MINOR CURRICULA

This Document contains the Senate Approved Minor Curricula for various disciplines. For the exact subject numbers please refer to the UG curriculum available on the Institute Web Site/ERP.

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REQUIREMENT FOR MINOR IN AEROSPACE ENGINEERING

Following courses need to be taken to earn a Minor in Aerospace Engineering

Sl. No.	Subject No.	Subject Name	Semester	Prerequisite	L-T-P	Credit
1.	AE21001	Introduction to Aerodynamics	3rd	None	3-1-0	4
2.	AE21002	Low Speed Aerodynamics	4th	AE21001	3-1-0	4
3.	AE29002	Aerodynamics Laboratory - I	4th	AE21001	0-0-3	2
4.	AE21004	Introduction to Aerospace Structures	4th	None	3-1-0	4
5.	AE29004	Structures Laboratory - I	4th	None	0-0-3	2
6.	AE31001	Thermodynamics & Aerospace Propulsion Systems	5th	None	3-1-0	4
7.	AE31007	Mechanics of Flight	5th	AE21001	3-1-0	4
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REQUIREMENT FOR MINOR IN AGRICULTURAL AND FOOD ENGINEERING

Subject Number	Subject Name	Semester	Pre-requisite	L-T-P	Credit
	Core Subjects				
AG31003	Land and Water Resources Engineering	5th	None	3-1-0	4
AG31005	Principles of Food Engineering	5th	None	3-1-0	4
AG30002	Tractor and Power Systems	6th	None	3-0-0	3
	Laboratory Subjects (any two)				
AG39003	Land and Water Resources Engineering Lab	5th	None	0-0-3	2
AG39005	Food Engineering Lab	5th	None	0-0-3	2
AG39002	Tractor and Power Systems Lab	6th	None	0-0-3	2
	Elective I (any one)				
AG20001	Crop Production Technology	3rd	None	3-0-0	3
AG20002	Soil Technology	4th	None	3-0-0	3
AG40007	Agricultural Biotechnology	7th	None	3-0-0	3
	Elective – II (any one)				
AG40001	Mechanism and Dynamics of Machinery	7th	None	3-0-0	3
AG40003	GIS Principles and Applications	7th	None	3-0-0	3
AG40005	Mechanical Operations in Food Processing	7th	None	3-0-0	3
	Elective – III (any one)				
AG40009	CAD and Simulation of Agricultural Machinery	7th	AG40001	3-0-0	3
AG40011	Tube wells and Pumps	7th	None	3-0-0	3
AG40015	Thermal Operations in Food Processing	7th	None	3-0-0	3

Minor requirement in Biotechnology and Biochemical engineering

(six theory subjects and one lab).

Total Credit – 23

Number	Subject	L-T-P	Credit
BT 20001	Biochemistry	3-1-0	4
BT20003	Microbiology	3-0-0	3
BT29003	Microbiology Lab	0-0-3	2
BT20005	Biochemical Reaction Engineering and Bioenergetics	3-1-0	4
BT41013	Bioreactor analysis and design (Elective)	3-0-0	3
BT20002	Cell and Molecular Biology	3-1-0	4
BT40016	Downstream Processing (elective)	3-0-0	3
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Requirements for Minor in Civil Engineering

The requirement of Minor is 22-28 credits (5-6 subjects with 1 or 2 Labs)

Compulsory Subjects:

#	Course Code	Number	Name	L	T	P	Credit	Semester
1	M1		Transportation Engg.	4	0	0	4	3
2	M2		Structural Analysis	3	1	0	4	4
3	M3		Water Resources Engg.	3	0	0	3	4
4	M4		Water & W. water Engg.*	3	0	0	3	5
5	M5		Soil Mechanics	3	0	0	3	5
6	M6		Transportation Lab / WRE Lab / Soil Mechs Lab	0	0	3	2	3
7	M7		Concrete Lab**	0	0	3	2	5
8			Total	16	1	0	21	

