

# Bachelor of Technology in Electrical Engineering



<b>Programme Level</b>	Under Graduate
<b>Year of Commencement</b>	2009
<b>Minimum Duration</b>	4 Years (8 Semesters)
<b>Maximum Duration</b>	6 Years (12 Semesters)

## Motivation

Academic courses offered by IIT-Mandi for the B. Tech. / B. Tech. (Honors) program are classified as Institute Core (IC), Discipline Core (DC), Discipline Elective (DE) and Free Elective (FE) courses. As per IIT Mandi, a student must complete minimum credit requirements of 160 credits for regular B. Tech. and 172 credits for the B. Tech. with Honors. Hierarchically, IC courses provide a broader view of all engineering disciplines and IIT Mandi believes in making this learning process instrumental. Here, students are conceptualized with the fundamentals of these essential courses via theoretical approach and by conducting methodically structured experiments for same. The majority of these IC courses are offered during 1<sup>st</sup> and 2<sup>nd</sup> semesters of B. Tech. program. During the initial phase of this program, students are exposed to a flagship course of IIT Mandi, referred as Reverse Engineering, where students are instructed to dismantle the commercial appliances and reconstruct them back to a working state. This inculcates a spirit of learning-by-doing which is a hands-on approach of understanding the subjects. It also makes them realize that they need to interact with their surroundings to adapt and learn. The DC courses are more focused towards electrical-engineering subjects where the students are escorted deeper into core concepts. These are the fundamental knowledge that every engineer must have on their fingertips when they are working or pursuing higher studies. These DC courses are well structured and cover wide range of areas in electrical engineering. They are offered between 3<sup>rd</sup> – 5<sup>th</sup> semesters of the B. Tech. program along with few IC & DE courses. From 4<sup>th</sup> semester onwards, DE courses are offered to the students where they can opt for any of these courses with their own interest or by consulting with their faculty advisor(s). The list of DE courses is presented below in this document and is 3 – 6 level courses. They are advance subjects designed to render in-depth understanding of specific areas in electrical engineering. DE courses have wide variety and their contents are of state-of-the-art standard. These are the subjects which give them an edge while applying for the core-company jobs and makes them highly skilled asset of an organization. In the 4<sup>th</sup> semester, students are offered with the design practicum course which is inspired by the practicum-based learning. Here, students are segregated into groups where each group contains students from various disciplines like computer science, electrical, mechanical, civil, physics etc. Each group is supposed to carry out interdisciplinary project that solves real-world problems of the society and its cost is fully sponsored by IIT Mandi. In this era of interdisciplinary technology, students are encouraged to take courses apart from the core electrical engineering. These are FE courses and are offered from 6<sup>th</sup> semester onwards. Once again, the students can register for these courses based on their interest or the advices taken from faculty advisor(s). Another flag ship practicum course called Interdisciplinary Socio Technical Practicum is offered during 6<sup>th</sup> semester. This course provides invaluable opportunity for students to understand the real problems of local surrounding and come up with feasible solutions. In addition, students from IIT-Mandi collaborate with the international students while executing this course. It provides invaluable experience for them to work in multi-national culture. Eventually, the students are given optional choice in 7<sup>th</sup> - 8<sup>th</sup> semester to carry out major technical project (MTP) under the supervision of faculty member. It is a year-long project taken by B. Tech. students in their fourth year. The MTP is a capstone task which builds upon the previous three years of study taken by a B. Tech. students.

## Objectives

- To apply the knowledge acquired to solve various societal problems and leave deep impact in the development of our country.
- To learn and apply organizational and collaborative skills essential for successfully carrying out professional goals.
- To learn about advanced concepts and cutting-edge technologies.
- To contribute in terms of theoretical work, analysis or system development before they embark upon their professional careers.

