सीनेट की छियानबेवीं बैठक का कार्यवृत्त

MINUTES OF THE 96TH MEETING OF THE SENATE

07 जून 2023
7th JUNE 2023

भारतीय प्रौद्योगिकी संस्थान रूड़की
रूड़की – 247 667 (भारत)
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE – 247 667 (INDIA)

भारतीय प्रौद्योगिकी संस्थान रूड़की
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सूची / INDEX

22 JUN 2023

96.6	बायोसाइंसेस और बायोइंजीनियरिंग विभाग की पूर्णकालिक पीएचडी छात्रा सुश्री शालिनी कौशिक के चिकित्सा आधार पर उनकी स्थिति को पूर्णकालिक से अंशकालिक में बदलने के अनुरोध पर लिए करना। To consider the request of Ms. Shalini Kaushik, Full-time Ph.D. student, Department of Biosciences and Bioengineering, to change her status from Full-time to Part-time on medical grounds.	4
96.7	अध्यक्ष, सीनेट द्वारा दी गई मंजूरी को रिपोर्ट करना। To report the approvals accorded by the Chairman, Senate.	4
अन्य मद के अर्न्तगत/ **Under any other items**		
96.8	विदेशी विश्वविद्यालयों के साथ सहयोगी मास्टर्स डिग्री प्रोग्राम के लिए निम्नलिखित प्रस्तावों पर विचार करना। To consider the following proposals for Collaborative Masters' Degree Programmes with Foreign Universities.	4
96.9	ताइवान के तीन विश्वविद्यालयों के साथ सेमीकंडक्टर टेक्नोलॉजी मे सहयोगी संयुक्त एम.टेक कार्यक्रम करने पर विचार करना। To consider the Joint M.Tech. programmes in 'Semiconductor Technology' in collaboration with three universities from Taiwan.	4
96.10	पाठयक्रमों के ग्रेड मॉडरेशन के मौजूदा प्रावधान पर फिर से विचार करना। To re-consider the existing provision on Moderation of Grades of the Courses.	5
96.11	पीजी कार्यक्रमों के हिंदी नामों पर विचार करना। To consider the Hindi names of the PG programmes.	5
96.12	श्री अक्षय कुमार यादव (एन.सं.1799016) पूर्व पी.एच0डी छात्र, गणित विभाग को उनके शैक्षणिक पंजीकरण की बहाली की दया अपीलों पर विचार करना। To consider the Mercy Appeals of Mr. Akshay Kumar Yadav (En. No.: 1799016), ex-Ph.D. students Department of Mathematics for reinstatement of his academic registration.	6
96.13	अध्यक्ष, सीनेट द्वारा दी गई मंजूरी को रिपोर्ट करना। To report the approval accorded by the Chairman, Senate.	6
Ann.-I	दिनांक 07.06.2023 को उपस्थित सदस्यों की सूची। List of present members on 07.06.2023.	7-9
Ann-II	दिनांक 07.06.2023 को उपस्थित सदस्यों की सूची। List of absent members who conveyed their inability to join the meeting on 07.06.2023.	10

22 JUN 2023

22 JUN 2023

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

MEETING SECTION

Minutes of the 96th Meeting of the Senate held on 07.06.2023 at 04.00 P.M. in the Senate Hall.

The list of participants who attended the meeting and those could not attend are appended at **Annexure-I & Annexure-II** respectively.

At the outset, the Senate observed two minutes silence to pay tribute to late Prof. R.P. Saini, Department of Hydro & Renewable Energy who while in service untimely passed away on 02.03.2023.

The Chairman first welcomed a new member Prof. Avlokita Agarwal, Associate Dean of Students' Welfare (Student Wellness) and wished for her active participation in the proceedings of the Senate. Thanks was also placed on record for the valuable contributions of the outgoing member Prof. S.K. Ambatipudi, Associate Dean of Students' Welfare (Student Wellness).

The Chairman then welcomed the members to the 96th meeting of the Senate. In his opening remarks he applauded on the improvement of the IIT Roorkee ranking in NIRF 2023. The Institute has improved its rank by one place as it secured the 5th position in Engineering, 7th in Research and maintained its 5th rank in Innovation while also maintained the top rank 1st in Architecture & Planning which is commendable.

It was informed that the Institute rankings were evaluated on five parameters viz Teaching, Learning & Resources (TLR), Research and Professional Practice, Graduation Outcome, Outreach & Inclusivity and Perception, which shown the improvement. He congratulated each Faculty members, Staff and administrative officers for this achievement.

22 JUN 2023

The Chairman also referred the specific contributions of Dean of Academic Affairs and his team

(i) for developing a PG Admission Automation System for M.Tech. admission which was otherwise being carried out earlier by TCS.
(ii) For developing a mass 'SMS' facility by which students' grades are being communicated to their parents/guardians which enabled them to monitor the progress of their ward.

He congratulated to Dean of Academic Affairs and his entire team.

Further, it was informed that one of our alumni Prof. Om Prakash Kulshrestra donated ₹1.13 cr. which is the highest amount given by single alumnus in the year 2022.

The agenda was then taken up.

Item No. 96.1: To confirm the minutes of the 94th & 95th Senate meeting held on 22.02.2023 & 31.03.2023.

Since no comments were received, the Senate confirmed the minutes of the 94th & 95th Senate meetings as circulated on 07.03.2023 and 03.05.2023, respectively.

Item No. 96.2: To report on the actions taken to implement the decisions of the Senate taken in its 94th & 95th meeting held on 22.02.2023 & 31.03.2023.

The Senate noted the actions taken on the minutes.

Item No. 96.3: To consider the ESC, BSC and OEC Courses and Department wise Program Structures as per the new UG curriculum.

The Senate considered and approved the course baskets of ESC, BSC, OEC and ESSC **(Appendix A)** along with the Department wise UG Program Structures.

The structure consists of the complete Teaching Scheme, Credit requirements for different programs, semester wise credit distribution with Institute Core Courses (ICCs), Programme Core Courses (PCCs), Programme Elective Courses (PECs), Open Elective Courses (OECs), Community Outreach (CORE), Talent Enhancement Baskets (TEBs), Minor Specialization & Honours Courses.

22 JUN 2023

All suggestions and observations made during the deliberation were incorporated in the respective program structures. The approved department wise UG curricula are placed at **Appendix –B.**

Further, a minor typo in the expansion of the acronym ESSE in the 94th Senate was corrected and approved as Environmental Science and Sustainability Course. Also, it was decided to include the Deptt. of HRE in the group of ESSC along with CE, AR, ES which was missed in the Minutes of the 94th Senate.

The Senate also decided that Teaching Assistants / UGTAs be allowed for conducting the Practical classes of the department specific PCC course on Computer Programming.

Item No. 96.4: **To consider the proposal for consideration of admission through sports quota in IITs/CFTIs.**

The Senate considered and approved the proposal for admission through sports quota. The Senate approved one supernumerary seat in each programme/discipline in which the Institute admits undergraduate students.

The Senate decided that the candidates for the sports quota seats must qualify JEE (Advanced) and have a rank in the Common Rank List (CRL), and also satisfy a set of eligibility criteria as mentioned in the proposal. The Senate further approved that only the candidates who participated at least in the National-Level sports events shall be eligible.

Item No. 96.5: **To consider the proposal of the IKS Committee to establish a new Centre – "Centre of Excellence in Indian Knowledge Systems (CoEIKS)".**

The Senate recommended the proposal for the establishment of a new Centre – Centre for "**I**ndian **K**nowledge **S**ystems for **H**olistic **A**dvancement (**IKSHA**)" to the Board of Governors for approval.

22 JUN 2023

Item No. 96.6: **To consider the request of Ms. Shalini Kaushik, Full-time Ph. D. student, Department of Biosciences and Bioengineering, to change her status from Full-time to Part-time on medical grounds.**

The Senate considered the proposal and decided that Ms. Shalini Kaushik be permitted to convert her status from Full-time to Part-time from Autumn Semester 2023-24. The spring semester 2022-23 will be deemed as withdrawn on her medical grounds. The decision be communicated to the Head with a copy to the student.

Item No. 96.7: **To report the approval accorded by the Chairman, Senate.**

The Senate noted the items.

Item No. 96.8 : To consider the following proposals for Collaborative Masters' Degree Programmes with Foreign Universities.

The Senate considered and approved the proposal for 'Joint Degree' and 'Dual Degree' subject to fulfilment of the eligibility requirements for the respective program along with the following conditions:

(i) Students must have a supervisor at each institution.
(ii) Students must spend minimum 6 (six) months at the host institution during the entire program.
(iii) Students shall pay tuition fee at the home or host institution only.
(iv) The candidates, who could not join the host Institution due to any reason, may be allowed to continue in the home institution as per its existing guidelines.

Item No. 96.9 : To consider the Joint M.Tech. programmes in 'Semiconductor Technology' in collaboration with three universities from Taiwan.

The Senate considered and approved that the joint M. Tech. Program in 'Semiconductor Technology' shall be offered also as a Dual Degree Program.

22 JUN 2023

Item No. 96.10: To re-consider the existing provision on Moderation of Grades of the Courses.

The Senate considered the item and resolved that the existing provision on Moderation of Grades to continue. However, the course coordinators will submit the grades to the Chairpersons, DAPC/CAPC/ScAPC for display to the faculty members prior to informing the students. The respective Chairperson will submit the grades to the AAO after addressing the observations, if any, and inform the students.

Item No. 96.11: To consider the Hindi names of the PG programmes.

The Senate considered the following translated names in Hindi and suggested to re-check the Hindi version from Hindi *Rajbhasha Shabdkosh* and propose the commonly used names.

Name of Programme in English	**Name of Programme in Hindi**	**Re-visited proposed names of Programme in Hindi**
Master of Technology in Dam Safety and Rehabilitation	बाँध संरक्षा एवं पुनर्वास में प्रौद्योगिकी निष्णात	बाँध संरक्षा एवं पुनर्वास में प्रौद्योगिकी निष्णात
Master of Technology in Artificial Intelligence	आभासी समझ में प्रौद्योगिकी निष्णात	कृत्रिम बुद्धि में प्रौद्योगिकी निष्णात
Master of Technology in Data Science	डेटा विज्ञान में प्रौद्योगिकी निष्णात	डेटा विज्ञान में प्रौद्योगिकी निष्णात
M. Des. (Industrial Design)	एम. डेस. (औद्योगिक अभिकल्प)	एम. डेस. (औद्योगिक अभिकल्प)
MIM (Master in Innovation Management)	एमआईएम (नवाचार प्रबंधन में निष्णात)	एमआईएम (नवाचार प्रबंधन में निष्णात)

22 JUN 2023

Item No. 96.12: To consider the Mercy Appeals of Mr. Akshay Kumar Yadav (En. No.: 1799016), ex-Ph.D. student of Department of Mathematics for reinstatement of his academic registration.

The Senate considered and accepted the second mercy appeal of Mr. Akshay Kumar Yadav for reinstatement of his academic registration w.e.f. Autumn Semester 2023-24. The Senate further approved that his registration be transferred to the Department of AM&SC under the supervision of Prof. Millie Pant. The spring semester 2022-23 will be deemed as withdrawn.

Item No. 96.13: To report the approval accorded by the Chairman, Senate.

The Senate noted the items.

The meeting ended with a vote of thanks to the Chair.

22 JUN 2023

Annexure -I

Following were present

1.	Prof. K.K. Pant	Director & Chairman
2.	Prof. U.P. Singh	Dy. Director
3.	Prof. Prabhjot Singh Chani	Architecture & Planning
4.	Prof. Mahua Mukherjee	Architecture & Planning
5.	Prof. Gaurav Raheja	Architecture & Planning
6.	Prof. Sanjoy Ghosh	Biosciences & Bioengineering
7.	Prof. Naveen Kumar Nawani	Biosciences & Bioengineering
8.	Prof. Gopinath Packirisamy	Biosciences & Bioengineering
9.	Prof. Ranjana Pathania	Biosciences & Bioengineering
10.	Prof. Ramasare Prasad	Biosciences & Bioengineering
11.	Prof. Ashwani Kumar Sharma	Biosciences & Bioengineering
12.	Prof. Prakash Biswas	Chemical Engineering
13.	Prof. Amit Kumar Dhiman	Chemical Engineering
14.	Prof. P.P. Kundu	Chemical Engineering
15.	Prof. Vimal Chandra Srivastava	Chemical Engineering
16.	Prof. R.K. Dutta	Chemistry
17.	Prof. M.R. Maurya	Chemistry
18.	Prof. Jeevanandam P.	Chemistry
19.	Prof. R.K. Peddinti	Chemistry
20.	Prof. Muniappan Sankar	Chemistry
21.	Prof. K.R. Justin Thomas	Chemistry
22.	Prof. Rahul Dev Garg	Civil Engineering
23.	Prof. S.K. Ghosh	Civil Engineering
24.	Prof. Pramod Kumar Gupta	Civil Engineering
25.	Prof. Kamal Jain	Civil Engineering
26.	Prof. Praveen Kumar	Civil Engineering
27.	Prof. Priti Maheshwari	Civil Engineering
28.	Prof. G.D. Ransinchung R.N.	Civil Engineering
29.	Prof. K.S. Hari Prasad	Civil Engineering
30.	Prof. N.K. Samadhiya	Civil Engineering
31.	Prof. Vishwas Sawant	Civil Engineering
32.	Prof. Sugata Gangopadhyay	Computer Science & Engineering
33.	Prof. Pankaj Agrawal	Earthquake Engineering
34.	Prof. Bal Krishna Maheshwari	Earthquake Engineering
35.	Prof. M.L. Sharma	Earthquake Engineering
36.	Prof. Manish Shrikhande	Earthquake Engineering
37.	Prof. Anand Joshi	Earth Sciences
38.	Prof. R. Krishnamurthi	Earth Sciences
39.	Prof. Pramod Agarwal	Electrical Engineering
40.	Prof. B.R. Bhalja	Electrical Engineering
41.	Prof. Vishal Kumar	Electrical Engineering
42.	Prof. Mukesh Kumar Pathak	Electrical Engineering

22 JUN 2023

43.	Prof. P. Sumathi	Electrical Engineering
44.	Prof. Barjeev Tyagi	Electrical Engineering
45.	Prof. Anand Bulusu	Electronics & Communication Engg.
46.	Prof. Brajesh Kumar Kaushik	Electronics & Communication Engg.
47.	Prof. N.P. Pathak	Electronics & Communication Engg.
48.	Prof. Amaldendu Patnaik	Electronics & Communication Engg.
49.	Prof. (Mrs.) Smita Jha	Humanities & Social Sciences
50.	Prof. Nagendra Kumar	Humanities & Social Sciences
51.	Prof. Binod Mishra	Humanities & Social Sciences
52.	Prof. Sukh Pal Singh	Humanities & Social Sciences
53.	Prof. N.K. Goel	Hydrology
54.	Prof. M.K. Jain	Hydrology
55.	Prof. Himanshu Joshi	Hydrology
56.	Prof. Brijesh Kumar Yadav	Hydrology
57.	Prof. Sunil Kumar Singhal	Hydro & Renewable Energy
58.	Prof. Ramesh Chandra	Institute Instrumentation Centre
59.	Prof. Rajat Agarwal	Management Studies
60.	Prof. M.K. Barua	Management Studies
61.	Prof. (Ms.) Usha Lenka	Management Studies
62.	Prof. Vinay Sharma	Management Studies
63.	Prof. Premananda Bera	Mathematics
64.	Prof. Kusum Deep	Mathematics
65.	Prof. Maheshanand	Mathematics
66.	Prof. A. Swaminathan	Mathematics
67.	Prof. Sushanta Dutta	Mechanical & Industrial Engg.
68.	Prof. Akshay Dvivedi	Mechanical & Industrial Engg.
69.	Prof. B.K. Gandhi	Mechanical & Industrial Engg.
70.	Prof. P.K. Jha	Mechanical & Industrial Engg.
71.	Prof. Bhanu Kumar Mishra	Mechanical & Industrial Engg.
72.	Prof. Manish Mishra	Mechanical & Industrial Engg.
73.	Prof. Apurbba Kumar Sharma	Mechanical & Industrial Engg.
74.	Prof. Andallib Tariq	Mechanical & Industrial Engg.
75.	Prof. S.H. Upadhyay	Mechanical & Industrial Engg.
76.	Prof. B.S.S. Daniel	Metallurgical & Materials Engg.
77.	Prof. Vivek Pancholi	Metallurgical & Materials Engg.
78.	Prof. Ujjwal Prakash	Metallurgical & Materials Engg.
79.	Prof. Ajay	Physics
80.	Prof. Rajdeep Chatterjee	Physics
81.	Prof. Aalok Misra	Physics
82.	Prof. Tashi Nautiyal	Physics
83.	Prof. Davinder Kaur Walia	Physics
84.	Prof. Kanhaiya Lal Yadav	Physics
85.	Prof. M.L. Kansal	WRD&M
86.	Prof. Ashish Pandey	WRD&M
87.	Prof. Sanjeev Kumar, Head, Institute Computer Centre	
88.	Prof. Mukesh Kumar Singhal, Department of Hydro & Renewable Energy	

22 JUN 2023

89. Prof. M.V.Sunil Krishna, Assoc. DOSW (Students' Activities)
90. Prof. E. Rajasekar, Associate Dean, Infras. (Civil)
91. Prof. C.N. Ramchandran, ADOAA (Curriculum)
92. Dr. C. Jayakumar, Librarian
93. Chairman, SCSP
94. Prof. Anil Kumar Gourishetty — Special Invitee

Students' representatives:

95. Mr. Akshay Pandey, General Secretary, Academic Affairs (PG)

96. Mr. Prashant Garg, Registrar & Secretary, Senate

22 JUN 2023

Annexure –II

The following members conveyed their inability to join the meeting.

1. Prof. Millie Pant, Applied Math. and Scientific Computing
2. Prof. Partha Roy, Department of Biosciences and Bioengineering
3. Prof. P.K. Garg, Department of Civil Engineering
4. Prof. Rajat Rastogi, Department of Civil Engineering
5. Prof. Manoj Misra, Department of Computer Science & Engineering
6. Prof. Durga Toshniwal, Department of Computer Science & Engineering
7. Prof. Debashish Ghosh, Department of Electronics & Communication Engg.
8. Prof. Inderdeep, Department of Mechanical & Industrial Engg.
9. Prof. Kaushik Pal, Department of Mechanical and Industrial Engineering,
10. Prof. G.P. Chaudhari, Department of Metallurgical and Materials Engg.
11. Prof. B.V.M. Kumar, Department of Metallurgical and Materials Engg.
12. Prof. Dharm Dutt, Department of Paper Technology
13. Prof. Vipul Rastogi, Department of Physics
14. Prof. Ajay Wasan, Physics
15. Prof. Deepak Khare, WRD&M
16. Prof. Sumit Sen, Head, Centre of Excellence in Disaster Mitigation
17. Prof. Uttam K Roy, Head of the Centre of Transportation Systems.

22 JUN 2023

Offer by Department	Category	S_No	Course Code	Course_Title	Credit	L	T	P	Course_Offered	Opted by	Year	Semester	No of Students
HRE-Hydro and Renewable Energy	OEC	1	HRO-101	Alternate Fuels for Transportation	3	3	0	0	Both				
		2	HRO-102	Energy Resources, Economics and Sustainability	3	3	0	0	Both				
		3	HRO-103	Renewable Energy Resource Development Technology	3	3	0	0	Both				
		4	HRO-104	Small Hydro Power Development	3	3	0	0	Both				
BE-Biosciences and Bioengineering	BSC	1	BEB-101	Introduction to Bioanalytical Techniques.	4	3	1	0	Spring				
		2	BEB-102	Biosciences for engineers	4	3	1	0	Autumn	CH	II	AUTUMN	117
		3	BEB-103	Public Health and Emerging Diseases	4	3	1	0	Autumn				
		4	BEB-104	Fundamentals of Neuroscience	3	2	1	0	Autumn				
		5	BEB-105	Basic Chemistry for Life Science	4	3	1	0	Spring				
	ESC	1	BEE-101	Biomedical Nanomaterials	4	3	0	2	Autumn				
		2	BEE-102	Introduction to Computational Biology	4	3	1	0	Spring	BSMSCY	I	SPRING	35
		3	BEE-103	Introduction to Biological Engineering	4	3	1	0	Autumn				
		4	BEE-104	Introduction to Bio-catalysis	3	3	0	0	Spring				
		5	BEE-105	Introduction to Biophotonics	3	3	0	0	Spring	BSMSCY	I	SPRING	35
	OEC	1	BEO-101	Intellectual Property Rights, Biosafety and Bioethics	4	3	1	0	Both				
CE-Civil Engineering	ESC	1	CEE-101	Building Services	3	2	1	0	Spring				
		2	CEE-102	Mechanics of Solids	4	3	1	0	Spring	ME	I	SPRING	208
										IN	I	SPRING	
		3	CEE-103	Theory of Structures	4	3	1	0	Autumn	AR	II	AUTUMN	30
		4	CEE-104	Design of Reinforced Concrete Elements	4	3	1	2/2	Autumn	AR	III	AUTUMN	30
		5	CEE-105	Design of Steel Elements	3	2	1	0	Spring	AR	III	SPRING	30
		6	CEE-106	Geospatial Techniques and Programming	4	3	0	2	Both	BSMSHS	II	SPRING	33
	ESSC	1	ESS-101	Environmental Science and Sustainability Course-1	3	3	0	0	Spring	CE, AR, GT, GPT	I	SPRING	283
	OEC	1	CEO-101	Probability Methods in Engineering Problems	3	3	0	0	Both				
		2	CEO-102	Simulation of Behavior-Induced Mobility	3	2	1	0	Both				
		3	CEO-103	Water Resources Engineering	3	3	0	2/2	Both				
CH--Chemical Engineering	ESC	1	CHE-101	Energy Engineering	4	3	1	0	Autumn	GT	I	AUTUMN	114
										GPT	I	AUTUMN	
										BSMSCY	I	AUTUMN	
		2	CHE-102	Introduction to Process Technology	4	3	1	0	Spring				
	OEC	1	CHO-101	Computational Fluid Dynamics	4	3	1	0	Autumn				

CS--Computer Science and Engineering	ESC	1	CSE-101	Data Structures and Algorithms	4	3	1	0	Both	EE	II	AUTUMN	442
										ECE	I	AUTUMN	
										DSAI	II	AUTUMN	
										BSMSHS	I	AUTUMN	
										BSMSMA	I	AUTUMN	
										BE	II	AUTUMN	
										CH	II	SPRING	226
										BSMSPH	I	SPRING	
										MT	I	SPRING	
		2	CSE-102	Introduction to Automata Theory	4	3	1	0	Spring	BSMSMA	II	SPRING	49
CY--Chemistry	BSC	1	CYB-101	Fundamentals of Organic Chemistry	4	3	0	2	Autumn	BE	II	AUTUMN	46
		2	CYB-102	Inorganic Chemistry - I	4	3	0	2	Spring				
		3	CYB-103	Physical Chemistry-I	4	3	0	2	Spring	CH	I	SPRING	199
										MT	I	SPRING	
	ESSC	1	ESS-103	Environmental Science and Sustainability Course-3	3	3	0	0	Spring	BSMSCY, CH, BE, BSMSHS	I	SPRING	231
	OEC	1	CYO-101	Organic Electronic Materials	3	2	1	0	Both				
		2	CYO-102	Functional Materials: Preparation, Structure and Properties	3	3	0	0	Both				
		3	CYO-103	Introduction to instrumental methods of analysis	3	2	1	0	Both				
		4	CYO-104	Introduction to Computational Chemistry	3	2	1	0	Both				
EC--Electronics and Communication Engineering	ESC	1	ECE-101	Fundamentals of Electronics	4	3	1	0	Both	EE	I	AUTUMN	360
										DSAI	I	AUTUMN	
										BE	I	AUTUMN	
										BSMSPH	I	AUTUMN	
										MT	II	AUTUMN	
		2	ECE-102	Introduction to Communication System	4	3	1	0	Both	CSE	I	SPRING	199
										DSAI	II	SPRING	
										EPH	II	SPRING	
		3	ECE-103	Digital Electronics	4	3	1	0	Both	CSE	I	AUTUMN	136
										BSMSPH	II	AUTUMN	
										EE	I	SPRING	246
										GPT	I	SPRING	
										DSAI	I	SPRING	

22 JUN 2023

EE--Electrical Engineering	ESC	1	EEE-101	Control System Engineering	4	3	1	0	Both	ECE	II	SPRING	109
		2	EEE-102	Basic Electrical Engineering	4	3	1	2/2	Both	EPH	I	AUTUMN	340
										ME	I	SPRING	
										IN	I	SPRING	
										MT	II	SPRING	
		3	EEE-103	Measurements and Transducers	4	3	1	0	Both	EPH	I	SPRING	50
EQ--Earthquake Engineering	ESC	1	EQE-101	Solid Mechanics	4	3	1	0	Both	CE	I	SPRING	174
ES--Earth Sciences	BSC	1	ESB-101	Geological Processes	4	3	1	0	Both	GT	I	SPRING	79
										GPT	I	SPRING	
		2	ESB-102	Global Geophysics	4	3	1	0	Both	GT	II	AUTUMN	79
										GPT	II	AUTUMN	
	ESC	1	ESE-101	Geology for Engineers	4	3	1	0	Autumn	CE	II	AUTUMN	174
	OEC	1	ESO-101	Fractals and Applications	3	2	1	0	Both				
		2	ESO-102	Glaciology	3	2	1	0	Both				
		3	ESO-103	Planetary Geosciences	3	2	1	0	Both				
		4	ESO-104	Carbon Sequestration	3	2	1	0	Both				
HY--Hydrology	ESC	1	HYE-101	Engineering Hydrology	4	3	1	0	Spring	CE	II	SPRING	174
	OEC	1	HYO-101	Desalination and membrane technology	3	1	0	3	Autumn				
MA--Mathematics	BSC	1	MAB-103	Numerical Methods	4	3	1	0	Autumn	EE	II	AUTUMN	839
										ECE	II	AUTUMN	
										ME	II	AUTUMN	
										IN	II	AUTUMN	
										BSMSMA	II	AUTUMN	
										CSE	II	AUTUMN	
										DSAI	II	AUTUMN	
		2	MAI-101	Mathematics I	4	3	1	0	Autumn	ALL UG PROGRAMMES	I	AUTUMN	1353
		3	MAI-102	Mathematics II	4	3	1	0	Spring	ALL UG PROGRAMMES	I	SPRING	1353
		4	MAB-104	Mathematical Methods	4	3	1	0	Autumn	BSMSHS	II	AUTUMN	159
										EPH	II	AUTUMN	
										BSMSPH	II	AUTUMN	
										BSMSMA	II	AUTUMN	
	OEC	1	MAO-101	Optimization Techniques	4	3	1	0	Spring				
		2	MAO-102	Advanced Engineering Mathematics	4	3	1	0	Autumn				

22 JUN 2023

ME--Mechanical and Industrial Engineering	ESC	1	MIE-103	Engineering Thermodynamics	4	3	1	2/2	Both					
		2	MIE-102	Manufacturing Processes	4	3	0	2	Both					
		3	MIE-101	Engineering Mechanics	4	3	1	0	Both	CH	I	AUTUMN	373	
										CE	I	AUTUMN		
										MT	I	AUTUMN		
MT--Metallurgical and Materials Engineering	ESC	1	MTE-101	Non Destructive Testing	4	3	1	0	Autumn					
		2	MTE-102	Materials Characterization	4	3	1	0	Spring	BE	I	SPRING	84	
										GT	I	SPRING		
		3	MTE-103	Materials Science	4	3	1	0	Both	ME	I	AUTUMN	208	
										IN	I	AUTUMN		
	OEC	1	MTO-101	Introduction to Nanomaterials	3	2	0	2	Both					
		2	MTO-102	Thin Film Technology	3	3	0	0	Both					
PH--Physics	BSC	1	PHB-102	Quantum and Statistical Mechanics	4	3	1	0	Spring	ECE	II	SPRING	109	
		2	PHI-101	PHI-101 Physics-I	4	3	1	2/2	Autumn	ALL UG PROGRAMMES	I	AUTUMN	1353	
		3	PHB-103	Modern Physics	4	3	1	0	Spring	BSMSHS	I	SPRING	68	
										BSMSCY	I	SPRING		
		4	PHB-104	Engineering Optics	4	3	1	0	Spring					
DMA-Disaster Mitigation & Management	OEC	1	DMO-101	Participatory Nature-based Risk Resilience	4	3	1	0	Both					
		2	DMO-102	Introduction to Climate Change	4	3	1	0	Both					
	ESSC	1	ESS-101	Environmental Science and Sustainability Course	3	3	0	0	Spring	CE,AR,ES,HRE	I	SPRING	283	
		2	ESS-102	Environmental Science and Sustainability Course	3	3	0	0	Spring	EE,ECE,CSE,BSMSPH,EPH,DSAI,MA	I	SPRING	549	
		3	ESS-103	Environmental Science and Sustainability Course	3	3	0	0	Spring	BSMSCY,CH,BSBE,HSS	I	SPRING	231	
		4	ESS-104	Environmental Science and Sustainability Course	3	3	0	0	Spring	ME,PI,MT	I	SPRING	290	

22 JUN 2022

1-BACHELOR OF ARCHITECTURE
COMPONENT WISE DISTRIBUTION

Main Curriculum Components	Sub Components	Approved Credits for B.Arch.	Approved Credits Range	Proposed Credits for B.Arch. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	52
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		12	
	ESC	8-20		15	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	TBD	133	74	128
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	TBD		12	
	Technical Communication	2		2	
	Internship/Professional Training	TBD		12	
	PEC	TBD		18	
	TEB	6-8		8	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	190-200		191-194	
	MSC/DHC	18/20		18/20	
	Grand Total			209-214	

DEPARTMENT OF ARCHITECTURE & PLANNING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **110–Bachelor of Architecture**
Department : **AR – Architecture & Planning**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	**23**	**23**	**46**
2	**24/25**	**24/25**	**48/50**
3	**23/24**	**24**	**47/48**
4	**17**	**12**	**29**
5	**21**	**0**	**21**
Grand Total			**191-194**
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		**209-214**

