

**Four Year Degree Course in the Faculty of Engineering & Technology**  
**Course and Examination Scheme with Credit Grade System**  
**III Semester B.E. (Mining Engineering)**

Course Code	Subject	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory						Laboratory			
Theory Courses		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
								Sessional							
					MSE			IE							
MN301	Mining Geology - I	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN302	Introduction to Mining Technology	3	1	0	4	3	80	10	10	100	40	--	--	--	--
MN303	Fluid Mechanics	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN304	Mine Electrical Engineering	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN305	Mechanical Engineering	3	1	0	3	3	80	10	10	100	40	--	--	--	--
<b>Laboratories</b>															
MN306	Mining Geology - I	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN307	Fluid Mechanics	0	0	3	2	--	--	--	--	--	--	25	25	50	25
	Mine Visits	0	0	2	0	<b>Audit Course</b>									
<b>Total</b>		<b>15</b>	<b>5</b>	<b>8</b>	<b>--</b>	<b>--</b>	<b>--</b>			<b>500</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>100</b>	<b>--</b>
<b>Semester Total</b>		<b>28</b>			<b>20</b>	<b>600</b>									

*Note* : Student has to undergo Practical Training at mines for four weeks (one month) duration during winter vacation.

**Four Year Degree Course in the Faculty of Engineering & Technology**  
**Course and Examination Scheme with Credit Grade System**  
**IV Semester B.E. (Mining Engineering)**

Course Code	Subject	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory						Laboratory			
Theory Courses	L	T	P	Duration of Paper (Hrs.)		Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks	
							MSE	IE							
MN401	Mining Geology-II	3	1		0		3	3							80
MN402	Mine Surveying-I	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN403	Mining Machinery-I	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN404	Programming in C Language	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN405	Strength of Material	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN406	Statistical & Numerical Methods	3	1	0	4	3	80	10	10	100	40	--	--	--	--
<b>Laboratories</b>															
MN407	Mining Geology-II	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN408	Mine Surveying-I	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN409	Mining Machinery-I	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN410	Programming in C Language	0	0	3	2	--	--	--	--	--	--	25	25	50	25
	Mine Visits	0	0	2	0	<b>Audit Course</b>									
<b>Total</b>		<b>18</b>	<b>6</b>	<b>14</b>	<b>--</b>	<b>--</b>	<b>--</b>			<b>600</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>200</b>	<b>--</b>
<b>Semester Total</b>		<b>38</b>			<b>27</b>	<b>800</b>									

*Note* : Student has to undergo Practical Training at mines for four weeks (one month) duration during summer vacation.

**Four Year Degree Course in the Faculty of Engineering & Technology**  
**Course and Examination Scheme with Credit Grade System**  
**V Semester B.E. (Mining Engineering)**

Course Code	Subject	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory						Laboratory			
Theory	L	T	P	Duration of Paper (Hrs.)		Max. Marks ESE	Max. Marks		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks	
							Sessional								
					MSE		IE								
MN501	Rock Mechanics	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN502	Mine Climate Engineering	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN503	Drilling & Blasting Engineering	3	1	0	4	3	80	10	10	100	40	--	--	--	--
MN504	Mine Surveying - II	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN505	Mining Machinery - II	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN506	Mine Supports	3	1	0	4	3	80	10	10	100	40	--	--	--	--
<b>Laboratories</b>															
MN507	Rock Mechanics	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN508	Mine Climate Engg	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN509	Mine Surveying - II	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN510	Mining Machinery - II	0	0	3	2	--	--	--	--	--	--	25	25	50	25
	Mine Visits	0	0	2	0	<b>Audit Course</b>									
<b>Total</b>		<b>18</b>	<b>6</b>	<b>14</b>	<b>--</b>	<b>--</b>	<b>--</b>			<b>600</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>200</b>	<b>--</b>
<b>Semester Total</b>		<b>38</b>			<b>28</b>	<b>800</b>									

*Note* : Student has to undergo Practical Training at mines for four weeks (one month) duration during winter vacation.

