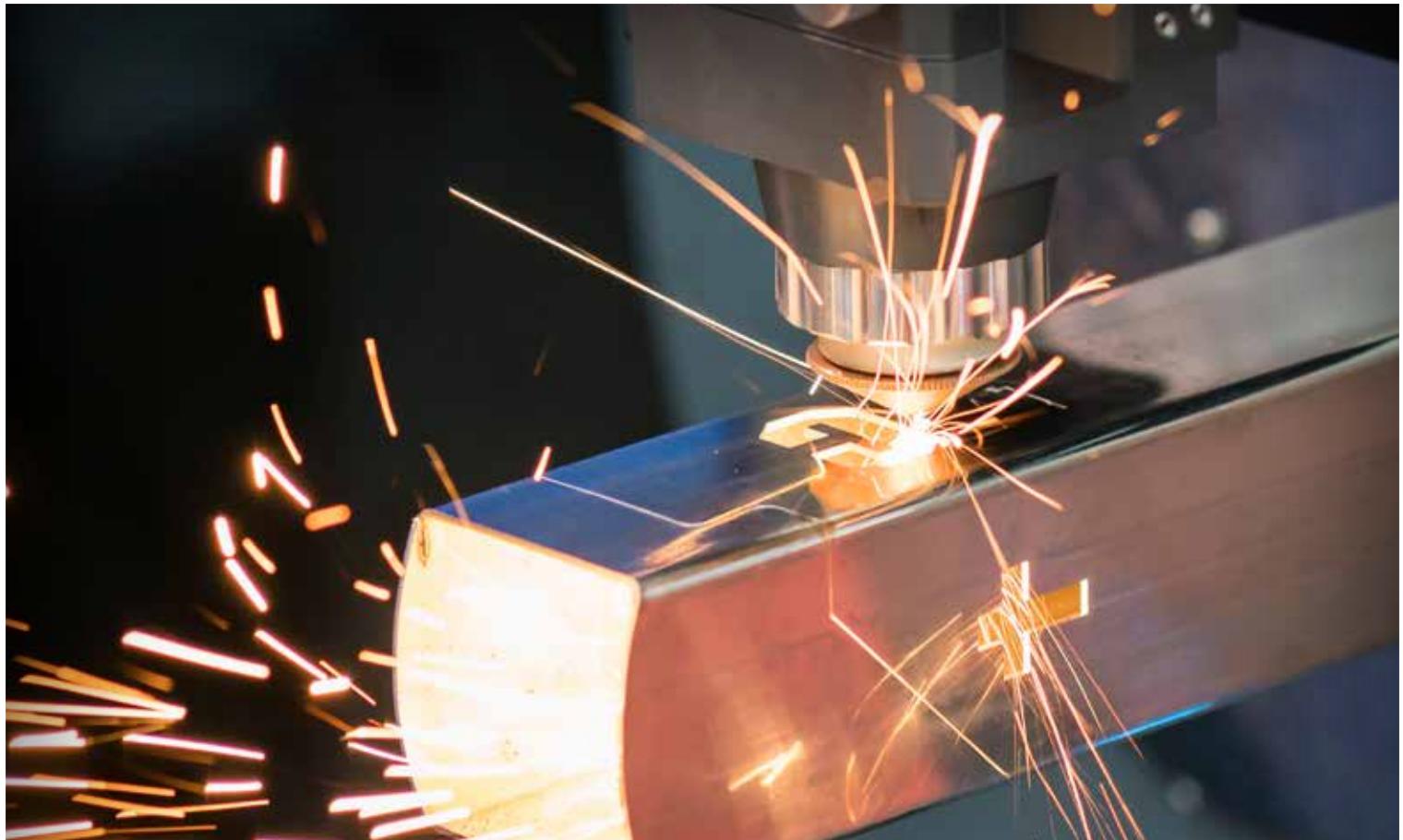
Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Engineering Mechanics	12 weeks	Prof. K. Ramesh	IIT Madras	112106286
Core 2	Numerical Methods for Engineers	12 weeks	Prof. Niket S Kaisare	IIT Madras	127106019
Core 3	Basics of Finite Element Analysis-I	8 weeks	Prof. Nachiketa Tiwari	IIT Kanpur	112104193
	Finite Element Method	12 weeks	Prof. Biswanath Banerjee Prof. Amit Shaw	IIT Kharagpur	112105308
	Introduction to Finite Volume Methods I	8 weeks	Prof. Ashoke De	IIT Kanpur	101104074
Core 4	Finite Element Method: Variational Methods to Computer Programming	12 weeks	Prof. Atanu Banerjee Prof. Arup Nandy	IIT Guwahati	112103295
Elective 1	Foundations of Computational Materials Modelling	12 weeks	Prof. Narasimhan Swaminathan	IIT Madras	112106289
Elective 2	A Short Lecture Series on Contour Integration in the Complex Plane	4 weeks	Prof. Venkata Sonti	IISc Bangalore	112108285
Elective 3	Optimization from Fundamentals	12 weeks	Prof. Ankur A. Kulkarni	IIT Bombay	112101298
Elective 4	Advanced Finite Element Methods	To Be Developed	-	-	-
Elective 5	Computational Plasticity	To Be Developed	-	-	-
Elective 6	Computational Continuum Mechanics	12 weeks	Prof. Sachin Singh Gautam	IIT Guwahati	112103296
Elective 7	Finite Element Modeling of Welding Processes	12 weeks	Prof. Swarup Bag	IIT Guwahati	112103299
Elective 8	Evolutionary Computation for Single and Multi-Objective Optimization	8 weeks	Prof. Deepak Sharma	IIT Guwahati	112103301
Elective 9	Tools in Scientific Computing	8 weeks	Prof. Aditya Bandopadhyay	IIT Kharagpur	112105299
Elective 10	Advanced Dynamics	12 Weeks	Prof. Anirvan DasGupta	IIT KGP	112105304
Elective 11	Dynamics and Control of Mechanical Systems	12 weeks	Prof. Ashitava Ghosal	IISc Bangalore	112108313
Elective 12	Nonlinear Adaptive Control	12 weeks	Prof. Srikant Sukumar	IIT Bombay	112101312