22 JUN 2023

	Components	Maximum	Minimum	Comments
	Discipline (DIS)	20	10	To be evaluated by DoSW
Non-Credit Elements (NCE)	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	32	10	1 week internship= 1 unit (To be coordinated by departments/centres/school)
	Participation in professional development programs by Industry experts/ field experts (PPD -1, PPD-2 & PPD-3)	12	6	To be coordinated by departments/centres/school (2^{nd}, 3^{rd} and 4^{th} Years)
Minimum non-credit to be earned: 30				

22 JUN 2023

DEPARTMENT OF ARCHITECTURE & PLANNING

Program Code : **110 – Bachelor of Architecture**
Department : **AR – Architecture & Planning**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T/D /I	P/S	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
5	ARC-101	Computer Programming for Architects	PCC	4	1	2	2	3	0	20 - 30	20 - 30	20 - 30	20-30	-
6	ARC-103	Foundation Studio-I	PCC	4	1	1	4	0	7	-	80	20	-	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics - II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	CEE-106	Geospatial Techniques and Programming	ESC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
4	ESS-101	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	ARC-102	Foundation Studio-II	PCC	4	1	1	4	0	7	-	80	20	-	-
6	ARC-104	Building Materials & Construction-I	PCC	3	1	0	4	3	0	-	60	20	-	20
7	ARC-106	Climatology in Architecture	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										

22 JUN 2023

DEPARTMENT OF ARCHITECTURE & PLANNING

Program Code : **110 – Bachelor of Architecture**
Department : **AR – Architecture & Planning**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T/D /I	P/S	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSSEC-I	HSS Elective Course-I	HSSEC	3										
2	OEC-I	Open Elective Course-I	OEC	3/4										
3	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	ARC-201	Architectural Design Studio-I	PCC	5	1	2	4	0	7	-	80	20	-	-
5	ARC-203	Building Materials & Construction-II	PCC	3	1	0	4	3	0		40 - 60	20 - 30	20-30	-
6	ARC-205	History of Architecture-I	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
7	CEE-103	Theory of Structures	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**24/25**										
(Spring)														
1	ARC-202	Computer Aided Architectural Design Studio-II	PCC	5	1	2	4	0	7	-	80	20	-	-
2	ARC-204	Building Materials & Construction-III	PCC	3	1	0	4	3	0		40 - 60	20 - 30	20-30	-
3	ARC-206	History of Architecture - II	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
4	ARC-208	Principles of Architecture	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
5	ARC-210	Landscape Design and Site Development	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
6	OEC-II	Open Elective Course-II	OEC	3/4										
7	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**24/25**										

22 JUN 2023

DEPARTMENT OF ARCHITECTURE & PLANNING

Program Code : **110 – Bachelor of Architecture**
Department : **AR – Architecture & Planning**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T/D/I	P/S	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	ARC-301	Integrated Architectural Design Studio-III	PCC	5	1	2	4	0	7	-	80	20	-	-
2	ARC-303	Building Services (Water Supply and Sanitation)	PCC	3	1	1	3	3	0	20-35	-	20-30	40-50	-
3	ARC-351	Fundamental of AI/ML	PCC	2	1	1	0	-	-	20-35	-	20-30	40-50	-
4	CEE-104	Design of Reinforced Concrete Elements	ESC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
5	OEC-III	Open Elective Course-III	OEC	3/4										
6	HSSEC-II	HSS Elective Course-II	HSSEC	3										
7	ART-I	Talent Enhancement Course-I	TEB	3	2	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23/24**										
(Spring)														
1	ARC-302	Building Services (HVAC & Electrical Systems)	PCC	3	1	1	3	3	0	20-35	-	20-30	40-50	-
2	ARC-304	Contemporary World Architecture	PCC	3	2	1	0			20-35	-	20-30	40-50	-
3	CEE-105	Design of Steel Elements	ESC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
4	ART-II	Talent Enhancement Course-II	TEB	5	1	2	4	0	7	-	80	20	-	-
5	ARL-I	Program Elective-I	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
6	ARL-II	Program Elective-II	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
7	ARC-399	Community Outreach	CORE	2							100			
8	ARC-391	Technical Communication	PCC	2	1	1	0	-	-	50	-	-	50	-
9	MSC/DHC-I	Minor Specialization Course-I/ Departmental Honours Course-I	MSC/DHC	3/4										
		Total		**24/ 27-28**										

22 JUN 2023

DEPARTMENT OF ARCHITECTURE & PLANNING

Program Code : **110 – Bachelor of Architecture**
Department : **AR – Architecture & Planning**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T/D /I	P/S	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	ARC-401	Integrated Architectural Design Studio-IV	PCC	5	1	2	4	0	7	-	80	20	-	-
2	ARC-403	Working Drawing, Specification and Estimation	PCC	3	1	0	4	0	3	-	40 - 60	20 - 30	-	20 - 30
3	ARC-405	Construction Planning and Management	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
4	ARL-III	Program Elective-III	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
5	ARL-IV	Program Elective-IV	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
6	MSC/DHC-II	Minor Specialization Course-II/ Departmental Honours Course-II	MSC/DHC	3/4										
7	MSC/DHC - III	Minor Specialization Course-III/ Departmental Honours Course-III	MSC/DHC	3/4										
		Total		**17/ 23-25**										
(Spring)														
1	ARC-402	Professional Training	PCC	12	-	-	-	-	-	-	-	-	-	100
		Total		**12**										

22 JUN 2023

DEPARTMENT OF ARCHITECTURE & PLANNING

Program Code : **110 – Bachelor of Architecture**
Department : **AR – Architecture & Planning**
Year : **V**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T/D/I	P/S	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	ARP-501	Design Thesis – Project	PCC	12	0	2	0	-	-	-	-	-	-	100
2	ARC-503	Professional Practice, Valuation & Arbitration	PCC	3	2	1	0	3	-	20-35	-	20-30	40-50	-
3	ARL-V	Program Elective-V	PEC	3	2	1	0	3	-	20-35	-	20-30	40-50	-
4	ARL-VI	Program Elective-VI	PEC	3	2	1	0	3	-	20-35	-	20-30	40-50	-
5	MSC/DHC -IV	Minor Specialization Course-IV/ Departmental Honours Course-IV	MSC/DHC	3/4										
6	MSC/DHC - V	Minor Specialization Course-V/ Departmental Honours Course-V	MSC/DHC	3/4										
		Total		**21/ 27-29**										
(Spring)														
1	ARP-502	Internship	NCE	Report and Seminar										

22 JUN 2023

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Sub Code	Course Title	Sub. Area	Credits	L	T/D/I	P/S	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Program Elective - 1														
1	ARL-301	Structure and Architecture	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ARL-303	Applied Art and Visual Sensitivity	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective - 2														
3	ARL-302	Product Design Prototyping and Fabrication	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
4	ARL-304	Industrialized Construction and Technology	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective -3														
5	ARL-401	Modern Indian Architecture	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
6	ARL-403	Vernacular Architecture	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective -4														
7	ARL-402	Disaster Resilient Built Environments	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
8	ARL-404	Acoustics and Illumination	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective - 5														
9	ARL-501	Hill Architecture	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
10	ARL-503	Housing and Real Estate	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective - 6														
11	ARL-502	Architecture and Urban Conservation	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
12	ARL-504	Architectural Journalism	PEC	3	2	1	0	3	0	20-35	-	20-30	40-50	-

22 JUN 2023

List of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	C W S	PRS	M T E	E T E	PRE
TEB – A (Interior Design)														
1	ART-101	Interior Design	TEB	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ART-102	Interior Design Studio	TEB	5	1	2	4	0	7	-	80	20	-	-
TEB-B (Universal Design)														
1	ART-103	Universal Design and Accessibility Planning	TEB	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ART-104	Design for Universal Access	TEB	5	1	2	4	0	7	-	80	20	-	-
TEB-C (Urban Design)														
1	ART-105	Urban Design	TEB	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ART-106	Urban Design for Selected Typology	TEB	5	1	2	4	0	7	-	80	20	-	-
TEB-D (Sustainable Built Environment)														
1	ART-107	Sustainable Built Environment (SBE)	TEB	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ART-108	SBE Design for Indian Climatic Zones	TEB	5	1	2	4	0	7	-	80	20	-	-
TEB-E (Urban Planning)														
1	ART-109	Urban Planning	TEB	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ART-110	Urban Planning Studio	TEB	5	1	2	4	0	7	-	80	20	-	-
TEB-F (Human Settlement Planning)														
1	ART-111	Ekistics	TEB	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ART-112	Settlement Planning	TEB	5	1	2	4	0	7	-	80	20	-	-

22 JUN 2023

Minor Specialisation Courses (20 credits)

Slno.	Code	Course	Semester	Credit
1	ARC-104	Building Materials & Construction-I	Spring	3
2	ARC-106	Climatology in Architecture	Spring	3
3	ARC-203	Building Materials and Construction-II	Autumn	3
4	ARC-206	History of Architecture-I	Autumn	3
5	ARC-204	Building Materials and Construction-III	Spring	3
6	ARC-205	History of Architecture-II	Autumn	3
7	ARC-208	Principles of Architecture	Autumn	3
8	ARC-210	Landscape Design and Site Development	Spring	3
9	ARC-304	Contemporary World Architecture	Spring	3
10	ARC-405	Construction Planning and Management	Autumn	3
11	ARC-503	Professional Practice, Valuation & Arbitration	Spring	3

Departmental Honours Courses (20 credits)

A. Elective courses from B.Arch over and above the minimum
B. Any of the following courses from M.Arch/MURP basket

Sl no.	Code	Course	Credit
1	ARC-603	Contemporary Architecture-Theories and Trends	3
2	ARC-605	Urban Design	3
3	ARC-607	Advanced Building Technologies	3
4	ARC-655	Ecology and Sustainable Development	3
5	ARC-657	Planning Theory and Techniques	3
6	ARC-659	Housing	3
7	ARC-661	Planning Legislation and Governance	3
8	ARC-604	Sustainable Built Environment	4
9	ARC-606	Megastructures	3
10	ARC-654	Infrastructure Planning	4
11	ARC-656	Rural Planning and Development	3

2-B. TECH. (BIOSCIENCE & BIOENGINEERING)
COMPONENT WISE DISTRIBUTION

Main Curriculum Components	Sub Components	Approved Credits for B. Tech.	Approved Credits Range	Proposed Credits for B. Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		16	
	ESC	8-20		12	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	45	91
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		8	
	PEC	22-26		24	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		155-158	
	MSC/DHC	18/20		18/20	
	Grand Total			173-178	

DEPARTMENT OF BIOSCIENCE & BIOENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : 125 B. Tech. (Bioscience & Bioengineering)
Department : BE Bioscience & Bioengineering

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	24	47
2	23/24	24/25	47/49
3	23/24	18	41/42
4	16	4	20
Grand Total			**155-158**
Total with MSC/DHC	With addition 18-20 credits		**173-178**

22 JUN 2023

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2nd& 3rd Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF BIOSCIENCE & BIOENGINEERING

Program Code : 125 **B. Tech. (Bioscience & Bioengineering)**
Department : BE **Department of Bioscience & Bioengineering**
Year : I

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	BEC-101	Computer Programming	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6	ECE-101	Fundamentals of Electronics	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-103	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	MTE-102	Material Characterization	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BEC-102	Microbiology	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
6	BEC-104	Biochemistry and Biophysics	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
7	BEC-191	Technical Communication	PCC	2	0	2	0	-	-	100				
8	BEC-108	Bioinformatics	PCC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
		Total		**24**										

22 JAN 2023

DEPARTMENT OF BIOSCIENCE & BIOENGINEERING

Program Code : **125** **B. Tech. (Bioscience & Bioengineering)**
Department : **BE** **Department of Bioscience & Bioengineering**
Year : **II**

Teaching Scheme					Contact Hours/Week			ExamDuration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	HSSEC-I	HSS Elective Course	HSSEC	3										
3	OEC-I	Open Elective Course-I	OEC	3/4										
4	CSE-101	Data Structures and Algorithms	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	CYB-101	Fundamentals of Organic Chemistry	BSC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6	BEC-201	Transport Phenomenon in Biological System	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	BEC-203	Cell Biology and Genetics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
		Total		**23/24**										
(Spring)														
1	OEC-II	Open Elective Course-II	OEC	3/4										
2	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	BEC-202	Physiology of Animals and Plants	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	BEC-204	Molecular Biology and Genetic Engineering	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	BEC-206	Structural Biology	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	BEC-208	Bioprocess Calculations	PCC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
7	BEC-210	Immunology	PCC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
8	BET-I	Talent Enhancement Course-I	TEB	3	0	0	6	-	-	-	50	-	-	50
		Total		**24/25**										

22 JUN 2023

DEPARTMENT OF BIOSCIENCE & BIOENGINEERING

Program Code : **125** **B. Tech. (Bioscience & Bioengineering)**
Department : **BE** **Department of Bioscience & Bioengineering**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSSEC-II	HSS Elective Course-II	HSSEC	3										
2	OEC-III	Open Elective Course-III	OEC	3/4										
3	BEC-351	Fundamentals of AI/ML	PCC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
4	BEC-301	Bioprocess Engineering	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	BEC-303	Computational Biology	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	BEC-305	Animal and Plant Tissue Culture	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	BEC-399	Community Outreach	CORE	2						100				
8	BEL-I	Program Elective Course-I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23/24**										
(Spring)														
1	BEC-300	Lab Based Project/ Industrial Oriented Problem Solving/ Case Study, etc.	PCC	4	0	0	8	-	-	-	-	-	100	-
2	BEC-302	Genomics, Proteomics and Metabolomics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	BEL-II	Program Elective Course-II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	BEL-III	Program Elective Course-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BET-II	Talent Enhancement Course-II	TEB	3	0	0	6	-	-	-	50	-	-	50
6	MSC/DHC - I	Minor Specialization Course - I / Departmental Honours Course - I	MSC/ DHC	3/4										
		Total		**18 /21-22**										

22 JUN 2023

DEPARTMENT OF BIOSCIENCE & BIOENGINEERING

Program Code	:	**125**	**B. Tech. (Bioscience & Bioengineering)**
Department	:	**BE**	**Department of Bioscience & Bioengineering**
Year	:	**IV**	

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
(Autumn)														
1	BEP-400A/ BEL	BTP/Project/Internship/Entrepreneurship/ PEC*	PCC/PEC*	4	0	0	8	-	-	-	-	-	100	-
2	BEL-IV	Program Elective Course -IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	BEL-V	Program Elective Course -V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	BEL-VI	Program Elective Course -VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	MSC/DHC-II	Minor Specialization Course -II /Departmental Honours Course - II	MSC/ DHC	3/4										
6	MSC/DHC-III	Minor Specialization Course -III /Departmental Honours Course - III	MSC/ DHC	3/4										
		Total		**16/22-24**										
(Spring)														
1	BEP-400B/ BEL	BTP/Project/Internship/Entrepreneurship/ PEC*	PCC/PEC*	4	0	0	8	-	-	-	-	-	100	-
2	MSC/DHC-IV	Minor Specialization Course -IV /Departmental Honours Course – IV	MSC/ DHC	3/4										
3	MSC/DHC-V	Minor Specialization Course - IV/Departmental Honours Course - IV	MSC/ DHC	3/4										
		Total		**04/10-12**										

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
Basket-1 (Cell and Molecular Biology)														
1.	BEL-401	Gene Regulation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	BEL-402	Food Biotechnology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	BEL-403	Virology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	BEL-404	Nano- Bioengineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	BEL-405	Separation and Analysis of Biomolecules	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	BEL-406	Drug Discovery	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	BEL-407	Principles of Synthetic Biology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8.	BEL-408	Stem Cell Technology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9.	BEL-409	Industrial Bioprocessing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
10.	BEL-410	High Throughput Sequencing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11.	BEL-411	Chemical Genetics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12.	BEL-412	Genetically Modified Organisms	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13.	BEL-413	Vaccine Biotechnology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	BEL-414	Tissue Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	BEL-415	Biomaterials and Devices	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16.	BEL-416	Molecular Diagnostics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17.	BEL-417	Fundamentals of Neuroscience	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18.	BEL-418	Biotherapeutics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

19.	BEL-419	Molecular Genetics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20.	BEL-420	Immunotechnology and Therapeutics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Basket-2 (Biological Engineering)														
21.	BEL-451	Bioprocess Control	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22.	BEL-452	Bioprocess Modelling and Simulation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
23.	BEL-453	Bioreactor Design and Analysis	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24.	BEL-454	Bioprocess Optimization	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
25.	BEL-455	Bioseparation Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
26.	BEL-456	Bioelectronic Medical Devices	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
27.	BEL-457	Plant Design and Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Basket-3 (Structural and Computational Biology)														
28.	BEL-471	Machine Learning and Deep Learning	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
29.	BEL-472	Protein Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
30.	BEL-473	Biophotonics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
31.	BEL-474	Biomolecular NMR	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
32.	BEL-475	Biomolecular Modelling	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
33.	BEL-476	Systems Biology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
34.	BEL-477	Molecular Biophysics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
35.	BEL-478	Biomolecular Interactions	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
36.	BEL-479	X-Ray Crystallography	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
37.	BEL-480	Fundamentals of Cryo-EM	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
38.	BEL-481	Structural Bioinformatics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
39.	BEL-482	DNA Computing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

List of Talent Enhancement Basket Courses

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
TEB-A: Cell and Molecular Biology														
1	BET-101	Emerging Techniques in Cell and Molecular Biology-I	TEB	3	0	0	6	-	-	-	50	-	-	50
2	BET-102	Emerging Techniques in Cell and Molecular Biology-II	TEB	3	0	0	6	-	-	-	50	-	-	50
TEB-B: Structural and Computational Biology														
1	BET-103	3D Structural Characterization	TEB	3	0	0	6	-	-	-	50	-	-	50
2	BET-104	Computational Characterization of Biomolecules	TEB	3	0	0	6	-	-	-	50	-	-	50
TEB-C: Bioprocess Engineering														
1	BET-105	Bioprocess Engineering-I	TEB	3	0	0	6	-	-	-	50	-	-	50
2	BET-106	Bioprocess Engineering-II	TEB	3	0	0	6	-	-	-	50	-	-	50

List of Minor Specialization Courses

Minor in Computational Biology and Bioinformatics

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
1	BE-XXX	Biosciences for engineers	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	BEC-108	Bioinformatics	MSC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
3	BEC-303	Computational Biology	MSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	BE-XXX	Programming for Computational Biology	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BEL-471	Machine Learning and Deep Learning	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	BEL-481	Structural Bioinformatics	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

Minor in Cell and Molecular Biology

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
1	BE-XXX	Fundamentals of Biotechnology	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	BEL-473	Biophotonics	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	BEL-417	Fundamentals of Neuroscience	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	BE-XXX	IPR and Bioethics	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BE-XXX	Bionanotechnology	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	BE-XXX	Recombinant DNA technology	MSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

List of Department Honours Specialization Courses:

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
1	BEL-XXX	Drug Discovery and Development	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	BEL -XXX	Advanced Virology	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	BEL -XXX	Microbial Genetics	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	BEL -XXX	Protein Crystallography	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	BEL -XXX	Advances in Food Biotechnology	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	BEL -XXX	Biomedical Optics and Biophotonics	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	BEL -XXX	Protein NMR	DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

22 JUN 2023

3-B.Tech. (Civil Engineering)
Component wise distribution

Main Curriculum Components	Sub Components	Approved Credits for B.Tech.	Approved Credits Range	Proposed Credits for B.Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		12	
	ESC	8-20		16	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	48	90
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		6	
	PEC	22-26		22	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		154/157	
	MSC/DHC	18/20		18/20	
	Grand Total			172/177	

DEPARTMENT OF CIVIL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code	:	**113**	**B.Tech. (Civil Engineering)**
Department	:	**CE**	**Civil Engineering**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	19	42
2	24/25	23/24	47/49
3	24/25	19	43-44
4	14	8	22
Grand Total			**154/157**
Total with MSC/DHC	With addition 18-20 credits		**172/177**

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2^{nd}& 3^{rd} Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF CIVIL ENGINEERING

Program Code : **113 - B.Tech. (Civil Engineering)**
Department : **Department of Civil Engineering**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics -I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	CEC-101	Computer Programming	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	TMI-101	Tinkering & Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6	MIE-101	Engineering Mechanics	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-101	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	CEC-102	Geospatial Engineering-I	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
5	CEC-104	Fluid Mechanics	PCC	3	3	0	2/2	3	0	15-30	20	15-25	30-40	-
6	EQE-101	Solid Mechanics	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**19**										

22 JUN 2023

DEPARTMENT OF CIVIL ENGINEERING

Program Code : **113 - B.Tech. (Civil Engineering)**
Department : **Department of Civil Engineering**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSSEC-I	HSS Elective Course-I	HSSEC	3										
2	OEC-I	Open Elective Course-I	OEC	3/4										
3	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	CEC-201	Geospatial Engineering -II	PCC	5	2	0	6*	3	2	10-25	10-25	15-25	30-40	10-25
5	CEC-203	Structural Analysis-I	PCC	3	3	0	2/2	3	2	15-30	20	15-25	30-40	-
6	CEC-205	Channel Hydraulics	PCC	3	3	0	2/2	3	0	15-30	20	15-25	30-40	-
7	ESE-101	Geology for Engineers	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**24/25**										
(Spring)														
1	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	OEC-II	Open Elective Course-II	OEC	3/4										
3	CEC-202	Water Supply Engineering	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	CEC-204	Structural Analysis -II	PCC	3	3	0	2/2	3	0	15-30	20	15-25	30-40	-
5	CEC-206	Design of Reinforced Concrete Elements	PCC	3	3	0	2/2	3	0	15-30	20	15-25	30-40	-
6	HYE-101	Engineering Hydrology	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	CEL-I	Program Elective Course - I	PEC	3										
		Total		**23/24**										

***Includes field survey camp**

22 JUN 2023

DEPARTMENT OF CIVIL ENGINEERING

Program Code : **113 - B.Tech. (Civil Engineering)**
Department : **Department of Civil Engineering**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSSEC-II	HSS Elective Course-II	HSSEC	3										
2	OEC-III	Open Elective Course-III	OEC	3/4										
3	CEC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	30-40	-
4	CEC-301	Soil Mechanics	PCC	3	3	0	2/2	3	0	15-30	20	15-25	30-40	-
5	CEC-303	Waste Water Engineering	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	CEC-305	Design of Steel Elements	PCC	3	3	0	2/2	3	0	15-30	20	15-25	30-40	-
7	CEC-307	Highway and Traffic Engineering	PCC	3	3	0	2/2	3	0	15-30	20	15-25	30-40	-
8	CEC-399	Community Outreach	CORE	2						100				
9	CET-I	Talent Enhancement Course-I	TEB	2	1	0	2	2	0	10-20	20-30	15-25	30-40	-
		Total		**24/25**										
(Spring)														
1	CEC-300	Design of Structural Systems	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
2	CEC-302	Foundation Engineering	PCC	3	3	0	2/2	3	-	15-30	20	15-25	30-40	-
3	CEC-304	Railway Engineering	PCC	3	3	0	0	3	-	20-35	0	20-30	40-50	-
4	CEL-II	Program Elective Course – II	PEC	3										
5	CEC-391	Technical Communication	PCC	2	0	2	0	0	0	-	100	-	-	-
6	CET-II	Talent Enhancement Course-II	TEB	4	2	1	2	3	-	10-25	25	15-25	30-40	-
7	MSC/DHC - I	Minor Specialization Course - I / Departmental Honours Course - I	MSC/DHC	3/4										
		Total		**19/ 22-23**										

DEPARTMENT OF CIVIL ENGINEERING

Program Code : **113 - B.Tech. (Civil Engineering)**
Department : **Department of Civil Engineering**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	CEP-400/ CEL	Project/Entrepreneurship/Project-Based Internship/PEC*	PCC/PEC*	6						100				
2	CEL-III	Program Elective Course – III	PEC	4										
3	CEL-IV	Program Elective Course – IV	PEC	4										
4	MSC/DHC - II	Minor Specialization Course - II / Departmental Honours Course – II	MSC/ DHC	3/4										
5	MSC/DHC - III	Minor Specialization Course - III / Departmental Honours Course - III	MSC/ DHC	3/4										
		Total		**14/ 20-22**										
(Spring)														
1	CEL-V	Program Elective Course-V	PEC	4										
2	CEL-VI	Program Elective Course-VI	PEC	4										
3	MSC/DHC – IV	Minor Specialization Course - IV / Departmental Honours Course – IV	MSC/DHC – IV	3/4										
4	MSC/DHC - V	Minor Specialization Course - V / Departmental Honours Course - V	MSC/DHC - V	3/4										
		Total		**8/ 14-16**										

22 JUN 2023

List of Program Elective Courses

Second Year Spring (3 credits each)

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CEL-201	Building Materials	PEC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
2.	CEL-202	Engineering Graphics	PEC	3	2	0	2	3	-	10-25	25	15-25	30-40	-
3.	CEL-203	Intelligent Transportation System	PEC	3	2	1	0	3	-	20-35	-	20-30	40-50	-

Third Year Spring (3 credits each)

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CEL-301	Construction Planning And Management	PEC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
2.	CEL-302	System Analysis	PEC	3	3	0	2/2	3	-	15-30	20	15-25	30-40	-
3.	CEL-303	Airport Planning And Design	PEC	3	3	0	0	3	-	20-35	-	20-30	40-50	0
4.	CEL-304	Foundations Of Industrial Machines	PEC	3	2	1	0	3	-	20-35	-	20-30	40-50	0

List of Program Elective Courses

Fourth Year Autumn (4 credits each)

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CEL-4XX	Rock Engineering	PEC	4	3	1	0	3	0	20-35	-	20-35	40-50	-
2.	CEL-531	Advanced Hydrology	PEC	4	3	1	0	3	0	20-35	-	20-35	40-50	-
3.	CEL-534	Modeling, Simulation & Optimization	PEC	4	3	1	0	3	0	20-35	-	20-35	40-50	-
4.	CEL-501	Environmental Modeling& Simulation	PEC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
5.	CEL-502	Environmental Seperation Process	PEC	4	3	1	0	3	0	20-35	-	20-35	40-50	-
6.	CEL-503	Waste Water Treatment	PEC	4	3	1	0	3	0	20-35	-	20-35	40-50	-
7.	CEL-505	Statistics & Instrumentation For Environmental Engineers	PEC	4	3	1	2	3	0	15-30	20	15-25	30-40	-
8.	CEL-524	Soil Dynamics And Machine Foundations	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
9.	CEL-542	Continuum Mechanics	PEC	4	3	1	0	3	0	20-35	-	20-35	40-50	-
10.	CEL-543	Advanced Concrete Design	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
11.	CEL-544	Structural Dynamics	PEC	4	3	1	0	3	0	20-35	-	20-35	40-50	-
12.	CEL-641	Behaviour & Design of Steel Structures	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
13.	CEL-561	Traffic Analysis And Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
14.	CEL-563	Urban Mass Transit Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
15.	CEL-564	Geometric Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
16.	CEL-565	Planning, Design And Construction of Rural Roads	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
17.	CEL-567	Transportation Systems Analysis	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
18.	CEL-568	Advanced Highway Material Characterisation	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
19.	CEL-5XX	Advanced Highway Construction And Maintenance	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
20.	CEN-511	Surveying Measurements And Adjustments	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
21.	CEN-512	Principles of Photogrammetry	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
22.	CEN-513	Remote Sensing And Image Processing	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-

23.	CEN-514	Geodesy And Gps Surveying	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
24.	CEN-614	Theory And Applications of GIS	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
25.	CEL-5XX	Programming For Geospatial Data Analysis	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-

Fourth Year Spring (4 credits each)

1.	CEN-4XX	Ground Water Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	CEL-602	Water Quality Management	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	CEL-603	Industrial & Hazard Waste Management	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	CEL-604	Environmental Impact & Risk Assessment	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	CEN-605	Solid Waste Management	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	CEL-606	Environmental Remediation of Contaminated Sites	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	CEL-636	Hydropower Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8.	CEL-625	Ground Improvement Engineering	PEC	4	2	1	0	3	0	20-35	-	20-30	40-50	-
9.	CEL-545	Finite Element Analysis	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
10.	CEL-642	Analysis And Design of Bridges	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
11.	CEL-643	Analysis And Design of High-rise Buildings	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
12.	CEL-644	Analysis And Design of Plates And Shells	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
13.	CEL-645	Mechanics of Composites	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	CEL-646	Engineering Design Optimization And Reliability	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
15.	CEL-647	Condition Assessment And Retrofitting Of Structures	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
16.	CEL-648	Concrete Technology	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
17.	CEL-649	Fracture Mechanics In Quasi-Brittle Materials	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18.	CEL-650	Design of Bridge Sub-Structure	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
19.	CEL-651	Wind Engineering	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
20.	CEL-653	Introduction To Theories of Inelasticity	PEC	4	3	1	0	3	0	20-25	-	25-35	40-50	-
21.	CEL-6XX	Pavement Analysis And Design	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
22.	CEL-662	Intersection Design And Control	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
23.	CEL-663	Pavement Evaluation And Management	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
24.	CEL-664	Transportation Planning	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-

22 JUN 2023

25.	CEL-665	Road Traffic Safety	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
26.	CEL-666	Transport Economics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
27.	CEL-614	Theory And Applications Of GIS	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
28.	CEL-XXX	Transportation Data Analysis Techniques	PEC	4	3	1	0	3	0	25-35	-	20-30	40-50	0

22 JUN 2023

Basket of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	C W S	P R S	MTE	E T E	PRE
TEB-I (Computer Aided Design)														
1	CET-101	CAD in Structural Analysis	TEB	2	1	0	2	2	-	10-20	20-30	15-25	30-40	0
2	CET-102	CAD in Geotechnical Engg.	TEB	4	2	1	2	2	-	10-20	20-30	15-25	30-40	0
TEB-II (Material Testing)														
1	CET-103	Highway Material Characterization	TEB	2	1	0	2	2	-	10-20	20-30	15-25	30-40	0
2	CET-104	Structural Materials and Testing	TEB	4	2	1	2	2	-	10-20	20-30	15-25	30-40	0