**Four Year Degree Course in the Faculty of Engineering & Technology**  
**Course and Examination Scheme with Credit Grade System**  
**VI Semester B.E. (Mining Engineering)**

Course Code	Subject	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory						Laboratory			
Theory	L	T	P	Duration of Paper (Hrs.)		Max. Marks ESE	Max. Marks		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks	
							Sessional								
					MSE		IE								
MN601	Mineral Processing	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN602	Mine Rescue Engineering	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN603	Underground Coal Mining	4	0	0	4	3	80	10	10	100	40	--	--	--	--
MN604	Underground Metalliferous Mining	4	0	0	4	3	80	10	10	100	40	--	--	--	--
MN605	Surface Mining	4	0	0	4	3	80	10	10	100	40	--	--	--	--
<b>Laboratories</b>															
MN606	Mineral Processing	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN607	Mine Rescue Engineering	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN608	Vocational Training	0	0	2	2	--	--	--	--	--	--	50	--	50	25
	Mine Visits	0	0	2	0	<b>Audit Course</b>									
<b>Total</b>		<b>18</b>	<b>2</b>	<b>10</b>	<b>--</b>	<b>--</b>	<b>--</b>			<b>500</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>150</b>	<b>--</b>
<b>Semester Total</b>		<b>30</b>			<b>24</b>	<b>650</b>									

*Note* : Student has to undergo Practical Training at mines for four weeks (one month) duration during summer vacation.

**Four Year Degree Course in the Faculty of Engineering & Technology**  
**Course and Examination Scheme with Credit Grade System**  
**VII Semester B.E. (Mining Engineering)**

Course Code	Subject	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory						Laboratory			
Theory		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
					Sessional										
					MSE			IE							
MN701	Ground Control in Mines	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN702	Surface Mine Environment	3	0	0	3	3	80	10	10	100	40	--	--	--	--
MN703	Computer Applications in Mining	3	1	0	3	3	80	10	10	100	40	--	--	--	--
MN704	Mine Planning	3	1	0	4	3	80	10	10	100	40	--	--	--	--
MN705	Mine Systems Engineering	3	1	0	4	3	80	10	10	100	40	--	--	--	--
<b>Laboratories</b>															
MN706	Ground Control in Mines	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN707	Surface Mine Environment	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN708	Computer Applications in Mining	0	0	3	2	--	--	--	--	--	--	25	25	50	25
MN709	Project Seminar	0	0	2	2							50	--	50	25
	Mine Visits	0	0	2	0	<b>Audit Course</b>									
<b>Total</b>		<b>15</b>	<b>4</b>	<b>13</b>	<b>--</b>	<b>--</b>	<b>--</b>			<b>500</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>200</b>	<b>--</b>
<b>Semester Total</b>		<b>32</b>			<b>25</b>	<b>700</b>									

*Note* : Student has to undergo Practical Training at mines for four weeks (one month) duration during winter vacation.

**Four Year Degree Course in the Faculty of Engineering & Technology**  
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**VIII Semester B.E. (Mining Engineering)**

Course Code	Course Title	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory						Laboratory			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
								MSE	IE						
MN801	Mine Management	3	1	0	4	3	80	10	10	100	40	--	--	--	--
MN802	Mine Legislation & Safety	3	1	0	4	3	80	10	10	100	40	--	--	--	--
MN803	Mineral Economics	3	1	0	4	3	80	10	10	100	40	--	--	--	--
MN804	Elective-I: 1. Clean Coal Technologies 2. Geostatistics 3. Advanced Mine Surveying	3	0	0	3	3	80	10	10	100	40	--	--	--	--
MN805	Elective-II 1. Underground Space Technology 2. Mine Safety Engineering 3. Management Information System	3	0	0	3	3	80	10	10	100	40	--	--	--	--
<b>Laboratories</b>															
MN806	Project	0	0	4	4	--	--	--	--	--	--	50	50	100	50
MN807	Vocational Training	0	0	2	2	--	--	--	--	--	--	25	25	50	25
MN808	Survey Camp	0	0	2	2	--	--	--	--	--	--	25	25	50	25
<b>Total</b>		<b>15</b>	<b>3</b>	<b>8</b>	<b>--</b>	<b>--</b>	<b>--</b>			<b>500</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>200</b>	<b>--</b>
<b>Semester Total</b>		<b>26</b>			<b>26</b>	<b>700</b>									