Robotics

(2 Core + 5 Elective) Minimum of 50 Weeks

Robotics is an interdisciplinary area that requires understanding of mechanical, electrical and computer science fundamentals. The online learning domain in Robotics has been introduced to nurture and develop the next-generation professionals in the area of robotics who can contribute in the design, development, and implementation of robotic systems in the industry. The domain will have focus on Design, Analysis, and Application development (new system development) and the curriculum has been developed with this focus. The two core courses will focus on the kinematics, dynamics, and control of industrial manipulators and wheeled mobile robots. Three elective baskets provide courses in the mechanical design, sensors and actuators, and computational intelligence. By choosing appropriate courses, students will be able to specialise in their chosen discipline and can contribute in the design and control of robotic systems. The domain is primarily intended for PG students who want to specialise in Robotics. However, UG students also may find it useful if they plan to take up higher studies in Robotics.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Introduction to Robotics	12 weeks	Prof. Asokan T Prof. Balaraman Ravindran Prof. Krishna Vasudevan	IIT Madras	107106090
	Robotics	8 weeks	Prof. DK Pratihar	IIT Kharagpur	112105249
	Mechanism and Robot Kinematics	8 weeks	Prof. Anirvandasgupta	IIT Kharagpur	112105236
	Robotics and Control : Theory and Practice	8 weeks	Prof. N. Sukavanam Prof. M. Felix Orlando	IIT Roorkee	112107289
	Introduction to Robotics	12 weeks	Prof. Ashish Dutta	IIT Kanpur	112104298
	Mechanics and Control of Robotic Manipulators	8 Weeks	Prof. Santhakumar Mohan	IIT Palakkad	112106304
Core 2	Wheeled Mobile Robots	8 weeks	Prof. Asokan Thondiyath Prof. Santhakumar Mohan	IIT Madras IIT Palakkad	112106298
Elective 1	Sensors and Actuators	12 weeks	Prof. Hardik J Pandya	IISc Bangalore	108108147
Elective 2	Microprocessors and Microcontrollers	12 weeks	Prof. Santanu Chattopadhyay	IIT Kharagpur	108105102
Elective 3	Digital Image Processing	12 weeks	Prof. Prabir Kumar Biswas	IIT Kharagpur	117105135
Elective 4	Fundamental of Power Electronics	12 weeks	Prof. Vivek Agarwal Prof. L Umanand	IISc Bangalore	108101126
	Power Electronics	12 weeks	Prof. G. Bhuvaneshwari	IIT Delhi	108102145
Elective 5	Embedded Systems Design	12 weeks	Prof. Anupam Basu	IIT Kharagpur	106105159
	Ethical Hacking	12 weeks	Prof. Indranil Sengupta	IIT Kharagpur	106105217
Elective 6	Industrial Automation and Control	12 weeks	Prof. Alokanti Deb	IIT Kharagpur	108105088
Elective 7	Kinematics of Mechanisms and Machines	8 weeks	Prof. Anirvan Dasgupta	IIT Kharagpur	112105268
	Mechanics of Human Movement	12 weeks	Prof. Sujatha Srinivasan	IIT Madras	112106248
Elective 8	Modelling and Simulation of Dynamic Systems	8 weeks	Prof. Pushparaj Mani Pathak	IIT Roorkee	112107214
Elective 9	Design of Mechatronic Systems	12 Weeks	Prof. Prasanna Gandhi	IIT Bombay	112101304
Elective 10	Fundamentals of Artificial Intelligence	12 weeks	Prof. Shyamanta M. Hazarika	IIT Guwahati	112103280
	An Introduction to Artificial Intelligence	12 weeks	Prof. Mausam	IIT Delhi	106102220
Elective 11	Introduction to Machine Learning	8 weeks	Prof. Sudeshna Sarkar	IIT Kharagpur	106105152
	Introduction to Machine Learning	12 weeks	Prof. Balaraman Ravindran	IIT Madras	106106139
	Practical Machine Learning with Tensorflow	8 weeks	Prof. Ashish Tendulkar Prof. B. Ravindran	IIT Madras & Google	106106213
	Machine Learning, ML	8 weeks	Prof. Carl Gustaf Jansson	KTH Royal Institute of Technology, Sweden	106106202
Elective 12	Reinforcement Learning	12 weeks	Prof. Balaraman Ravindran	IIT Madras	106106143
Elective 13	Deep Learning	12 weeks	Prof. Prabir Kumar Biswas	IIT Kharagpur	106105215
	Deep Learning	12 weeks	Prof. Sudarshan Iyengar	IIT Ropar	106106184
Elective 14	Robot Motion Planning	8 weeks	Prof. Ashish Dutta	IIT Kanpur	112104308