List of Open Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CEO-101	Probability Methods In Engineering Problems	OEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
2.	CEO-102	Simulation of Behavior-Induced Mobility	OEC	3	2	1	0	3	0	20-35	-	20-30	40-50	0
3.	CEO-103	Water Resources Engineering	OEC	3	3	0	2/2	3	0	15-30	20	15-25	30-40	-

22 JUN 2023

Minor Specialization Courses (20 credits)

S.No.	Subject Code	Course Title	Semester	Credits
1	CEC-202	Water Supply Engineering	Spring	3
2	CEC-102	Geospatial Engineering-I	Spring	3
3	CEC-104	Fluid Mechanics	Spring	3
4	CEC-203	Structural Analysis-I	Autumn	3
5	CEC-307	Highway & Traffic Engg	Autumn	3
6	CEC-301	Soil Mechanics	Autumn	3
7	CEL-301	Construction Planning and Management	Spring	3
8	CEL-201	Building Materials	Spring	3

Departmental Honours Courses (20 credits)

S.No.	Subject Code	Course Title	Credits
1.	CEL-521	Advanced Numerical Analysis	4
2.	CEL-523	Engineering Behaviour Of Rocks	4
3.	CEL-525	Fem In Geotechnical Engineering	4
4.	CEL-542	Continuum Mechanics	4
5.	CEL-543	Advanced Concrete Design	4
6.	CEL-544	Structural Dynamics	4
7.	CEL-545	Finite Element Analysis	4
8.	CEL-623	Stability Analysis Of Slopes	4
9.	CEL-624	Design Of Under-Ground Excavations	4
10.	CEL-628	Constitutive Modelling Of Geological Materials	4
11.	CEL-629	Earthquake Resistant Design Of Geotechnical Structures	4
12.	CEL-501	Environmental Modelling& Simulation	4
13.	CEL-502	Environmental Seperation Process	4
14.	CEL-504	Environmental Chemistry	4
15.	CEL-505	Statistics & Instrumentation For Environmental Engineers	4
16.	CEL-603	Industrail& Hazard Waste Management	4
17.	CEL-606	Environmental Remediation Of Contaminated Sites	4
18.	CEL-611	Analytical And Digital Photogrammetry	4
19.	CEL-612	Advanced Digital Image Processing	4
20.	CEL-613	Thermal, Microwave And Hyperspectral Remote Sensing	4
21.	CEL-615	Geoinformatics For Natural Disasters	4

22 JUN 2023

22.	CEL-616	Geoinformatics For Landuse Surveys	4
23.	CEL-617	Satellite Geodesy	4
24.	CEL-618	Modelling And Analysis Of Geospatial Data	4
25.	CEL-534	Modeling, Simulation & Optimization	4
26.	CEL-638	Climate Change And Its Impact On Water Resources	4
27.	CEL-561	Traffic Analysis And Design	4
28.	CEL-563	Urban Mass Transit Systems	4
29.	CEL-564	Geometric Design	4
30.	CEL-565	Planning, Design And Construction Of Rural Roads	4
31.	CEL-567	Transportation Systems Analysis	4
32.	CEL-568	Advanced Highway Material Characterization	4
33.	CEL-5XX	Advanced Highway Construction And Maintenance	4
34.	CEL-6XX	Pavement Analysis And Design	4
35.	CEL-662	Intersection Design And Control	4
36.	CEL-663	Pavement Evaluation And Management	4
37.	CEN-664	Transportation Planning	4
38.	CEL-665	Road Traffic Safety	4
39.	CEL-666	Transport Economics	4
40.	CEL-632	Hydraulic Structures	4
41.	CEL-XXX	Transportation Data Analysis Techniques	4

22 JUN 2023

4-B. TECH. (CHEMICAL ENGINEERING)
COMPONENT WISE DISTRIBUTION

Main Curriculum Components	Sub Components	Approved Credits for B. Tech.	Approved Credits Range	Proposed Credits for B. Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		20	
	ESC	8-20		8	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	47	91
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		8	
	PEC	22-26		22	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		155-158	
	MSC/DHC	18/20		18/20	
	Grand Total			173/178	

DEPARTMENT OF CHEMICAL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **112** **B. Tech. (Chemical Engineering)**
Department : **CH** **Chemical Engineering**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	21	44
2	23/24	21/22	44/46
3	21/22	22	43/44
4	12	12	24
Grand Total			**155/158**
Total with MSC/DHC	**With addition 18-20 credits**		**173/178**

22 JUN 2023

	Components	Maximum Units	Minimum Units	Comments
Non-Credit Elements (NCE)	**Discipline (DIS)**	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt./Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2^{nd}& 3^{rd} Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF CHEMICAL ENGINEERING

Program Code : **112 - B.Tech. (Chemical Engineering)**
Department : **Department of Chemical Engineering**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-1	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-1	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	CHC-101	Computer Programming	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4	T-2	-	-	-	-	-	70	30	-	-	-
					M-2	2	0	0	2	-	50	-	-	50	-
6	MIE-101	Engineering Mechanics	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	CYB-103	Physical Chemistry-I	BSC	4	3	0	2	3	0	20-35	-	20-30	40-50	-
2	CHC-102	Chemical Process Calculations	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	CHC-104	Fluid Mechanics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
5	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	ESS-103	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
		Total		**21**										

22 JUN 2023

DEPARTMENT OF CHEMICAL ENGINEERING

Program Code : **112 - B.Tech. (Chemical Engineering)**
Department : **Department of Chemical Engineering**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	HSSEC-1	HSS Elective Course	HSSEC	3										
2.	OEC-1	Open Elective Course	OEC	3/4										
3.	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	BSB-102	Biosciences for Engineers	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	CHC-201	Heat Transfer	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	CHC-203	Chemical Engineering Thermodynamics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	CHC-205	Chemical Engineering Lab-I	PCC	2	0	0	4	-	-	-	50	-	-	50
		Total		**23/24**										
(Spring)														
1.	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	OEC-II	Open Elective Course	OEC	3/4										
3.	CSE-101	Data Structure and Algorithm	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	CHC-202	Chemical Reaction Engineering	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	CHC-204	Mass Transfer	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	CHC-206	Chemical Engineering Lab-II	PCC	2	0	0	4	-	-	-	50	-	-	50
		Total		**21/22**										

22 JUN 2023

DEPARTMENT OF CHEMICAL ENGINEERING

Program Code : **112 - B.Tech. (Chemical Engineering)**
Department : **Department of Chemical Engineering**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
		(Autumn)												
1.	HSSEC-1	HSS Elective Course	HSSEC	3										
2.	OEC-1	Open Elective Course	OEC	3/4										
3.	CHC-351	Fundamentals of AI/ML	PCC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
4.	CHC-301	Computer Applications in Chemical Engineering	PCC	2	0	0	4	-	-	-	50	-	-	50
5.	CHT-I	Talent Enhancement Course-I	TEB	3	2	0	2	3	0	10-25	25	15-25	30-40	-
6.	CHC-303	Chemical Engineering Lab-III	PCC	2	0	0	4	-	-	-	50	-	-	50
7.	CHC-305	Process Equipment Design	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
8.	CHC-399	Community Outreach	CORE	2						100				
		Total		**21/22**										
				(Spring)										
1	CHC-300	Case Study /Industry Oriented Problem/ Lab Based Project	PCC	4	0	0	8	-	-	-	50	-	-	50
2	CHC-302	Process Instrumentation and Control	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
3	CHC-304	Plant Design and Process Economics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	CHC-391	Technical Communication	PCC	2	0	2	0	-	-	100				
5	CHL-I	Program Elective-I	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	CHL-II	Program Elective-II	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	CHT-II	Talent Enhancement Course-II	TEB	3	2	0	2	3	0	10-25	25	15-25	30-40	-
8	MSC/DHC-I	Minor Specialization Course-I/ Departmental Honours Course-I	MSC/DHC	3/4										
		Total		**22/25-26**										

DEPARTMENT OF CHEMICAL ENGINEERING

Program Code : **112 - B.Tech. (Chemical Engineering)**
Department : **Department of Chemical Engineering**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S.No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	CHP-400A/CHL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/PEC*	4						100				
2.	CHL-III	Program Elective-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	CHL-IV	Program Elective-IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MSC/DHC-II	Minor Specialization Course-II / Departmental Honours Course-II	MSC/DHC	3/4										
5.	MSC/DHC-III	Minor Specialization Course-III / Departmental Honours Course-III	MSC/DHC	3/4										
		Total		**12/18-20**										
(Spring)														
1.	CHP-400B/CHL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/PEC*	4						100				
2.	CHL-V	Program Elective-V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	CHL-VI	Program Elective-VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MSC/DHC-IV	Minor Specialization Course-IV / Departmental Honours Course-IV	MSC/DHC	3/4										
5.	MSC/DHC-V	Minor Specialization Course-V/ Departmental Honours Course-V	MSC/DHC	3/4										
		Total		**12/18-20**										

22 JUN 2023

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CHL-323	Transport Phenomena	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2.	CHL-324	Industrial Pollution Abatement	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3.	CHL-326	Fluidization Engineering	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	CHL-327	Petroleum Refining	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5.	CHL-328	Petrochemicals	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6.	CHL-329	Fertilizer Technology	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7.	CHL-511	Process Integration	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8.	CHL-513	Biochemical Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9.	CHL-515	Computational Fluid Dynamics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
10	CHL-517	Optimization of Chemical Processes	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11	CHL-510	Advanced Process Control	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12	CHL-512	Solid and Hazardous Waste Management	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13	CHL-514	Pollution Control Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14	CHL-516	Kinetics of Polymerization	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15	CHL-518	Waste to Energy Conversion	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16	CHL-520	Oil and Gas Transport	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17	CHL-522	Nanotechnology in Chemical Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18	CHL-524	Microfluidics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
19	CHL-526	Supercritical Fluids: Theory and Applications	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20	CHL-528	Introduction to Granular Rheology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
21	CHL-530	Drug Delivery	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22	CHL-532	Colloids and Interfacial Science	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
23	CHL-534	Novel Separation Techniques	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24	CHL-536	Design of Experiments and Parameter Estimation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
25	CHL-538	Industrial Safety and Hazard Management	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
26	CHL-540	Multiphase Flow	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

List of Talent Enhancement Basket Courses

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	C W S	PRS	MTE	E T E	PRE
TEB-A: Characterization Techniques														
1	CHT-101	Advanced Characterization Techniques-I	TEB	3	2	0	2	3	0	10-25	25	15-25	30-40	-
2	CHT-102	Advanced Characterization Techniques-II	TEB	3	2	0	2	3	0	10-25	25	15-25	30-40	-
TEB-B: Modeling and Simulations														
1	CHT-103	Process Modeling and Simulations-I	TEB	3	2	0	2	3	0	10-25	25	15-25	30-40	-
2	CHT-104	Process Modeling and Simulations-II	TEB	3	2	0	2	3	0	10-25	25	15-25	30-40	-

List of OEC course

S.No.	Course Code	Course title	Semester	Credits
1	CHO-101	Computational Fluid Dynamics	Autumn	4

Minor Specialization Courses

S.No.	Code	Course title	Semester	Credits
1	CHC-102	Chemical Process Calculations	Spring	4
2	CHC-104	Fluid Mechanics	Spring	4
3	CHC-201	Heat Transfer	Autumn	4
4	CHC-203	Chemical Engineering Thermodynamics	Autumn	4
5	CHC-202	Chemical Reaction Engineering	Spring	4
6	CHC-204	Mass Transfer	Spring	4
7	CHC-305	Process Equipment Design	Autumn	4

Departmental Honours Courses

S.No.	Code	Course title	Credits
1	CHL-511	Process Integration	4
2	CHL-513	Biochemical Engineering	4
3	CHL-515	Computational Fluid Dynamics	4
4	CHL-517	Optimization of Chemical Processes	4
5	CHL-510	Advanced Process Control	4
6	CHL-512	Solid and Hazardous Waste Management	4
7	CHL-514	Pollution Control Systems	4
8	CHL-516	Kinetics of Polymerization	4
9	CHL-518	Waste to Energy Conversion	4
10	CHL-520	Oil and Gas Transport	4
11	CHL-522	Nanotechnology in Chemical Engineering	4
12	CHL-524	Microfluidics	4
13	CHL-526	Supercritical Fluids: Theory and Applications	4
14	CHL-528	Introduction to Granular Rheology	4
15	CHL-530	Drug Delivery	4
16	CHL-532	Colloids and Interfacial Science	4
17	CHL-534	Novel Separation Techniques	4
18	CHL-536	Design of Experiments and Parameter Estimation	4
19	CHL-538	Industrial Safety and Hazard Management	4
20	CHL-540	Multiphase Flow	4

5-B.Tech. (Computer Science &Engineering)
Component wise distribution

Main Curriculum Components	Sub Components	Approved Credits for B.Tech.	Approved Credits Range	Proposed Credits for B.Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		16	
	ESC	8-20		12	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	40	88
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		10	
	PEC	22-26		24	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		152-155	
	MSC/DHC	18/20		18/20	
	Grand Total			170-175	

DEPARTMENT OF COMPUTER SCIENCE &ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **114** **B.Tech. (Computer Science &Engineering)**
Department : **CSE** **Computer Science &Engineering**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	17	40
2	23/24	23/24	46/48
3	24/25	20	44/45
4	16	6	22
Grand Total			**152-155**
Total with MSC/DHC	With addition 18-20 credits		**170-175**

22 JUN 2023

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2^{nd}& 3^{rd} Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Program Code : **114 - B.Tech.(Computer Science & Engineering)**
Department : **Department of Computer Science & Engineering**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	CSC-101	Programming with C and C++	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4 (T-2)	-	-	-	-	-	70	30	-	-	-
				4 (M-2)	2	0	0	2	-	50	-	-	50	-
6	ECE-103	Digital Electronics	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-102	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	ECE-102	Introduction to Communication System	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	CSC-102	Data Structures	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
		Total		**17**										

22 JUN 2023

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Program Code : **114 - B.Tech.(Computer Science & Engineering)**
Department : **Department of Computer Science & Engineering**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSSEC-I	HSS Elective Course	HSSEC	3										
2	OEC-I	Open Elective Course-I	OEC	3/4										
3	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	MAB-103	Numerical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	CSC-201	Computer Organization & Architecture	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	CSC-203	Design and Analysis of Algorithms	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	CST-I	Talent Enhancement Course-I	TEB	2	0	0	4	-	-	-	100	-	-	-
		Total		**23/24**										
(Spring)														
1	OEC-II	Open Elective Course-II	OEC	3/4										
2	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	CSC-202	Theory of Computation	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	CSC-204	Operating Systems	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	CSC-206	Software Engineering	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6	CEE-106	Geospatial Techniques and Programming	ESC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
		Total		**23/24**										

27 JUN 2023

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Program Code : **114 - B.Tech. (Computer Science & Engineering)**
Department : **Department of Computer Science & Engineering**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSSEC-II	HSS Elective Course	HSSEC	3										
2	OEC-III	Open Elective Course-III	OEC	3/4										
3	CSC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
4	CSC-301	Database Management Systems	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	CSC-303	Computer Networks	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	CSC-305	Compiler Design	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	CSC-399	Community Outreach	CORE	2						100				
8	CST-II	Talent Enhancement Course-II	TEB	2	0	0	4	-	-	-	100	-	-	-
		Total		**24/25**										
(Spring)														
1	CSC-300	Engineering Analysis and Design (LBP/IOP/DTP)	PCC	4	0	0	8	-	-	-	50	-	-	50
2	CSC-391	Technical Communication	PCC	2	0	0	4	-	-	-	50	-	-	50
3	CST-III	Talent Enhancement Course-III	TEB	2	0	0	4	-	-	-	100	-	-	-
4	CSL-I	Program Elective Course-I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	CSL-II	Program Elective Course-II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	CSL-III	Program Elective Course-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	MSC/DHC-I	Minor Specialization Course-I / Departmental Honours Course-I	MSC/DHC	3/4										
		Total		**20/23-24**										

22 JUN 2023

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Program Code : **114 - B.Tech.(Computer Science & Engineering)**
Department : **Department of Computer Science & Engineering**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	CSP-400A/CSL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/PEC*	4						100				
2	CSL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	CSL-V	Program Elective Course-V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	CSL-VI	Program Elective Course-VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	MSC/DHC-II	Minor Specialization Course-II/ Departmental Honours Course-II	MSC/ DHC	3/4										
6	MSC/DHC-III	Minor Specialization Course-III/ Departmental Honours Course-III	MSC/ DHC	3/4										
		Total		**16/22-24**										
(Spring)														
1	CSP-400B/CSL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/PEC*	6						100				
2	MSC/DHC – IV	Minor Specialization Course-IV/ Departmental Honours Course-IV	MSC/ DHC	3/4										
3	MSC/DHC - V	Minor Specialization Course-V/ Departmental Honours Course-V	MSC/ DHC	3/4										
		Total		**6/12-14**										

22 JUN 2023

List of Program Elective Courses/ Departmental Honors Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S.No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CSL-371	Artificial Intelligence	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	CSL -372	Computer Graphics	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	CSL -373	Probability Theory for Computer Engineers	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	CSL -381	Information Retrieval	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	CSL-382	Machine Learning	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	CSL-374	Software Testing	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	CSL-5xx	Software-Defined Networking and Applications	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8.	CSL-5xx	Computer Vision	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9.	CSL-376	Parallel and Distributed Algorithms	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
10.	CSL-476	Software Project Management	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11.	CSL-377	Bioinformatics	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12.	CSL-380	Intrusion Detection Systems	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13.	CSL-3xx	Quantum Computation	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	CSL-510	Network Programming	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	CSL-511	Advanced Database Management Systems	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16.	CSL-512	Formal Methods and Software Verification	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17.	CSL-513	Information and Network Security	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18.	CSL-514	Advanced Automata Theory	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
19.	CSL-515	Data Mining and Warehousing	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20.	CSL-4xx	Modelling and Simulation	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
21.	CSL-517	Advanced Topics in Software Engineering	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22.	CSL-518	Logic and Automated Reasoning	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

23.	CSL-519	Social Network Analysis	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24.	CSL-520	Cloud Computing	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
25.	CSL-521	Mobile and Pervasive Computing	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
26.	CSL-3xx	Advanced Graph Theory	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
27.	CSL-523	Computational Geometry	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
28.	CSL-524	Algorithms and Foundations of Chip Design	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
29.	CSL-526	Machine Learning	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
30.	CSL-527	Internet of Things	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
31.	CSL-3xx	Design and Verification of Graphics Processing Units	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
32.	CSL-530	Design and Analysis of Symmetric Cryptosystems	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
33.	CSL-531	Dynamic Graph Algorithms	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
34.	CSL-532	Data Stream Mining	PEC/DHC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

List of Talent Enhancement Basket Courses

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	P R S	MTE	ETE	PRE
TEB-A (Systems)														
1	CST-101	Cyber Physical Systems	TEB	2	0	0	4	-	-	-	100	-	-	-
2	CST-102	Linux Programming	TEB	2	0	0	4	-	-	-	100	-	-	-
3	CST-103	System Programming	TEB	2	0	0	4	-	-	-	100	-	-	-
TEB-B (Intelligent Computing)														
1	CST-104	Applications of ML	TEB	2	0	0	4	-	-	-	100	-	-	-
2	CST-105	Applications of DL	TEB	2	0	0	4	-	-	-	100	-	-	-
3	CST-106	Applications of NLP	TEB	2	0	0	4	-	-	-	100	-	-	-
TEB-C (Cyber Security)														
1	CST-107	Cryptography	TEB	2	0	0	4	-	-	-	100	-	-	-
2	CST-108	Secure Socket Programming	TEB	2	0	0	4	-	-	-	100	-	-	-
3	CST-109	Cloud Security	TEB	2	0	0	4	-	-	-	100	-	-	-

Minor Specialization Courses

S.No.	Code	Course title	Semester	Credits
1	CSC-102	Data Structures	Spring	4
2	CSC-201	Computer Organization & Architecture	Autumn	4
3	CSC-202	Theory of Computation	Spring	4
4	CSC-203	Design and Analysis of Algorithms	Autumn	4
5	CSC-204	Operating Systems	Spring	4
6	CSC-303	Computer Networks	Autumn	4
7	CSC-301	Database Management Systems	Autumn	4
8	CSC-206	Software Engineering	Spring	4

6-B. TECH. (ELECTRICAL ENGINEERING)
COMPONENT WISE DISTRIBUTION

Main Curriculum Components	Sub Components	Approved Credits for B. Tech.	Approved Credits Range	Proposed Credits for B. Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		16	
	ESC	8-20		12	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	40	88
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		8	
	PEC	22-26		24	
	TEB	6-8		8	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		152-155	
	MSC/DHC	18/20		18/20	
	Grand Total			170/175	

DEPARTMENT OF ELECTRICAL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **115** **B. Tech. (Electrical Engineering)**
Department : **EE** **Electrical Engineering**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	20	43
2	21/22	24/25	45/47
3	22/23	18	40/41
4	16	08	24
Grand Total			**152/155**
Total with MSC/DHC	With addition 18-20 credits		**170/175**

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2nd& 3rd Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF ELECTRICAL ENGINEERING

Program Code : 115 B. Tech. (Electrical Engineering)
Department : EE Department of Electrical Engineering
Year : I

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	EEC-101	Programming with C++	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	
5	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6	ECE-101	Fundamentals of Electronics	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-102	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	ECE-103	Digital Electronics	ESC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
5	EEC-102	Basic Electrical Science	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
6	EEC-104	Signals and Systems	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
		Total		**20**										

22 JUN 2023

DEPARTMENT OF ELECTRICAL ENGINEERING

Program Code : 115 B. Tech. (Electrical Engineering)
Department : EE Department of Electrical Engineering
Year : II

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	MAB-103	Numerical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	CSE-101	Data Structures and Algorithms	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	EEC-201	Network Theory	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	HSSEC-I	HSS Elective Course	HSSEC	3										
6	OEC-I	Open Elective Course-I	OEC	3/4										
		Total		**21/22**										
(Spring)														
1	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	EEC-202	Electrical & Electronic Measurements	PCC	4	3	0	2	3	2	10-25	25	15-25	30-40	-
3	EEC-204	Control Systems	PCC	5	3	1	2	3	0	10-25	25	15-25	30-40	-
4	EEC-206	Electrical Machines	PCC	4	3	1	2	3	3	10-25	25	15-25	30-40	-
5	EEC-208	Power Systems-I	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
6	OEC-II	Open Elective Course-II	OEC	3/4										
		Total		**24/25**										

22 JUN 2022

DEPARTMENT OF ELECTRICAL ENGINEERING

Program Code : **115** **B. Tech. (Electrical Engineering)**
Department : **EE** **Department of Electrical Engineering**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	EEC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	EEC-301	Power Systems-II	PCC	4	3	0	2			10-25	25	15-25	30-40	-
3	EEC-303	Power Electronics	PCC	4	3	1	2/2	3	2	15-30	20	15-25	30-40	-
4	EEC-399	Community Outreach	CORE	2						100				
5	EET-I	Talent Enhancement Course-I	TEB	4	0	0	8	-	-	-	50	-	-	50
6	HSSEC-II	HSS Elective Course-II	HSSEC	3										
7	OEC-III	Open Elective Course-III	OEC	3/4										
		Total		**22/23**										
(Spring)														
1	EEL-I	Program Elective Course - I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	EEL-II	Program Elective Course - II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	EEC-300	Engineering Analysis and Design	PCC	4	2	0	2	2	0	10-25	25	15-25	30-40	-
5	EEC-391	Technical Communication	PCC	2	0	0	4	0	0	-	-	-	100	-
6	EET-II	Talent Enhancement Course-II	TEB	4	0	0	8	-	-	-	50	-	-	50
7	MSC/DHC - I	Minor Specialization Course - I / Departmental Honours Course - I	MSC/ DHC	3/4										
		Total		**18 /21-22**										

22 JUN 2022

DEPARTMENT OF ELECTRICAL ENGINEERING

Program Code : 115 B. Tech. (Electrical Engineering)
Department : EE Department of Electrical Engineering
Year : IV

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	EEL-III	Program Elective Course -III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	EEL-IV	Program Elective Course -IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	EEL-V	Program Elective Course -V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	EEL-VI	Program Elective Course -VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	MSC/DHC-II	Minor Specialization Course -II /Departmental Honours Course - II	MSC/ DHC	3/4										
6	MSC/DHC-III	Minor Specialization Course -III /Departmental Honours Course - III	MSC/ DHC	3/4										
		Total		**16/22-24**										
(Spring)														
1	EEP-400/EEL	BTP/Project/Internship/Entrepreneurship/ PEC*	PCC/PEC*	8						100				
2	MSC/DHC-IV	Minor Specialization Course -IV /Departmental Honours Course – IV	MSC/ DHC	3/4										
3	MSC/DHC-V	Minor Specialization Course - IV/Departmental Honours Course - IV	MSC/ DHC	3/4										
		Total		**08/14-16**										

22 JUN 2023

ELECTRICAL ENGINEERING DEPARMENT
PEC List Undergraduate Program

General Elective List

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Sub Code	Course Title	Sub. Area	Credits	L	T	P	Th	Pr	CWS	PRS	MTE	ETE	PRE
1.	EEL-351	Artificial Neural Networks	PEC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
2.	EEL-352	Digital Image Processing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	EEL-353	Digital Design with VHDL	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
4.	EEL-354	Digital Control Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	EEL-355	Digital Signal Processing	PEC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
6.	EEL-357	Advanced Microprocessors and Interfacing	PEC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
7.	EEL-358	Data Structures	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
8.	EEL-359	Single Chip Microcontroller and Its Applications	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
9.	EEL-360	Embedded Systems	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
10.	EEL-365	Digital Signal Processors	PEC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
11.	EEL-361	Optimization Techniques	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12.	EEL-363	Fuzzy Logic Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13.	EEL-364	Utilization and Traction	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	EEL-365	Numerical Methods for Electrical Engineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	EEL-366	Computational Electromagnetics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16.	EEL-XXX	Cyber Security Aspects in Power Systems	PEC											
17.	EEL-XXX	AI Application in Modern Power Systems	PEC											
18.	EEL-XXX	Dynamic Estimation and Control of Modern Power System	PEC											

22 JUN 2023

Program Elective List (PEC) suggested by different Group

1. Power Electronics and Electric Drives (EDPE)

S.No.	Code	Title	Area	Cr	L	T	P	TH	PH	CWS	PRS	MTE	ETE	PRE
1.	EEL-540	Advanced Power Electronics	PEC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
2.	EEL-542	Advanced Electric Drives	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
3.	EEL-543	FACTS Devices	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	EEL-641	Microcontroller and Its Applications to Power Converters	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5.	EEL-642	DSP Controlled Electric Drives	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6.	EEL-643	Electric Drives for Hybrid Vehicles	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	EEL-647	Control Techniques in Power Electronics for AC Drives	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
8.	EEL-648	Pulse Width Modulation for Power Converters	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9.	EEL-649	Enhanced Power Quality AC-DC Converters	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
10.	EEL-650	Switch Mode Power Supply	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11.	EEL-651	Power Quality Improvement Techniques	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
12.	EEL-690	Advanced Computer Controlled Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13.	EEL-541	Analysis of Electrical Machines	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
14	EEL-542	Advanced Electric Drives	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
15	EEL-643	Electric Drives for Hybrid Vehicles	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16	EEL-644	Design of Electric Drives	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17	EEL-645	Instrumentation in Electric Drives	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18	EEL-646	Drive System in Electric Traction	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
19	EEL-652	CAD of Power Apparatus	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20	EEL-653	Selected Topics in Machines and Transformers	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
21	EEL-654	Synchronous Machines and System Stability	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22	EEL-655	Special Machines	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
23	EEL-656	Testing and Commissioning of Electrical Equipment	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24	EEL-501	Electric Vehicles: Power Train & Drives	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
25	EEL-503	Energy Storage Techniques	PEC	4	3	0	0	3	-	20-35	-	20-30	40-50	-
26	EEL-505	Charging Infrastructure	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
27	EEL-509	Automobile Engineering for Electric Vehicles	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

28	EEL-673	Design of WBG Device based Power Converters	PEC	4	3	0	2/2	3	0	15-30	20	15-25	30-40	-
29	EEL-302	Electric Drives	PEC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
30	EEL-634	High Power Converters for EV	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
31	EEL-635	Digital Implementation for Power Electronics Systems	PEC	4	3	0	2/2	3	0	15-30	20	15-25	30-40	-

2. Power System Engineering (PSE)

S.No.	Code	Title	Area	Cr	L	T	P	TH	PH	CWS	PRS	MTE	ETE	PRE
1.	EEL-543	FACTS Devices	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	EEL-560	Computer Aided Power System Analysis	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
3.	EEL-561	Power System Operation and Control	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	EEL-562	Distribution System Analysis and Operation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	EEL-563	EHV AC Transmission Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	EEL-564	HVDC Transmission Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	EEL-651	Power Quality Improvement Techniques	PEC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
8.	EEL-660	High Voltage Technique	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9.	EEL-661	Power System Planning	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
10.	EEL-663	Flexible AC Transmission Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11.	EEL-664	Wind Energy	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12.	EEL-665	Relaying and Switchgear	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13.	EEL-666	Distribution System Automation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	EEL-667	Power System Reliability	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	EEL-668	Digital Protection of Power Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16.	EEL-669	Power System Dynamics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17.	EEL-670	Substation Automation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18.	EEL-671	Power System Deregulation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
19.	EEL-681	Wide Area System Monitoring Control	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20.	EEL-612	Electrical Transients in Power System	PEC	4	3	0	2	3	2	10-25	25	15-25	30-40	-
21	EEL-672	Smart Grid Technology	PEC	4	3	0	2	3	2	10-25	25	15-25	30-40	-
22	EEL-XXX	Engineering Optimization Methods	PEC	4	3	0	2	3	2	10-25	25	15-25	30-40	-
23	EEL-695	Modelling and Control of Sustainable Energy System	PEC	4	3	0	2	3	2	10-25	25	15-25	30-40	-
24	EEL-XXX	Micro-grid Analysis, Control, and Protection	To be approved.											