*Note* : Total duration of Practical Training during vacations between third to eighth semester should be atleast two months out of which one month practical training should be completed before sixth semester.

### III Semester B. E. (Mining Engineering)

**Course Code:** MN301  
**Title of the Course:** Mining Geology - I

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Unit	Contents	Hrs.
I	Introduction to Geology, science of geology, its various branches and its application in mining engineering. Internal structure of the earth, continental drift and plate tectonics, earthquake and volcanism Geomorphology, weathering, classification of various geological process, geological work of wind, reverse, underground water and glaciers, erosional and depositional land forms.	9
II	Structural geology – Attitude of strata, dip: true & apparent, strike, Folds: elements, terminology and descriptive morphological and genetic classification. Joints: classification, Faults: elements, terminology, classification, Effects of folds and faulting on outcrop of strata and on mining operation. Unconformity, Problems of dip, thickness and depth of strata.	9
III	Minerology – definition and classification of minerals, General physical properties of minerals, physical properties of following minerals groups, silica, feldspar, pyroxene, & mica minerals.	9
IV	Petrology: Introduction to petrology, rock cycle, rock forming minerals. Igneous petrology: elementary knowledge of magma and its consolidation. Mode of occurrence, textures and structures of igneous rocks. Nomenclature and classification of igneous rocks. Brief description of important igneous rocks.	9
V	Sedimentary and metamorphic petrology: General idea of the formation and classification of sedimentary rocks. Textures and structures of sedimentary rocks. Metamorphic rocks: metamorphism, kinds of metamorphism, textures and structures and classification of metamorphic rocks. Brief description of important sedimentary and metamorphic rocks.	9
<b>Total</b>		<b>45</b>

**Text Books:**

- |                                     |   |                 |
|-------------------------------------|---|-----------------|
| 1. Engineering and General Geology  | : | Parbin Singh    |
| 2. Physical and Engineering Geology | : | S.K. Garg       |
| 3. Rutley's Elements of Minerology  | : | H.H. Read       |
| 4. Principles of Petrology          | : | G.W. Tyrell     |
| 5. Structural Geology               | : | M.P. Billings   |
| 6. Geological Maps                  | : | G.W. Chiplonkar |
| 7. A Text Book of Geology           | : | P.K. Mukherjee  |
| 8. Applied Geology                  | : | S. Banger       |