Discipline

Metallurgical & Materials Engineering

Domains

1. Materials Joining
2. Electronic Materials
3. Materials Characterization
4. Minor in Metallurgy

Materials Joining

(2 Core + 3 Elective) Minimum of 40 Weeks

The modern material assemblies require the combined use of alloys for given commercial applications. Materials Joining technologies are of critical importance for the construction of virtually all the components of the assemblies. This minor course aims to elaborate the importance of material joining processes, their physical principles, operational conditions, the metallurgy of joining, design of welded structures, and performance of the welded structures under service loading.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Weldability of Metals	8 weeks	Prof. Dheerendra Kumar Dwivedi	IIT Roorkee	112107257
	Welding Metallurgy	12 Weeks	Prof. Pradeep K. Jha	IIT Roorkee	113107092
Core 2	Welding Processes	12 Weeks	Prof. Murugaiyan Amirthalingam	IIT Madras	113106087
	Joining Technologies for Metals	12 weeks	Prof. Dheerendra Kumar Dwivedi	IIT Roorkee	112107213
Elective 1	Advances in Welding and Joining Technologies	8 weeks	Prof. Swarup Bag	IIT Guwahati	112103244
Elective 2	Theory and Practice of Non Destructive Testing	8 Weeks	Prof. Ranjit Bauri	IIT Madras	113106070
Elective 3	Analysis and Modeling of Welding	8 Weeks	Prof. Gandham Phanikumar	IIT Madras	113106067
Elective 4	Welding of Advanced High Strength Steels for Automotive Applications.	4 weeks	Prof. Murugaiyan Amirthalingam	IIT Madras	113106082
Elective 5	Thermo-Mechanical And Thermo-Chemical Processes	8 weeks	Prof. Vivek Pancholi Prof. S. R. Meka	IIT Roorkee	113107091
Elective 6	Aqueous Corrosion and its Control	12 Weeks	Prof. V. S. Raja	IIT Bombay	113101098
Elective 7	Cathodic Protection Engineering	4 weeks	Prof. V.S. Raja	IIT Bombay	113101099
Elective 8	Finite Element Modeling of Welding Processes	12 Weeks	Prof. Swarup Bag	IIT Guwahati	112103299
Elective 9	Corrosion Failures and Analysis	8 Weeks	Prof. Kallol Mondal	IIT Kanpur	113104101
Elective 10	Mechanical Behaviour of Materials (Part - I)	12 weeks	Prof. Shashank Shekhar Prof. Sudhanshu Shekhar Singh	IIT Kanpur	113104104

Electronic Materials

(3 Core + 2 Elective) Minimum of 40 Weeks

Electronic materials are used in a wide range of electronic devices that pervade the gadgets we use today, and are likely to continue to use in the foreseeable future. The NPTEL Domain in Electronic Materials aims to make you understand fundamental as well as practical and industrial aspects of this area.

The core course, Physics of Materials, takes you through the core scientific aspects of properties of materials and helps you understand why specific materials demonstrate specific properties. This course will be accessible to almost any student in Engineering. The other core courses Fundamentals of electronic device fabrication, Fundamentals of electronic materials and devices (or) Fundamentals of semiconductor devices, look at how practical devices are built based on the science of their operation. Practical and industrial aspects are described and the behavior of devices examined.