3. Systems and Control (S & C):

S.No.	Code	Title	Area	Cr	L	T	P	TH	PH	CWS	PRS	MTE	ETE	PRE
1.	EEL-580	Advanced Linear Control Systems	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
2.	EEL-581	Intelligent Control Techniques	PEC	4	3	0	2	3		10-25	25	15-25	30-40	
3.	EEL-582	Advanced System Engineering	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
4.	EEL-585	Non Linear Systems and Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	EEL-680	Machine Learning	PEC	4	3	1	0	3	-	20-35	-	20-35	40-50	-
6.	EEL-681	Wide Area System Monitoring Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
7.	EEL-682	Advanced Digital System Design	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
8.	EEL-683	Introduction to Robotics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
9.	EEL-684	System Reliability	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
10.	EEL-685	Stochastic Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
11.	EEL-686	Optimal Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
12.	EEL-687	Operation Research	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
13.	EEL-688	Interval Control Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
14.	EEL-689	Modeling and Simulation	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
15.	EEL-690	Advanced Computer Controlled Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
16.	EEL-692	Graph Theory and Applications	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
17.	EEL-657	Digital Control of Power Converters	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
18.	EEL-659	Control and Management of Smart Grid	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
19.	EEL-672	Smart Grid Technology	PEC	4	3	0	2	3	2	10-25	25	15-25	30-40	-
20	EEL-584	Mathematics for Systems and Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
21	EEL-615	Robust Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
22	EEL-694	Advances in Model Order Reduction Techniques	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
23	EEL-696	Intelligent Control of Robotic Systems	PEC	4	3	0	2/2	3	-	15-30	20	15-25	30-40	-
24	EEL-697	Dynamics and Control of Autonomous Vehicles	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
25	EEL-698	Advances in Sampled-Data Systems	PEC	4	3	1	0	3	-	20-35	0	20-30	40-50	-
26	EEL-507	Control Systems for Electric Vehicle	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
27	EEL-613	Sliding Mode Control and Observation	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

28	EEL-611	FPGA Implementation of Signal Processing	PEC	4	3	1	0	3	-	20-35	-	20-30	40—50	-
29	EEL-521	Digital Signal and Image Processing	PEC	4	3	0	2	3	-	10-25	-	15-25	30-40	-
30	EEL-620	Process Instrumentation and Control	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
31	EEL-624	Telemetry and SCADA	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
32	EEL-612	Electrical Transients in Power Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
33	EEL-667	Power system Reliability	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
34	EEL-669	Power System Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
35	EEL-561	Power System Operation and Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

4. Instrumentation and Signal Processing

Sl. No.	Code	Subject	Area	Cr	L	T	P	TH	PH	CWS	PRS	MTE	ETE	PRE
1	EEL-XXX	Sensors and Instrumentation	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
2	EEL-XXX	Biomedical Instrumentation	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
3	EEL-XXX	Measurement Errors and Statistical Analysis	PEC	4	3	1	0	3	-	20-35	0	20-30	40-50	-
4	EEL-XXX	Noise and Interference in Instrumentation	PEC	4	3	1	0	3	-	20-35	0	20-30	40-50	-
5	EEL-XXX	Ultrasonic and Laser Instrumentation	PEC	4	3	1	0	3	-	20-35	0	20-30	40-50	-
6	EEL-XXX	Power System Instrumentation	PEC	4	3	1	0	3	-	20-35	0	20-30	40-50	-
7	EEL-XXX	Process Instrumentation and Control	PEC	4	3	1	0	3	-	20-35	0	20-30	40-50	-
8	EEL-XXX	Bioelectric Signals and Processing	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
9	EEL-XXX	Medical Imaging	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
10	EEL-XXX	Computer Applications in Medical Engineering	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
11	EEL-XXX	FPGA Implementation of Signal Processing Systems	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
12	EEL-XXX	Introduction to Robotics	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
13	EEL-XXX	Biomedical Robotics	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
14	EEL-XXX	Machine Learning for Signal Processing	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
15	EEL-XXX	Intelligent Sensors and Instrumentation	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
16	EEL-XXX	Advanced Industrial and Electronic	PEC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
17	EEL-XXX	Telemetry and SCADA	PEC	4	3	1	0	3	-	20-35	0	20-30	40-50	-

List of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)					
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	M T E	ETE	PRE	
TEB-A															
1.	EET-101	Microprocessor and Applications-I	TEB	4	0	0	8	-	-	-	50	-	-	50	
2.	EET-102	Microcontroller and Applications-II	TEB	4	0	0	8	-	-	-	50	-	-	50	
TEB-B															
1	EET-103	Design of Electronic Circuits	TEB	4	0	0	8	-	-	-	50	-	-	50	
2.	EET-104	PCB Design and Fabrications	TEB	4	0	0	8	-	-	-	50	-	-	50	
TEB-C															
1	EET-105	Special Experiment on Machines	TEB	4	0	0	8	-	-	-	50	-	-	50	
2.	EET-106	Special Experiment on Power Electronics and Devices	TEB	4	0	0	8	-	-	-	50	-	-	50	
TEB-D															
1	EET-107	Prototyping and Design of Power Converters	TEB	4	0	0	8	-	-	-	50	-	-	50	
2.	EET-108	Development of BMS	TEB	4	0	0	8	-	-	-	50	-	-	50	
TEB-E															
1	EET-109	Power and Energy Management-I	TEB	4	0	0	8	-	-	-	50	-	-	50	
2.	EET-110	Power and Energy Management-II	TEB	4	0	0	8	-	-	-	50	-	-	50	
TEB-F															
1	EET-111	Substation automation-I	TEB	4	0	0	8	-	-	-	50	-	-	50	
2.	EET-112	Substation automation-II	TEB	4	0	0	8	-	-	-	50	-	-	50	

TEB-G														
1	EET-113	Distribution System SCADA-I	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-114	Distribution System SCADA-II	TEB	4	0	0	8	-	-	-	50	-	-	50
TEB-H														
1	EET-115	Numerical Modeling of Power Apparatus-I	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-116	Numerical Modeling of Power Apparatus-II	TEB	4	0	0	8	-	-	-	50	-	-	50
TEB-I														
1	EET-117	Solar Energy System for EV Application-I	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-118	Solar Energy System for EV Application-II	TEB	4	0	0	8	-	-	-	50	-	-	50
TEB-J														
1	EET-119	Dynamic Estimation and Control of Power System-I	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-120	Dynamic Estimation and Control of Power System-II	TEB	4	0	0	8	-	-	-	50	-	-	50
TEB-K														
1	EET-121	Digital Design for Industrial Applications-I	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-122	Digital Design for Industrial Applications-II	TEB	4	0	0	8	-	-	-	50	-	-	50
TEB-L														
1	EET-123	Industrial Controller Design-I	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-124	Industrial Controller Design-II	TEB	4	0	0	8	-	-	-	50	-	-	50

TEB-M															
1	EET-125	Introduction to Robotic Operating System	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-126	Introduction to Robot Design	TEB	4	0	0	8	-	-	-	50	-	-	50
TEB-N															
1	EET-127	SCADA and Application-I	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-128	SCADA and Application-II	TEB	4	0	0	8	-	-	-	50	-	-	50
TEB-O															
1	EET-129	Instrumentation Laboratory-I	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-130	Instrumentation Laboratory-II	TEB	4	0	0	8	-	-	-	50	-	-	50
TEB-P															
1	EET-131	Medical Signal Monitoring	TEB	4	0	0	8	-	-	-	50	-	-	50
2.	EET-132	Medical Signal Analysis	TEB	4	0	0	8	-	-	-	50	-	-	50

Minor Specializations Courses (18-20 credits)

S.No.	Subject Code	Course Title	Semester		Credits
			Autumn	Spring	
1	EEC-202	Electrical and Electronic Measurement		•	4
2	EEC-208	Power System-I		•	4
3	EEC-204	Control Systems		•	5
4	EEC-206	Electrical Machines		•	4
5	EEC-303	Power Electronics	•		4
6	EEC-201	Network Theory	•		4
7	EEC-104	Signals and Systems		•	4

Departmental Honours Courses (18-20 credits)

S.No.	Code	Title	Credits
1.	EEL-540	Advanced Power Electronics	4
2.	EEL-650	Switch Mode Power Supply	4
3.	EEL-541	Analysis of Electrical Machines	4
4.	EEL-655	Special Machines	4
5	EEL-561	Power System Operation and Control	4
6.	EEL-564	HVDC Transmission Systems	4
7.	EEL-668	Digital Protection of Power Systems	4
8.	EEL-612	Electrical Transients in Power System	4
9.	EEL-580	Advanced Linear Control Systems	4
10.	EEL-585	Non-Linear Systems and Control	4
11.	EEL-686	Optimal Control	4
12.	EEL-694	Advances in Model Order Reduction Techniques	4
13	EEL-XXX	Biomedical Instrumentation	4

14	EEL-XXX	Digital Signal and Image Processing	4
15	EEL-XXX	Advanced Industrial and Electronic Instrumentation	4
16	EEL-XXX	Telemetry and SCADA	4

22 JUN 2023

7-B.TECH. (ELECTRONICS & COMMUNICATION ENGINEERING)
COMPONENT WISE DISTRIBUTION

Main Curriculum Components	Sub Components	Approved Credits for B.Tech.	Approved Credits Range	Proposed Credits for B.Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		20	
	ESC	8-20		8	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	45	91
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		10	
	PEC	22-26		22	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		155-158	
	MSC/DHC	18/20		18/20	
	Grand Total			173/178	

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **116** **B.Tech. (Electronics & Communication Engineering)**
Department : **ECE** **Electronics & Communication Engineering**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	21	44
2	23/24	23/24	46/48
3	21/22	18/22	39/44
4	12/20	14/22	26/42
Grand Total			**155/178**
Total with MSC/DHC	**With addition 18-20 credits**		**173/198**

	Components	Maximum Units	Minimum Units	Comments
Non-Credit Elements (NCE)	**Discipline (DIS)**	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2nd& 3rd Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Program Code : **116 - B.Tech. (Electronics and Communication Engineering)**
Department : **Department of Electronics and Communication Engineering**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	ECC-101	Introduction to Programming	PCC	4	3	0	2/2	3	0	15-30	20	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6	CSE-101	Data Structures and Algorithms	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-102	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	ECC-102	Semiconductor Devices and Applications	PCC	4	3	0	2/2	3	0	15-30	20	15-25	30-40	-
5	ECC-104	Digital Logic and Systems	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	ECC-106	Signals and Systems	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**21**										

22 JUN 2023

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Program Code : **116 - B.Tech.(Electronics and Communication Engineering)**
Department : **Department of Electronics and Communication Engineering**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	MAB-103	Numerical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ECC-201	Fundamentals of Communication System	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	ECC-203	Electromagnetics and Radiating Systems	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	ECC-205	Network Theory	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
6	HSSEC-I	HSS Elective Course-I	HSSEC	3										
7	OEC-I	Open Elective Course-I	OEC	3/4										
		Total		**23/24**										
(Spring)														
1	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	PHB-102	Quantum and Statistical Mechanics	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	EEE-101	Control System Engineering	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	ECT-I	Talent Enhancement Course-I	TEB	2	0	0	4	-	-	-	50	-	-	50
5	ECC-202	Digital Communications	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	ECC-204	Analog Circuits	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	OEC-II	Open Elective Course-II	OEC	3/4										
		Total		**23/24**										

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Program Code : **116 - B.Tech.(Electronics and Communication Engineering)**
Department : **Department of Electronics and Communication Engineering**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	ECC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	ECC-301	Digital Signal Processing	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	ECC-303	Microwave Engineering	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	ECC-305	Digital Electronics and Linear IC Lab	PCC	2	0	0	3	-	-	-	50	-	-	50
5	ECC-399	Community Outreach	CORE	2	0	0	3	-	-	100				
6	ECT-II	Talent Enhancement Course-II	TEB	2	0	0	4	-	-	-	50	-	-	50
7	HSSEC-II	HSS Elective Course-II	HSSEC	3										
8	OEC-III	Open Elective Course-III	OEC	3/4										
		Total		**21/22**										
(Spring)														
1	ECL-I	Program Elective Course - I	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	ECL-II	Program Elective Course - II	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	ECC-300	Lab Based Project/Industry oriented problem solving	PCC	4	0	1	6	-	-	-	50	-	-	50
4	ECC-302	Microwave Laboratory	PCC	2	0	0	4	-	-	-	50	-	-	50
5	ECC-304	Communication Systems Lab	PCC	2	0	0	4	-	-	-	50	-	-	50
6	ECC-306	Technical Communication	PCC	2	0	2	0				100			
7	ECT-III	Talent Enhancement Course-III	TEB	2	0	0	4	-	-	-	50	-	-	50
8	MSC/DHC - I	Minor Specialization Course - I / Departmental Honours Course - I	MSC/ DHC	3/4										
		Total		**18/21-22**										

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Program Code : **116 - B.Tech.(Electronics and Communication Engineering)**
Department : **Department of Electronics and Communication Engineering**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	ECP-400A/ ECL	BTP/Project/Internship/Entrepreneurship/PEC *	PCC/PEC*	4						100				
2	ECL-III	Program Elective Course -III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ECL-IV	Program Elective Course -IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	MSC/DHC-II	Minor Specialization Course -II /Departmental Honours Course - II	MSC/ DHC	3/4										
5	MSC/DHC-III	Minor Specialization Course -III /Departmental Honours Course - III	MSC/ DHC	3/4										
		Total		**12/18-20**										
(Spring)														
1	ECP-400B/ECL	BTP/Project/Internship/Entrepreneurship/PEC *	PCC/PEC*	6						100				
2	ECL-V	Program Elective Course -V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ECL-VI	Program Elective Course -VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	MSC/DHC-IV	Minor Specialization Course -IV /Departmental Honours Course – IV	MSC/ DHC	3/4										
5	MSC/DHC-V	Minor Specialization Course - IV/Departmental Honours Course - IV	MSC/ DHC	3/4										
		Total		**14/20-22**										

22 JUN 2023

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Sub Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	ECL-343	Fundamentals of Microelectronics	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2.	ECL-360	Introduction to Information and Communication Theory	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3.	ECL-347	Introduction to Microwave Semiconductor Device Modelling Techniques	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	ECL-316	Digital Image processing	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5.	ECL-357	Electronics Subsystems	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6.	ECL-358	Machine Learning in Semiconductor Manufacturing	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7.	ECL-514	Detection and Estimation Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8.	ECL-614	Adaptive Signal Processing Techniques	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9.	ECL-618	Wireless Technologies: 5G and Beyond	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
10.	ECL-619	Introduction to Compressed Sensing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11.	ECL-620	Advanced Wireless Communication	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12.	ECL-577	VLSI Technology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13.	ECL-584	Mixed Signal Circuits	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	ECL-587	Nanoscale Devices	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	ECL-591	VLSI Physical Design	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16.	ECL-561	Compact Modelling of Semiconductor Devices	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17.	ECL-526	Statistical Machine Learning for Variation-Aware Electronic Device and Circuit Simulation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18.	ECL-635	Magnetic Random Access Memory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
19.	ECL-550	Radar Signal Processing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20.	ECL-631	RF Receiver Design	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
21.	ECL-515	Information and Coding Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22.	ECL-519	Wireless Communication Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

23.	ECL-525	Hardware Architecture for deep-learning	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24.	ECL-573	Digital VLSI Circuit Design	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
25.	ECL-579	Foundations of Semiconductor Device Physics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
26.	ECL-581	Analog VLSI Circuit Design	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
27.	ECL-542	MicrowaveIntegratedCircuits	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
28.	ECL-544	AdvancedRadarEngineering	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

List of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
RFM-1 (TEB-A)														
1	ECT-101	RF Simulation Techniques	TEB	2	0	0	4	-	-	-	50	-	-	50
2	ECT-102	Design of Passive Microwave Components	TEB	2	0	0	4	-	-	-	50	-	-	50
3	ECT-103	Microwave Measurement Techniques	TEB	2	0	0	4	-	-	-	50	-	-	50
CNSP-1 (TEB-B)														
1	ECT-104	Communication Networks	TEB	2	0	0	4	-	-	-	50	-	-	50
2	ECT-105	Optical Communication Technologies	TEB	2	0	0	4	-	-	-	50	-	-	50
3	ECT-106	Software Defined Radios	TEB	2	0	0	4	-	-	-	50	-	-	50
CNSP-2 (TEB-C)														
1	ECT-107	Introduction to Bio-Signal and Image Analysis	TEB	2	0	0	4	-	-	-	50	-	-	50
2	ECT-108	Principles and Techniques of FMCW Radar Systems	TEB	2	0	0	4	-	-	-	50	-	-	50
3	ECT-109	Advanced DSP	TEB	2	0	0	4	-	-	-	50	-	-	50
MVLSI-1 (TEB-D)														
1	ECT-110	Digital System Design Using High Level Language	TEB	2	0	0	4	-	-	-	50	-	-	50
2	ECT-111	VLSI Circuit Design	TEB	2	0	0	4	-	-	-	50	-	-	50
3	ECT-112	Physical Design	TEB	2	0	0	4	-	-	-	50	-	-	50
MVLSI-2 (TEB-E)														
1	ECT-113	Analog Circuit Design	TEB	2	0	0	4	-	-	-	50	-	-	50
2	ECT-114	Mixed Signal System Design	TEB	2	0	0	4	-	-	-	50	-	-	50
3	ECT-115	Measurement Techniques	TEB	2	0	0	4	-	-	-	50	-	-	50

22 JUN 2023

MVLSI-3 (TEB-F)														
1	ECT-116	Fabrication Techniques	TEB	2	0	0	4	-	-	-	50	-	-	50
2	ECT-117	Semiconductor Characterization	TEB	2	0	0	4	-	-	-	50	-	-	50
3	ECT-118	Device Modeling	TEB	2	0	0	4	-	-	-	50	-	-	50
MVLSI-4 (TEB-G)														
1	ECT-119	Microprocessor and Computer Architecture	TEB	2	0	0	4	-	-	-	50	-	-	50
2	ECT-120	VLSI DSP	TEB	2	0	0	4	-	-	-	50	-	-	50
3	ECT-121	Embedded Systems	TEB	2	0	0	4	-	-	-	50	-	-	50
MVLSI-5 (TEB-H)														
1	ECT-122	Emerging Materials and Devices	TEB	2	0	0	4	-	-	-	50	-	-	50
2	ECT-123	Memories	TEB	2	0	0	4	-	-	-	50	-	-	50
3	ECT-124	Emerging Computing Techniques	TEB	2	0	0	4	-	-	-	50	-	-	50

22 JUN 2023

Minor Specializations Courses (20 credits)

S.No.	Code	Course title	Semester	Credits
1	ECC-102	Semiconductor Devices and Applications	Spring	4
2	ECC-104	Digital Logic and Systems	Spring	4
3	ECC-106	Signals and Systems	Autumn	4
4	ECC-201	Fundamentals of Communication System	Autumn	4
5	ECC-203	Electromagnetics and Radiating Systems	Spring	4
6	ECC-202	Digital Communications	Spring	3
7	ECC-204	Analog Circuits	Autumn	3
8	ECC-303	Microwave Engineering	Autumn	4
9	ECC-301	Digital Signal Processing	Autumn	3

Departmental Honours Courses (20 credits)

S.No.	Code	Course title	Semester	Credits
1	ECL-614	Adaptive Signal Processing Techniques	Spring	4
2	ECL-618	Wireless Technologies: 5G and Beyond	Spring	4
3	ECL-620	Advanced Wireless Communication	Autumn	4
4	ECL-577	VLSI Technology	Autumn	4
5	ECL-584	Mixed Signal Circuits	Spring	4
6	ECL-573	Digital VLSI Circuit Design	Spring	4
7	ECL-542	Microwave Integrated Circuits	Autumn	4
8	ECL-544	Advanced Radar Engineering	Autumn	4
9	ECL-631	RF Receiver Design	Autumn	4

8-B.TECH. (ENGINEERING PHYSICS)
COMPONENT WISE DISTRIBUTION

Main Curriculum Components	Sub Components	Approved Credits for B.Tech.	Approved Credits Range	Proposed Credits for B.Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		16	
	ESC	8-20		12	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	48	90
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		6	
	PEC	22-26		22	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		154-157	
	MSC/DHC	18/20		18/20	
	Grand Total			172-177	

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : 122 B.Tech. (Engineering Physics)
Department : PH Physics

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	20	43
2	21/22	22/23	43/45
3	24/25	22	46/47
4	16	6	22
Grand Total			**154-157**
Total with MSC/DHC	With addition 18-20 credits		**172-177**

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2^{nd}& 3^{rd} Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF PHYSICS

Program Code : **122 - B.Tech.(Engineering Physics)**
Department : **Department of Physics**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	PHC-101	Computer Programming	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6	EEE-102	Basic Electrical Engineering	ESC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-102	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	PHC-102	Mechanics and Relativity	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	PHC-104	Analog Electronics	PCC	4	3	1	0	3	0	10-25	25	15-25	30-40	-
6	EEE-103	Measurements and Transducers	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**20**										

22 JUN 2023

DEPARTMENT OF PHYSICS

Program Code : **122 - B.Tech. (Engineering Physics)**
Department : **Department of Physics**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	MAB-104	Mathematical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHC-203	Thermal & Statistical Physics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	PHC-205	Digital Electronics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	PHC-207	Physics Lab – II	PCC	2	0	0	4	-	-	-	50	-	-	50
6	HSSEC-I	HSS Elective Course	HSSEC	3										
7	OEC-I	Open Elective Course	OEC	3/4										
		Total		**21/22**										
(Spring)														
1	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	ECE-102	Introduction to Communication System	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHC-202	Mathematical Physics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	PHC-204	Quantum Mechanics - I	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	PHC-206	Applied Optics	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6	OEC-II	Open Elective Course	OEC	3/4										
		Total		**22/23**										

22 JUN 2023

DEPARTMENT OF PHYSICS

Program Code : **122 - B.Tech. (Engineering Physics)**
Department : **Department of Physics**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	PHC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	PHC-301	Atomic and Molecular Spectroscopy	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	PHC-303	Signals and Systems	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	PHC-391	Technical Communication	PCC	2	0	0	4	-	-	-	50	-	-	50
5	PHC-399	Community Outreach	CORE	2						100				
6	PHT-I	Talent Enhancement Course-I	TEB	2	0	1	3	-	-	100				
7	HSSEC-II	HSS Elective Course	HSSEC	3										
8	OEC-III	Open Elective Course	OEC	3/4										
9	PHL-I	Program Elective Course –I	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
		Total		**24/25**										
(Spring)														
1	PHC-300	Engineering Analysis and Design /Lab Based Project/ Practical Problems	PCC	4										
2	PHC-302	Condensed Matter Physics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	PHC-304	Nuclear Physics & Applications	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	PHC-306	Microprocessor and Microcontroller	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	PHC-308	Quantum Electronics and Devices	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	PHT-II	Talent Enhancement Course-II	TEB	4	1	1	3	-	-	100				
7	PHL-II	Program Elective Course -II	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
8	MSC-I	Minor Specialization Course - I	MSC	3/4										
		Total		**22/25-26**										

DEPARTMENT OF PHYSICS

Program Code : **122 - B.Tech. (Engineering Physics)**
Department : **Department of Physics**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	PHL-III	Program Elective Course –III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	PHL-IV	Program Elective Course –IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHL-V	Program Elective Course –V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	PHL-VI	Program Elective Course -VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	MSC-II	Minor Specialization Course -II	MSC	3/4										
6	MSC-III	Minor Specialization Course -III	MSC	3/4										
		Total		**16/22-24**										
(Spring)														
1	PHP-400/ PHL	BTP/Project-Internship/Entrepreneurship/ PEC*	PCC/PEC*	6						100				
3	MSC-IV	Minor Specialization Course -IV	MSC	3/4										
4	MSC-IV	Minor Specialization Course -IV	MSC	3/4										
		Total		**6/12-14**										

List of Program Elective Courses

PECs (Programme Elective Courses) in 3rd year:

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	PHC-311	Classical Electrodynamics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
2.	PHC-313	Classical Mechanics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
3.	PHC-314	Statistical Mechanics	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	PHC-316	Quantum Mechanics – II	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5.	PHL-305	Fiber and Integrated Optics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
6.	PHL-306	Accelerator Physics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
7.	PHL-307	Essential Mathematics for AI	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
8.	PHL-308	Computer Architecture for AI	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
9.	PHL-309	Machine Learning	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
10.	PHL-310	Money, Banking and Financial Markets	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
11.	PHL-311	Nuclear Instrumentation	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
12.	PHL-312	Numerical Techniques, including FEM, FDM, FDTD, FIM	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
13.	PHL-313	Solar Energy Materials and Devices	PEC											

22 JUN 2023

PECs (Programme Elective Courses) in 4th year:

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	PHL-501	Nuclear Astrophysics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
2	PHL-502	Physics of Nano systems	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
3	PHL-503	Super fluidity and Superconductivity	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
4	PHL-504	Fiber and Nonlinear Optics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
5	PHL-505	Quantum Optics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
6	PHL-506	Advanced Quantum Computing	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
7	PHL-507	Advanced topics in Mathematical Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
8	PHL-508	Introduction to Superstring Theory	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
9	PHL-509	Advanced Electroceramics Technology	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
10	PHL-510	Advanced Characterization Techniques	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
11	PHL-511	Atomic and Molecular Collision Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
12	PHL-512	A Primer in Quantum Field Theory	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
13	PHL-513	Astrophysics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
14	PHL-514	Solar-Terrestrial Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
15	PHL-515	General Relativity	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
16	PHL-516	Computational Nuclear Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
17	PHL-517	Particle Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
18	PHL-518	Advanced Atomic and Molecular Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
19	PHL-520	Quantum Theory of Solids	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
20	PHL-521	Weather Forecasting	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
21	PHL-522	Nuclear Instrumentation	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
22	PHL-523	Physics and Technology of Thin Films	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
23	PHL-524	Advanced Nuclear reactions	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
24	PHL-525	Semiconductor Photonics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
25	PHL-526	Advanced Light Sources	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
26	PHL-527	Superconducting Radio Frequency for particle accelerators	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-

22 JUN 2023

List of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
TEB-A														
1	PHT-101	Experimental Techniques in Quantum Materials	TEB	2	0	1	3	-	-	100				
2	PHT-102	Ad. Experimental Techniques in Quantum Materials	TEB	4	1	1	3	-	-	100				
TEB-B														
1	PHT-103	Experimental Techniques in Laser Physics	TEB	2	0	1	3	-	-	100				
2	PHT-104	Ad. Experimental Techniques in Photonics	TEB	4	1	1	3	-	-	100				
TEB-C														
1	PHT-105	Experimental Techniques in Gamma Spectroscopy	TEB	2	0	1	3	-	-	100				
2	PHT-106	Experimental Techniques in Charged Particle Spectroscopy	TEB	4	1	1	3	-	-	100				
TEB-D														
1	PHT-107	Methods and Experiments in Atmospheric and Space Physics	TEB	2	0	1	3	-	-	100				
2	PHT-108	Ad. Experimental Techniques in Atmospheric and Space Physics	TEB	4	1	1	3	-	-	100				
TEB-E														
1	PHT-109	Principles of Electroceramic Processing & Fabrication	TEB	2	0	1	3	-	-	100				
2	PHT-110	Advanced Techniques of Electroceramic Characterization	TEB	4	1	1	3	-	-	100				

22 JUN 2023

TEB-F										
1	PHT-111	Theoretical & Computational Techniques	TEB	2	0	1	3	-	-	100
2	PHT-112	Ad. Computational Techniques	TEB	4	1	1	3	-	-	100

Minor Specialisation Courses

S.No.	Code	Course title	Semester	Credits
1	PHC-102	Mechanics and Relativity	Spring	3
2	PHC-206	Applied Optics	Spring	4
3	PHC-311	Classical Electrodynamics	Autumn	4
4	PHC-313	Classical Mechanics	Autumn	4
5	PHC-204	Quantum Mechanics - I	Spring	4
6	PHC-316	Quantum Mechanics - II	Spring	3
7	PHC-302	Condensed Matter Physics	Spring	3
8	PHC-308	Quantum Electronics and Devices	Spring	3

9-B.Tech. (Mechanical Engineering)
Component wise distribution

Main Curriculum Components	Sub Components	Approved Credits for B.Tech.	Approved Credits Range	Proposed Credits for B.Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		16	
	ESC	8-20		12	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	44	90
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		8	
	PEC	22-26		24	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		154-157	
	MSC/DHC	18/20		18/20	
	Grand Total			172-174	

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **117** **B.Tech. (Mechanical Engineering)**
Department : **ME** **Mechanical & Industrial Engineering**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	21	44
2	23/24	23/24	46/48
3	19/20	21/25	40/45
4	12/20	12/20	24/40
Grand Total			**154/157**
Total with MSC/DHC	With addition 18-20 credits		**172/174**

22 JUN 2023

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2nd& 3rd Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

Program Code : **117 - B.Tech.(Mechanical Engineering)**
Department : **Department of Mechanical and Industrial Engineering**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	MIC-101	Programming and Data Structure	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6	MTE-103	Materials Science	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-104	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	EEE-102	Basic Electrical Engineering	ESC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
5	CEE-102	Mechanics of Solids	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	MIC-102	Engineering Thermodynamics	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
		Total		**21**										

22 JUN 2023

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

Program Code : **117 - B.Tech.(Mechanical Engineering)**
Department : **Department of Mechanical and Industrial Engineering**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	OEC-I	Open Elective Course-I	OEC	3/4										
2	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	MAB-103	Numerical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	MIC-201	Mechanical Engineering Drawing	PCC	4	2	0	4 (2*2)	3	0	15-30	20	15-25	30-40	-
5	MIC-203	Manufacturing Technology	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6	MIC-205	Fluid Mechanics	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
		Total		**23/24**										
(Spring)														
1	OEC-II	Open Elective Course-II	OEC	3/4										
2	HSSEC-I	HSS Elective Course	HSSEC	3										
3	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	MIC-202	Theory of Machines	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
5	MIC-204	Energy Conversion	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
6	MIC-206	Theory of Production Processes	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
7	MIT-I	Talent Enhancement Course-I	TEB	2										
		Total		**23/24**										

