

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	
	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

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

		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	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										

DEPARTMENT OF EARTH SCIENCES

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 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										

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 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										

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 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											

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 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-101	Hydrogeological Systems	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-							
2	EST-102	Groundwater Management	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-							
TEB-B (Geomodelling)																					
3	EST-103	Computational Geophysics	TEB	4	3	0	2	3	0	10-25	25	15-25	30-40	-							
4	EST-104	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-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-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