The electives listed aim to give the learner an edge by providing deeper insight into specific aspects related to this domain. Material Characterization is very important in this domain since very high purity materials are required. Material Characterization is the process of analyzing materials using appropriate techniques to determine the nature and quality of the material. Another elective takes the learner deeper into the area of Photovoltaics, the basis for Solar cells, the electronic device likely to power our world

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Physics of Materials	12 weeks	Prof. Prathap Haridoss	IIT Madras	113106039
Core 2	Fundamentals of Electronic Device Fabrication	4 weeks	Prof. Parasuraman S	IIT Madras	113106062
Core 3	Fundamentals of Electronic Materials and Devices	8 weeks	Prof. Parasuraman Swaminathan	IIT Madras	113106065
	Fundamentals of Semiconductor Devices	12 weeks	Prof. Digbijoy N. Nath	IISc Bangalore	108108122
Elective 1	Solar Photovoltaics: Principles, Technologies & Materials	8 weeks	Prof. Ashish Garg	IIT Kanpur	113104084
Elective 2	Material Characterization	12 weeks	Prof. Sankaran. S	IIT Madras	113106034
Elective 3	Analysis of Defects in Devices	To Be Developed	-	-	-
Elective 4	Solid State Physics	8 Weeks	Prof. Nirmal Ganguli	IISER Bhopal	115106127
Elective 5	Mechanical Behaviour of Materials (Part - I)	12 weeks	Prof. Shashank Shekhar Prof. Sudhanshu Shekhar Singh	IIT Kanpur	113104104
Elective 6	Materials Design for Electronic, Electromechanical and Optical Functions	12 Weeks	Prof. Pavan Nukala	IISc Bangalore	113108515
Elective 7	Thin Film Technology	12 Weeks	Prof. Samit K Ray	IIT Kharagpur	127105531

Materials Characterization

(3 Core + 2 Elective) Minimum of 40 Weeks

Materials Characterization is a critical domain within metallurgical and materials engineering that focuses on analyzing the structure, properties, and performance of materials at various scales. It involves a range of techniques and methodologies to understand the composition, microstructure, mechanical behavior, and other properties of materials, which is essential for their design, processing, and application in various industries.

Key Concepts

Microstructural Analysis: Examination of the internal structure of materials at the microscopic level, including grain size, phase composition, and defects.

Mechanical Testing: Evaluation of mechanical properties such as hardness, strength, toughness, and ductility to assess material performance under different loading conditions.

Chemical Analysis: Determination of elemental composition and chemical bonding using techniques like spectroscopy, X-ray diffraction, and electron microscopy.

Thermal Analysis: Investigation of thermal properties such as melting point, heat capacity, and thermal expansion to understand material behavior at high temperatures.

Surface Characterization: Study of surface morphology, roughness, and chemical composition to assess surface quality and performance.

Non-Destructive Testing: Techniques for evaluating material properties without causing damage, including ultrasonic testing, eddy current testing, and radiography.

Materials Characterization is crucial for understanding the properties and behavior of materials, which is essential for their selection, processing, and application in various industries. NPTEL's courses offer comprehensive education in this domain, providing candidates with the knowledge and skills needed to excel in metallurgical and materials engineering careers. This certification opens up opportunities in industries such as aerospace, automotive, electronics, and manufacturing, empowering professionals to contribute significantly to materials innovation and development.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	X-Ray Crystallography & Diffraction	12 weeks	Prof. Ranjit Kumar Ray	IEST Shibpur	112106227
Core 2	Fundamentals of X-Ray Diffraction and Transmission Electron Microscopy	8 weeks	Prof. S. Sankaran	IIT Madras	113106069
Core 3	Fundamentals of Optical and Scanning Electron Microscopy	8 Weeks	Prof. S. Sankaran	IIT Madras	113106064
Core 4	Techniques of Material Characterization	12 Weeks	Prof. Shibayan Roy	IITKGP	113105101
Elective 1	Elementary Stereology for Quantitative Metallography	4 weeks	Prof. Sandeep Sangal	IIT Kanpur	113106081
Elective 2	Theory and Practice of Non Destructive Testing	8 Weeks	Prof. Ranjit Bauri	IIT Madras	113106070
Elective 3	Analytical Chemistry	12 Weeks	Prof. Debasish Ray	IIT Kharagpur	104105084
Elective 4	Texture in Materials	12 Weeks	Prof. Somjeet Biswas	IIT Kharagpur	113105103
Elective 5	Mechanical Behaviour of Materials (Part - I)	12 weeks	Prof. Shashank Shekha Prof. Sudhanshu Shekhar Singh	IIT Kanpur	113104104

Minor in Metallurgy

(3 Core + 2 Elective) Minimum of 40 Weeks

A Minor in Metallurgy is a specialized program within Metallurgical & Materials Engineering that provides students with a foundational understanding of metallurgical principles, materials science, and engineering applications. This minor program offers courses focused on the study of metals, alloys, and materials processing techniques, preparing students for careers in industries such as manufacturing, aerospace, automotive, and materials research.