22 JUN 2023

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

Program Code : **117 - B.Tech.(Mechanical Engineering)**
Department : **Department of Mechanical and Industrial Engineering**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	OEC-III	Open Elective Course-III	OEC	3/4										
2	MIC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
3	MIC-303	Mechanics of Materials	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	MIC-305	Heat and Mass Transfer	PCC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
5	MIT-II	Talent Enhancement Course-II	TEB	2										
6	MIC-391	Technical Communication	PCC	2	0	2	0			100	-	-	-	-
7	MIC-399	Community Outreach	CORE	2						100				
		Total		**19/20**										
(Spring)														
1	HSSEC-II	HSS Elective Course	HSSEC	3										
2	MIC-300	Engineering Analysis and Design(Design Thinking based project)/ Industry Oriented Problem Solving/ Lab-based Projects/ Practical Problems/ Case Study	PCC	4	0	0	8	-	-	100	-	-	-	-
3	MIC-302	Machine Design	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
4	MIL-I	Program Elective Course-I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	MIL-II	Program Elective Course-II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	MIT-III	Talent Enhancement Course-III	TEB	2						-	-	-	100	-
7	MSC/DHC-I	Minor Specialization Course-I / Departmental Honours Course-I	MSC/DHC	3/4										
		Total		**21/24-25**										

22 JUN 2023

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

Program Code : **117 - B.Tech.(Mechanical Engineering)**
Department : **Department of Mechanical and Industrial Engineering**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	MIP-400A/MIL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/PEC*	4						100				
2	MIL-III	Program Elective Course-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	MIL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	MSC/DHC-II	Minor Specialization Course-II / Departmental Honours Course-II	MSC/DHC	4										
5	MSC/DHC-III	Minor Specialization Course-III / Departmental Honours Course-III	MSC/DHC	4										
		Total		**12/20**										
(Spring)														
1	MIP-400B/MIL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/PEC*	4						100				
2	MIL-V	Program Elective Course-V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	MIL-VI	Program Elective Course-VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	MSC/DHC-IV	Minor Specialization Course-IV / Departmental Honours Course-IV	MSC/DHC	4										
5	MSC/DHC-V	Minor Specialization Course-V / Departmental Honours Course-V	MSC/DHC	4										
		Total		**12/20**										

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	MIL-320	Automobile Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
2.	MIL-321	Vibration and Noise	PEC	4	3	1	2/2	3	-	15-25	15-20	15-25	30-40	-
3.	MIL-322	Principles of Lubrication Technology	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4.	MIL-323	Design of Pressure Vessels & Piping	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	MIL-324	FEM applications in Mechanical Engg.	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6.	MIL-325	Numerical Methods in Manufacturing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
7.	MIL-326	Value Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
8.	MIL-327	Reverse Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
9.	MIL-328	Manufacturing System Analysis	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
10.	MIL-329	Computer Integrated Manufacturing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
11.	MIL-330	Ergonomics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
12.	MIL-331	Total Quality Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
13.	MIL-332	Industrial Hazards and Safety	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
14.	MIL-333	Industrial Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
15.	MIL-334	Facilities Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
16.	MIL-335	Concurrent Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
17.	MIL-336	Financial Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
18.	MIL-337	Processing of Non-Metals	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
19.	MIL-338	Measurement & Instrumentation	PEC	4	3	1	2/2	3	-	15-25	15-20	15-25	30-40	-
20.	MIL-339	Design of Heat Exchangers	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
21.	MIL-340	Refrigeration and Air-Conditioning	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
22.	MIL-341	Thermal Systems Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

23.	MIL-342	Environmental Pollution and Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
24.	MIL-343	Power Plants	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
25.	MIL-344	Industrial Combustion	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
26.	MIL-345	Compressible Flow	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
27.	MIL-346	Waste Heat recovery Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
28.	MIL-349	Fire Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
29.	MIL-350	Industrial Ventilation and Air Conditioning	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
30.	MIL-351	Gas Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
31.	MIL-352	Experimental Methods in Thermal Engineering	PEC	4	3	1	2/2	3	-	15-30	20	15-30	30-40	-
32.	MIL-354	Automatic Control	PEC	4	3	1	2/2	3	-	15-30	20	15-30	30-40	-
33.	MIL-3xx	Learning from Engineering Failures	PEC	4	2	0	4	3	-	20-35	-	20-30	40-50	-
34.	MIL-3xx	Production Planning and Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
35.	MIL-3xx	Engineering Economy	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
36.	MIL-311	Operations Research	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
37.	MIL-310	Quality Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
38.	MIL-313	Work System Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
39.	MIL-411	Maintenance Technology for Rotating Components	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
40.	MIL-412	Vehicle Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
41.	MIL-413	Micro Electro Mechanical Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
42.	MIL-415	Piping Technology	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
43.	MIL-416	Non Linear Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
44.	MIL-417	Energy and Variational Principles in Engineering Mechanics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
45.	MIL-500	Instrumentation and Experimental Methods	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
46.	MIL-502	Robotics and Control	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
47.	MIL-508	Advanced Automatic Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
48.	MIL-509	Extended Finite Element Methods	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
49.	MIL-515	Manufacturing System Analysis	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
50.	MIL-516	Artificial Intelligence	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

22 JUN 2023

51.	MIL-517	Automated Materials Handling Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
52.	MIL-523	Gas Turbines &Compressors	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
53.	MIL-524	Two Phase Flow &Heat Transfer	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
54.	MIL-525	Solar Energy	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
55.	MIL-526	Advanced Gas Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
56.	MIL-527	Computational Fluid Dynamics & Heat Transfer	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
57.	MIL-528	Boundary Layer Theory	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
58.	MIL-529	Turbulent Flows	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
59.	MIL-530	Cold Preservation of Foods	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
60.	MIL-531	Hydro-dynamic Machines	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
61.	MIL-532	Renewable Energy Systems	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
62.	MIL-533	Refrigeration & Air-Conditioning System Design	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
63.	MIL-534	Air Conditioning and Ventilation	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
64.	MIL-535	Cryogenic Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
65.	MIL-536	Convective Heat and Mass Transfer	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
66.	MIL-537	I. C. Engines	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
67.	MIL-538	I. C. Engine Combustion Processes Modelling	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
68.	MIL-539	Micro and Nano Scale Thermal Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
69.	MIL-540	Combustion	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
70.	MIL-541	Bio-Fluid Mechanics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
71.	MIL-542	Energy Management	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
72.	MIL-543	Fluid Power Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
73.	MIL-544	Design of Heat Exchangers	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
74.	MIL-545	Fuel Cells	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
75.	MIL-547	Product and Process Optimization	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
76.	MIL-550	Advanced Machine Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
77.	MIL-551	Dynamics of Mechanical Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
78.	MIL-552	Advanced Mechanics of Solids	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
79.	MIL-553	Industrial Tribology	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

22 JUN 2023

80.	MIL-554	Computer Aided Mechanism Design	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
81.	MIL-555	Experimental Stress Analysis	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
82.	MIL-556	Dynamics of Road Vehicles	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
83.	MIL-557	Finite Element Methods	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
84.	MIL-558	Fracture Mechanics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
85.	MIL-559	Computer Aided Design	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
86.	MIL-560	Mechanics of Composite Materials	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
87.	MIL-561	Advanced Mechanical Vibrations	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
88.	MIL-562	Noise Control in Mechanical Systems	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
89.	MIL-563	Mechatronics	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
90.	MIL-565	Smart Materials, Structures, and Devices	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
91.	MIL-566	Computer Aided Analysis of Mechanical Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
92.	MIL-567	Computer Graphics	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
93.	MIL-568	Advanced Robotics	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
94.	MIL-569	Expert System Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
95.	MIL-572	Advanced manufacturing Process	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
96.	MIL-573	Design for Manufacturability	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
97.	MIL-574	Maintenance Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
98.	MIL-575	Product Design and Development	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
99.	MIL-576	Machine Tool Design and Numerical Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
100.	MIL-577	Industrial Automation	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
101.	MIL-578	Computer Aided Process Planning	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
102.	MIL-579	Information Systems and Data Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
103.	MIL-580	Welding Science	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
104.	MIL-581	Manufacturing Resources Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
105.	MIL-582	Flexible Manufacturing Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
106.	MIL-583	Materials Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
107.	MIL-584	Operations Research	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
108.	MIL-585	Supply Chain Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

109.	MIL-586	Metal Forming	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
110.	MIL-587	Metal Casting	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
111.	MIL-588	Non-Traditional Machining Processes	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
112.	MIL-593	Non-Conventional Welding Processes	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
113.	MIL-594	Safety Aspects of Welded Structures	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
114.	MIL-595	Failure Analysis of Welding Joints	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
115.	MIL-596	Automation & Application of Robots in Welding	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
116.	MIL-597	Welding Procedures for Specific Applications	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
117.	MIL-598	Weldability of Metals	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
118.	MIL-599	Surface Engineering	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
119.	MIL-601	Additive manufacturing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
120.	MIL-602	Bond Graph Modelling of Engineering Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
121.	MIL-603	Finite Element Method for Thermal Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
122.	MIL-604	Fire Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
123.	MIL-605	Friction and wear	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
124.	MIL-606	Numerical Methods in Manufacturing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
125.	MIL-607	Processing of non-metals	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
126.	MIL-608	Fatigue in Structures & Materials	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
127.	MIL-609	Solid state joining processes.	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
128.	MIL-610	Laser Material Processing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
129.	MIL-611	Nanomechanics to Multiscale Modeling	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
130.	MIL-612	Hydrodynamic Stability	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
131.	MIL-613	Fusion Joining Technologies	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
132.	MIL-614	Solid State Joining Technologies	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
133.	MIL-615	Material Characterization & Testing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
134.	MIL-621	Instrumentation and Experimental Methods	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
135.	MIL-622	Metallurgical Aspects in Joining and Additive Manufacturing	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
136.	MIL-623	Inspection and Testing for Quality Assurance	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
137.	MIL-624	Design and Analysis of Joints	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-

138.	MIL-625	Safety Analysis of Metallic Joints	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
139.	MIL-626	Failure Analysis and Prevention	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
140.	MIL-627	Hybrid Joining Technologies	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
141.	MIL-628	FEM for Manufacturing Processes	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
142.	MIL-629	Reverse Engineering and Rapid Tooling	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
143.	MIL-630	Residual Stress and Distortion	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
144.	MIL-631	Dissimilar Metal Joining	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
145.	MIL-6xx	Aircraft Propulsion	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
146.	MIL-6xx	Isogeometric Analysis	PEC	4	3	0	2	3	-	15-30	20	15-25	30-40	-

List of Talent Enhancement Course

(3 courses of 2 credits each: Total 06 credits)

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
TEB-A (DESIGN)														
1	MIT-101	Solid Modelling	TEB	2	0	0	4	-	-	-	50	-	-	50
2	MIT-102	CAE	TEB	2	0	0	4	-	-	-	50	-	-	50
3	MIT-103	Design Optimization	TEB	2	0	0	4	-	-	-	50	-	-	50
TEB-B (ADDITIVE MANUFACTURING)														
1	MIT-104	Solid Modeling & Reverse Engineering	TEB	2	1	0	2	-	-	-	50	-	-	50
2	MIT-105	Data Processing for Additive Manufacturing	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-106	Rapid Prototyping	TEB	2	1	0	2	-	-	-	50	-	-	50
TEB-C (INDUSTRIAL AUTOMATION)														
1	MIT-107	Introduction to Automation	TEB	2	1	1	0		-	25	-	25	50	-
2	MIT-108	System Integration	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-109	Cloud Computing	TEB	2	1	0	2	-	-	-	50	-	-	50
TEB-D (WELDING ENGINEERING)														
1	MIT-110	Design Guidelines for Welding	TEB	2	1	0	2	-	-	-	50	-	-	50
2	MIT-111	Advanced Welding Processes	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-112	Quality Assurance in Weldments	TEB	2	1	0	2	-	-	-	50	-	-	50

22 JUN 2023

TEB-E (COMPUTATIONAL THERMO-FLUIDS)														
1	MIT-113	Basics of Computational Thermo-fluids	TEB	2	2	0	0	-	-	20-35	-	20-30	40-50	-
2	MIT-114	Thermofluid Simulation Software	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-115	Problem based Learning with Simulation Tools	TEB	2	0	0	4	-	-	-	50	-	-	50
TEB-F (MEASUREMENT IN THERMAL SYSTEMS)														
1	MIT-116	Basics of Measurements	TEB	2	2	0	2/2	-	-	-	50	-	-	50
2	MIT-117	Data Acquisition and Analysis	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-118	Instrumentation and measurement techniques	TEB	2	2	0	2/2	-	-	-	50	-	-	50
TEB-G (FLUID MACHINERY & FLUID POWER)														
1	MIT-119	Introduction to Fluid Machines and Fluid Power	TEB	2	2	0	0	-	-	20-35	-	20-30	40-50	-
2	MIT-120	Hydrodynamic Machines	TEB	2	2	0	2/2	-	-	-	50	-	-	50
3	MIT-121	Fluid Power Systems	TEB	2	2	0	0	-	-	20-35	-	20-30	40-50	-
TEB-H (HVAC)														
1	MIT-122	Fundamentals of HVAC	TEB	2	2	0	2/2	-	-	-	50	-	-	50
2	MIT-123	HVAC Systems and Equipment	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-124	HVAC Applications	TEB	2	1	0	2	-	-	-	50	-	-	50

Minor Specialization Courses

SN	Course Code	Course Name	Credits	Semester
1.	MIC-102	Engineering Thermodynamics	4	Spring
2.	MIC-201	Mechanical Engineering Drawing	4	Autumn
3.	MIC-203	Manufacturing Technology	4	Autumn
4.	MIC-205	Fluid Mechanics	4	Autumn
5.	MIC-202	Theory of Machines	4	Spring
6.	MIC-204	Energy Conversion	4	Spring
7.	MIC-206	Theory of Production Processes	4	Spring
8.	MIC-303	Mechanics of Materials	4	Autumn
9.	MIC-305	Heat and Mass Transfer	4	Autumn
10.	MIC-302	Machine Design	4	Spring

Departmental Honors Courses

All PG/pre-Ph. D. courses of Department of Mechanical and Industrial Engineering

10-B.TECH. (PRODUCTION & INDUSTRIAL ENGINEERING)
COMPONENT WISE DISTRIBUTION

Main Curriculum Components	Sub Components	Approved Credits for B.Tech.	Approved Credits Range	Proposed Credits for B.Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		16	
	ESC	8-20		12	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	44	90
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		8	
	PEC	22-26		24	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		154-157	
	MSC/DHC	18/20		18/20	
	Grand Total			172-174	

22 JUN 2023

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **119** **B.Tech. (Production & Industrial Engineering)**
Department : **ME** **Mechanical & Industrial Engineering**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	21	44
2	23/24	23/24	46/48
3	19/20	21	40/41
4	12	12	24
Grand Total			**154-157**
Total with MSC/DHC	With addition 18-20 credits		**172-177**

22 JUN 2023

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2^{nd}& 3^{rd} Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

Program Code : **119 - B.Tech.(Production & Industrial Engineering)**
Department : **Department of Mechanical and Industrial Engineering**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
4	MIC-101	Programming and Data Structure	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4 (T-2)	-	-	-	-	-	70	30	-	-	-
				4 (M-2)	2	0	0	2	-	50	-	-	50	-
6	MTE-103	Materials Science	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	-	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3	ESS-104	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	EEE-102	Basic Electrical Engineering	ESC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
5	CEE-101	Mechanics of Solids	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6	MIC-102	Engineering Thermodynamics	PCC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
		Total		**21**										

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

Program Code : **119 - B.Tech.(Production & Industrial Engineering)**
Department : **Department of Mechanical and Industrial Engineering**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	OEC-I	Open Elective Course-I	OEC	3/4										
2	DAI-101	Data Science	DSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3	MAB-103	Numerical Methods	BSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4	MIC-201	Mechanical Engineering Drawing	PCC	4	2	0	4 (2*2)	3	-	20-35	-	20-30	40-50	-
5	MIC-203	Manufacturing Technology	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
6	MIC-205	Fluid Mechanics	PCC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
		Total		**23/24**										
(Spring)														
1	OEC-II	Open Elective Course-II	OEC	3/4										
2	HSSEC-I	HSS Elective Course-I	HSSEC	3										
3	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
4	MIC-202	Theory of Machines	PCC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
5	MIC-206	Theory of Production Processes	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
6	MIC-208	Principles of Industrial Engineering	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
7	MIT-I	Talent Enhancement Course-I	TEB	2										
		Total		**23/24**										

22 JUN 2023

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

Program Code : **119 - B.Tech.(Production & Industrial Engineering)**
Department : **Department of Mechanical and Industrial Engineering**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	OEC-III	Open Elective Course	OEC	3/4										
2	MIC-351	Fundamentals of AI/ML	PCC	2	2	0	0			20-35	-	20-30	40-50	-
3	MIC-305	Heat and Mass Transfer	PCC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
4	MIC-307	Operations Management	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5	MIT-II	Talent Enhancement Course-II	TEB	2										
6	MIC-391	Technical Communication	PCC	2	0	2	0			100	-	-	-	-
7	MIC-399	Community Outreach	CORE	2						100				
		Total		**19/20**										
(Spring)														
1	HSSEC-II	HSS Elective Course-I	HSSEC	3										
2	MIC-300	Engineering Analysis and Design (Design Thinking based project)/ Industry Oriented Problem Solving/ Lab-based Projects/ Practical Problems/ Case Study	PCC	4	0	0	8	-	-	100	-	-	-	-
3	MIC-302	Machine Design	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
4	MIL-I	Program Elective Course-I	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5	MIL-II	Program Elective Course-II	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6	MIT-III	Talent Enhancement Course-III	TEB	2										
7	MSC/DHC-I	Minor Specialization Course-I / Departmental Honours Course-I	MSC/DHC	3/4										
		Total		**21/ 24-25**										

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

Program Code : **IN - B.Tech.(Production & Industrial)**
Department : **Department of Mechanical and Industrial Engineering**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	MIP-400A/MIL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/PEC*	4						100				
2	MIL-III	Program Elective Course-III	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3	MIL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4	MSC/DHC-II	Minor Specialization Course-II / Departmental Honours Course-II	MSC/DHC	3/4										
5	MSC/DHC-III	Minor Specialization Course-III / Departmental Honours Course-III	MSC/DHC	3/4										
		Total		**12/ 18-20**										
(Spring)														
1	MIP-400B/MIL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/ PEC*	4						100				
2	MIL-V	Program Elective Course-V	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3	MIL-VI	Program Elective Course-VI	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4	MSC/DHC-IV	Minor Specialization Course-IV / Departmental Honours Course-IV	MSC/DHC	3/4										
5	MSC/DHC-V	Minor Specialization Course-V / Departmental Honours Course-V	MSC/DHC	3/4										
		Total		**12/ 18-20**										

22 JUN 2022

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	MIL-320	Automobile Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
2.	MIL-321	Vibration and Noise	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
3.	MIL-322	Principles of Lubrication Technology	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4.	MIL-323	Design of Pressure Vessels & Piping	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	MIL-324	FEM applications in Mechanical Engg.	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6.	MIL-325	Numerical Methods in Manufacturing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
7.	MIL-326	Value Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
8.	MIL-327	Reverse Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
9.	MIL-328	Manufacturing System Analysis	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
10.	MIL-329	Computer Integrated Manufacturing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
11.	MIL-330	Ergonomics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
12.	MIL-331	Total Quality Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
13.	MIL-332	Industrial Hazards and Safety	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
14.	MIL-333	Industrial Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
15.	MIL-334	Facilities Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
16.	MIL-335	Concurrent Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
17.	MIL-336	Financial Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
18.	MIL-337	Processing of Non-Metals	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
19.	MIL-338	Measurement & Instrumentation	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
20.	MIL-339	Design of Heat Exchangers	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
21.	MIL-340	Refrigeration and Air-Conditioning	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
22.	MIL-341	Thermal Systems Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
23.	MIL-342	Environmental Pollution and Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

24.	MIL-343	Power Plants	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
25.	MIL-344	Industrial Combustion	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
26.	MIL-345	Compressible Flow	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
27.	MIL-346	Waste Heat recovery Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
28.	MIL-349	Fire Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
29.	MIL-350	Industrial Ventilation and Air Conditioning	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
30.	MIL-351	Gas Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
31.	MIL-352	Experimental Methods in Thermal Engineering	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
32.	MIL-354	Automatic Control	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
33.	MIL-3xx	Learning from Engineering Failures	PEC	4	2	0	4	3	-	15-30	20	15-25	30-40	-
34.	MIL-3xx	Production Planning and Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
35.	MIL-3xx	Engineering Economy	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
36.	MIL-311	Operations Research	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
37.	MIL-310	Quality Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
38.	MIL-313	Work System Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
39.	MIL-411	Maintenance Technology for Rotating Components	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
40.	MIL-412	Vehicle Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
41.	MIL-413	Micro Electro Mechanical Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
42.	MIL-415	Piping Technology	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
43.	MIL-416	Non Linear Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
44.	MIL-417	Energy and Variational Principles in Engineering Mechanics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
45.	MIL-500	Instrumentation and Experimental Methods	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
46.	MIL-502	Robotics and Control	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
47.	MIL-508	Advanced Automatic Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
48.	MIL-509	Extended Finite Element Methods	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
49.	MIL-515	Manufacturing System Analysis	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
50.	MIL-516	Artificial Intelligence	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
51.	MIL-517	Automated Materials Handling Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

52.	MIL-523	Gas Turbines &Compressors	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
53.	MIL-524	Two Phase Flow &Heat Transfer	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
54.	MIL-525	Solar Energy	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
55.	MIL-526	Advanced Gas Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
56.	MIL-527	Computational Fluid Dynamics & Heat Transfer	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
57.	MIL-528	Boundary Layer Theory	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
58.	MIL-529	Turbulent Flows	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
59.	MIL-530	Cold Preservation of Foods	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
60.	MIL-531	Hydro-dynamic Machines	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
61.	MIL-532	Renewable Energy Systems	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
62.	MIL-533	Refrigeration & Air-Conditioning System Design	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
63.	MIL-534	Air Conditioning and Ventilation	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
64.	MIL-535	Cryogenic Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
65.	MIL-536	Convective Heat and Mass Transfer	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
66.	MIL-537	I. C. Engines	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
67.	MIL-538	I. C. Engine Combustion Processes Modelling	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
68.	MIL-539	Micro and Nano Scale Thermal Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
69.	MIL-540	Combustion	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
70.	MIL-541	Bio-Fluid Mechanics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
71.	MIL-542	Energy Management	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
72.	MIL-543	Fluid Power Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
73.	MIL-544	Design of Heat Exchangers	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
74.	MIL-545	Fuel Cells	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
75.	MIL-547	Product and Process Optimization	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
76.	MIL-550	Advanced Machine Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
77.	MIL-551	Dynamics of Mechanical Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
78.	MIL-552	Advanced Mechanics of Solids	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
79.	MIL-553	Industrial Tribology	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
80.	MIL-554	Computer Aided Mechanism Design	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-

22 JUN 2023

81.	MIL-555	Experimental Stress Analysis	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
82.	MIL-556	Dynamics of Road Vehicles	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
83.	MIL-557	Finite Element Methods	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
84.	MIL-558	Fracture Mechanics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
85.	MIL-559	Computer Aided Design	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
86.	MIL-560	Mechanics of Composite Materials	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
87.	MIL-561	Advanced Mechanical Vibrations	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
88.	MIL-562	Noise Control in Mechanical Systems	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
89.	MIL-563	Mechatronics	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
90.	MIL-565	Smart Materials, Structures, and Devices	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
91.	MIL-566	Computer Aided Analysis of Mechanical Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
92.	MIL-567	Computer Graphics	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
93.	MIL-568	Advanced Robotics	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
94.	MIL-569	Expert System Design	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
95.	MIL-572	Advanced manufacturing Process	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
96.	MIL-573	Design for Manufacturability	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
97.	MIL-574	Maintenance Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
98.	MIL-575	Product Design and Development	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
99.	MIL-576	Machine Tool Design and Numerical Control	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
100.	MIL-577	Industrial Automation	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
101.	MIL-578	Computer Aided Process Planning	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
102.	MIL-579	Information Systems and Data Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
103.	MIL-580	Welding Science	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
104.	MIL-581	Manufacturing Resources Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
105.	MIL-582	Flexible Manufacturing Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
106.	MIL-583	Materials Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
107.	MIL-584	Operations Research	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
108.	MIL-585	Supply Chain Management	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
109.	MIL-586	Metal Forming	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

110.	MIL-587	Metal Casting	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
111.	MIL-588	Non-Traditional Machining Processes	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
112.	MIL-593	Non-Conventional Welding Processes	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
113.	MIL-594	Safety Aspects of Welded Structures	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
114.	MIL-595	Failure Analysis of Welding Joints	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
115.	MIL-596	Automation & Application of Robots in Welding	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
116.	MIL-597	Welding Procedures for Specific Applications	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
117.	MIL-598	Weldability of Metals	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
118.	MIL-599	Surface Engineering	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
119.	MIL-601	Additive manufacturing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
120.	MIL-602	Bond Graph Modelling of Engineering Systems	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
121.	MIL-603	Finite Element Method for Thermal Engineering	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
122.	MIL-604	Fire Dynamics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
123.	MIL-605	Friction and wear	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
124.	MIL-606	Numerical Methods in Manufacturing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
125.	MIL-607	Processing of non-metals	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
126.	MIL-608	Fatigue in Structures & Materials	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
127.	MIL-609	Solid State Joining Processes	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
128.	MIL-610	Laser Material Processing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
129.	MIL-611	Nanomechanics to Multiscale Modeling	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
130.	MIL-612	Hydrodynamic Stability	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
131.	MIL-613	Fusion Joining Technologies	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
132.	MIL-614	Solid State Joining Technologies	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
133.	MIL-615	Material Characterization & Testing	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
134.	MIL-621	Instrumentation and Experimental Methods	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
135.	MIL-622	Metallurgical Aspects in Joining and Additive Manufacturing	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
136.	MIL-623	Inspection and Testing for Quality Assurance	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
137.	MIL-624	Design and Analysis of Joints	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
138.	MIL-625	Safety Analysis of Metallic Joints	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

139.	MIL-626	Failure Analysis and Prevention	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
140.	MIL-627	Hybrid Joining Technologies	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
141.	MIL-628	FEM for Manufacturing Processes	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
142.	MIL-629	Reverse Engineering and Rapid Tooling	PEC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
143.	MIL-630	Residual Stress and Distortion	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
144.	MIL-631	Dissimilar Metal Joining	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
145.	MIL-6xx	Aircraft Propulsion	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
146.	MIL-6xx	Isogeometric Analysis	PEC	4	3	0	2	3	0	15-30	20	15-25	30-40	-

List of Talent Enhancement Course

(3 courses of 2 credits each: Total 06 credits)

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
TEB-A (DESIGN)														
1	MIT-101	Solid Modelling	TEB	2	0	0	4	-	-	-	50	-	-	50
2	MIT-102	CAE	TEB	2	0	0	4	-	-	-	50	-	-	50
3	MIT-103	Design Optimization	TEB	2	0	0	4	-	-	-	50	-	-	50
TEB-B (ADDITIVE MANUFACTURING)														
1	MIT-104	Solid Modeling & Reverse Engineering	TEB	2	1	0	2	-	-	-	50	-	-	50
2	MIT-105	Data Processing for Additive Manufacturing	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-106	Rapid Prototyping	TEB	2	1	0	2	-	-	-	50	-	-	50
TEB-C (INDUSTRIAL AUTOMATION)														
1	MIT-107	Introduction to Automation	TEB	2	1	1	0		-	25	-	25	50	-
2	MIT-108	System Integration	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-109	Cloud Computing	TEB	2	1	0	2	-	-	-	50	-	-	50
TEB-D (WELDING ENGINEERING)														
1	MIT-110	Design Guidelines for Welding	TEB	2	1	0	2	-	-	-	50	-	-	50
2	MIT-111	Advanced Welding Processes	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-112	Quality Assurance in Weldments	TEB	2	1	0	2	-	-	-	50	-	-	50

TEB-E (COMPUTATIONAL THERMO-FLUIDS)															
1	MIT-113	Basics of Computational Thermo-fluids	TEB	2	2	0	0	-	-	20-35	-	20-30	40-50	-
2	MIT-114	Thermofluid Simulation Software	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-115	Problem based Learning with Simulation Tools	TEB	2	0	0	4	-	-	-	50	-	-	50
TEB-F (MEASUREMENT IN THERMAL SYSTEMS)															
1	MIT-116	Basics of Measurements	TEB	2	2	0	2/2	-	-	-	50	-	-	50
2	MIT-117	Data Acquisition and Analysis	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-118	Instrumentation and measurement techniques	TEB	2	2	0	2/2	-	-	-	50	-	-	50
TEB-G (FLUID MACHINERY & FLUID POWER)															
1	MIT-119	Introduction to Fluid Machines and Fluid Power	TEB	2	2	0	0	-	-	20-35	-	20-30	40-50	-
2	MIT-120	Hydrodynamic Machines	TEB	2	2	0	2/2	-	-	-	50	-	-	50
3	MIT-121	Fluid Power Systems	TEB	2	2	0	0	-	-	20-35	-	20-30	40-50	-
TEB-H (HVAC)															
1	MIT-122	Fundamentals of HVAC	TEB	2	2	0	2/2	-	-	-	50	-	-	50
2	MIT-123	HVAC Systems and Equipment	TEB	2	1	0	2	-	-	-	50	-	-	50
3	MIT-124	HVAC Applications	TEB	2	1	0	2	-	-	-	50	-	-	50

Minor Specialization Courses

SN	Course Code	Course Name	Credits	Semester
1.	MIC-102	Engineering Thermodynamics	4	Spring
2.	MIC-201	Mechanical Engineering Drawing	4	Autumn
3.	MIC-203	Manufacturing Technology	4	Autumn
4.	MIC-205	Fluid Mechanics	4	Autumn
5.	MIC-202	Theory of Machines	4	Spring
6.	MIC-206	Theory of Production Processes	4	Spring
7.	MIC-208	Principles of Industrial Engineering	4	Spring
8.	MIC-305	Heat and Mass Transfer	4	Autumn
9.	MIC-307	Operations Management	4	Autumn
10.	MIC-302	Machine Design	4	Spring

Departmental Honors Courses

- **All PG/pre-Ph. D. courses of Department of Mechanical and Industrial Engineering**

11-B. TECH. (METALLURGICAL & MATERIALS ENGINEERING)
COMPONENT WISE DISTRIBUTION

Main Curriculum Components	Sub Components	Approved Credits for B. Tech.	Approved Credits Range	Proposed Credits for B. Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	57
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		16	
	ESC	8-20		16	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	45	89
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		8	
	PEC	22-26		22	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		157-160	
	MSC/DHC	18/20		18/20	
	Grand Total			175-180	

DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **118** **B. Tech. (Metallurgical & Materials Engineering)**
Department : **MT** **Metallurgical & Materials Engineering**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	23	46
2	23/24	24/25	47/49
3	20/21	20	40/41
4	12	12	24
Grand Total			**157-160**
Total with MSC/DHC	**With addition 18-20 credits**		**175-180**

22 JUN 2023

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt./Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2nd& 3rd Years)
Minimum non-credit units to be earned: 24				

DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

Program Code : **MT - B.Tech.(Metallurgical and Materials Engineering)**
Department : **Department of Metallurgical and Materials Engineering**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
4	MTC-101	Computer Programming	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6	MIE-101	Engineering Mechanics	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	-	20-35	-	20-30	40-50	-
2	CYB-103	Physical Chemistry-I	BSC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
3	MAI-102	Mathematics-II	BSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4	ESS-104	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	CSE-101	Data Structures and Algorithms	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6	MTC-102	Introduction to Materials Engineering	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
7	MTC-104	Metallurgical Thermodynamics and Kinetics	PCC	3	2	1	0	3	-	20-35	-	20-30	40-50	-
		Total		**23**										

22 JUN 2023

DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

Program Code : **MT - B.Tech.(Metallurgical and Materials Engineering)**
Department : **Department of Metallurgical and Materials Engineering**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	OEC-I	Open Elective Course-I	OEC	3/4										
2	DAI-101	Data Science	DSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3	ECE-101	Fundamentals of Electronics	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4	MTC-201	Phase Transformation and Heat Treatment	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
5	MTC-203	Mechanical Behaviour of Materials	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
6	MTC-205	Iron and Steel Making	PCC	4	3	0	2/2	3	-	15-30	20	15-25	30-40	-
		Total		**23/24**										
(Spring)														
1	OEC-II	Open Elective Course-II	OEC	3/4										
2	HSSEC-I	HSS Elective Course	HSSEC	3										
3	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
4	EEE-102	Basic Electrical Engineering	ESC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
5	MTC-202	Metal Processing	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6	MTC-204	Characterization Techniques for Materials	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
7	MTC-206	Engineering Polymers and Composites	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
		Total		**24/25**										

22 JUN 2023

DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

Program Code : **MT - B.Tech.(Metallurgical and Materials Engineering)**
Department : **Department of Metallurgical and Materials Engineering**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	OEC-III	Open Elective Course-III	OEC	3/4										
2	MTC-351	AI/ML in Materials Engineering	PCC	2	2	0	0			20-35	-	20-30	40-50	-
3	MTC-301	Electrical and Electronic Materials	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
4	MTC-303	Metal Processing lab	PCC	2	0	0	4	-	0	-	50	-	-	50
5	MTC-391	Technical Communication	PCC	2	0	2	0	-	0	100	-	-	-	-
6	MTC-399	Community Outreach	CORE	2						100				
7	MTT-I	Talent Enhancement Course-I	TEB	3	2	1	0	3	0	20-35	-	20-30	40-50	-
8	MTL-I	Program Elective Course-I	PEC	3	3	0	0	3	0					
		Total		**20/21**										
(Spring)														
1	HSSEC-II	HSS Elective Course-II	HSSEC	3										
2	MTC-300	Engineering Analysis and Design	PCC	4	2	0	4	3	0	10-25	25	15-25	30-40	-
3	MTC-302	Corrosion Engineering	PCC	3	3	0	2/2	3	0	15-30	20	15-25	30-40	-
4	MTC-304	Ceramics and Metal Powder Processing	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	MTT-II	Talent Enhancement Course-II	TEB	3	2	1	0	3	0	20-35	-	20-30	40-50	-
6	MTL-II	Program Elective Course-II	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7	MSC/DHC-I	Minor Specialization Course-I / Departmental Honours Course-I	MSC/ DHC	3/4										
		Total		**20/ 23-24**										

22 JUN 2023

DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING

Program Code : **MT - B.Tech.(Metallurgical and Materials Engineering)**
Department : **Department of Metallurgical and Materials Engineering**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	MTP-400A/MTL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/PEC*	4						100				
2	MTL-III	PEC-III	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3	MTL-IV	PEC-IV	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4	MSC/DHC-II	Minor Specialization Course-II / Departmental Honours Course-II	MSC/ DHC	3/4										
5	MSC/DHC-III	Minor Specialization Course-III / Departmental Honours Course-III	MSC/ DHC	3/4										
				12/ 18-20										
(Spring)														
1	MTP-400B/ MTL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/ PEC*	4						100				
2	MTL-V	PEC-V	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3	MTL-VI	PEC-VI	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4	MSC/DHC-IV	Minor Specialization Course-IV/ Departmental Honours Course-IV	MSC/ DHC	3/4										
5	MSC/DHC-V	Minor Specialization Course-V / Departmental Honours Course-V	MSC/ DHC	3/4										
		Total		**12/ 18-20**										

22 JUN 2023

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	MTL-311	Fuel, Furnaces and Refractories	PEC	3	2	1	0	3	-	20-35	-	20-30	40-50	-
2.	MTL-312	Mineral Processing	PEC	3	2	0	2	3	-	10-25	25	15-25	30-40	-
3.	MTL-313	Introduction to Nanomaterials	PEC	3	2	0	2	3	-	10-25	25	15-25	30-40	-
4.	MTL-314	Thin Film Technology	PEC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
5.	MTL-315	Transport Phenomena	PEC	3	2	1	0	3	-	20-35	-	20-30	40-50	-
6.	MTL-511	Principles of Solidification	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
7.	MTL-512	Engineering Ceramics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
8.	MTL-513	Principles of Materials Selection	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
9.	MTL-514	High Temperature Materials	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
10.	MTL-515	Composite Materials	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
11.	MTL-516	Diffusion in Solids	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
12.	MTL-517	Defects in Crystalline Materials	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
13.	MTL-518	Nanotechnology: Materials & Devices	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
14.	MTL-519	Advanced Steel Technology	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
15.	MTL-520	Physical Metallurgy of light metals & alloys	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
16.	MTL-521	Corrosion protection methods	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
17.	MTL-522	Microsensor, MEMS & Smart Devices	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
18.	MTL-523	Electro-Ceramics	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
19.	MTL-524	Materials for Renewable Energy	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
20.	MTL-525	Biomaterials	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
21.	MTL-526	Energy storage Materials	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
22.	MTL-527	Failure Analysis	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
23.	MTL-528	Tribology of Engineering Materials	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
24.	MTL-529	Non-ferrous extraction	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
25.	MTL-530	Materials Modeling and Simulation	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-

List of Talent Enhancement Basket Courses

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	E T E	PRE
TEB-A (Materials Processing)														
1	MTT-101	Additive Manufacturing	TEB	3	2	1	0	3	-	20-35	-	20-30	40-50	-
2	MTT-102	Metal Recovery and Recycling	TEB	3	2	1	0	3	-	20-35	-	20-30	40-50	-
3	MTT-103	Metallurgy of Joining	TEB	3	2	1	0	3	-	20-35	-	20-30	40-50	-
TEB-B (Materials Characterization)														
1	MTT-104	X-ray Diffraction Techniques	TEB	3	2	1	0	3	-	20-35	-	20-30	40-50	-
2	MTT-105	Electron Microscopy	TEB	3	2	1	0	3	-	20-35	-	20-30	40-50	-
3	MTT-106	Crystallographic Texture	TEB	3	2	1	0	3	-	20-35	-	20-30	40-50	-

Open electives:

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	MTO-101	Introduction to Nanomaterials	OEC	3	2	0	2	3	-	10-25	25	15-25	30-40	-
2.	MTO-102	Thin Film Technology	OEC	3	3	0	0	3	-	20-35	-	20-30	40-50	-

Minor Specialisation Courses

S.No.	Code	Course title	Semester	Credits
1	MTC-102	Introduction to Materials Engineering	Spring	3
2	MTC-104	Metallurgical Thermodynamics and Kinetics	Spring	3
3	MTC-201	Phase Transformation and Heat Treatment	Autumn	4
4	MTC-203	Mechanical Behaviour of Materials	Autumn	4
5	MTC-205	Iron and Steel Making	Autumn	4
6	MTC-202	Metal Processing	Spring	4
7	MTC-204	Characterization Techniques for Materials	Spring	4
8	MTC-206	Engineering Polymers and Composites	Spring	3
9	MTC-301	Electrical and Electronic Materials	Autumn	3
10	MTC-302	Corrosion Engineering	Spring	3
11	MTC-304	Ceramics and Metal Powder Processing	Spring	4

Departmental Honours Courses: All PG Program Elective Courses of the Department of Metallurgical & Materials Engineering.

12-B. TECH. (DATA SCIENCE AND ARTIFICIAL INTELLIGENCE)
COMPONENT WISE DISTRIBUTION

Main Curriculum Components	Sub Components	Approved Credits for B. Tech.	Approved Credits Range	Proposed Credits for B. Tech. by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	57
	HSSEC	6		6	
	MC	3		3	
	BSC	12-20		16	
	ESC	8-20		16	
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
Program Core Course	CCCC	40-48	87-91	40	88
	AI/ML	2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4	
	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		10	
	PEC	22-26		24	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-160		156-159	
	MSC/DHC	18/20		18/20	
	Grand Total			174/179	

22 JUN 2022

MEHTA FAMILY SCHOOL FOR DATA SCIENCE AND ARTIFICIAL INTELLIGENCE
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **125** **B. Tech. (Data Science and Artificial Intelligence)**
Department : **DSAI** **Mehta Family School for Data Science and Artificial Intelligence**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	23	46
2	23/24	21/22	44/46
3	19/20	21	40/41
4	20	6	26
Grand Total			**156/159**
Total with MSC/DHC	With addition 18-20 credits		**174/179**

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	**16**	**8**	To be evaluated by DoSW
	NCC/NSS/NSO	**8**	**4**	To be evaluated by DoSW
	Internship (INT)	**24**	**8**	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	**8**	**4**	To be coordinated by the departments/Centres/school (2^{nd}& 3^{rd} Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

MEHTA FAMILY SCHOOL FOR DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

Program Code : **125** **B. Tech. (Data Science and Artificial Intelligence)**
Department : **DSAI** **Mehta Family School for Data Science and Artificial Intelligence**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights(%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	DAC-101	Computer Programming in C++	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	TMI-101	Tinkering and Mentoring	TMI	4 (T-2)	-	-	-	-	-	70	30	-	-	-
				(M-2)	2	0	0	2	-	50	-	-	50	-
6	ECE-101	Fundamental of Electronics	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	3	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-102	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	DAC-102	Computer Organization and Architecture	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	DAC-104	Programming in Python	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	ECE-103	Digital Electronics	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	DAC-151	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
		Total		**23**										

22 JUN 2023

MEHTA FAMILY SCHOOL FOR DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

Program Code : **125** **B. Tech. (Data Science and Artificial Intelligence)**
Department : **DSAI** **Mehta Family School for Data Science and Artificial Intelligence**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	OEC-I	Open Elective Course	OEC	3/4										
3	MAB-103	Numerical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	DAC-201	Discrete Structures	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	DAC-203	Artificial Intelligence	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	CSE-101	Data Structure and Algorithm	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23/24**										
(Spring)														
1	HSSEC-I	HSS Elective Course-I	HSSEC	3										
2	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	OEC-II	Open Elective Course-II	OEC	3/4										
4	DAC-202	Applied Machine Learning	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	DAC-204	Programming for DS and AI	PCC	2	0	0	4	-	-	-	100	-	-	-
6	ECE-102	Introduction to Communication Systems	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	DAT-I	Talent Enhancement Course-I	TEB	2	0	0	3	-	-	-	-	-	100	-
		Total		**21/22**										

22 JUN 2023

MEHTA FAMILY SCHOOL FOR DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

Program Code : **125** **B. Tech. (Data Science and Artificial Intelligence)**
Department : **DSAI** **Mehta Family School for Data Science and Artificial Intelligence**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	OEC-III	Open Elective Course	OEC	3/4										
2	DAC-301	Deep Learning	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	DAC-303	Computer Network	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	DAC-305	Principle of Databases	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	DAC-399	Community Outreach	CORE	2							100			
6	DAT-II	Talent Enhancement Course-II	TEB	2	0	0	3	-	-	-	-	-	100	-
		Total		**19/20**										
(Spring)														
1	HSSEC-II	HSS Elective Course-II	HSSEC	3										
2	DAC-300	Case Study (Industry Oriented Problem/ Lab Based Project)*	PCC	4	0	0	8	0	0	50	-	-	-	50
3	DAC-391	Technical Communication	PCC	2	0	0	4	0	-	-	100	-	-	-
4	DAC-304	AI/ML Lab	PCC	2	0	0	4	0	-	-	100	-	-	-
5	DAL-I	Program Elective Course- I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	DAL-II	Program Elective Course- II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	DAT-III	Talent Enhancement Course-III	TEB	2	0	0	3	-	-	-	-	-	100	-
8	MSC/DHC - I	Minor Specialization Course - I / Departmental Honours Course - I	MSC/ DHC	3/4										
		Total		**21/ 24-25**										

22 JUN 2023

MEHTA FAMILY SCHOOL FOR DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

Program Code : 125 B. Tech. (Data Science and Artificial Intelligence)
Department : DSAI Mehta Family School for Data Science and Artificial Intelligence
Year : IV

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	DAP-400A/ DAL	Project (BTP-I)/Entrepreneurship**/Project-based Internship/PEC*	PCC/PEC*	4						100				
2	DAL-III	Program Elective Course -III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	DAL-IV	Program Elective Course -IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	DAL-V	Program Elective Course -V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	DAL-VI	Program Elective Course -VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	MSC/DHC-2	Minor Specialization Course –II/ Departmental Honours Course - II	MSC/ DHC	3/4										
7	MSC/DHC-3	Minor Specialization Course –III/ Departmental Honours Course - III	MSC/ DHC	3/4										
		Total		**20/26-28**										
(Spring)														
1	DAP-400B/ DAL	Project (BTP-I)/Entrepreneurship**/Project-based Internship/PEC*	PCC/PEC*	6						100				
2	MSC/DHC-IV	Minor Specialization Course –IV / Departmental Honours Course – IV	MSC/ DHC	3/4										
3	MSC/DHC-V	Minor Specialization Course -V/ Departmental Honours Course -V	MSC/ DHC	3/4										
		Total		**6/12-14**										

22 JUN 2023

List of Program Elective Courses

3rd Year Electives

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	DAL-301	Casual Inference	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	DAL-302	Information Theory and Cryptography	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	DAL-303	Information Retrieval	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	DAL-304	Computer Architecture for AI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	DAL-305	Intelligent Cloud Computing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	DAL-306	Intelligent and Learning Agents	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	DAL-307	Intelligent Robotics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8.	DAL-308	Applications of AI in Healthcare	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

4th Year Electives

9.	DAL-401	E-commerce	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
10.	DAL-402	Security and Privacy	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11.	DAL-403	AI in Neuroscience & Cognitive Behaviour	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12.	DAL-404	AI based Diagnostics tools	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13.	DAL-565	Computer Vision	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	DAL -559	Stochastic Processes and Applications	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	DAL -628	Evolutionary Algorithms	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16.	DAL -558	Data Stream Mining	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17.	DAL -564	AI and Medical Physics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18.	DAL -562	AI for Investment	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
19.	DAL -567	Introduction to Materials Informatics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20.	DAL -561	AI for Earth Observations	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
21.	DAL -519	Social Network Analysis	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22.	DAL -568	ML and AI Applications in Earth	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

		Sciences												
23.	DAL -571	Big Data Analytics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24.	DAL -576	Data Science in Bioinformatics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
25.	DAL -579	Leveraging Data Science for Finance	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
26.	DAL -581	Advanced Applications of Pattern Recognition	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
27.	DAL -582	Recommended Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
28.	DAL -583	Data-Driven Analytics for Smart Transportation Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
29.	DAL -5xx	AI for Fluid Mechanics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

List of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
TEB-A (Computer Vision and Image Processing)														
1.	DAT-101	Computer Vision	TEB	2	0	0	4	-	-	-	-	-	100	-
2.	DAT-102	Image Enhancement Techniques	TEB	2	0	0	4	-	-	-	-	-	100	-
3.	DAT-103	AI based earth imaging	TEB	2	0	0	4	-	-	-	-	-	100	-
TEB-B (AI for Sustainable Development Goals (SDG))														
4.	DAT-104	AI for Energy	TEB	2	0	0	4	-	-	-	-	-	100	-
5.	DAT-105	AI for Healthcare	TEB	2	0	0	4	-	-	-	-	-	100	-
6.	DAT-106	AI for Smart Transportation	TEB	2	0	0	4	-	-	-	-	-	100	-
TEB-C (AI for Economics)														
7.	DAT-107	AI for e-commerce	TEB	2	0	0	4	-	-	-	-	-	100	-
8.	DAT-108	AI Data Mining and Warehousing for online market places	TEB	2	0	0	4	-	-	-	-	-	100	-
9.	DAT-109	AI for asset management	TEB	2	0	0	4	-	-	-	-	-	100	-

22 JUN 2023

Minor Specialization Courses

S.No.	Code	Course title	Semester	Credits
1	DAC-102	Computer Organization and Architecture	Spring	4
2	DAC-104	Programming in Python	Spring	4
3	DAC-203	Artificial Intelligence	Autumn	4
4	DAC-202	Applied Machine Learning	Spring	4
5	DAC-303	Computer Networks	Autumn	4

Departmental Honours Courses

Sub. Code	Title	Credits
DAL-507	Advanced Data Structures and Algorithms	4
DAL-xxx	Statistical Machine Learning	4
DAL-503	Hardware Architectures for AI	4
DAL-xxx	AI Driven Non-linear Dynamics	4
DAL-xxx	Optimization in Machine Learning	4
All PG PECs / Pre-PhD courses of MFS		

13-Department of Earth Sciences

5 year Integrated M.Tech. (Geological Technology)

Component wise distribution

Main Curriculum Components	Sub Components	Approved Credits for 5 year Program	Approved Credits Range	Proposed credits for 5 year IMT by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	**5**	**53**
	HSSEC	6		**6**	
	MC	3		**3**	
	BSC	12-20		**20**	
	ESC	8-20		**8**	
	DSC	4		**4**	
	ESSC	3		**3**	
	TM	4		**4**	
Program Core Course	CCCC	52-62	127-133	**62**	**130**
	AI/ML	2		**2**	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		**4**	
	Technical Communication	2		**2**	
	BTP/Entrepreneurship/ Project-based internship/PEC/Thesis	16		**16**	
	PEC	32-40		**36**	
	TEB	6-8		**8**	
	OEC	9-12	9-12	**9-12**	**9-12**
	CORE	2	2	**2**	**2**
	Total	**190-200**		**194-197**	
	MSC/DHC	**18/20**		**18/20**	
	Grand Total			**212-217**	

22 JUN 2023

DEPARTMENT OF EARTH SCIENCES
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

5 year Integrated M.Tech. (Geological Technology)

Program Code : **410–Int. M.Tech. (Geological Technology)**
Department : **ES - Earth Sciences**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	23	46
2	24/25	22/23	46/48
3	22/23	24	46/47
4	21	19	40
5	8	8	16
Grand Total			194-197
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		**212-217**

22 JUN 2023

	Components	Maximum	Minimum	Comments
	Discipline (DIS)	20	10	To be evaluated by DoSW
Non-Credit Elements (NCE)	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	32	10	1 week internship= 1 unit (To be coordinated by departments/centres/school)
	Participation in professional development programs by Industry experts/ field experts (PPD -1, PPD-2 & PPD-3)	12	6	To be coordinated by departments/centres/school (2^{nd}, 3^{rd} and 4^{th} Years)
Minimum non-credit to be earned: 30				

DEPARTMENT OF EARTH SCIENCES

Program Code : **410 –Int. M.Tech. (Geological Technology)**
Department : **ES - Earth Sciences**
Year : **I**

S. No.	Sub.Code	Course Title	Sub. Area	Credits	Contact Hours/Week L	T	P	Exam. Duration Theory	Practical	Relative Weight (%) CWS	PRS	MTE	ETE	PRE
		(Autumn)												
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	ESC-101	Computer Programming	PCC	4	3	0	2	3	2	10-25	25	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6	CHE-101	Energy Engineering	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
		(Spring)												
1.	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2.	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	ESS-101	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	ESB-101	Geological Processes	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	ESC-102	Mineralogy and Petrology	PCC	4	3	0	2	3	2	10-25	25	15-25	30-40	-
6.	ESC-191	Technical Communication	PCC	2	0	0	4	0	0	-	-	-	100	-
7.	MTE-102	Material Characterization	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
				23										

-169-

22 JUN 2023

DEPARTMENT OF EARTH SCIENCES

Program Code : **410 –Int. M.Tech. (Geological Technology)**
Department : **ES - Earth Sciences**
Year : **II**

		Teaching Scheme			Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	**Sub.Code**	**Course Title**	**Sub. Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
		(Autumn)												
1	OEC-I	Open Elective Course-I	OEC	3/4										
2	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESC-201	Structural Geology	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
4	ESC-203	Palaeontology	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
5	ESC-205	Metamorphic Petrology	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
6	ESB-102	Global Geophysics	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	EST-I	Talent Enhancement Course-I	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
		Total		**24/25**										
		(Spring)												
1	HSSEC-I	HSS Elective Course-I	HSSEC	3										
2	OEC-II	Open Elective Course-II	OEC	3/4										
3	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	ESC-202	Economic Geology	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	ESC-204	Igneous Petrology	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
6	ESC-206	Sedimentology	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
7	ESC-208	Field Training	PCC	3	0	0	6	0	0	-	-	-	100	-
		Total		**22/23**										

22 JUN 2023

DEPARTMENT OF EARTH SCIENCES

Program Code : **410 –Int. M.Tech. (Geological Technology)**
Department : **ES - Earth Sciences**
Year : **III**

		Teaching Scheme			Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	**Sub.Code**	**Course Title**	**Sub. Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
		(Autumn)												
1	OEC-III	Open Elective Course-III	OEC	3/4										
2	ESC-351	Fundamental of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
3	ESC-301	Geomorphology	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
4	ESC-303	Ore Geology and Mineral Exploration	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	ESL-I	Program Elective Course-I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	EST-II	Talent Enhancement Course-II	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
7	ESC-399	Community Outreach	CORE	2						100				
		Total		**22/23**										
		(Spring)												
1	HSSEC-II	HSS Elective Course-II	HSSEC	3										
2	ESC-300	Industry Oriented Projects/ Field Training	PCC	4	-	-	8	0	0	-	-	-	100	
3	ESC-302	Geochemistry and Cosmo chemistry	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	ESC-304	Remote Sensing	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
5	ESC-306	Geohydrology	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
6	ESC-308	Stratigraphy	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
7	ESL-II	Program Elective Course-II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8	MSC-I	Minor Specialization Course-I	MSC	3/4										
		Total		**24/ 27-28**										

-171-

22 JUN 2023

DEPARTMENT OF EARTH SCIENCES

Program Code : **410 –Int. M.Tech. (Geological Technology)**
Department : **ES - Earth Sciences**
Year : **IV**

		Teaching Scheme			Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	**Sub.Code**	**Course Title**	**Sub. Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
		(Autumn)												
1	ESC-401	Engineering Geology	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ESC-403	Geographical Information System (GIS)	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
3	ESC-405	Well Logging	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
4	ESL-III	Program Elective Course-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	ESL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	ESL-V	Program Elective Course-V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	MSC-II	Minor Specialization Course-II	MSC	3/4										
		Total		**21/ 24-25**										
		(Spring)												
1	ESC-402	Petroleum Geosciences	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ESL-VI	Program Elective Course-VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESL-VII	Program Elective Course-VII	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	ESL-VIII	Program Elective Course-VIII	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	ESL-IX	Program Elective Course-IX	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	MSC-III	Minor Specialization Course-III	MSC	3/4										
		Total		**19/ 22-23**										

DEPARTMENT OF EARTH SCIENCES

Program Code : **410 –Int. M.Tech. (Geological Technology)**
Department : **ES - Earth Sciences**
Year : **V**

		Teaching Scheme			Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	**Sub. Code**	**Course Title**	**Sub. Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
		(Autumn)												
1	ESP-501	Thesis Stage-I	PCC	8	0	0	0	0	0	-	-	-	100	
2	MSC-IV	Minor Specialization Course-IV	MSC	3/4										
		Total		**8/ 11-12**										
		(Spring)												
1	ESP-502	Thesis Stage-II	PCC	8	0	0	0	0	0	-	-	-	100	
2	MSC-V	Minor Specialization Course-V	MSC	3/4										
		Total		**8/ 11-12**										

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Sub Code	Course Title	Sub. Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Program Elective Course - I														
1.	ESL-301	Himalayan Geology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	ESL-303	Metamorphic Processes and Tectonic Regimes	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	ESL-304	Soil and Rock Mechanics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - II														
4.	ESL-305	Basin Analysis	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	ESL-306	Indian Mineral Deposits	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	ESL-307	Advanced Structural Geology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - III														
7.	ESL-401	Advanced Remote Sensing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8.	ESL-402	Precambrian Tectonics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9.	ESL-403	Geodynamics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - IV														
10.	ESL-405	Marine Geology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11.	ESL-406	Paleoclimatology and Palaeoceanography	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	ESL-407	Quaternary Geosciences	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - V														
13.	ESL-409	Coal Geology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	ESL-410	Environmental Impact Assessment and Management	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	ESL-411	Stress and Strain Analysis in Geology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

Program Elective Course - VI														
16.	ESL-412	Advanced Stratigraphy and Facies Modelling	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17.	ESL-413	Global Environment	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18.	ESL-414	Isotope Geology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
19.	ESL-415	Advanced GIS	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - VII														
20.	ESL-416	Petroleum Geomechanics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
21.	ESL-417	Exploration Geophysics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22.	ESL-418	Petrophysics and Seismic Rock Characterization	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - VIII														
23.	ESL-419	Shear Zone Metasomatism	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24.	ESL-420	Industrial Mineralogy	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
25.	ESL-421	Sequence Stratigraphy	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - IX														
26.	ESL-422	Carbonate Sedimentology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
27.	ESL-423	Microtectonics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
28.	ESL-424	Vertebrate Palaeontology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

22 JUN 2023

Basket of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	C W S	P R S	MTE	E T E	PRE
TEB-A (Natural Hazards)														
1	EST-101	Natural hazards and mitigation	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
2	EST-102	Engineering Geophysics	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
TEB-B (Environmental Geosciences)														
3	EST-103	Environmental geology	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
4	EST-104	Environmental geophysics	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
TEB-C (Oil Exploration)														
5	EST-105	Geology of Petroleum	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6	EST-106	Geophysics for oil exploration	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-

Minor Specialisation Courses (20 credits)

S. No.	Course Code	Course Title	Credits	Semester
1.	ESC-102	Mineralogy and Petrology	4	Spring
2.	ESC-201	Structural Geology	3	Autumn
3.	ESC-202	Economic Geology	4	Spring
4.	ESC-301	Geomorphology	3	Autumn
5.	ESC-304	Remote Sensing	3	Spring
6.	ESC-306	Geohydrology	3	Spring
7.	ESC-402	Petroleum Geosciences	3	Spring

14-Department of Earth Sciences

5 year Integrated M.Tech. (Geophysical Technology)

Component wise distribution

Main Curriculum Components	Sub Components	Approved Credits for 5 year Program	Approved Credits Range	Proposed credits for 5 year IMT by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	**5**	**53**
	HSSEC	6		**6**	
	MC	3		**3**	
	BSC	12-20		**20**	
	ESC	8-20		**8**	
	DSC	4		**4**	
	ESSC	3		**3**	
	TM	4		**4**	
Program Core Course	CCCC	52-62	127-133	**62**	**130**
	AI/ML	2		**2**	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		**4**	
	Technical Communication	2		**2**	
	BTP/Entrepreneurship/ Project-based internship/PEC/Thesis	16		**16**	
	PEC	32-40		**36**	
	TEB	6-8		**8**	
	OEC	9-12	9-12	**9-12**	**9-12**
	CORE	2	2	**2**	**2**
	Total(+	**190-200**		**194/197**	
	MSC/DHC	**18/20**		**18/20**	
	Grand Total			**212-217**	

DEPARTMENT OF EARTH SCIENCES
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
5 year Integrated M.Tech. (Geophysical Technology)

Program Code : **411 – Int. M.Tech. (Geophysical Technology)**
Department : **ES - Earth Sciences**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	23	46
2	22/23	23/24	45/47
3	23/24	23	46/47
4	19	22	41
5	8	8	16
Grand Total			**194-197**
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		**212-217**

22 JUN 2023

	Components	Maximum	Minimum	Comments
	Discipline (DIS)	20	10	To be evaluated by DoSW
Non-Credit Elements (NCE)	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	32	10	1 week internship= 1 unit (To be coordinated by departments/centres/school)
	Participation in professional development programs by Industry experts/ field experts (PPD -1, PPD-2 & PPD-3)	12	6	To be coordinated by departments/centres/school (2^{nd}, 3^{rd} and 4^{th} Years)
Minimum non-credit to be earned: 30				

22 JUN 2023

DEPARTMENT OF EARTH SCIENCES

Program Code : **411 – Int. M.Tech. (Geophysical Technology)**
Department : **ES - Earth Sciences**
Year : **I**

S. No.	Sub.Code	Course Title	Sub. Area	Credits	Teaching Scheme: L	T	P	Contact Hours/Week: Theory	Practical	Exam. Duration	CWS	PRS	MTE	ETE	PRE
		(Autumn)													
1	HSI-101	Soft skills	HSSC	3	2	0	2	2	0		10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0		20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0		15-30	20	15-25	30-40	-
4	ESC-101	Computer Programming	PCC	4	3	0	2	3	2		10-25	25	15-25	30-40	-
5	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-		70	30	-	-	-
				M-2	2	0	0	2	-		50	-	-	50	-
6	CHE-101	Energy Engineering	ESC	4	3	1	0	3	0		20-35	-	20-30	40-50	-
		Total		**23**											
		(Spring)													
1	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	3	0		20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0		20-35	-	20-30	40-50	-
3	ESS-101	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0		20-35	-	20-30	40-50	-
4	ECE-103	Digital Electronics	ESC	4	3	1	0	3	0		20-35	-	20-30	40-50	-
5	ESB-101	Geological Processes	BSC	4	3	1	0	3	0		20-35	-	20-30	40-50	-
6	ESC-102	Mineralogy and Petrology	PCC	4	3	0	2	3	2		10-25	25	15-25	30-40	-
7	ESC-191	Technical Communication	PCC	2	0	0	4	0	0		-	-	-	100	-
		Total		**23**											

