

B. Tech. in Engineering Physics

Preamble:

Engineering Physics (EP) is a unique program which will provide a rigorous foundation in Physics along with a good background in Engineering disciplines. It will enhance the cross-functionality and bridge the gap between pure science and traditional engineering disciplines. This is necessary because in today's world major scientific and technological breakthroughs happen in a multi-disciplinary environment where scientists from pure science work along with engineers. It is, therefore, highly important to inculcate both scientific and technological aspects, and the EP programme will serve this purpose. A point to note is the fact that it has already been running successfully at IIT-M, IIT-B, IIT-G, IIT-D, etc.

The curriculum for EP at IIT Mandi introduces students to a wide variety of fields in pure as well as applied Physics. The core courses cover basic areas in Physics, such as Quantum Mechanics, Statistical Mechanics and Condensed Matter Physics; as well as basic courses in Mathematics and Engineering. In addition to the compulsory courses, students will complete a certain number of elective courses in Physics intended to provide a good exposure in various directions in both theoretical and applied Physics. The vision is to cater to and enhance the curiosity of students with varied interests in the field. Laboratory courses aim to cover the basic techniques used in different fields which would be an essential asset to every experimentalist. IIT Mandi has the necessary state-of-the-art labs to serve this purpose.

Besides, a number of courses in other branches of science and engineering, along with humanities and social sciences, will also be available as electives. This will allow students to explore their areas of interest. If a student is inclined towards electrical engineering, s/he can take the requisite number of courses/credits in that program and get a minor.

Program Details:

The B.Tech. in Engineering Physics will follow the same curriculum structure followed by the other B.Tech. degree programmes at IIT Mandi. The detailed curriculum, including theory and laboratory courses semester-wise, is described below:

B.Tech. (Engineering Physics) - 1st Sem.						
Sr.No.	Core/Elective	Course Name	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	IC-110	Engineering Mathematics	2	1	0	3
2	IC-152	Data Science - 1	3	0	0	3
3	IC-152P	Data Science – 1 Lab	0	0	3	2
4	IC-160	Electrical Systems Around Us	3	0	0	3
5	IC-160P	Electrical Systems Around Us Lab	0	0	3	2
6	IC-140	Graphics for design	2	0	3	4
7	IC-101P	Reverse Engineering	0	0	3	2
8	IC	HSS Course	3	0	0	3
9	IC	HSS - Creative understating				1
					Total Credits	23

B.Tech. (Engineering Physics) – 2nd Sem.						
Sr.No.	Core/Elective	Course Name	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	IC-111	Linear Algebra	3	0	0	3
2	IC-252	Data Science - 2	3	0	2	4
3	IC-161	Applied Electronics	3	0	0	3
4	IC-161P	Applied Electronics Lab	0	0	3	2
5	IC-142	Engineering Thermodynamics	3	1	0	4
6	IC-141	Product Realization Technology	2	0	0	2
7	IC-141P	Product Realization Technology Lab	0	0	3	2
8	IC	HSS Course	3	0	0	3
					Total Credits	23

B.Tech. (Engineering Physics) – 3rd Sem.						
Sr.No.	Core/Elective	Course Name	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	IC-121	Mechanics of particles and waves	3	0	0	3
2	IC-130	Applied Chemistry for Engineers	3	0	0	3
3	IC-130P	Chemistry Practicum	0	0	3	2
4	C-1, EP301	Engineering Mathematics-2	3	0	0	3
5	IC-352	Data Science - 3	3	0	0	3
6	IC-240	Mechanics of Rigid Bodies	3	0	0	3
7	IC	HSS Course	3	0	0	3
					Total Credits	20

B.Tech. (Engineering Physics) – 4th Sem.						
Sr.No.	Core/Elect ive	Course Name	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	IC-221	Foundation of electrodynamics	3	0	0	3
2	IC-222P	Physics Practicum	0	0	3	2
3	IC-221	Signals and systems	3	0	0	3
4	IC-241	Materials Science for Engineers	3	0	0	3
5	IC-242	Continuum Mechanics	3	0	0	3
6	IC-201P	Design Practicum	0	0	6	4
7	IC-136	Understanding Biotechnology & Its Applications	3	0	0	3
					Total Credits	21