Key Concepts

Metallurgical Principles: Understanding the structure-property relationships of metals and alloys, including crystallography, phase transformations, and mechanical behavior.

Materials Processing: Learning about various manufacturing processes used to produce and shape metallic materials, such as casting, forging, extrusion, and heat treatment.

Materials Characterization: Introduction to techniques for analyzing the microstructure, composition, and properties of metals and alloys, including microscopy, spectroscopy, and mechanical testing.

Corrosion and Degradation: Studying the mechanisms and prevention of corrosion and degradation in metallic materials, including surface treatments and coatings.

Alloy Design and Selection: Exploring the principles of alloy design, selection, and optimization for specific applications based on desired properties and performance requirements.

A Minor in Metallurgy provides students with valuable insights into the science and engineering of metallic materials, preparing them for careers in industries reliant on metals and alloys. NPTEL's courses offer a convenient and accessible platform for students to pursue this minor program, providing them with high-quality education and certification in metallurgical engineering and materials science. This certification serves as a testament to their expertise and commitment to excellence in the field of metallurgy, opening up opportunities for professional growth and success in various industries and research domains.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Ironmaking and Steelmaking	12 Weeks	Prof. Gour Gopal Roy	IIT Kharagpur	113105098
Core 2	Aqueous Corrosion and Its Control	12 Weeks	Prof. V. S. Raja	IIT Bombay	113101098
Core 3	Mechanical Behavior of Materials	12 Weeks	Prof. S. Sankaran	IIT Madras	113106101
Core 4	Metallurgical Thermodynamics, Physical Metallurgy and Phase Transformation	To Be Developed	-	-	-
Core 5	Material Characterization	12 Weeks	Prof. Sankaran.S	IIT Madras	113106034
Core 6	Introduction to Materials Science and Engineering	12 Weeks	Prof. Rajesh Prasad	IIT Delhi	113102080
Core 7	Thermodynamics and Kinetics of Materials	12 weeks	Prof. Saswata Bhattacharya	IIT Hyderabad	113106109
Core 8	Principles of Extractive Metallurgy	12 weeks	Prof. Tarun Kumar Kundu	IIT Kharagpur	113105441
Core 9	Artificial Intelligence and Machine Learning in Materials Engineering	12 Weeks	Prof. Krishanu Biswas	IIT Kanpur	113104517
Elective 1	Extraction Metallurgy	To Be Developed	-	-	-
Elective 2	Modeling of Tundish Steelmaking Process in Continuous Casting	8 Weeks	Prof. Pradeep Kumar Jha	IIT Roorkee	113107096
Elective 3	Introduction to Mineral Processing	12 Weeks	Prof. Arun Kumar Majumder	IIT Kharagpur	105105171

Minor in Metallurgy

(3 Core + 2 Elective) Minimum of 40 Weeks

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Elective 4	Corrosion/Environmental Degradation/Surface Engineering	12 weeks	Prof. (hag) Harish Hirani	IIT Delhi	113102109
Elective 5	Welding Process	12 Weeks	Prof. Murugaiyan	IIT Madras	113106087
Elective 6	Powder Metallurgy	12 weeks	Prof. Ranjit Bauri	IIT Madras	113106098
Elective 7	Corrosion - Part II	8 weeks	Prof. Kallol Mondol	IIT Kanpur	113104089
Elective 8	Thermo-Mechanical and Thermo-Chemical Processes	8 weeks	Prof. Vivek Pancholi Prof. S. R. Meka	IIT Roorkee	113107091
Elective 9	Dealing with Materials Data: Collection, Analysis and Interpretation	12 weeks	Prof. M P Gururajan Prof. Hina Gokhale	IIT Bombay	113101096
Elective 10	Properties of Materials (Nature and Properties of Materials : III)	8 weeks	Prof. Ashish Garg	IIT Kanpur	113104096
Elective 11	Diffusion in Multicomponent Solids	12 weeks	Prof. Kaustubh Kulkarni	IIT Kanpur	113104097
Elective 12	Corrosion Failures and Analysis	8 weeks	Prof. Kallol Mondal	IIT Kanpur	113104101
Elective 13	Mechanical Behaviour of Materials (Part - I)	12 weeks	Prof. Shashank Shekhar Prof. Sudhanshu Shekhar Singh	IIT Kanpur	113104104
Elective 14	Phase Diagrams in Single Component and Binary Systems in Bengali	8 Weeks	Prof. Kallol Mondal	IIT Kanpur	113104516
Elective 15	Metallurgical and Electronic Waste Recycling	8 Weeks	Prof. Arunabh Meshram	IIT Kanpur	113104529
Elective 16	Materials Processing (Casting, Forming and Welding)	12 Weeks	Prof. Swarup Bag	IIT Guwahati	112103528