22 JUN 2023

DEPARTMENT OF EARTH SCIENCES

Program Code : **411 – Int. M.Tech. (Geophysical Technology)**
Department : **ES - Earth Sciences**
Year : **II**

		Teaching Scheme			Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	**Sub.Code**	**Course Title**	**Sub. Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
		(Autumn)												
1	OEC-I	Open Elective Course-I	OEC	3/4										
2	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESC-201	Structural Geology	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
4	ESB-102	Global Geophysics	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	ESL-I	Program Elective Course-I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	EST-I	Talent Enhancement Course-I	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
		Total		**22/23**										
		(Spring)												
1	HSSEC-I	HSS Elective Course-I	HSSEC	3										
2	OEC-II	Open Elective Course-II	OEC	3/4										
3	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	ESC-202	Economic Geology	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	ESC-206	Sedimentology	PCC	3	2	0	2	3	0	10-25	25	15-25	30-40	-
6	ESC-208	Field Training	PCC	3	0	0	6	0	0	-	-	-	100	-
7	ESC-210	Geophysical Signal Processing	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23/24**										

DEPARTMENT OF EARTH SCIENCES

Program Code : **411 – Int. M.Tech. (Geophysical Technology)**
Department : **ES - Earth Sciences**
Year : **III**

		Teaching Scheme			Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	**Sub. Code**	**Course Title**	**Sub. Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
		Semester-V (Autumn)												
1	OEC-III	Open Elective Course-III	OEC	3/4										
2	ESC-351	Fundamental of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
3	ESC-311	Seismology	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
4	ESC-313	Electrical Prospecting	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	ESL-II	Program Elective Course-II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	EST-II	Talent Enhancement Course-II	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
7	ESC-399	Community Outreach	CORE	2						100				
		Total		**23/24**										
		Semester-VI (Spring)												
1	HSSEC-II	HSS Elective Course-II	HSSEC	3										
2	ESC-300	Industry Oriented Field Training	PCC	4	-	-	8	0	0	-	-	-	100	
3	ESC-312	Electromagnetic Prospecting	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
4	ESC-314	Seismic Prospecting	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5	ESL-III	Program Elective Course-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	ESL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	MSC-I	Minor Specialization Course-I	MSC	3/4										
		Total		**23/ 26-27**										

DEPARTMENT OF EARTH SCIENCES

Program Code : **411 – Int. M.Tech. (Geophysical Technology)**
Department : **ES - Earth Sciences**
Year : **IV**

		Teaching Scheme			Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Sub.Code	Course Title	Sub. Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
		(Autumn)												
1	ESC-405	Well Logging	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ESC-411	Gravity and Magnetic Prospecting	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
3	ESC-413	Numerical Modeling in Geophysics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	ESL-V	Program Elective Course-V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	ESL-VI	Program Elective Course-VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	MSC-II	Minor Specialization Course-II	MSC	3/4										
		Total		**19/ 22-23**										
		(Spring)												
1	ESC-402	Petroleum Geosciences	PCC	3	2	1	0	3	0	20-35	-	20-30	40-50	-
2	ESC-412	Geophysical Inversion	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESL-VII	Program Elective Course-VII	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	ESL-VIII	Program Elective Course-VIII	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	ESL-IX	Program Elective Course-IX	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	ESP-400	Mini-Project	PCC	3	0	0	6	0	0	-	-	-	100	-
7	MSC-III	Minor Specialization Course-III	MSC	3/4										
		Total		**22/ 25-26**										

DEPARTMENT OF EARTH SCIENCES

Program Code : **411 – Int. M.Tech. (Geophysical Technology)**
Department : **ES - Earth Sciences**
Year : **V**

		Teaching Scheme			Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	**Sub.Code**	**Course Title**	**Sub. Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
		(Autumn)												
1	ESP-501	Thesis Stage-I	PCC	8	0	0	0	0	0	-	-	-	100	
2	MSC-IV	Minor Specialization Course-IV	MSC	3/4										
		Total		**8/ 11-12**										
		(Spring)												
1	ESP-502	Thesis Stage-II	PCC	8	0	0	0	0	0	-	-	-	100	-
2	MSC-V	Minor Specialization Course-V	MSC	3/4										
		Total		**8/ 11-12**										

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Sub Code	Course Title	Sub. Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Program Elective Course - I														
1.	ESL-201	Geotechnical Investigations	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	ESL-202	Application of Satellites in Geophysics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	ESL-203	Stratigraphy	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - II														
4.	ESL-351	Digital Image Processing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	ESL-352	Modelling of Hydrological Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	ESL-403	Geodynamics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - III														
7.	ESL-353	Advanced Seismology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8.	ESL-412	Advanced Stratigraphy and Facies Modelling	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9.	ESL-354	Dynamic Systems in Earth Sciences	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - IV														
10.	ESL-355	Reservoir Geophysics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11.	ESL-356	Strong Motion Seismology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12.	ESL-418	Petrophysics and Seismic Rock Characterization	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - V														
13.	ESL-451	Seismic Imaging	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14.	ESL-452	Advanced Seismic Prospecting	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15.	ESL-453	Integrated Geo-exploration	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - VI														
16.	ESL-454	Magnetotellurics and Geomagnetic Depth Sounding	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

17.	ESL-455	High Performance Computing in Earth Sciences	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18.	ESL-401	Advanced Remote Sensing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - VII														
19.	ESL-415	Advanced GIS	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	
20.	ESL-456	Synthetic Seismogram	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	
21.	ESL-457	Hydrogeophysics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	
Program Elective Course - VIII														
22.	ESL-458	Marine Geophysics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
23.	ESL-459	Advanced Electromagnetic Prospecting	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24	ESL-416	Petroleum Geomechanics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Program Elective Course - IX														
25.	ESL-413	Global Environment	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
26	ESL-421	Sequence Stratigraphy	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
27.	ESL-460	Carbonate Sedimentology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

Basket of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	C W S	P R S	MTE	E T E	P RE
TEB-A (Water Resources)														
1	EST-151	Hydrogeological Systems	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
2	EST-152	Groundwater Management	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
TEB-B (Geomodelling)														
3	EST-153	Computational Geophysics	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
4	EST-154	Geophysical Modelling of Earth Processes	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
TEB-C (Petroleum Geosciences)														
5	EST-155	Geology of Petroleum	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6	EST-156	Geophysics for Oil Exploration	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-

Minor Specialisation Courses (20 credits)

S. No.	Course Code	Course Title	Credits	Semester
1.	ESC-102	Mineralogy and Petrology	4	Spring
2.	ESC-201	Structural Geology	3	Autumn
3.	ESC-301	Geomorphology	3	Autumn
4.	ESC-311	Seismology	4	Autumn
5.	ESC-413	Numerical Modeling in Geophysics	3	Autumn
6.	ESC-304	Remote Sensing	3	Spring
7.	ESC-314	Seismic Prospecting	4	Spring
8.	ESC-402	Petroleum Geosciences	3	Spring

15-Department of Humanities and Social Science

5 year BSMS (Economics) with exit policy

Component wise distribution

Main Curriculum Components	Sub Components	Approved Credits for 5 year BSMS	Approved Credits Range	Proposed credits for 5 year BSMS by Department	Proposed Credits Range	Approved Credits for 4 year BSMS exit	Approved Credits Range	Proposed credits for 4 year BSMS exit by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	**5**	**53**	5	52-58	**5**	**53**
	HSSEC	6		**6**		6		**6**	
	MC	3		**3**		3		**3**	
	BSC	12-20		**20**		12-20		**20**	
	ESC	8-20		**8**		8-20		**8**	
	DSC	4		**4**		4		**4**	
	ESSC	3		**3**		3		**3**	
	TM	4		**4**		4		**4**	
Program Core Course	CCCC	52-62	127-133	**56**	**128**	40-48	87-91	**44**	**90**
	AI/ML	2		**2**		2		**2**	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		**4**		4		**4**	
	Technical Communication	2		**2**		2		**2**	
	BTP/Entrepreneurship/ Project-based internship/PEC	16		**16**		6-10		**6**	
	PEC	32-40		**40**		22-26		**24**	
	TEB	6-8		**8**		6-8		**8**	
	OEC	9-12	9-12	**9-12**	**9-12**	9-12	9-12	**9-12**	**9-12**
	CORE	2	2	**2**	**2**	2	2	**2**	**2**
	Total	**190-200**		**192-195**		**150-160**		**154-157**	
	MSC/DHC	**18/20**		**18/20**		**18/20**		**18/20**	
	Grand Total			**210-215**				**172-177**	

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCE
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
5 year BSMS (Economics) with exit policy

Program Code : **322 - BS-MS (Economics)**
Department : **HSS – Humanities and Social Science**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	21	44
2	23/24	21/22	44/46
3	21/22	23	44/45
4	24	20	44
5	6	10	16
Grand Total			**192/195**
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		**210/215**

-191-

22 JUN 2023

	Components	Maximum	Minimum	Comments
	Discipline (DIS)	20	10	To be evaluated by DoSW
Non-Credit Elements (NCE)	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	32	10	1 week internship= 1 unit (To be coordinated by departments/centres/school)
	Participation in professional development programs by Industry experts/ field experts (PPD -1, PPD-2 & PPD-3)	12	6	To be coordinated by departments/centres/school (2^{nd}, 3^{rd} and 4^{th} Years)
Minimum non-credit to be earned: 30				

22 JUN 2023

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCE
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
5 year BSMS (Economics) with exit policy

Program Code : **322 - BS-MS (Economics)**
Department : **HSS – Humanities and Social Science**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	21	44
2	23/24	21/22	44/46
3	21/22	23	44/45
4	16	6	22
Grand Total			**154/157**
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		**172/177**

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	16	8	To be evaluated by DoSW
	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	24	8	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	8	4	To be coordinated by the departments/Centres/school (2nd& 3rd Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCE

Program Code : **322 - BS-MS (Economics)**
Department : **HSS – Humanities and Social Science**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S.No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2.	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4.	HSC-101	Computer Programming for Economists	PCC	4	3	0	2	3	2	10-25	25	15-25	30-40	-
5.	TMI-101	Tinkering & Mentoring	TM	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6.	CSE-101	Data Structures and Algorithms	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1.	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2.	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	ESS-103	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	HSC-102	Introductory Microeconomics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	HSC-104	Introductory Macroeconomics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	PHB-103	Modern Physics	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**21**										

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCE

Program Code : **322 - BS-MS (Economics)**
Department : **HSS – Humanities and Social Science**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S.No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	OEC-I	Open Elective Course-I	OEC	3/4										
3.	HSC-201	Advanced Microeconomics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	HSC-203	Advanced Macroeconomics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	HSC-205	Introduction to Econometric Theory	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6.	MAB-104	Mathematical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23/24**										
(Spring)														
1.	HSSEC-I	HSS Elective Course-I	HSSEC	3										
2.	OEC-II	Open Elective Course-II	OEC	3/4										
3.	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	HSC-202	Elementary Development Economics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	HSC-204	Advanced Econometric Theory	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6.	CEE-106	Geospatial Techniques and Programming	ESC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
		Total		**21/22**										

22 JUN 2023

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCE

Program Code : **322 - BS-MS (Economics)**
Department : **HSS – Humanities and Social Science**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S.No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1	OEC-III	Open Elective Course-III	OEC	3/4										
2	HSC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
3	HSC-301	Environmental Economics: Theory & Policy	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	HSC-391	Technical Communication	PCC	2	1	0	2			100				
5	HST-I	Talent Enhancement Course-I	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6	HSL-I	Program Elective Course-I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	HSC-399	Community Outreach	CORE	2						100				
		Total		**21/22**										
(Spring)														
1	HSSEC-II	HSS Elective Course-II	HSSEC	3										
2	HSC-302	Monetary Economics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	HST-II	Talent Enhancement Course-II	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
4	HSL-II	Program Elective Course-II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	HSL-III	Program Elective Course-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	HSL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	MSC/DHC-I	Minor Specialization Course-I/ Departmental Honours Course-I	MSC/DHC	3/4										
		Total		**23/ 26-27**										

Note: Students willing to exit with BS Degree in Economics must inform to Dean (Academic Affairs) after completion of 6th semester

-197-

22 JUN 2023

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCE

Program Code : **322 - BS-MS (Economics)**
Department : **HSS – Humanities and Social Science**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S.No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	HSC-400	Eng. Anal & Design*—Industry Oriented Problems/Lab Based Projects/ Practical Problems/Case Study	PCC	4	0	0	8	0	0	0	50	0	0	50
2.	HSC-403	Financial Economics: Theory & Applications	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
3.	HSC-405	Principles of International Economics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	HSL-V	Program Elective Course-V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	HSL-VI	Program Elective Course-VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	HSL-VII	Program Elective Course-VII	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7.	MSC/DHC-II	Minor Specialization Course-II/ Departmental Honours Course-II	MSC/DHC	3/4										
		Total		**24/ 27-28**										
(Spring)														
1.	HSC-402	Public Policy	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	HSC-404	Growth Economics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	HSL-VIII	Program Elective Course-VIII	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	HSL-IX	Program Elective Course-IX	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	HSL-X	Program Elective Course-X	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	MSC/DHC-III	Minor Specialization Course-III/ Departmental Honours Course-III	MSC/DHC	3/4										
		Total		**20/ 23-24**										

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCE

Program Code : **322 - BS-MS (Economics)**
Department : **HSS – Humanities and Social Science**
Year : **V**

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S.No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	HSP-501	Thesis (Stage-I)	PCC	6						100				
2.	MSC/DHC-IV	Minor Specialization Course-IV/ Departmental Honours Course-IV	MSC/DHC	3/4										
3.	MSC/DHC-V	Minor Specialization Course-V / Departmental Honours Course-V	MSC/DHC	3/4										
		Total		**6/ 12-14**										
Semester-II (Spring)														
1.	HSP-502	Thesis (Stage-II)	PCC	10						100				
		Total		**10**										

22 JUN 2023

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCE

Program Code : **322 - BS-MS (Economics) Exit policy**
Department : **HSS – Humanities and Social Science**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S.No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	HSC-400	Eng. Anal & Design*/Industry Oriented Problems/Lab Based Projects/ Practical Problems/Case Study	PCC	4	0	0	8	0	0	0	50	0	0	50
2.	HSC-403	Financial Economics: Theory & Applications	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
3.	HSL-V	Program Elective Course-V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	HSL-VI	Program Elective Course-VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MSC/DHC-II	Minor Specialization Course-II/ Departmental Honours Course-II	MSC/DHC	3/4										
6.	MSC/DHC-III	Minor Specialization Course-III/ Departmental Honours Course-III	MSC/DHC	3/4										
		Total		**16/ 22-24**										
(Spring)														
1.	HSP-400/ HSL	Project/Entrepreneurship/ Project-based Internship/PEC*	PCC/PEC*	6						100				
2.	MSC/DHC-IV	Minor Specialization Course-IV/ Departmental Honours Course-IV	MSC/DHC	3/4										
3.	MSC/DHC-V	Minor Specialization Course-V/ Departmental Honours Course-V	MSC/DHC	3/4										
		Total		**6/ 12-14**										

-200-

22 JUN 2022

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	HSL-301	Economics of Risk and Uncertainty	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	HSL-302	Agricultural Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	HSL-303	Labour Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	HSL-501	Game Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	HSL-502	Indian Economy	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	HSL-503	Advanced Development Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	HSL-504	Behavioural Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8	HSL-505	Industrial Organization	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9	HSL-506	Energy Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
10	HSL-601	Research Methods	PEC	4	3	0	2	3	0	20-35	-	20-30	40-50	-
11	HSL-602	Economics of Services	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12	HSL-603	Health Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13	HSL-604	Public Finance	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14	HSL-605	Economics of Infrastructure	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15	HSL-606	Ecological Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16	HSL-607	Panel Data Analysis	PEC	4	3	0	2	3	0	20-35	-	20-30	40-50	-
17	HSL-651	Advanced International Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18	HSL-652	Welfare Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
19	HSL-653	History of Economic Thought	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20	HSL-654	Institutional Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
21	HSL-655	Innovation & Economic Policy	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22	HSL-656	Resource Economics & Valuation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
23	HSL-657	Household Economics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

-201-

22 JUN 2023

List of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	C W S	PRS	MTE	E T E	PRE
TEB-A: Economic Data Analysis														
1	HST-101	Cross-sectional Data Analysis	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
2	HST-102	Time Series Data Analysis	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
TEB-B: Applied Econometrics														
1	HST-103	Applied Production Econometrics	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
2	HST-104	Optimization and Nonparametric Efficiency Analysis	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
TEB-C: Business Analytics														
1	HST-105	Analytics for Business and Society	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-
2	HST-106	Social and Economic Networks	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-

-202-

22 JUN 2023

Minor Specialization Courses

SN	Course Code	Course Name	Credits	Semester
1.	HSC-201	Advanced Microeconomics	4	Autumn
2.	HSC-203	Advanced Macroeconomics	4	Autumn
3.	HSC-205	Introduction to Econometric Theory	4	Autumn
4.	HSC-102	Introductory Microeconomics	4	Spring
5.	HSC-104	Introductory Macroeconomics	4	Spring
6.	HSC-202	Elementary Development Economics	4	Spring

Departmental Honours Courses (20 credits)

SN	Course Code	Course Name	Credits
1.	HSL-503	Advance Development Economics	4
2.	HSL-651	Advance International Economics	4
3.	HSL-603	Public Finance	4
4.	HSL-606	Ecological Economics	4
5.	HSL-303	Labour Economics	4
6.	HSL-301	Economics of Risk and Uncertainty	4
7.	HSL-501	Game Theory	4
8.	HSL-653	History of Economic Thought	4
9.	HSL-655	Innovation & Economic Policy	4
10.	HSL-656	Resource Economics & Valuation	4

16-Department of Chemistry

5 year BSMS (Chemical Sciences) with exit policy

Component wise distribution

Main Curriculum Components	Sub Components	Approved Credits for 5 year BSMS	Approved Credits Range	Proposed credits for 5 year BSMS by Department	Proposed Credits Range	Approved Credits for 4 year BSMS exit	Approved Credits Range	Proposed credits for 4 year BSMS exit by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	**5**	**52**	5	52-58	**5**	**52**
	HSSEC	6		**6**		6		**6**	
	MC	3		**3**		3		**3**	
	BSC	12-20		**16**		12-20		**16**	
	ESC	8-20		**11**		8-20		**11**	
	DSE	4		**4**		4		**4**	
	ESSC	3		**3**		3		**3**	
	TM	4		**4**		4		**4**	
Program Core Course	CCCC	52-62	127-133	**59**	**128**	40-48	87-91	**50**	**91**
	AI/ML	2		**2**		2		**2**	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		**4**		4		**4**	
	Technical Communication	2		**2**		2		**2**	
	BTP/Entrepreneurship/ Project-based internship/PEC	16		**16**		6-10		**6**	
	PEC	32-40		**39**		22-26		**21**	
	TEB	6-8		**6**		6-8		**6**	
	OEC	9-12	9-12	**9-12**	**9-12**	9-12	9-12	**9-12**	**9-12**
	CORE	2	2	**2**	**2**	2	2	**2**	**2**
	Total	**190-200**		**191-194**		**150-160**		**154-157**	
	MSC/DHC	**18/20**		**18/20**		**18/20**		**18/20**	
	Grand Total			**209-211**				**172-177**	

DEPARTMENT OF CHEMISTRY
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
5 Years BSMS (Chemical Sciences)

Program Code : 321 - **BS-MS (Chemical Sciences)**
Department : CY - **Chemistry**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	23	46
2	23/24	23/24	46/48
3	24/25	19	43/45
4	18	22	40
5	6	10	16
Grand Total			**191/194**
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		**209/214**

-205-

22 JUN 2023

	Components	Maximum	Minimum	Comments
	Discipline (DIS)	20	10	To be evaluated by DoSW
Non-Credit Elements (NCE)	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	32	10	1 week internship= 1 unit (To be coordinated by departments/centres/school)
	Participation in professional development programs by Industry experts/ field experts (PPD -1, PPD-2 & PPD-3)	12	6	To be coordinated by departments/centres/school (2^{nd}, 3^{rd} and 4^{th} Years)
Minimum non-credit to be earned: 30				

22 JUN 2023

DEPARTMENT OF CHEMISTRY
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
4 Years BSMS (Chemical Sciences) Exit

Program Code : **321 - BS-MS (Chemical Sciences)**
Department : **CY - Chemistry**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	23	46
2	23/24	23/24	46/48
3	24/25	19	43/44
4	13	6	19
Grand Total			**154/157**
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		**172-177**

-207-

22 JUN 2023

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	16	8	To be evaluated by DoSW
	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	24	8	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	8	4	To be coordinated by the departments/Centres/school (2nd& 3rd Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF CHEMISTRY

Program Code : **321 BS-MS (Chemical Sciences)**
Department : **CY Chemistry**
Year : **I**

S. No.	Sub. Code	Course Title	Sub. Area	Credits	Teaching Scheme: L	T	P	Contact Hours/Week: Theory	Practical	Exam. Duration	CWS	PRS	MTE	ETE	PRE
(Autumn)															
1.	HSI-101	Soft Skills-I	HSSC	3	2	0	2	2	0		10-25	25	15-25	30-40	-
2.	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0		20-35	0	20-30	40-50	0
3.	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0		15-30	20	15-25	30-40	0
4.	CYC-101	Computer Programming	PCC	4	3	0	2	3	0		10-25	25	15-25	30-40	0
5.	TMI-101	Tinkering & Mentoring	TM	4 T-2	-	-	-	-	-		70	30	-	-	-
				M-2	2	0	0	2	-		50	-	-	50	-
6.	CHE-101	Energy Engineering	ESC	4	3	1	0	3	0		20-35	0	20-30	40-50	0
		Total		**23**											
(Spring)															
1.	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0		20-35	-	20-30	40-50	-
2.	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0		20-35	0	20-30	40-50	0
3.	ESS-103	Environmental Science and Sustainable	ESSC	3	3	0	0	3	0		20-35	0	20-30	40-50	0
4.	PHB-103	Modern Physics	BSC	4	3	1	0	3	0		20-35	0	20-30	40-50	0
5.	CYC-102	Organic Chemistry-I	PCC	3	3	0	0	3	0		20-35	0	20-30	40-50	0
6.	BEE-102	Introduction to Computational Biology	ESC	4	3	1	0	3	0		20-35	0	20-30	40-50	0
7.	BEE-105	Introduction to Biophotonics	ESC	3	3	0	0	3	0		20-35	0	20-30	40-50	0
		Total		**23**											

DEPARTMENT OF CHEMISTRY

Program Code : 321 **BS-MS (Chemical Sciences)**
Department : CY **Chemistry**
Year : II

S. No.	Sub. Code	Course Title	Sub. Area	Credits	Contact Hours/Week L	T	P	Exam. Duration Theory	Practical	Relative Weight (%) CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	HSSEC-I	HSS Elective Course	HSSEC	3										
2.	OEC-I	Open Elective Course	OEC	3/4										
3.	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CYC-201	Thermodynamics and Electrochemistry	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
5.	CYC-203	Main Group and Cluster Chemistry	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
6.	CYC-205	Organic Chemistry-II	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	0
7.	CYC-207	Quantum Chemistry and Chemical Bonding	PCC	4	3	1	0	3	0	20-35	0	20-30	40-50	0
		Total		**23/24**										
(Spring)														
1.	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	OEC-II	Open Elective Course	OEC	3/4										
3.	CYC-202	Coordination and Organometallic Chemistry	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	0
4.	CYC-204	Chemical Kinetics and Catalysis	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	0
5.	CYC-206	Organic Chemistry-III	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
6.	CYC-208	Molecular Symmetry, Group Theory and Spectroscopy	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
7.	CYC-291	Technical Communication	PCC	2	2	0	0	2	0	20-35	0	20-30	40-50	0
		Total		**23/24**										

-210-

22 JUN 2023

DEPARTMENT OF CHEMISTRY

Program Code : **321** **BS-MS (Chemical Sciences)**
Department : **CY** **Chemistry**
Year : **III**

S. No.	Sub. Code	Course Title	Sub. Area	Credits	Contact Hours/Week L	T	P	Exam. Duration Theory	Practical	Relative Weight (%) CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	HSSEC-II	HSS Elective Course	HSSEC	3										
2.	OEC-III	Open Elective Course	OEC	3/4										
3.	CYC-351	Artificial Intelligence in Chemistry	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
4.	CYC-301	Advanced Coordination Chemistry	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5.	CYC-303	Physical Laboratory	PCC	4	0	0	8	0	4	-	50	-	-	50
6.	CYC-305	Inorganic Laboratory	PCC	4	0	0	8	0	4	-	50	-	-	50
7.	CYT-I	Talent Enhancement-I	TEB	3	1	0	4	2	4	10-15	15-25	10-15	15-25	40-50
8.	CYC-399	Community Outreach	CORE	2	0	0	4	0	4	100				
		Total		**24/25**										
(Spring)														
1.	CYC-302	Organic Laboratory	PCC	4	0	0	8	0	4	-	50	-	-	50
2.	CYT-II	Talent Enhancement-II	TEB	3	0	0	6	0	4	-	50	-	-	50
3.	CYL-I	Program Elective Course-I	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	CYL-II	Program Elective Course-II	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5.	CYL-III	Program Elective Course-III	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6.	CYL-IV	Program Elective Course-IV	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
7.	MSC/DHC-I	Minor Specialization Course-I/Departmental Honours Course-I	MSC/DHC	3/4										
		Total		**19/ 22-23**										

Note: Students willing to exit with BS Degree in Chemical Sciences must inform to Dean (Academic Affairs) after completion of 6th semester

-211-

22 JUN 2021

DEPARTMENT OF CHEMISTRY

Program Code : **321 BS-MS (Chemical Sciences)**
Department : **CY Chemistry**
Year : **IV**

S. No.	Sub. Code	Course Title	Sub. Area	Credits	Contact Hours/Week L	T	P	Exam. Duration Theory	Practical	Relative Weight (%) CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	CYC-401	Advanced Surface and Colloidal Chemistry	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
2.	CYL-V	Program Elective Course-V	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
3.	CYL-VI	Program Elective Course-VI	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CYL-VII	Program Elective Course-VII	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
5.	CYL-VIII	Program Elective Course-VIII	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
6.	CYL-IX	Program Elective Course-IX	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
7.	MSC/DHC-II	Minor Specialization Course-II/Departmental Honours Course-II	MSC/DHC	3/4										
		Total		**18/ 21-22**										
(Spring)														
1.	CYC-400	Lab based Project	PCC	4	0	0	8	0	0	0	50	0	0	50
2.	CYC-402	Advanced Molecular Spectroscopy	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
3.	CYC-404	Heterocyclic Chemistry	PCC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CYL-X	Program Elective Course-X	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
5.	CYL-XI	Program Elective Course-XI	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
6.	CYL-XII	Program Elective Course-XII	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
7.	CYL-XIII	Program Elective Course-XIII	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
8.	MSC/DHC - III	Minor Specialization Course-III/ Departmental Honours Course-III	MSC/DHC	3/4										
		Total		**22/ 25-26**										

DEPARTMENT OF CHEMISTRY

Program Code : **321 BS-MS (Chemical Sciences)**
Department : **CY Chemistry**
Year : **V**

S. No.	Sub. Code	Course Title	Sub. Area	Credits	Contact Hours/Week L	T	P	Exam. Duration Theory	Practical	Relative Weight (%) CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	CYP-501	Thesis Stage I	PCC	6	0	0	12	0	0	0	0	0	100	0
2.	MSC/DHC - IV	Minor Specialization Course-IV/ Departmental Honours Course-IV	MSC/DHC	3/4										
3.	MSC/DHC - V	Minor Specialization Course - V / Departmental Honours Course - V	MSC/DHC	3/4										
		Total		**6/12-14**										
(Spring)														
1.	CYP-502	Thesis Stage II	PCC	10	0	0	20	0	0	0	0	0	100	0
		Total		**10**										

-213-

22 JUN 2023

DEPARTMENT OF CHEMISTRY

Program Code : **321** **BS-MS Exit Program (Chemical Sciences)**
Department : **CY** **Chemistry**
Year : **IV**

S. No.	Sub. Code	Course Title	Sub. Area	Credits	Teaching Scheme: L	T	P	Contact Hours/Week: Theory	Practical	Exam. Duration	CWS	PRS	MTE	ETE	PRE
(Autumn)															
1.	CYL-V	Program Elective Course-V	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0	
2.	CYL-VI	Program Elective Course-VI	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0	
3.	CYL-VII	Program Elective Course-VII	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0	
4.	CYC-400	Lab based Project/Industry Oriented Problem	PCC	4	0	0	8	0	0	0	50	0	0	50	
5.	MSC/DHC - II	Minor Specialization Course - II / Departmental Honours Course - II	MSC/DHC	3/4											
6.	MSC/DHC - III	Minor Specialization Course-III / Departmental Honours Course-III	MSC/DHC	3/4											
		Total		**13/ 19-21**											
(Spring)															
1.	CYP-400	Project	PCC	6	0	0	12	0	0	0	0	0	100	0	
2.	MSC/DHC - IV	Minor Specialization Course-IV/ Departmental Honours Course-IV	MSC/DHC	3/4											
3.	MSC/DHC - V	Minor Specialization Course-V/ Departmental Honours Course-V	MSC/DHC	3/4											
		Total		**6/ 12-14**											