B.Tech. (Engineering Physics) – 5th Sem.						
Sr.No.	Core/Elect ive	Course Name	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	C-2, PH301	Quantum Mechanics and Applications	3	0	0	3
2	C-3, EE311	Device Electronics for Integrated Circuits	3	0	0	3
3	C-4, EP302	Computational Methods for Engineering	3	0	2	4
4	DE-1	Discipline Elect.- 1	3	0	0	3
5	DE-2	Discipline Elect.-2	3	0	0	3
6	IC	HSS Course	3	0	0	3
					Total Credits	19

B.Tech. (Engineering Physics) – 6th Sem.						
Sr.No.	Core/Elect ive	Course Name	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	C-5, PH302	Introduction to Statistical Mechanics	3	0	0	3
2	C-6, PH501	Solid State Physics	3	0	0	3
3	C-7, EP401P	Engineering of Instrumentation	1	0	3	4
4	C8-PH502	Photonics	3	0	0	3
5	E	Open/Free Elective	3	0	0	3
6	DP301P(E)	Interdisciplinary Socio-Technical Practicum (ISTP)				4
					Total Credits	20

B.Tech. (Engineering Physics) – 7th Sem.						
Sr.No.	Core/Elective	Course Name	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	C- 9, DP402P	Engineering Physics Practicum	1	0	3	4
2	DE-3	Discipline Elective	3	0	0	3
3	DP401P(E)	MTP-I	0	0	0	3
4	E	Open/Free Electives (2 No.)	-	-	-	6
					Total Credits	16

B.Tech. (Engineering Physics) – 8th Sem.						
Sr.No.	Core/Elective	Course Name	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
1	DE-4	Disci. Elective	3	0	0	3
2	DP402P(E)	MTP-II	-	-	-	5
3	E	Open/Free Electives (3 no.)	-	-	-	9
					Total Credits	17

Credits distribution over the four-year program

Semester /Courses	1 st #courses (credits)	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	Total #courses (credit)
IC	7(23)	8(23)	6(17)	7(21)	1(3)	-	-	-	29(87)
Core (Discipline)	-	-	1(3)	-	3(10)	4(13)	1(4)	-	10(30)
Electives (Discipline)	-	-	-	-	2(6)	-	1(3)	1(3)	4(12)
Free/Open electives	-	-	-		--	2(7) (3+ ISTP)	3(9) (6+ MTPI)	4(14) (9+ MTPII)	9(30)

Engineering Physics Discipline Core Courses Details

	CORE COURSES	L	T	P	C	Semester
C-1	Engineering Mathematics-2 (EP301)	3	0	0	3	3
C-2	Quantum Mechanics and Applications (PH301)	3	0	0	3	5
C-3	Device Electronics for Integrated Circuits (EE311)	3	0	0	3	5
C-4	Computational Methods for Engineering (EP302)	3	0	2	4	5
C-5	Introduction to Statistical Mechanics (PH302)	3	0	0	3	6
C-6	Solid State Physics (PH501)	3	0	0	3	6
C-7	Engineering of Instrumentation (EP401P)	1	0	3	4	6
C-8	Photonics (PH502)	3	0	0	3	6
C-9	Engineering Physics Practicum (EP402P)	1	0	3	4	7
	TOTAL CREDITS				30	

Tentative list of elective courses from Physics are listed below.

Sr.No.	Code	Course Name
1.	PH503	Laser and Applications
2.	PH503	Organic Optoelectronics
3.	PH507	X-ray as a probe to study the material properties
4.	PH508	Magnetism and Magnetic Materials
5.	PH601	Mesoscopic Physics and Quantum Transport
6.	PH603	Advanced Condensed Matter Physics
7.	PH612	Nuclear and Particle Physics
8.	PH524	Atomic and Molecular Physics
9.	PH613	Special Topics in Quantum Mechanics
10.	PH605	Superconductivity