*** In case of any conflict, students may opt for Environmental Engg. From Elective-3 group.**
**** Those who have done this as depth will take Two Labs out of three from M6**

ANY ONE of the following courses:

#	Course Code	Number	Name	L	T	P	Credit	Semester
1	M8		R. C. Design#	3	1	0	4	5
2	M8		Steel Design	3	0	0	3	6
3	M8		Str. Dyn. & Eq. Engg.	3	0	0	3	7
4	M8		One from Elective-2	3	0	0	3	6

 # Those who have not taken this subject as Depth, for them this is compulsory.

Minimum credit requirement is: 24

Requirements for Earning a *Minor in* Chemical Engineering

The following three theory and one laboratory courses are **compulsory** for earning a **Minor in Chemical Engineering**.

1. Mass Transfer I (CH30005) **3-1-0 4 credits**
2. Reaction Engineering (CH30009) **3-1-0 4 credits**
3. Transport Phenomena (CH30012) **3-1-0 4 credits**
4. Mass Transfer Laboratory (CH39018) **0-0-3 2 Credits**

Any three of the following courses are to be taken for completing the **Minor** requirements.

Sub. No.	Subject Name	Semes-ter	Pre-requisite	L-T-P	Credits
CH20001	Fluid Mechanics	3	None	3-1-0	4
CH20002	Heat Transfer	4	None	3-1-0	4
CH20004	Chemical Engg. Thermodynamics	4	None	3-1-0	4
CH30007	Mechanical Operations	5	None	3-1-0	4
CH30010	Mass Transfer II	6	CH30005	3-1-0	4
CH30011	Instrumentation and Process Control	5	Maths III, Maths IV & CH20001	3-1-0	4
CH30016	Computer Aided Process Engineering	6	Maths III, Maths IV & CH30005	3-0-0	3
CH40001	Biochemical Engineering	7	CH30009, CH30012	3-0-0	3

REQUIREMENT FOR MINOR IN COMPUTER SCIENCE AND ENGINEERING

Important Instructions:

1. A total of 6 courses must be taken.
2. The courses marked with * are compulsory.
3. If a course comes with a lab component, that component has to be cleared separately.
4. Either Course 2a or Course 2b has to be taken — both cannot be used for fulfilling the core requirement of the minor program.
5. For Electives I, II and III, CSE Department electives of B.Tech/M.Tech level may be chosen.

Sl No	Subject Number	Subject Name	Semester	Prerequisites	L-T-P	Credit
1*	**CS21003**	**Algorithms I ##**	**3rd**	**PDS + Lab**	**3-1-0**	**3**
	CS29003	**Algorithms Laboratory**			**0-0-3**	**2**
2a*	**CS21002**	**Switching Circuits and Logic Design**	**4th**	**None**	**3-1-0**	**4**
	CS29002	**Switching Circuits and Logic Design Laboratory**			**0-0-3**	**2**
2b*	**EC31003**	**Digital Electronic Circuits**	**4th**	**None**	**3-0-0**	**3**
	EC39003	**Digital Electronic Circuits Laboratory**			**0-0-3**	**2**
3*	**CS31702**	**Computer Architecture and Operating Systems**	**6th**	2a or 2b	**4-0-0**	**4**
4		**Elective - I**	**Autumn**	**As approved by Senate**		
5		**Elective - II**	**Autumn**			
6		**Elective - III**	Spring			

MA21007—Design and Analysis of Algorithms offered by Mathematics Department can be taken in lieu of theory course CS21003- Algorithms I (Approved in 316 Senate).
The lab component must be CS29003.