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam. Duration		Relative Weight (%)				
S. No.	Sub Code	Course Title	Sub. Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1.	CYL-302	Bioinorganic and Biomimetic Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
2.	CYL-306	Analytical Methods in Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
3.	CYL-308	Chemistry of Industrial Processes	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
4.	CYL-310	Polymer Chemistry	PEC	3	2	0	2	3	0	10-25	25	15-25	30-40	0
5.	CYL-312	Programming in Quantum Chemistry	PEC	3	2	0	2	3	0	10-25	25	15-25	30-40	0
6.	CYL-314	Machine Learning in Catalysis	PEC	3	2	0	2	3	0	10-25	25	15-25	30-40	0
7.	CYL-512	Nuclear and Radiochemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
8.	CYL-518	Structure, Bonding and Properties of Solids	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
9.	CYL-520	Inorganic Rings and Polymers	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
10.	CYL-522	Synthesis and Properties of Materials	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
11.	CYL-524	Modern Organic Synthetic Methods	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
12.	CYL-526	Solid State Chemistry and Applications	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
13.	CYL-606	Total Synthesis	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
14.	CYL-607	Electroanalytical Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
15.	CYL-609	Inorganic Biochemistry and Reaction Mechanism	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
16.	CYL-610	Molecular Modelling and Simulations	PEC	3	2	0	2	2	0	10-25	25	15-25	30-40	0
17.	CYL-612	Carbon Nanomaterials and their Applications	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
18.	CYL-613	Frontiers in Inorganic Biochemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
19.	CYL-614	Asymmetric Synthesis	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0

20.	CYL-615	Crystal and Molecular Structure	PEC	3	2	0	2	2	0	10-25	25	15-25	30-40	0
21.	CYL-617	Supramolecular Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
22.	CYL-621	Organic Structure Determination	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
23.	CYL-623	Organic Semiconductors	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
24.	CYL-625	Proteins and Polypeptides	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
25.	CYL-627	Solid State Chemistry and Applications	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
26.	CYL-629	Advanced Topics in Statistical Mechanics, and Quantum Chemistry	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
27.	CYL-633	Nanoscale Materials: Properties and Applications	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
28.	CYL-635	Advanced Magnetic Resonance Spectroscopy	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
29.	CYL-638	Reactivity, Structure Determination, Devices and Electronic Structure of Solids	PEC	3	2	0	2	3	0	10-25	25	15-25	30-40	0
30.	CYL-640	Organic Materials	PEC	3	2	0	2	3	0	10-25	25	15-25	30-40	0
31.	CYL-642	Computational Methods in Material Science	PEC	3	2	0	2	3	0	10-25	25	15-25	30-40	0
32.	CYL-644	High Energy Density Materials	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
33.	CYL-646	Fluorescence and Ultrafast Spectroscopy	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0
34.	CYL-648	Synthesis and Applications of Tetrapyrroles	PEC	3	3	0	0	3	0	20-35	0	20-30	40-50	0

List of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	C W S	P R S	MTE	E T E	P R E
TEB-A: Mathematical Methods and Computational Chemistry														
1	CYT-101	Mathematical Methods in Chemistry	TEB	3	1	0	4	2	4	10-15	15-25	10-15	15-25	40-50
2	CYT-102	Computational Chemistry	TEB	3	0	0	6	-	-	-	50	-	-	50
TEB-B: Materials Chemistry														
1	CYT-103	Synthesis and Characterization of Functional Materials-I	TEB	3	1	0	4	2	4	10-15	15-25	10-15	15-25	40-50
2	CYT-104	Synthesis and Characterization of Functional Materials-II	TEB	3	0	0	6	-	-	-	50	-	-	50
TEB-C: Characterization Techniques														
1	CYT-105	Techniques for Analyzing (Inorganic) Molecules and Materials	TEB	3	1	0	4	2	4	10-15	15-25	10-15	15-25	40-50
2	CYT-106	Advanced Techniques for Analyzing (Inorganic) Molecules and Materials	TEB	3	0	0	6	-	-	-	50	-	-	50
TEB-D: Drug Designing														
1	CYT-107	Drug Design and Synthesis-I	TEB	3	1	0	4	2	4	10-15	15-25	10-15	15-25	40-50
2	CYT-108	Drug Design and Synthesis-II	TEB	3	0	0	6	-	-	-	50	-	-	50

Minor Specialization Courses

SN	Course Code	Course Name	Credits	Semester
1.	CYC-102	Organic Chemistry-I	3	Spring
2.	CYC-202	Coordination and Organometallic Chemistry	4	Spring
3.	CYC-203	Main Group and Cluster Chemistry	3	Autumn
4.	CYC-204	Chemical Kinetics and Catalysis	3	Spring
5.	CYC-206	Organic Chemistry-III	3	Spring
6.	CYC-207	Quantum Chemistry and Chemical Bonding	4	Autumn
7.	CYC-208	Molecular Symmetry, Group Theory and Spectroscopy	3	Spring

Departmental Honours Courses (20 credits)

SN	Course Code	Course Name	Credits
1.	CYL-608	Chemical Biology	3
2.	CYL-703	Advanced Material Characterization Techniques	4
3.	CYL-902	Advanced Inorganic Chemistry	3
4.	CYL-903	Advanced Organic Chemistry	3
5.	CYL-904	Advanced Physical Chemistry	3
6.	CYL-905	Spectroscopic Methods of Structural Elucidation	4

17-DEPARTMENT OF MATHEMATICS

5 year BSMS (Mathematics and Computing) with exit policy

Component wise distribution

Main Curriculum Components	Sub Components	Approved Credits for 5 year BSMS	Approved Credits Range	Proposed credits for 5 year BSMS by Department	Proposed Credits Range	Approved Credits for 4 year BSMS exit	Approved Credits Range	Proposed credits for 4 year BSMS exit by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	**5**	**53**	5	45-65	**5**	**53**
	HSSEC	6		**6**		6		**6**	
	MC	3		**3**		3		**3**	
	BSC	12-20		**20**		12-20		**20**	
	ESC	8-20		**8**		8-20		**8**	
	DSC	4		**4**		4		**4**	
	ESSC	3		**3**		3		**3**	
	TM	4		**4**		4		**4**	
Program Core Course	CCCC	52-62	127-133	**56**	**128**	40-48	82-100	**44**	**92**
	AI/ML	2		**2**		2		**2**	
	Engg. Analysis and design (design thinking-based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		**4**		4		**4**	
	Technical Communication	2		**2**		2		**2**	
	BTP/Entrepreneurship/ Project-based internship/PEC/ Thesis	16		**16**		6-10		**8**	
	PEC	32-40		**40**		22-26		**24**	
	TEB	6-8		**8**		6-8		**8**	
	OEC	9-12	9-12	**9-12**	**9-12**	9-12	9-12	**9-12**	**9-12**
	CORE	2	2	**2**	**2**	2	2	**2**	**2**
	Total	**190-200**		**192-195**		**138-179**		**156-159**	
	MSC/DHC	**18/20**		**18-20**		**18-20**		**18-20**	
	Grand Total			**210-215**		156-199		**174-179**	

DEPARTMENT OF MATHEMATICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
5 year BSMS (Mathematics and Computing) with exit policy

Program Code : **323 - BS-MS (Mathematics and Computing)**
Department : **MA – Mathematics**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	**23**	**21**	**44**
2	**23/24**	**19/20**	**42/44**
3	**19/20**	**19**	**38/39**
4	**20**	**20**	**40**
5	**18**	**10**	**28**
Grand Total			**192-195**
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		**210-215**

	Components	Maximum	Minimum	Comments
	Discipline (DIS)	20	10	To be evaluated by DoSW
Non-Credit Elements (NCE)	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	32	10	1 week internship= 1 unit (To be coordinated by departments/centres/school)
	Participation in professional development programs by Industry experts/ field experts (PPD -1, PPD-2 & PPD-3)	12	6	To be coordinated by departments/centres/school (2^{nd}, 3^{rd} and 4^{th} Years)
Minimum non-credit to be earned: 30				

22 JUN 2023

DEPARTMENT OF MATHEMATICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
4 year BSMS (Mathematics and Computing) with exit policy

Program Code : **323 - BS-MS (Mathematics and Computing)**
Department : **MA – Mathematics**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	21	44
2	23/24	19/20	42/44
3	19/20	19	38/39
4	16	16	32
Grand Total			156-159
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		174-179

22 JUN 2023

	Components	Maximum Units	Minimum Units	Comments
Non-Credit Elements (NCE)	Discipline (DIS)	16	8	To be evaluated by DoSW
	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	24	8	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	8	4	To be coordinated by the departments/Centres/school (2nd& 3rd Years)
Minimum non-credit units to be earned: 24				

DEPARTMENT OF MATHEMATICS

Program Code : **323 - BS-MS (Mathematics and Computing)**
Department : **MA – Mathematics**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2.	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4.	MAC-101	Computer Programming	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
5.	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6.	CSE-101	Data Structures and Algorithms	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**23**										
(Spring)														
1.	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2.	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	ESS-102	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	MAC-102	Discrete Mathematics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MAC-104	Elementary Real Analysis	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	MAC-106	Database Management Systems	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		**21**										

22 JUN 2023

DEPARTMENT OF MATHEMATICS

Program Code : **323 - BS-MS (Mathematics and Computing)**
Department : **MA – Mathematics**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	DAI-102	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	OEC-I	Open Elective Course-I	OEC	3/4										
3.	MAB-104	Mathematical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MAB-103	Numerical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MAC-201	Operations Research	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	MAC-203	Stochastic Calculus	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
			Total	**23/24**										
(Spring)														
1.	HSSEC-I	HSS Elective Course-I	HSSEC	3										
2.	OEC-II	Open Elective Course-II	OEC	3/4										
3.	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	CSE-102	Introduction to Automata Theory	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MAC-202	Complex Analysis	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	MAC-291	Technical Communication	PCC	2	2	0	0	3	0	100				
			Total	**19/20**										

DEPARTMENT OF MATHEMATICS

Program Code : **323 - BS-MS (Mathematics and Computing)**
Department : **MA – Mathematics**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	OEC-III	Open Elective Course-III	OEC	3/4										
2.	MAC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
3.	MAC-301	Basic Abstract Algebra	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MAL-I	Program Elective Course-I	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MAT-I	Talent Enhancement-I	TEB	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	MAC-399	Community Outreach	CORE	2	2	0	0	3		100				
			Total	**19-20**										
(Spring)														
1.	HSSEC-II	HSS Elective Course-II	HSSEC	3										
2.	MAC-302	Theory of Differential Equations	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	MAL-II	Program Elective Course-II	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MAT-II	Talent Enhancement-II	TEB	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MAC-300	Lab/Industry Based Project	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	MSC-I	Minor Specialization Course-I	MSC	3/4										
			Total	**19/ 22-23**										

Note: Students willing to exit with BS Degree in Mathematics and Computing must inform to Dean (Academic Affairs) after completion of 6th semester

DEPARTMENT OF MATHEMATICS

Program Code : **323 - BS-MS (Mathematics and Computing)**
Department : **MA – Mathematics**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	MAC-401	Abstract Algebra	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	MAC-403	Linear Algebra	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	MAC-405	Real Analysis	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MAL-III	Program Elective Course-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MAL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	MSC-II	Minor Specialization Course-II	MSC	3/4										-
7.	MSC-III	Minor Specialization Course-IV	MSC	3/4										-
			Total	**20/ 26-28**										
(Spring)														
1.	MAC-402	Topology	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	MAC-404	Functional Analysis	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	MAL-V	Program Elective Course-V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MAL-VI	Program Elective Course-VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MAL-VII	Program Elective Course-VII	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6.	MSC-IV	Minor Specialization Course-IV	MSC	3/4										-
7.	MSC-V	Minor Specialization Course-V	MSC	3/4										-
			Total	**20/ 26-28**										

DEPARTMENT OF MATHEMATICS

Program Code : **323 - BS-MS (Mathematics and Computing)**
Department : **MA – Mathematics**
Year : **V**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	MSP-501	Thesis Stage-I	PCC	6	0	0	0	0	0	-	-	30	70	-
2.	MAL-VIII	Program Elective Course-VIII	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	MAL-IX	Program Elective Course-IX	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MAL-X	Program Elective Course-X	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
Total				**18**										
(Spring)														
1.	MSP-502	Thesis Stage-II	PCC	10	0	0	0	0	0	-	-	30	70	-
Total				**10**										

DEPARTMENT OF MATHEMATICS

Program Code : **323 - BS-MS Exit Program (Mathematics and Computing)**
Department : **MA – Mathematics**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
(Autumn)														
1.	MAC-401	Linear Algebra	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2.	MAC-403	Real and Functional Analysis	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	MAL-III	Program Elective Course-III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MAL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MSC-II	Minor Specialization Course-II	MSC	3/4										
6.	MSC-III	Minor Specialization Course-III	MSC	3/4										
			Total	**16/ 22-24**										
(Spring)														
1.	MAP-400/ MAL	BTP/Project-Internship/ Entrepreneurship/ PEC*	PCC/ PEC*	8						100				
2.	MAL-V	Program Elective Course-V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3.	MAL-VI	Program Elective Course-VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	MSC-IV	Minor Specialization Course-V	MSC	3/4	3	0/1								-
5.	MSC-V	Minor Specialization Course-VI	MSC	3/4	3	0/1								-
			Total	**16/ 22-24**										

List of Program Elective Courses

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	MAL-411	Analytic Number Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	MAL-412	Combinatorial Mathematics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	MAL-413	Credit Risk Modeling	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	MAL-4xx	Design and Analysis of Algorithms	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	MAL-414	Differential Geometry	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
6	MAL-416	Graph Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
7	MAL-417	Mathematical Image Processing	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
8	MAL-4xx	Mathematical Modeling and Simulation	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
9	MAL-4xx	Number Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
10	MAL-4xx	Statistical Machine Learning	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
11	MAL-511	Abstract Harmonic Analysis	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
12	MAL-512	Advanced Complex Analysis	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
13	MAL-513	Advanced Matrix Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
14	MAL-514	Advanced Numerical Analysis	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
15	MAL-515	Advanced Operations Research	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
16	MAL-516	Advanced Partial Differential Equations	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
17	MAL-517	Algebraic Number Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
18	MAL-518	Algebraic Topology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
19	MAL-519	Approximation Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
20	MAL-520	Coding Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
21	MAL-521	Commutative Algebra	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
22	MAL-522	Computational Fluid Dynamics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
23	MAL-523	Control Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
24	MAL-524	Dynamical Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

25	MAL-5xx	Fluid Dynamics	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
26	MAL-xxx	Fourier Analysis and Applications	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
27	MA-527	Fuzzy Sets and Fuzzy Systems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
28	MAL-528	Hyperbolic Conservation Laws	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
29	MAL-529	Integral Equations and Calculus of Variations	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
30	MAL-531	Mathematical Biology	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
31	MAL-532	Mathematical Cryptography	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
32	MAL-533	Measure Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
33	MAL-534	Multivariate Techniques	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
34	MAL-535	Numerical Linear Algebra	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
35	MAL-536	Operator Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
36	MAL-537	Optimal Control Theory	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
37	MAL-538	Orthogonal Polynomials and Special Functions	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
38	MAL-539	Portfolio Optimization	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
39	MAL-540	Regularization Theory for Inverse Problems	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
40	MAL-541	Representation Theory of Finite Groups	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
41	MAL-542	Semigroup Theory and Applications	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
42	MAL-543	Sobolev Spaces and Applications	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
43	MAL-544	Statistical Inference	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
44	MAL-545	Stochastic Differential Equations	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
45	MAL-546	Stochastic Partial Differential Equations	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
46	MAL-547	Wavelet Analysis	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-

List of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	CWS	PRS	MTE	ETE	PRE
TEB-I (Optimization)														
1	MAT-101	Numerical Optimization	TEB	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	MAT-102	Non linear Programming	TEB	4	3	1	0	3	0	20-35	-	20-30	40-50	-
TEB-II (Numerical Analysis)														
1	MAT-103	Numerical Analysis	TEB	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	MAT-104	Finite Element Methods	TEB	4	3	1	0	3	0	20-35	-	20-30	40-50	-
TEB-III (Financial Mathematics)														
1	MAT-105	Financial Mathematics	TEB	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	MAT-106	Financial Risk Management	TEB	4	3	1	0	3	0	20-35	-	20-30	40-50	-

Minor Specialisation Courses (20 credits)

Students of other departments can take any 5 courses from the following.

Sub. Code	Course Title	Credits	Prerequisite	Semester
MAC-102	Discrete Mathematics	4		Spring
MAC-104	Elementary Real Analysis	4		Spring
MAB-104	Mathematical Methods*	4		Autumn
MAB-103	Numerical Methods*	4		Autumn
MAC-201	Operations Research	4		Autumn
MAC-202	Complex Analysis	4	MAC-104	Spring
MAC-301	Basic Abstract Algebra	4		Autumn
MAC-302	Theory of Differential Equations	4	MAB-201	Spring
MAC-403	Linear Algebra	4		Autumn
MAC-405	Real Analysis	4	MAC-104	Autumn

*Not allowed if already studied in the BSC category

18-DEPARTMENT OF PHYSICS

5 year BSMS (Physics) with exit policy

Component wise distribution

Main Curriculum Components	Sub Components	Approved Credits for 5 year BSMS	Approved Credits Range	Proposed credits for 5 year BSMS by Department	Proposed Credits Range	Approved Credits for 4 year BSMS exit	Approved Credits Range	Proposed credits for 4 year BSMS exit by Department	Proposed Credits Range
Institute Core Course	HSSC	5	52-58	5	53	5	45-65	5	53
	HSSEC	6		6		6		6	
	MC	3		3		3		3	
	BSC	12-20		16		12-20		16	
	ESC	8-20		12		8-20		12	
	DSC	4		4		4		4	
	ESSC	3		3		3		3	
	TM	4		4		4		4	
Program Core Course	CCCC	52-62	127-133	51	126	40-48	82-100	51	90
	AI/ML	2		2		2		2	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		4		4		4	
	Technical Communication	2		2		2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	16		16		6-10		6	
	PEC	32-40		45		22-26		19	
	TEB	6-8		6		6-8		6	
	OEC	9-12	9-12	9-12	9-12	9-12	9-12	9-12	9-12
	CORE	2	2	2	2	2	2	2	2
	Total	190-200		190-193		138-179		154-157	
	MSC/DHC	18/20		18/20		18/20		18/20	
	Grand Total			208-213		156-199		172-177	

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
5 Years BSMS (Physics)

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	21	44
2	22/23	19/20	41/43
3	23/24	20	43/44
4	20	14	34
5	16	12	28
Grand Total			190/193
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		208/213

22 JUN 2023

	Components	Maximum	Minimum	Comments
	Discipline (DIS)	20	10	To be evaluated by DoSW
Non-Credit Elements (NCE)	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	32	10	1 week internship= 1 unit (To be coordinated by departments/centres/school)
	Participation in professional development programs by Industry experts/ field experts (PPD -1, PPD-2 & PPD-3)	12	6	To be coordinated by departments/centres/school (2^{nd}, 3^{rd} and 4^{th} Years)
Minimum non-credit to be earned: 30				

22 JUN 2023

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
4 Years BSMS (Physics) Exit

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	21	44
2	22/23	19/20	41/43
3	23/24	20	43/44
4	20	6	26
Grand Total			**154-157**
Total with Minor Specialization Courses	**with additional 18-20 credits (mentioned in the parentheses)**		**172-177**

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	Discipline (DIS)	16	8	To be evaluated by DoSW
	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	24	8	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	8	4	To be coordinated by the departments/Centres/school (2^{nd}& 3^{rd} Years)
Minimum non-credit units to be earned: 24				

22 JUN 2023

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	HSI-101	Soft skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2.	MAI-101	Mathematics - I	BSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3.	PHI-101	Physics - I	BSC	4	3	1	2/2	3	-	15-30	20	15-25	30-40	-
4.	PHC-101	Computer Programming	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
5.	TMI-101	Tinkering and Mentoring	TMI	4 T-2	-	-	-	-	-	70	30	-	-	-
				M-2	2	0	0	2	-	50	-	-	50	-
6.	ECE-101	Fundamentals of Electronics	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
		TOTAL		**23**										
Spring Semester														
1.	HSI-102	Indian Knowledge System	HSSC	2	2	0	0	2	-	20-35	-	20-30	40-50	-
2.	MAI-102	Mathematics - II	BSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
3.	ESS-102	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	CSE-101	Data Structure and Algorithm	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	PHC-102	Mechanics and Relativity	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
6.	PHC-112	Atomic and Nuclear Physics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
7.	PHC-114	Physics Lab – I	PCC	2	0	0	4	-	4	-	50	-	-	50
		TOTAL		**21**										

22 JUN 2021

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	HSSEC-I	HSS Elective Course-I	HSSEC	3										
2.	OEC-I	Open Elective Course-I	OEC	3/4										
3.	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
4.	ECE-103	Digital Electronics	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	MAB-104	Mathematical Methods	BSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6.	PHC-203	Thermal & Statistical Physics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
7.	PHC-207	Physics Lab – II	PCC	2	0	0	4	-	4	-	50	-	-	50
		TOTAL		**22/23**										
Spring Semester														
1.	DAI-101	Data Science	DSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
2.	OEC-II	Open Elective Course-II	OEC	3/4										
3.	PHC-204	Quantum Mechanics - I	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4.	PHC-214	Optics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
5.	PHC-202	Mathematical Physics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
6.	PHC-212	Physics Lab – III	PCC	2	0	0	4	-	4	-	50	-	-	50
		TOTAL		**19/20**										

22 JUN 2023

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	HSSEC-II	HSS Elective Course	HSSEC	3										
2.	OEC-III	Open Elective Course-III	OEC	3/4										
3.	PHC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
4.	PHC-311	Classical Electrodynamics	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	PHC-313	Classical Mechanics	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6.	PHC-315	Physics Lab –IV	PCC	2	0	0	4	-	4	-	50	-	-	50
7.	PHC-399	Community Outreach	CORE	2						100				
8.	PHL-I	Program Elective Course-I	PEC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
		Total		**23/24**										
Spring Semester														
1.	PHC-302	Condensed Matter Physics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
2.	PHC-391	Technical Communication	PCC	2	0	0	4	0	-	-	50	-	-	50
3.	PHC-314	Statistical Mechanics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
4.	PHC-316	Quantum Mechanics – II	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
5.	PHC-318	Physics Lab – V	PCC	3	0	0	6	-	3	-	50	-	-	50
6.	PHL-II	Program Elective Course-II	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
7.	PHT-I	Talent Enhancement-I	TEB	2	0	1	3	-	-	100				
8.	MSC/DHC -I	Minor Specialization Course-I/Departmental Honours Course-I	MSC/DHC	3/4										
		Total		**20/ 23-24**										

Note: Students willing to exit with BS Degree in Physics must inform to Dean (Academic Affairs) after completion of 6th semester

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	PHC-400	Engg. Analysis and Design/Lab Based Project/Practical Problems	PCC	4	-	-	-	0	0	20-35	-	20-40	60-80	0
2.	PHT-II	Talent Enhancement-II	TEB	4	1	1	3	-	-	100				
3.	PHL-III	Program Elective Course-III	PEC	4	3	0	0	3	-	20-35	-	20-30	40-50	-
4.	PHL-IV	Program Elective Course-IV	PEC	4	3	0	0	3	-	20-35	-	20-30	40-50	-
5.	PHL-V	Program Elective Course-V	PEC	4	3	0	0	3	-	20-35	-	20-30	40-50	-
6.	MSC/DHC -II	Minor Specialization Course-II/Departmental Honours Course-II	MSC/ DHC	3/4										
		Total		**20/23-24**										
Spring Semester														
1.	PHL-VI	Program Elective Course-VI	PEC	3	3	0	-	3	-	20-35	-	20-30	40-50	-
2.	PHL-VII	Program Elective Course-VII	PEC	3	3	0	-	3	-	20-35	-	20-30	40-50	-
3.	PHC-402	Advanced Mathematical Physics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	PHC-404	Semiconductor Devices	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MSC/DHC -III	Minor Specialization Course-III/Departmental Honours Course-III	MSC/ DHC	3/4										
		Total		**14/17-18**										

*Project only for 8 and above CGPA.

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **V**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	PHL-VIII	Program Elective Course-VIII	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
2.	PHL-IX	Program Elective Course-IX	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
3.	PHL-X	Program Elective Course-X	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
4.	PHP-501	Thesis stage - I	PCC	4	-	-	-	-	-	-	-	30	70	0
5.	MSC/DHC-IV	Minor Specialization Course-IV/Departmental Honours Course-IV	MSC/DHC	3/4										
		Total		**16/19-20**										
Spring Semester														
1.	PHP-502	Thesis stage - II	PCC	12	-	-	-	-	-	-	-	30	70	0
2.	MSC/DHC-V	Minor Specialization Course-IV/Departmental Honours Course-IV	MSC/DHC	3/4										
		Total		**12/15-16**										

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **324 -BS-MS (Physics) with Exit Policy**
Department : **PH – Physics**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	PHC-400	Engg. Analysis and Design/Lab Based Project/Practical Problems	PCC	4	-	-	-	0	0	20-35	-	20-40	60-80	0
2.	PHT-II	Talent Enhancement-II	TEB	4	1	1	3	-	-	100				
3.	PHL-III	Program Elective Course-III	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4.	PHL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	PHL-V	Program Elective Course-V	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6.	MSC/DHC-II	Minor Specialization Course-II/Departmental Honours Course-II	MSC/DHC	3/4										
7.	MSC/DHC-III	Minor Specialization Course-III/Departmental Honours Course-III	MSC/DHC	3/4										
		Total		**20/26-28**										
Spring Semester														
1.	PHP-400/ PHL	Project/Internship Based Project/Entrepreneurship/PEC*	PCC /PEC*	6						100				
2.	MSC/DHC-IV	Minor Specialization Course-IV/Departmental Honours Course-IV	MSC/DHC	3/4										
3.	MSC/DHC-V	Minor Specialization Course-IV/Departmental Honours Course-IV	MSC/DHC	3/4										
		Total		**6/12-14**										

*Project only for 8 and above CGPA.

List of Program Elective Courses

PECs (Programme Elective Courses) in 3rd year:

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1.	PHC-301	Atomic and Molecular Spectroscopy	PEC	3	3	0	-	3	-	20-35	-	20-30	40-50	-
2.	PHC-303	Signals and systems	PEC	3	3	0	-	3	-	20-35	-	20-30	40-50	-
3.	PHC-304	Nuclear Physics & Applications	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	PHC-306	Microprocessor and microcontroller	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5.	PHC-308	Quantum Electronics and Devices	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6.	PHL-306	Accelerator Physics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
7.	PHL-307	Essential Mathematics for AI	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
8.	PHC-308	Computer Architecture for AI	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
9.	PHL-309	Machine Learning	PEC	3	3	1	0	3	0	20-35	-	20-30	40-50	-
10.	PHL-310	Money, Banking and Financial Markets	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
11.	PHL-311	Nuclear Instrumentation	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
12.	PHL-312	Numerical Techniques, including FEM, FDM, FDTD, FIM	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
13.	PHL-313	Solar Energy Materials and Devices	PEC											

PECs (Programme Elective Courses) in 4th and 5th years:

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1	PHL-501	Nuclear Astrophysics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
2	PHL-502	Physics of Nanosystems	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
3	PHL-503	Superfluidity and Superconductivity	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
4	PHL-504	Fiber and Nonlinear Optics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
5	PHL-505	Quantum Optics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
6	PHL-506	Advanced Quantum Computing	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
7	PHL-507	Advanced topics in Mathematical Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
8	PHL-508	Introduction to Superstring Theory	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
9	PHL-509	Advanced Electroceramics Technology	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
10	PHL-510	Advanced Characterization Techniques	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
11	PHL-511	Atomic and Molecular Collision Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
12	PHL-512	A Primer in Quantum Field Theory	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
13	PHL-513	Astrophysics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
14	PHL-514	Solar-Terrestrial Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
15	PHL-515	General Relativity	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
16	PHL-516	Computational Nuclear Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
17	PHL-517	Particle Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
18	PHL-518	Advanced Atomic and Molecular Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
19	PHL-520	Quantum Theory of Solids	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
20	PHL-521	Weather Forecasting	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
21	PHL-522	Nuclear Instrumentation	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
22	PHL-523	Physics and Technology of Thin Films	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
23	PHL-524	Advanced Nuclear reactions	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
24	PHL-525	Semiconductor Photonics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
25	PHL-526	Advanced Light Sources	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
26	PHL-527	Superconducting Radio Frequency for particle accelerators	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-

List of Talent Enhancement Course

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	C W S	PRS	MTE	E T E	P R E
(TEB-I)														
1	PHT-101	Experimental Techniques in Quantum Materials	TEB	2	0	1	3	-	-	100				
2	PHT-102	Ad. Experimental Techniques in Quantum Materials	TEB	4	1	1	3	-	-	100				
(TEB-II)														
1	PHT-103	Experimental Techniques in Laser Physics	TEB	2	0	1	3	-	-	100				
2	PHT-104	Ad. Experimental Techniques in Photonics	TEB	4	1	1	3	-	-	100				
(TEB-III)														
1	PHT-105	Experimental Techniques in Gamma Spectroscopy	TEB	2	0	1	3	-	-	100				
2	PHT-106	Experimental Techniques in Charged Particle Spectroscopy	TEB	4	1	1	3	-	-	100				
(TEB-IV)														
1	PHT-107	Methods and Experiments in Atmospheric and Space Physics	TEB	2	0	1	3	-	-	100				
2	PHT-108	Ad. Experimental Techniques in Atmospheric and Space Physics	TEB	4	1	1	3	-	-	100				
(TEB-V)														

1	PHT-109	Principles of Electroceramic Processing & Fabrication	TEB	2	0	1	3	-	-	100
2	PHT-110	Advanced Techniques of Electroceramic Characterization	TEB	4	1	1	3	-	-	100
(TEB-VI)										
1	PHT-111	Theoretical & Computational Techniques	TEB	2	0	1	3	-	-	100
2	PHT-112	Ad. Computational Techniques	TEB	4	1	1	3	-	-	100

22 JUN 2023

Minor Specialisation Courses

S.No.	Code	Course title	Semester	Credits
1	PHC-102	Mechanics and Relativity	Spring	3
2	PHC-206	Applied Optics	Spring	4
3	PHC-311	Classical Electrodynamics	Autumn	4
4	PHC-313	Classical Mechanics	Autumn	4
5	PHC-204	Quantum Mechanics - I	Spring	4
6	PHC-316	Quantum Mechanics - II	Spring	3
7	PHC-302	Condensed Matter Physics	Spring	3
8	PHC-308	Quantum Electronics and Devices	Spring	3