### III Semester B. E. (Mining Engineering)

**Course Code:** MN302  
**Title of the Course:** Introduction to Mining Technology

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	4	3	10	10	80	100

Unit	Contents	Hrs.
I	<p><b>Introduction to Mining:</b>  Mining contribution to civilization, Main mineral resources of India and world, Occurrences, Distribution and Mining of minerals in India and its contribution to national growth, Mining and its consequences.</p> <p><b>Basic Terminology:</b>  Mine, Mining, Mining Engineering, surface mining, underground mining, mineral, rock, ore, mineral deposit, seam, veins, lode, beds, hanging wall, footwall, shaft, cross cut, drift, adit, level, incline, winze, raise, panel, pillar, gallery, roadway, face, strike and dip, sump, bench, haul road, bench slope, overall pit slope, overburden, waste dump, stripping ratio.</p>	6
II	<p><b>Exploration &amp; Development:</b>  Phases of mining, Prospecting to reclamation, Brief introduction to various methods of prospecting and exploration.</p> <p><b>Mine Opening:</b>  Development of mineral deposits; brief introduction to modes of primary access, choice of mode of entry - adit, shaft, decline, and combined model; their applicability and comparison.</p>	9
III	<p><b>Shaft Sinking:</b>  Location, size, shape, site selection, sinking shaft-preparatory arrangements, drilling and blasting, mucking, hosting, ventilation, pumping, lighting, supporting of sides, complete cycle of operations, special method of sinking to be used in difficult ground conditions, deepening and widening of shafts, modern technique of shaft sinking/boring.</p>	6
IV	<p><b>Exploitation Techniques:</b>  Elementary idea of methods of mining (both surface and underground) for coal and non-coal deposits; cyclic and continuous methods of mining and their comparison.</p> <p>Unit operations in mining; elementary idea about production cycle, drilling, blasting, supporting, loading, hauling and processing as applicable to underground methods of mining. Brief description of Bord and Pillar (development), and Longwall (advancing and retreating) methods of coal mining.</p> <p>Brief description of elements of an opencast mine; ramp, haul roads, benches, production cycle, dumping of overburden and backfilling.</p> <p>Introduction to underground metalliferous stoping methods; brief descriptions of underhand and overhand stoping methods.</p>	12
V	<p><b>Drifting:</b>  Small and medium size tunnelling and drifting; drivage work in varying ground conditions using conventional methods – drilling, blasting, mucking, transportation, supports, services and cycle of operations.</p> <p>Mechanical methods of drivage of roadways and tunnels.</p>	12
<b>Total</b>		45

**Text cum Reference Books:**

1. Introduction to Mining Engineering by H.L. Hartman
2. Coal Mining Methods: S K Das
3. SME Mining Engineer's Handbook: Hustrulid

**III Semester B. E. (Mining Engineering)**

**Course Code: MN303**  
**Title of the Course: Fluid Mechanics**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	80

Unit	Contents	Hrs.
I	Introduction and properties of fluids. Viscosity, laws, factors affecting and its measurements. Pressure and its measurements: absolute, gauge, atmospheric and vacuum pressure, manometers and mechanical gauges.	9
II	Hydrostatic force on surfaces: Total pressure and centre of pressure for plane, inclined and curve submerged surfaces, pressure on lock gates. Fluid kinematics: Types of fluid flows, rate of flow, continuity equation in three dimensions, velocity potential and stream function, free and forced vortex flows.	9
III	Equation of motion, Euler's and Bernoulli's equation and their practical applications. Venturimeter, Orificemeter and pitot tube. Momentum equation and moment of momentum. Flow through orifices: Introduction, classification of orifices, coefficient of contraction, velocity and discharges. Flow through notches: Introduction, classification of notches, rectangular, triangular, trapezoidal notches.	9
IV	Flow through pipes: loss of energy in friction, loss of pressure due to sudden expansion, contraction, bends, entry and exit. Darcy's and Chezy's equation. Hydraulic gradient and total energy line. Flow through pipes connected in series and parallel.	9
V	Mine pumps: Principle of working of reciprocating pumps and turbine pumps. Features of different types of pumps, reciprocating, centrifugal, turbine, mono pump, roto pump, three throw ram pumps, sludge pumps, borehole submersible pumps, air lift pumps, characteristics curves, simple calculations, maintenance of pumps.	9
<b>Total</b>		<b>45</b>

**Text Books:**

1. Fluid Mechanics & Hydraulic Machines by Dr. R.K. Bansal
2. Fluid Mechanics & Machinery by Mody & Seth
3. Fluid Mechanics by R.K. Rajput
4. Hydraulic Machines by R.K. Rajput
5. Fluid Mechanics & Fluid Power Engineering by Dr. D.S. Kumar