REQUIREMENTS FOR MINOR
IN
ELECTRONICS & ELECTRICAL COMMUNICATION ENGINEERING

Core Requirements:

Subject Number	Subject Name	Semester	Pre-requisite	L-T-P	Credits
EC21002	Analog Electronic Circuits	Spring	EC21001 Or EC21003	3-1-0	4
EC29002	Analog Circuits Laboratory	Spring	Same as above	0-0-3	2
EC31003	Digital Electronic Circuits	Autumn	EC21002	3-1-0	4
EC39003	Digital Circuits Laboratory	Autumn	Same as above	0-0-3	2

Choice of any four:

Subject Number	Subject Name	Semester	Pre-requisite	L-T-P	Credits
EC21005	Network Theory	Autumn	Nil	3-1-0	4
EC21007	Semiconductor Devices	Autumn	Nil	3-1-0	4
EC21006	Electromagnetic Engineering	Spring	Nil	3-1-0	4
EC30001	Analog Communication	Autumn	EC21002	3-0-0	3
EC31002	Digital Communication	Spring	EC31003	3-1-0	4
EE	Control Systems Engineering	Autumn	EC21004 or EE (Signals & Networks)	3-0-0	3
EC31004	VLSI Engineering	Spring	EC21007, EC21002, EC31003	3-0-0	3
EC31005	RF & Microwave Engineering	Autumn	EC21006	3-1-0	4
EC31006	Microcontrollers and Embedded Systems	Spring	EC31003	3-0-0	3
EC31008 OR EE	Digital Signal Processing Digital Signal Processing	Spring Autumn	EC21004 Or EE (Signals & Networks)	3-1-0 3-1-0	4 4

Minor in Electrical Engineering - Option 1

Sl.	Group	Subject Code	Name of Subject	L	T	P	C
1.	I	EE21002	Electrical Machines	3	1	0	4
2.	I	EE29002	Electrical Machines Lab	0	0	3	2
3.	I	EE33006	Power Electronics	3	0	0	3
4.	I	EE39006	Power Electronics Lab	0	0	3	2
5.	I	EE33001	Power Systems				
6.	II	EE33008	Control System Engineering	3	1	0	4
7.	II	EE30014	Utilization of Electric Power	3	0	0	3
8.	II	EE30010	Advanced Electrical Machines	3	0	0	3
9.	II	EE40010	Advanced Power System	3	0	0	3
10.	II	EE30012	Electromagnetic Theory & Application	3	0	0	3
11.	II	EG43001	Non-conventional Electrical Power Generation	3	0	0	3
12.	II	EE23001	Signals and Networks	3	1	0	4
13.	II	IE23002	Measurements & Electronic Instruments	3	1	0	4

Minor in Electrical Engineering - Option 2

Sl.	Group	Subject Code	Name of Subject	L	T	P	C
1.	I	EE23001	Signals and Networks	3	1	0	4
2.	I	EE29001	Signals and Networks Lab	0	0	3	2
3.	I	IE23002	Measurements & Electronic Instruments	3	1	0	4
4.	I	IE29002	Measurements & Electronic Instruments Lab	0	0	3	2
5.	I	EE33008	Control Systems Engineering	3	1	0	4
6.	II	EE40013	Digital Signal Processing	3	0	0	3
7.	II	EE40016	Dynamics of Physical System	3	0	0	3
8.	II	EE40016	Industrial Automation & Control	3	1	0	4
9.	II	PG18607	Control Theory	3	1	0	4
10.	II	PG18609	Estimation of Signals & Systems	3	1	0	4
11.	II	IE40011	Intelligent Control	3	0	0	3
12.	II	EE23002	Electrical Machines	3	1	0	4
13.	II	EE33001	Power Systems	3	1	0	4

Take all subjects from Group I and any three from Group II

Requirements for Minor in Instrumentation Engineering:

Part I (Compulsory)

Sl. No.	Subject No.	*Subject Name*	L-T-P
1	EE21001	Signals and Networks	3-1-0
2	EE29001	Signals and Networks Laboratory	0-0-3
3	IE20002	Measurements and Electronic Instruments	3-0-0
4	IE29002	Measurements and Electronic Instruments Laboratory	0-0-3
5	EE41001	Industrial Instrumentation	3-0-0

Part II (Any three among the followings)