Discipline

Humanities and Social Science

Domains

1. English Studies
2. Psychology

English Studies

(5 Core + 1 Elective) Minimum of 60 Weeks

The idea behind English Studies domain is to introduce the learners to a wide range of literary periods, genres and theoretical frameworks that are usually covered in any standard BA/MA curriculum. The courses are chosen on the basis of their representativeness in terms of periods/genres/theories (as well as on the availability of courses in NPTEL)

On completing this domain specialisation the learners will have an in-depth idea of the important literary historical periods and canonical texts as well as a comprehensive understanding of New Literatures and possibilities for future research.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Introduction to Cultural Studies	12 weeks	Prof. Avishek	IIT Madras	109106136
Core 2	Literary Criticism (From Plato to Leavis)	12 weeks	Prof. Merin Simi Raj	IIT Madras	109106171
	Literary Theory and Literary Criticism	8 weeks	Prof. Aysha Viswamohan	IIT Madras	109106084
	Introduction to Literary Theory	8 weeks	Prof. Sayan Chattopadhyay	IIT Kanpur	109104135
Core 3	English Literature of the Romantic Period, 1798 - 1832	8 weeks	Prof. Pramod K Nayar	University of Hyderabad	109106149
Core 4	Feminist Writings	12 weeks	Prof. Avishek Parui	IIT Madras	109106146
	Gender and Literature	8 weeks	Prof. Avishek Parui	IIT Guwahati	109103122
Core 5	History of English Language and Literature	12 weeks	Prof. Merin Simi Raj	IIT Madras	109106124
Core 6	Posthumanism: An Introduction	8 Weeks	Prof. Pramod K Nayar	University of Hyderabad	109106503
Elective 1	Indian Fiction in English	12 weeks	Prof. Merin Simi Raj	IIT Madras	109106135
	Introduction to Modern Indian Drama	8 weeks	Prof. Kiran Keshavamurthy	IIT Guwahati	109103140
Elective 2	Twentieth Century Fiction	12 weeks	Prof. Avishek Parui	IIT Madras	109106172
	The Nineteenth-Century English Novel	12 weeks	Prof. Divya A	IIT Madras	109106145
Elective 3	American Literature & Culture	12 weeks	Prof. Aysha Viswamohan	IIT Madras	109106099
Elective 4	Disability Studies: An introduction	8 weeks	Prof. Hemachandran Karah	IIT Madras	109106168
Elective 5	Introduction to Film studies	12 weeks	Prof. Aysha Viswamohan	IIT Madras	109106079
Elective 6	Postcolonial Literature	4 weeks	Prof. Sayan Chattopadhyay	IIT Kanpur	109104116
Elective 7	Introduction to World Literature	12 weeks	Prof. Merin Simi Raj	IIT Madras	109106147
Elective 8	Literature and Life	12 weeks	Prof. S P Dhanavel	IIT Madras	109106189
Elective 9	Contextualizing Gender	12 weeks	Prof. Rashmi Gaur	IIT Roorkee	109107191
Elective 10	Performance Traditions of the Mahabharata in Tamil Nadu	12 weeks	Prof. Sashikanth Ananthachari Prof. Rajesh Kumar	IIT Madras	109106500