### III Semester B. E. (Mining Engineering)

**Course Code:** MN304  
**Title of the Course:** Mine Electrical Engineering

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Unit	Contents	Hrs.
I	<p><b>Mine Power Supply System:</b>            Performance of short transmission lines, radial &amp; ring-main distribution system, sub station arrangements for opencast &amp; underground mines (OC&amp;UG), voltage selection &amp; power distribution in OC&amp;UG mines. Mining cables, their construction, ratings, selection &amp; application, fault detection &amp; cable joint.            Importance &amp; significance of insulation resistance &amp; its testing.</p>	
II	<p><b>Power Economics:</b>            Understanding standard energy bills, importance of parameters therein &amp; calculation of energy charges, types of power tariffs, importance of power factor &amp; its improvement in mines.</p>	
III	<p><b>Electrical Drives and their Control:</b>            Group &amp; individual drive, selection of motors &amp; starters for mining applications like haulage, ventilation fans, pumps, compressors, locomotives, winders.            Introduction to power semiconductor devices, thyristor &amp; its applications, basic principle of operation of thyristor controlled variable speed drive, electrical braking.</p>	
IV	<p><b>Transformers, Switchgears &amp; Electrical Safety in Mine Applications:</b>            Principle of working, construction &amp; applications of mining type transformers &amp; lighting transformer, ratings &amp; their selection, thermal &amp; overload relays, their applications.            Circuit breakers, introduction of working principle, rating calculation &amp; applications of OCB, ACB, &amp; MCCB, gate end boxes, drill panel, field switch, &amp; trans switch.            Equipment earthing practice in mines, principle of flameproof enclosures, intrinsic safety, IE rules as applied to mines.</p>	
V	<p><b>Basic Electronics, Instrumentation &amp; Communication:</b>            Transistor as amplifier in CE, CB &amp; CC modes, bridge rectifiers &amp; filters, working principle of feedback sinusoidal oscillators.            Working principle of electronic voltmeter, digital frequency counter, CRO stroboscope, transducers &amp; sensors used in measurement of strain, flow &amp; displacement.            Different types of communication systems in mines, wired telephone system, fibre optics applications in mines, signalling systems in mines, data transmission systems</p>	
<b>Total</b>		45

#### Text and Reference Book/s:

1. Electrical equipments in mines by H. Cotton
2. A course in Electrical Power By Soni, Gupta and Bhatnagar
3. Electrical power by S L Uppal
4. Principles of Power Systems by V K Mehta
5. Principles of electrical engineering by V K Mehta & Rohit Mehta

6. Electric drives by N K Dey & P K Sen
7. Electric drives by Vedam Subramaniam
8. Electronic Principles by Malvino
9. Integrated Electronics by Millman & Halkias
10. Communication systems by B P Lathi
11. A course in Electrical Engineering By B L Thereja
12. Legislation in Indian Mines: A critical Appraisal by Prasad & Rakesh
13. Underground Mining Methods Handbook, SME, 1982
14. SME Mining Engineers Handbook, SME

### PREREQUISITE

Course on Basic Electrical Engineering, covered during First/Second Semester B.E.

### OBJECTIVES OF THE COURSE is to impart knowledge on

- Electrical power supply system in mines, its distribution, control & fault detection
- Power economics with emphasis on energy conservation
- Electric drives & their solid state control
- Transformers, circuits breakers, relays & safety measures
- Principles of basic electronics, electronic measurements, communication systems in mines.