Sl. No.	Subject No.	*Subject Name*	L-T-P
1	IE40001	Biomedical Instrumentation	3-0-0
2	IE40002	Optoelectronics	3-0-0
3	EE40013	Digital Signal processing	3-1-0
4	EE31001	Control Systems Engineering	3-1-0
5	EE30004	Embedded Systems	3-0-0
6	IE40005	Advanced Sensing Techniques	3-0-0
7	IE30004	Data Communication	3-0-0
8	EE60062	Digital Image Processing	3-0-0
9	IE40003	Intelligent Control	3-0-0
10	EE40016	Industrial Automation and Control	3-1-0

DEPARTMENT OF INDUSTRIAL ENGINEERING AND MANAGEMENT

B.TECH (HONS) CURRICULUM
MINOR IN INDUSTRIAL ENGINEERING
S.K.SOM Committee (2008)

Pre-requisite, six theory subject and one laboratory subject need be taken as listed:

PRE-REQUISITE

SL	Sub. No.	Subject Name	L-T-P	C	Prerequisite
1.		Probability and Statistics			

COMPULSORY SUBJECTS (TOTAL THREE)

ODD SEMESTER					
SL	**Sub. No.**	**Subject Name**	**L-T-P**	**C**	**Prerequisite**
1.		Operations Research-I	3-1-0	4	None
2.		Operations Research –II	3-1-0	4	OR-I
EVEN SEMESTER					
3.		Production Planning and Control	3-1-0	4	OR-I

COMPULSORY LABORATORY

1.		**Operations Research Laboratory**	0-0-3	2	OR-I

ELECTIVE SUBJECTS (ANY THREE)

SL	Sub. No.	Subject Name	L-T-P	C	Prerequisite
1.		Work System Design	3-0-0	3	
2.		Production Design and Process Planning	3-1-0	4	OR-I
3.		Engineering Economy, Costing & Accounting	3-1-0	4	None
4.		Quality Design and Control	3-1-0	4	OR-I
5.		Simulation	3-0-0	3	OR-I
6.		Logistics and Supply Chain Management	3-1-0	4	OR-I
7.		Quality Engineering	3-1-0	4	QDC
8.		Management of Inventory Systems	3-0-0	3	PPC
9.		Management and Productivity	3-0-0	3	PPC

Minor Requirements in Mechanical Engineering

Six subjects and one lab are to be chosen from the following three groups to earn a minor in Mechanical Engineering with at least one subject from each group.

- Total Credit Requirement – Minimum 25

Number	Subject	L-T-P	CREDIT
	GROUP A		
ME30703	*Casting Forming & Welding*	**3-1-0**	**4**
ME30704	**Machine Tool & Machining**	**3-1-0**	**4**
ME39703	*Casting Forming & Welding Lab*	**0-0-3**	**2**
	GROUP B		
ME20701	Fluid Mechanics	**3-1-0**	**4**
ME20702	Thermodynamics	**3-1-0**	**4**
ME30705	**Heat Transfer**	**3-1-0**	**4**
ME30702	**Applied Thermo-Fluids – I**	**3-1-0**	**4**
ME40701	Applied Thermo-Fluids – II	**3-1-0**	**4**
ME39702	Thermo-Fluids Lab – 1	**0-0-3**	**2**
ME49701	Thermo-Fluids Lab – 2	**0-0-3**	**2**
	GROUP C		
ME20703	**Dynamics**	**3-1-0**	**4**
ME20704	**Kinematics of Machines**	**3-0-0**	**3**
ME30701	Mechanics of Solids	**3-1-0**	**4**
ME30708	**Dynamics of Machines**	**3-1-0**	**4**
ME30706	***Design of Machine Elements***	**3-1-0**	**4**
ME40703	*Systems & Controls*	**3-1-0**	**4**
ME39701	*Mechanics of Solids Lab*	**0-0-3**	**2**
ME30706	*Machine Design Practice*	**0-0-3**	**2**

Minor Requirements in Mechanical Engineering
for Students of Manufacturing Science and Engineering