**Semester wise distribution of all courses**  
(Minimum credit requirements for B.Tech. degree 160 credits)

**Semester I**

Course Code	Course Name	L-T-P-C
IC110	Engineering Mathematics	2.5-0.5-0-3
IC152	Data Science I	3-0-3-4
IC160	Electrical Systems Around Us	3-0-0-3
IC160P	Electrical Systems Around Us Lab	0-0-3-2
IC140	Graphics for Design	2-0-3-4
IC101P	Reverse Engineering	0-0-3-2
HS106	English I	3-0-0-3
HS107	Exploring Creative Art Forms	1-0-0-1
<b>Total</b>		<b>22 credits</b>

**Semester II**

Course Code	Course Name	L-T-P-C
IC111	Linear Algebra	2.5-0.5-0-3
IC141	Product Realization Technology	2-0-0-2
IC141P	Product Realization Technology Lab	0-0-3-2
IC161	Applied Electronics	3-0-0-3
IC161P	Applied Electronics Lab	0-0-3-2
IC252	Data Science II	3-0-2-4
IC142	Engineering Thermodynamics	3-0-0-3
HSXX1	HSS Language competence basket course	3-0-0-3
<b>Total</b>		<b>22 credits</b>

**Semester III**

Course Code	Course Name	L-T-P-C
IC260 (IC basket course)	Signals and Systems (Compulsory for EE student from Engg. Science basket)	2.5-0.5-0-3
IC240	Mechanics of Rigid Bodies	3-0-0-3
IC272	Data Science III	2-0-2-3
EE210+EE210P	Digital Systems Design	3-0-2-4
EE203	Network Theory	2.5-0.5-0-3
EE311	Device Electronics for Integrated Circuits	3-0-0-3
HSXX2	HSS basket course	3-0-0-3
<b>Total</b>		<b>22 credits</b>

**Semester IV**

Course Code	Course Name	L-T-P-C
IC201P	Design Practicum	0-0-6-4
ICXXX (IC basket course) or IC M&I Practicum as Free Elective	Science-I IC basket course or M&I Practicum	3-0-0-3
EE211	Analog Circuit Design	2-0-2-3
EE201+EE201P	Electro-mechanics	2.5-0.5-2-4
EE304 + EE 304P	Communication Theory	3-0-2-4
EEXX1	Discipline Elective-I	3-0-0-3
<b>Total</b>		<b>21 credits</b>

### Semester V

Course Code	Course Name	L-T-P-C
ICXXX or IC M&I Practicum as Free Elective	Science-II IC basket course or M&I Practicum	3-0-0-3
IC221	Foundations of Electrodynamics	3-0-0-3
CS201+CS201P	Computer Organization	3-0-2-4
EE301 + EE 301P	Control Systems	3-0-2-4
EE303	Power Systems	3-1-0-4
EEXX2	Discipline Elective-II	3-0-0-3
<b>Total</b>		<b>21 credits</b>

### Semester VI

Course Code	Course Name	L-T-P-C
IC222P	Physics Practicum	0-0-3-2
EEXX3	Discipline Elective-III	3-0-0-3
EEXX4	Discipline Elective-IV	3-0-0-3
FEXX1	Free Elective-I	3-0-0-3
FEXX2	Free Elective-II	3-0-0-3
HSXX3	HSS basket course	3-0-0-3
DP301P/EEXX5	Interdisciplinary Socio Technical Practicum/ Discipline Elective-V	0-0-6-4
<b>Total</b>		<b>21 credits</b>

### Semester VII

Course Code	Course Name	L-T-P-C
ITXX1	Industrial Internship	0-0-2-2
FEXX3	Free Elective-III	3-0-0-3
FEXX4	Free Elective-IV	4-0-0-4
HSXX1	HSS Elective-I	3-0-0-3
DP401P/EEXX6	Major Technical Project-I/Discipline Elective-VI	0-0-6-3
<b>Total</b>		<b>15 credits</b>

### Semester VIII

Course Code	Course Name	L-T-P-C
FEXX5	Free Elective-V	3-0-0-3
FEXX6	Free Elective-VI	3-0-0-3
FEXX7	Free Elective-VII	3-0-0-3
HSXX2	HSS Elective-II	2-0-0-2
DP402P/EEXX7	Major Technical Project-I/Discipline Elective-VII	0-0-10-5
<b>Total</b>		<b>16 credits</b>