### III Semester B. E. (Mining Engineering)

**Course Code:** MN305  
**Title of the Course:** Mechanical Engineering

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Unit	Contents	Hrs.
I	Power Transmission: General Principles; Power transmission by belts [flat and V], ropes, chains and gears. Ratio of tension, centrifugal tension, slip and creep in belts [explanation of terms only]. Power transmitted by belts. [When C.F. tension is neglected] and chain drives; power transmitted by gears, type of gears.	9
II	Brakes and Dynamometers: Band brake, block brake, band and block brake, single and multiple disc clutches, transmission and absorption type dynamometers. Bearing and Couplings: Main types of bearings and couplings, anti friction bearings, Lubrication: Laws of friction for dry and lubricated surfaces, methods of lubrication of bearings.	9
III	Thermodynamics: Laws of thermodynamics, concept of entropy, methods of heating and expansion of gases, internal energy, external work done, total heat of gas, change of entropy during different methods, representation on PV and TQ diagram. Air Standard Cycles: Carnot, Otto, Diesel and Joule's cycles. Air Standard efficiencies, and mean effective pressure, representation of PV and TQ diagram.	9
IV	Internal Combustion Engines: Classification based on types of fuel and working cycles, working of four stroke and two-strokes cycles. IC Engines; Their merits and demerits, study of parts of petrol and diesel Engine viz. fuel pump, injector and carburettor, Brief description of ignition system, cooling system, and lubrication system of IC Engines. Study of multi-cylinder engines. PV diagram, testing of IC engines, and thermal efficiencies, simple	9

	problems.	
V	Air Compressors: Reciprocating and Rotary compressors single and multistage compressors, inter cooler, after cooler, receiver clearance volume and volumetric efficiency. Refrigeration and air conditioning: Bale –Coleman refrigerators, vapour compression and absorption refrigerators, psychometric charts, introduction to comfort air-conditioning.	9
<b>Total</b>		45

**Text Books:**

1. Theory of Machines : Phatakkar
2. Thermal Engineering : P. K. Nag
3. Thermal Engineering : Rajput
4. Heat Engine : V. M. Domkundwar
5. Theory of Machines : Khurmi & Gupta
6. I. C. Engines : Ganeshan
7. Refrigeration & Air-conditioning : Khurmi

**Reference Book/s:**

1. Design of machine elements : Bhandari
2. Thermal Engineering : Sengel
3. I. C. Engines : Webster

**III Semester B. E. (Mining Engineering)**

**Course Code: MN306**  
**Title of the Course: Mining Geology- I Laboratory**

Course Scheme					Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
0	0	3	3	2	25	25	50

Sr. No.	Name of the Practical's to be performed
1	Megascope Identification of Rock Forming Minerals.
2	Megascope Identification of Ore Minerals.
3	Megascope Identification of Igneous Rocks In Hand Specimen. A) Igneous Plutonic Rocks B) Igneous Hypobasal Rocks C) Igneous Volcanic Rocks
4	Megascope Identification of Sedimentary Rocks In Hand Specimen.
5	Megascope Identification of Metamorphic Rock In Hand Specimen.
6	Study of Geological Map With Horizontal Beds And Igneous Intrusion.
7	Study of Geological Map With Folded And Inclined Rock Formations.
8	Study of Geological Map With Faulted Rock Formations.
9	Study of Geological Models With Folds, Faults, Unconformity And Igneous Intrusions.

**Reference Book/s:**

1. Engineering and General Geology : Parbin Singh
2. Physical and Engineering Geology : S.K. Garg

- |                                    |   |                 |
|------------------------------------|---|-----------------|
| 3. Rutley's Elements of Minerology | : | H.H. Read       |
| 4. Principles of Petrology         | : | G.W. Tyrell     |
| 5. Structural Geology              | : | M.P. Billings   |
| 6. Geological Maps                 | : | G.W. Chiplonkar |
| 7. A Text Book of Geology          | : | P.K. Mukherjee  |
| 8. Applied Geology                 | : | S. Banger       |

### III Semester B. E. (Mining Engineering)

**Course Code:** MN307  
**Title of the Course:** Fluid Mechanics Laboratory

Course Scheme					Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
0	0	3	3	2	25	25	50

Sr. No.	Name of the Practical's to be performed
1	Determination of metacentric height of floating body.
2	To find out type of flow using Reynold's Apparatus.
3	Determination of coefficient of discharge of an external mouth orifice.
4	To determination the coefficient of discharge through venturimeter.
5	To determine the coefficient of discharge through orifice meter.
6	To determine the coefficient of discharge for rectangular notch.
7	To determine the coefficient of discharge for triangular notch.
8	To verify Bernoulli's Theorem.
9	To determine coefficient of velocity (C <sub>v</sub> ), coefficient of contraction (C <sub>c</sub> ), coefficient of discharge (C <sub>d</sub> ) for a given orifice.
10	To determine impact of jet on vanes.