Any three subjects from Group – A, any three subjects from Group - B and one lab from Group – C are to be chosen to earn a minor in Mechanical Engineering

- Total Credit Requirement – Minimum 23

Number	Subject	L-T-P	CREDIT
	GROUP A		
ME20706	**Thermo-Fluid Science**	3-1-0	4
ME30708	Dynamics of Machines	3-1-0	4
ME30702	Applied Thermo-Fluids – I	3-1-0	4
ME40701	**Applied Thermo-Fluids – II**	3-1-0	4
	GROUP B		
ME41701	**Design Optimisation**	3-0-0	3
ME60110	**Mechanical Drives**	3-1-0	4
ME41705	**Soft Computing**	3-0-0	3
ME41707	Vibration and Noise Control	3-0-0	3
ME41719	Simulation of Mechanical Systems	**3-0-0**	3
ME41711	**Air Conditioning**	**3-0-0**	3
ME60138	CFD in Manufacturing Processes	3-1-0	4
ME41718	Micro-scale fluid flow and heat transfer	**3-0-0**	3
ME41714	Turbo Machinery	**3-0-0**	3
ME41706	**Finite Element Methods in Engineering**	**3-0-0**	3
ME60102	Fluid Drive and Control	**3-1-0**	4
ME41704	Modern Control Theory	**3-0-0**	3
	GROUP C		
	Thermo-Fluids Lab – 1	0-0-3	2
	Thermo-Fluids Lab – 2	0-0-3	2

Minor Requirement in Manufacturing Science and Engineering

for students of Mechanical Engineering

- All the subjects from Group A
- Two subjects from Group B
- Lab from Group C
- Total Credit Requirement – Minimum 23

	Subject	L-T-P	CREDIT
	GROUP A		
MF30702	Robots and Computer-Controlled Machines	3-1-0	4
MF30704	Non-Traditional Manufacturing	3-0-0	3
MF40701	***Computer Integrated Manufacturing***	3-1-0	4
	OR – I	3-1-0	4
	GROUP B		
ME41709	Metal Forming and Processing of Plastics	**3-0-0**	3
ME41705	**Soft Computing**	**3-0-0**	3
ME41703	**Quality Assurance and Reliability**	**3-0-0**	3
ME41717	Rapid Prototyping	**3-0-0**	3
ME41702	Metal Casting Technology	**3-0-0**	3
ME41708	Laser Applications in Manufacturing	**3-0-0**	3
ME41710	Non-destructive Evaluation and Imaging	**3-0-0**	3
ME41712	Quantity Production Methods	**3-0-0**	3
ME41718	Micro-scale fluid flow and heat transfer	**3-0-0**	3
ME41720	***Welding Technology***	**3-0-0**	3
ME41722	**Engineering Metrology**	**3-0-0**	3
ME60138	CFD in Manufacturing Processes	3-1-0	4
ME41726	Machine Tool Engineering	**3-0-0**	3
ME41728	Technology of Surface Coating	3-0-0	3
	OR-II	3-1-0	4
	GROUP C		
	Non-traditional Manufacturing and CIM Lab	0-0-3	2

Minor Requirement in Metallurgy and Materials Engineering

A) Six subjects (theory) from a set of core + elective subjects
B) 3-9 Hrs of Laboratory
C) Minimum credits to be covered: 18-24

Code	Subject Name	Semester	Pre-requisite	L-T-P	Credits
D2	Metallurgical Thermodynamics and Kinetics	3rd	None	3-1-0	4
L1	Metallurgical Thermodynamics and Kinetics Lab.	3rd	None	0-0-3	2
D3	Introduction to Engineering Materials (not for ME & MF students)	3rd	None	3-1-0	4
L2	Introduction to Engineering Materials Lab.	3rd	None	0-0-3	2
D4	Materials Processing	3rd	None	3-0-0	3
D5	Deformation behavior of Materials	4th	D3/Mat. Engg.	3-1-0	4
D7	Principles of Extractive Metallurgy	5th	D2	3-1-0	4
D8	Phase Transformation & Heat Treatment of Materials	5th	D3/Mat. Engg.	3-1-0	4
D11	Ironmaking & Steelmaking	6th	D7	3-1-0	4
D12	Materials Characterization	6th	None	3-0-0	3
D15	Corrosion & Environmental Degradation of Materials	7th	None	3-0-0	3
	Elective-II (5th minor subject from elective-II)	see list	None	3-0-0	3
	Elective-VI (6th minor subject from elective VI)	See list	None	3-0-0	3