**List of Core courses for Electrical Engineering Program  
(Total Credits for discipline core = 33)**

<b>Sr. No.</b>	<b>Course Title</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Total Credit</b>	<b>Semester</b>
1	Digital System Design	3	0	2	4	III
2	Network Theory	2.5	0.5	0	3	III
3	Device Electronics for Integrated Circuits	3	0	0	3	III
4	Electro-mechanics	2.5	0.5	2	4	IV
5	Analog Circuit Design	2	0	2	3	IV
6	Communication Theory	3	0	2	4	IV
7	Computer Organization	3	0	2	4	V
8	Control Systems	3	0	2	4	V
9	Power Systems	3	1	0	4	V

## Tentative list of elective courses

- EE 312P : Microelectronics Circuits Design Practicum (0-0-3-2)
- EE 305 : Digital Signal Processing (3-1-0-4)
- EE512 : CMOS analog IC design (3-0-2-4)
- EE514 : Robust Control Systems (3-0-0-3)
- EE615 : Nano-electronics and nano-microfabrication (3-0-0-3)
- EE516 : Biomedical Systems (2.5-0.5-2-4)
- EE621 : Radiating Systems (3-1-0-4)
- EE534 : Probability and Random Processes (4-0-0-4)
- EE522 : Matrix Theory (3-0-0-3)
- EE524 : Digital MOS LSI Circuits (3-0-0-3)
- EE509 : Linear Dynamical Systems (3-0-0-3)
- EE519P : CMOS Digital IC design practicum (0-0-3-2)
- EE520 : Microelectronics devices and modeling (3-0-0-3)
- EE608 : Digital Image Processing (3-0-2-4)
- EE503 : Advanced Communication Theory (3-0-0-3)
- EE504 : Switch Mode Power Conversion (2.5-0.5-0-3)
- EE508 : Fundamentals of Electric Drives (3-0-0-3)
- EE508P : Practicum on Electrical Drives (0-0-3-2)
- EE513 : Special Electrical Machines (3-0-0-3)
- EE527 : Analysis and Design of Power Electronic Converters (3-0-0-3)
- EE527P : Practicum on Analysis and Design of Power Electronic Converters (0-0-3-2)
- EE528 : Modeling and Analysis of Electrical Machines (3-0-0-3)
- EE622 : Microwave Integrated Circuits (3-0-0-3)
- EE309 : Power Electronics (2.5-0.5-0-3)
- EE309P : Power Electronics Lab (0-0-2-1)
- EE511 : Computer Vision (3-0-2-4)
- EE517 : Wireless Communication and Networking (3-0-0-3)
- EE523 : Digital VLSI Architecture Design (3-0-2-4)
- EE529 : Embedded Systems (3-0-2-4)
- EE619 : Mixed Signal VLSI Design (3-1-0-4)
- EE621 : Radiating Systems (3-1-0-4)
- EE507 : Transmission Lines and Basic Microwave Engineering (3-1-0-4)
- EE526 : Power Semiconductor Devices (3-0-0-3)
- EE530 : Applied Optimization (2-0-2-3)
- EE531 : Estimation and Detection theory (3-0-0-3)
- EE593 : Selected Topics in Low Power VLSI Design (3-0-0-3)
- EE536 : IoT Systems (2-0-2-3)
- EE604 : Advanced Electrical Drives (2.5-0.5-03)
- EE604P : Practicum on Advanced Electrical Drives (0-0-2-1)
- EE606 : Introduction to High Voltage Engineering and Dielectric Breakdown (3-0-0-3)
- EE611 : VLSI Technology (3-0-0-3)
- EE611P : VLSI Fabrication Practicum (0-0-3-2)
- EE620 : Advanced Digital Signal Processing (3-0-0-3)
- EE623P : Practicum on Digital Control of Electric Drives (1-0-3-3)
- EE592 : Selected Topics in Resonant Soft-switched DC-DC Converters (2-0-0-2)
- ~~CS307 : Systems Practicum (0-0-3-2)~~
- ~~CS309 : Information and Database Systems (3-0-2-4)~~
- ~~CS508 : Introduction to Heterogeneous Computing (2-0-0-2)~~
- BE302 : Bioelectric System Modelling (3-0-2-4)
- CS671 : Deep Learning and Applications (3-0-1-4)
- ~~CS202 : Data Structure and Algorithms (3-0-2-4)~~
- ~~CS207 : Applied Database Practicum (0-0-3-2)~~