**Reference Books:**

1. Fluid Mechanics & Hydraulic Machines by Dr. R. K. Bansal
2. Fluid Mechanics & Fluid Power Engineering by Dr. D.S. Kumar

## IV Semester B. E. (Mining Engineering)

**Course Code:** MN401  
**Title of the Course:** Mining Geology-II

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Unit	Contents	Hrs.
I	<b>Stratigraphy:</b> Principles of stratigraphic correlation, stratigraphic units and geological time scale, physiographic and tectonic divisions of India. General review of stratigraphy of India, detailed study including economic potential of Archean, Cuddapah, Vindhyan, Gondwana, Deccan Trap.	9
II	<b>Economic Geology:</b> Economic mineral deposits, Processes of ore genesis; magmatic concentration, hydrothermal, contact metasomatism, residual concentration etc. Synergitic and epigenetic deposits, Controls of ore localization, Metallogenic epochs and provinces. Study of important metallic and non-metallic deposits of India. Introduction to geology and Indian coalfields.	9
III	<b>Prospecting &amp; Exploration:</b> Principles of Prospecting and Exploration, Geophysical methods, electrical, seismic, magnetic and gravity methods of exploration. Geo-chemical methods, dispersion, anomaly, path finder elements, sampling methods. Exploratory drilling, Core logging, Geological characteristics influencing subsidence and rock bursts.	9
IV	<b>Geo-hydrology:</b> hydrologic cycle, vertical zones of sub surface water, water table, aquifers, aquicludes, aquifuges and aquitards, Purchased water table, Confined and unconfined aquifers, influents and effluents, spring. Hydrologic properties of rocks, porosity, permeability, Occurrence of ground water, water table maps and their uses.	9
V	<b>Remote Sensing and Geographical Information System:</b> Introduction to remote sensing technology, Analog and digital data products, remote sensing satellites, application of remote sensing for mining operations. Introduction to GIS and its applications.	9
<b>Total</b>		45

### Text cum Reference Books:

- |                                      |   |                          |
|--------------------------------------|---|--------------------------|
| 1. A Text Book of Geology            | : | P.K. Mukherjee           |
| 2. Principles of Engineering Geology | : | K.M. Bangar              |
| 3. Engineering Geology Manual        | : | B.S. Satyanarayana Swami |
| 4. Principles of Petrology           | : | G.W. Tyrell              |
| 5. Geological Maps                   | : | G.W. Chiplunkar          |
| 6. Physical & Engineering Geology    | : | S.K. Garg                |

## IV Semester B. E. (Mining Engineering)

**Course Code:** MN402  
**Title of the Course:** Mine Surveying-I

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Unit	Contents	Hrs.
I	Surveying: Definition, objective, classification and principles of surveying. Linear measurement : Instruments for measuring distances, ranging and chaining out survey lines, chain surveying- principle, field work, off-sets, booking and plotting, obstacles in chaining, problem solving. Angular measurement: Prismatic compass – principle and construction; bearing of lines; local attraction; magnetic declination.	12
II	Levelling: Definition of levelling terms; levelling instruments; different types of levelling; booking and reduction methods; differential, profile, cross-sectional and reciprocal levelling; underground levelling, shaft depth measurement; temporary and permanent adjustments of levels, problem solving. Contours: Characteristics, methods of contouring and uses of contours.	9
III	Theodolite: Essentials of the transit and modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing, traverse calculations, adjustment of the traverse; computation of co-ordinates; temporary and permanent adjustments. EDM: Principle of measurement; types; corrections; selection of equipment; total station.	9
IV	Tacheometry: Principles and classification of tacheometry, stadia tacheometry; distance and elevation formulae; tacheometric surveying; self reduction tacheometers. Curve setting: Elements, laying of simple circular curves on surface and belowground. Transition curve and super elevation.	9
V	Plane table survey: Introduction, methods of plane table surveying, micro-optic alidade. Field Astronomy: Definition of various astronomical terms, methods for determination of true north of survey line.	6
<b>Total</b>		45