MINOR Requirements in Ocean Engineering and Naval Architecture

All subjects in Group A and any 3 from Group B are requirements for a student to earn MINOR.
Total Credit Requirement: Minimum 22

Group A (Compulsory)

Sl	Sem	D/B	Sub. No.	Name of Subject	L	T	P	C
1	3	D	NA20001	Hydrostatics & Stability	3	1	0	4
2	3	D	NA20005	Marine Construction and Welding	3	0	0	3
3	5	D	NA30007	Resistance & Propulsion	3	1	0	4
4	5	D	NA39003	Hydrodynamics Laboratory	0	0	3	2
Total Cumulative Credit					9	2	3	13

Group B (any three)

Sl	Sem	D/B	Sub. No.	Name of Subject	L	T	P	C
1	3	D	NA20003	Marine Hydrodynamics	3	0	0	3
2	4	D	NA20002	Ship Strength	3	1	0	4
3	5	D	NA30011	Elements of Ocean Engineering	3	1	0	4
4	6	D	NA30004	Marine Design	3	1	0	4
5	6	D	NA30008	CAD-CAM in Mar. Des. & Prod.	3	0	0	3
6	Even	Elective	NA40024	High Perf. Marine Vehicles	3	0	0	3
7	Odd	Elective	NA60006	Coastal Engineering	3	0	0	3
Total Credit : 9 - 12								

MINOR IN ARCHITECTURE

MINIMUM CREDITS REQUIREMENT: 21

SL. NO.	Subject No	Subject Name	Semester	L-T-P	Credit
GROUP A		**Compulsory (9 Cr)**			
1	AR 13205	Graphics and Visual Communication	1st	1-0-3	3
2	AR 12001	Introduction to Architecture	1st	3-0-0	3
3	AR 23206	Computer Aided Design & Simulation	4th	1-0-3	3
GROUP B		**ANY 4 SUBJECTS (12 Cr)**			
1	AR 12002	Building Materials	2nd	3-0-0	3
2	AR 22003	Climatology and Solar Architecture	3rd	3-0-0	3
3	AR 22007	Environmental Studies**	3rd	3-0-0	3
4	AR 23205	Photography, Art & Advanced Visual Communication	3rd	1-0-3	3
5	AR 22004	Water Supply & Sanitation *	4th	3-0-0	3
6	AR 22010	Ergonomics and Product Design (E-1)	4th	3-0-0	3
7	AR 32004	Housing & Community Planning	6th	3-0-0	3
8	AR 42003	Modular Co-ordination (E-2)	7th	3-0-0	3
9	AR 42001	Landscape Design & Site Planning	7th	3-0-0	3
10	AR 52003	Principles of Town Planning & Urban Design	9th	3-0-0	3
11	AR 52008	Facility Planning and Specialised Building Design (E-4)	10th	3-0-0	3

Note: * Cannot be taken by students who have taken Water & Waste Water Engineering (CE 23001)
** Cannot be taken by students who have taken Environmental Engineering (CE 31301)

Requirement for Minor In Geology

For a minor in Geology, a student must take subjects listed against Serial No. 1,2,3, are compulsory. In addition, a student has to take any three from the rest. The pre-requisites for the subjects will be the same as stated previously. (Minimum 24 credits need to be earned for a Minor in Geology).