Psychology

(3 Core + 4 Elective) Minimum of 50 Weeks

The domain on Psychology is designed for a wide range of audience including those who are pursuing or interested in pursuing UG in psychology /UG or PG in social works/ PG in linguistics/ UG or PG in cognitive psychology/ UG in psychiatry etc. This will be beneficial for those who are preparing for the national-level exams too.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Introduction to Psychology	8 weeks	Prof. Braj Bhushan	IIT Kanpur	109104105
	Positive Psychology	8 weeks	Prof. Kamlesh Singh	IIT Delhi	109102157
	Human Behaviour	8 weeks	Prof. Naveen Kashyap	IIT Guwahati	109103142
Core 2	Introduction to Cognitive Psychology	12 weeks	Prof. Naveen Kashyap	IIT Guwahati	109103134
	Introduction to Advanced Cognitive Processes	8 weeks	Prof. Ark Verma	IIT Kanpur	109104126
Core 3	Introduction to Brain & Behaviour	8 weeks	Prof. Ark Verma	IIT Kanpur	109104171
Elective 1	How the Brain Creates Mind	4 weeks	Prof. Alok Bajpai	IIT Kanpur	109104108
	Psychiatry - An Overview and How the Brain Creates Mind	8 weeks	Prof. Alok Bajpai	IIT Kanpur	109104096
	Psychology of Everyday	4 weeks	Prof. Braj Bhushan Prof. Alok Bajpai	IIT Kanpur	109104151
Elective 2	Introduction to the Psychology of Language	8 weeks	Prof. Ark Verma	IIT Kanpur	109104143
	The Psychology of Language	8 weeks	Prof. Naveen Kashyap	IIT Guwahati	109103152
	Perspectives on Neurolinguistic	4 weeks	Prof. Smita Jha	IIT Roorkee	109107132
	Language and Mind	8 weeks	Prof. Rajesh Kumar	IIT Madras	109106085
Elective 3	Consumer Psychology	8 weeks	Prof. Naveen Kashyap	IIT Guwahati	109103136
Elective 4	Health Research Fundamentals	8 weeks	Multi Faculty	National Institute of Epidemiology	109106095
Elective 5	Disability Studies: An Introduction	8 weeks	Prof. Hemachandran Karah	IIT Madras	109106168
Elective 6	The Science of Happiness and Wellbeing	8 weeks	Prof. Priyadarshi Patnaik Prof. Manas K Mandal	IIT Kharagpur	109105199
	Sustainable Happiness	8 Weeks	Prof. Atasi Mohanty	IIT Kharagpur	109105493
Elective 7	Yoga and Positive Psychology for Managing Career and Life	8 weeks	Prof. Ashish Pandey	IIT Bombay	110101165
Elective 8	Engineering Psychology	8 Weeks	Prof. Naveen Kashyap	IIT Guwahati	109103540
Elective 9	Memory	8 Weeks	Prof. M. K. Asthana	IIT Roorkee	109107541

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Discipline

Mathematics

Domains

1. Foundations of Mathematics
2. Algebra



Foundations of Mathematics

(3 Core + 3 Elective) Minimum of 60 Weeks

Mathematics is at the heart of all scientific and engineering disciplines. This domain emphasises the foundational material - calculus and linear algebra while providing the learner with a wide choice of electives covering the basics of algebra, discrete mathematics, probability or differential equations. This domain would be especially of interest to those preparing for competitive examinations such as GATE, JAM etc.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Basic Calculus - 1	12 weeks	Prof. Arindama Singh	IIT Madras	111106146
Core 2	Calculus II	To be developed	-	-	-
Core 2	Linear Algebra	12 weeks	Prof. Pranav Haridas	Kerala School of Mathematics	111106135
	Linear Algebra	12 weeks	Prof. Arbind Kumar Lal	IIT Kanpur	111104137
Elective 1	Introduction to Abstract Group Theory	8 weeks	Prof. Krishna Hanumanthu	Chennai Mathematical Institute	111106113
Elective 2	Complex Analysis	12 weeks	Prof. Pranav Haridas	Kerala School of Mathematics	111106141
Elective 3	Introduction to Probability (with Examples Using R)	12 weeks	Prof. Siva Athreya	ISI Bangalore	111106150
Elective 4	Discrete Mathematics	12 weeks	Prof. Sudarshan Iyengar	IIT Ropar	106106183
Elective 5	Computational Mathematics with SageMath	8 weeks	Prof. Ajit Kumar	Institute of Chemical Technology, Mumbai	111106149
Elective 6	Introduction to Rings and Fields	8 weeks	Prof. Krishna Hanumanthu	Chennai Mathematical Institute	111106131
Elective 7	Ordinary Differential Equations	To be developed	-	-	-