Sl.	Subject Code	Name of Subject	L	T	P	C
1	GG24001	Introduction to Earth Science	4	0	0	4
	GG24901	Introductory Earth Science Lab	0	0	3	2
2	GG23003	Mineralogy	4	0	0	4
	GG23904	Determinative Mineralogy Lab	0	0	3	2
3	GG24005	Paleontology and Stratigraphy	3	0	0	3
4	GG34003	Mineral Resources	3	0	0	3
	GG34903	Mineral Resources Lab	0	0	3	2
5	GG23004	Petrology	3	0	0	3
6	GG23002	Structural Geology	3	0	0	3
	GG23902	Structural Geology Lab	0	0	3	2
7	EX54001	Remote Sensing	3	0	0	3
	EX54901	Remote Sensing Lab	0	0	3	2
8	GG50014	Environmental Geosciences	3	0	0	3
9	GG50019	Climate and Ocean System	3	0	0	3
10	GG50011	Basin Analysis	3	0	0	3
11		Geochemistry	4	0	0	4
		Geochemistry lab	0	0	3	2

Requirements for Minior In GEOPHYSICS

Any six subjects ***with at least one subject with a Lab*** from the below list can be chosen to earn a ***Minor in Geophysics***. Physics-II, Partial Differential Equations and Transform Calculus remain the prerequisite for all the courses.

Sl.	Subject Code	Name of Subject	L	T	P	C
1	EX20002	Physics of the Solid Earth	3	0	0	3
2	EX30008	Geophysical Signal Processing	3	0	0	3
3	EX44005	Electrical Methods of Prospecting	3	0	0	3
		Electrical Methods of Prospecting Lab	0	0	3	2
4	EX44007	Seismic Methods of Prospecting	3	1	0	4
		Seismic Methods of Prospecting Lab	0	0	3	2
5		Electromagnetic Methods of Prospecting	3	0	0	3
		Electromagnetic Methods of Prospecting Lab	0	0	3	2
6	EX40009	Seismology	3	1	0	4
7	EX34006	Gravity & Magnetic Methods of Prospecting	3	1	0	4
		Gravity & Magnetic Methods of Prospecting Lab	0	0	3	2
8	EX53001	Borehole Geophysics	3	0	0	3
		Borehole Geophysics Lab	0	0	3	2
9	EX43010	Nuclear Geophysics	3	0	0	3
		Nuclear Geophysics Lab	0	0	3	2
10	EX30004	Geophysical Field Theory	3	1	0	4
11	EX50017	Geophysical Inverse Theory	3	0	0	3

REQUIREMENTS FOR MINOR IN ECONOMICS

(Minor in economics can be conferred if a student completes six economics courses including two compulsory subjects from group-A and at least one each from the rest of the groups)

Group - A

Sl. No.	Subject No.	Subject Name	L-T-P	Credit	Prerequisites
1	HS20005	Micro Economics I	3-1-0	4	None
2	HS20007	Macro Economics I	3-1-0	4	None

Group - B

Sl. No.	Subject No.	Subject Name	L-T-P	Credit	Prerequisites
1	HS30079	Public Finance and Policy	3-1-0	4	HS20005/ HS20001
2	HS30081	Economics of Growth	3-1-0	4	(HS20005 & HS20007)/ HS20001
3	HS30082	Monetary Economics	3-1-0	4	HS20007/ HS20001
4	HS40078	International Trade	3-1-0	4	(HS20005 & HS20007)/ HS20001
5	HS50002	General Equilibrium and Welfare Economics	3-1-0	4	HS20006 and HS20008
6	HS20009	Development Economics	3-1-0	4	None

Group C & D

Sl. No.	Subject No.	Subject Name	L-T-P	Credit	Prerequisites
1	HS41002 & HS49002	Econometric Analysis I	3-1-2	5	MA20102
2	HS31083 &HS39083	Economic Appraisal of Projects with Lab	3-0-3	5	HS20001/ HS20005

Group – C& D

Sl. No.	Subject No.	Subject Name	L-T-P	Credit	Prerequisites
1	HS50008	Econometric Analysis II	3-0-2	4	HS41002
2	HS50009	Applied Econometrics	3-0-2	4	HS50008
3	HS50010	Input-Output Economics	3-0-0	3	IM21003
4	HS50019	Economic Modeling	3-0-0	3	HS20006

Group - E

Sl. No.	Subject No.	Subject Name	L-T-P	Credit	Prerequisites
1	HS30072	Environmental Economics	3-0-0	3	HS20001/ HS20005
2	HS30099	Resource Economics and Sustainability	3-0-0	3	HS30072
3	HS50012	Energy Economics	3-0-0	3	HS20005/ HS20001
4	HS50011	Banking Theory and Practice	3-0-0	3	HS30082/ HS30097
5	HS30097	Financial Institutions and Markets	3-0-0	3	None
6	HS40085	Labour Economics	3-0-0	3	None
7	HS40087	Urban Economics	3-0-0	3	None
8	HS20010	Indian Economy	3-0-0	3	None
9	HS30090	Agricultural Economics	3-1-0	4	None
10	HS30095	Comparative Development Perspectives	3-0-0	3	None

Note: In lieu of the two subjects enlisted under group-A, one may take HS20001. However, this would be counted as one subject only. He/she needs to take five more subjects from the rest of the groups (B to E) selecting at least one from each of them.

REQUIREMENTS FOR MINOR IN MATHEMATICS AND COMPUTING

Five theory and two laboratory subjects are to be chosen to earn a minor in Mathematics and Computing with at least one from Group A, at least one from Group B and at least from Group C.

Group A

Subject Number	Subject Name	Semester in which offered	Prerequisite	L-T-P	Credit
	Probability and Statistics	4th		3-0-0	3
	Real Analysis	5th	Mathematics-I	3-1-0	4
	Discrete Mathematics	4th	Mathematics - II	3-1-0	4
	Modern Algebra	6th		3-1-0	4
	Linear Algebra	5th	Mathematics-I	3-1-0	4
	Topology	6th	Real Analysis	3-1-0	4
	Functional Analysis	7th	Real Analysis	3-1-0	4
	Advanced Complex Analysis	8th	Mathematics-I	3-1-0	4

Group B

Subject Number	Subject Name	Semester in which offered	Prerequisite	L-T-P	Credit
	Operations Research	6th		3-0-0	4
	Operations Research Laboratory	6th		0-0-3	2
	Stochastic Process and Simulation	7th	Probability & Statistics / Probability & Stochastic Processes	3-1-0	4
	Advanced Numerical Techniques	6th	Numerical Solns. Of ODE & PDE	3-1-0	4
	Numerical Techniques Laboratory	6th		0-0-3	2
	Fluid Mechanics	7th	Partial Differential Equations	3-1-0	4

Group C

Subject Number	Subject Name	Semester in which offered	Prerequisite	L-T-P	Credit
	Design and Analysis of Algorithms	3rd	Programming & Data Structures	3-1-0	4
	Design and Analysis of Algorithms Laboratory	3rd		0-0-3	2
	Switching and Finite Automata	6th		3-1-0	4
	Object Oriented Programming	5th	Programming & Data Structures	3-0-0	4
	Object Oriented Programming Laboratory	5th		0-0-3	2
	File Organisation and Database Systems	8th	Programming & Data Structures	3-1-0	4
	Theory of Operating Systems	8th	Programming & Data Structures	3-0-0	3
	Operating Systems Laboratory	8th		0-0-3	2
	Graph Theory and Algorithms	9th		3-1-0	4

Requirements for Minor in Physics

Physics Minor

A. Any four from the list below (12-16 credits):

1. Physics II
2. Classical Mechanics I
3. Electrodynamics I
4. Quantum Mechanics I
5. Statistical Physics I
6. Condensed Matter Physics I
7. Nuclear and Particle Physics I

B. Any two Departmental Electives (6-8 credits).

C. Any one lab course worth 4 credits (4 credits)