Algebra

(3 Core + 3 Elective) Minimum of 56 Weeks

Algebra is the study of mathematical structures such as groups, rings and fields. The core courses of this domain provide learners with a strong foundation in these topics. Algebraic methods are indispensable in numerous other areas of mathematics such as Number Theory, Algebraic Geometry and Combinatorics. They are also needed for engineering applications like Cryptography and Error Control Coding. The elective courses allow learners to understand some of these applications in addition to pursuing more advanced topics such as Group Representation Theory or Galois Theory. This domain also includes elective courses with a computational focus for students with an interest in programming.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Linear Algebra	12 weeks	Prof. Pranav Haridas	Kerala School of Mathematics	111106135
	Linear Algebra	12 weeks	Prof. Arbind Kumar Lal	IIT Kanpur	111104137
Core 2	Introduction to Abstract Group Theory	8 weeks	Prof. Krishna Hanumanthu	CMI	111106113
Core 3	Introduction to Rings and Fields	8 weeks	Prof. Krishna Hanumanthu	CMI	111106131
Elective 1	A Basic Course in Number Theory	12 weeks	Prof. Shripad Garge	IIT Bombay	111101137
Elective 2	Computational Commutative Algebra	12 weeks	Prof. Manoj Kummini	CMI	111106138
Elective 3	Introduction to Galois Theory	8 weeks	Prof. Krishna Hanumanthu	CMI	111106145
Elective 4	Representations of Finite Groups	To be developed	-	-	-
Elective 5	Rings and Modules	12 weeks	Prof. Mousumi Mandal Prof. Ramakrishna Nanduri	IIT Kharagpur	111105161
Elective 6	Computational Mathematics with SageMath	8 weeks	Prof. Ajit Kumar	Institute of Chemical Technology, Mumbai	111106149
Elective 7	Combinatorics	12 Weeks	Prof. Narayanan N	IIT Madras	111106155
Elective 8	Category Theory	To be developed	-	-	-
Elective 9	Combinatorics and Applications	8 weeks	Prof. Ajit Kumar	Institute of Chemical Technology, Mumbai	111106149
Elective 10	Algebraic Combinatorics	12 weeks	Prof. Amritanshu Prasad Prof. Sankaran Viswanath	IMSc	111106158



Discipline

Sports Science

Domains

1. Sports Science

Sports Science

(5 Core + 2 Elective) Minimum of 60 Weeks

Sports Science is an interdisciplinary field that focuses on the scientific principles underlying physical activity, exercise, and sports performance. It combines knowledge from various disciplines such as physiology, biomechanics, psychology, nutrition, and medicine to enhance athletic performance, prevent injuries, and improve overall health and fitness. Sports scientists work with athletes and coaches to optimize training programs, develop innovative techniques, and apply cutting-edge research to real-world sports scenarios.

Key Areas in Sports Science:

Exercise Physiology: Examines how the body responds to physical activity and training, including cardiovascular, muscular, and metabolic adaptations.

Biomechanics: Analyzes the mechanical aspects of movement to improve efficiency and reduce the risk of injury.

Sports Psychology: Studies the mental and emotional aspects of sports, focusing on motivation, performance anxiety, and mental toughness.

Sports Nutrition: Investigates the role of diet and supplements in enhancing athletic performance and recovery.

Sports Medicine: Involves the prevention, diagnosis, and treatment of sports-related injuries and medical conditions. By taking these courses, students can gain comprehensive knowledge and skills in Sports Science, preparing them for careers as sports scientists, coaches, physical trainers, and more. These courses also offer valuable insights for those interested in personal fitness and health optimization.

Core/ Elective	Course Name	Duration	SME Name	Institute	NPTEL ID
Core 1	Strength & Conditioning for the Indian Population	12 weeks	Prof. Deckline Leitao Prof. Varun Suresh Kumar	IIT Madras	109106404
Core 2	Essentials of Sports Injury Prevention & Rehabilitation	8 weeks	Col (Dr) Anup Krishnan (Retd) Wg Cdr (Dr) CS Guru Lt Col (Dr) Atul Sharma	IIT Madras	109106405
Core 3	Introduction to Exercise Physiology & Sports Performance	8 weeks	Col (Dr) Anup Krishnan (Retd) Wg Cdr (Dr) CS Guru Prof. Pralay Majumdar	IIT Madras	109106406
Core 4	Sports and Performance Nutrition	8 weeks	Prof. Geetha Ghaliyavar	IIT Madras	109106402
Core 5	Sports Psychology	8 weeks	Prof. Chaitanya Sridhar Prof. Nivedita Rajan Prof. Priyanka Prabhakar	IIT Madras	109106403
Elective 1	Human Movement Science	8 weeks	Prof. Shruti Bhandurge Prof. Subham Badhyal	IIT Madras	109106401
Elective 2	Fundamentals of Sports Training, Load Management and recovery	8 weeks	Col (Dr) Anup Krishnan (Retd) Wg Cdr (Dr) CS Guru Prof. Kaustubh Shedjale	IIT Madras	109106407



NPTEL DOMAIN CERTIFICATION

↗ <https://nptel.ac.in/noc/Domain/>

NPTEL Office, IC & SR Building (3rd Floor), IIT Madras, Chennai 600 036

Tel: +91 44 2257 5905, +91 44 2257 5908

Mail: support@nptel.iitm.ac.in | Web URL: <https://nptel.ac.in/>