### Text Books:

1. Surveying Volume I, II, III by Dr. B. C. Punmia
2. Surveying Volume I and II by Dr T. P. Kanetkar and S V Kulkarni

### Reference Book:

1. Metalliferous Mine Surveying by Winniberg

## IV Semester B. E. (Mining Engineering)

**Course Code:** MN403  
**Title of the Course:** Mining Machinery-I

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Unit	Contents	Hrs.
I	Pit-Top and Pit-Bottom Circuits: Simple pit-bottom circuits, pit-top circuits, tippers, screening and handling plants, railway sidings. Wire Ropes: Wore ropes of different types and their construction and selection, space factor, fill factor, bending factor and factor of safety. Rope deterioration, estimation of size of rope, rope capping, recapping and rope splicing.	9
II	Rope Haulages: Types of rope haulages, selection, computations, and safety devices, Mine tubs, Mine cars, links, clips and rope capel. Application of rope haulages. Track laying and maintenance. Manriding system in underground mines, Types, construction and safety devices. Locomotives: Different types. Diesel, electric trolley wire, construction and operation, application and maintenance. Locomotive haulage computations, safety devices. Track laying and maintenance.	12
III	Conveyors: Construction and operation of belt, chain and cable belt conveyors. Conveyor computations. High angle conveyors, shiftable conveyors. Aerial Ropeways: Types, construction, application and operation, safety devices.	8
IV	Winding: Drum and friction winding with their variations and limitations, duty cycle, torque time diagrams and computations. Multilevel and deep winding. Drives for winding.	8
V	Head frames; types and fittings. Shaft fittings; signals, guides, Keps, tilting platform, cage receivers, protective roofing. Suspension gear, cages and skips. Safety devices on winders, emergency braking, over speed control, slow banking, depth indicators, automatic contrivances.	8
<b>Total</b>		45

#### Text Books:

1. Mine Winding & Transport : Walker
2. Mine Transport by N. T. Karelin
3. Mine Hoisting : M. A. Ramlu, Oxford & IBH, 1996

#### Reference Books:

1. SME Mining Engineer's Handbook: Hustrulid
2. Underground Mining Methods Handbook: Hustrulid

### IV Semester B. E. (Mining Engineering)

**Course Code:**

**MN404**

**Title of the Course:**

**Programing in C Language**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Unit	Contents	Hrs.
I	Introduction: Algorithms: Definition, Rationale & Desirable Characteristics; Flow charts: different components/symbols, drawing flowcharts as an initial step for programming in C Language – A Brief History; Identifiers and keywords; Data types, their ranges, declaration & initialization; Expressions; Operators: arithmetic, logical, bit-wise, assignment and conditional operators, unary, binary & ternary operators; C Syntax, compiler; IDE; variables & their significance to compiler: writing, editing, compiling & executing a source code in C Control statements: if...else, nested if, while, do...while(), for statements, nested for, switch...case, break, continue, and go to statements.	9
II	Storage types: Automatic, external, register and static variables. Functions: Declaring, defining and accessing/calling, Passing arguments, Calling a Function by Value and by Reference, Recursion, Library functions, User-defined Functions, Static functions. Arrays: Need, Types – Dimension of Arrays, Contiguous Memory Allocation, Bounds Overflow Checking, Passing arrays to a function; Use of arrays for arithmetic operations on matrices.	9
III	Strings: Defining and handling of strings, Operations on strings. Pointers: Declarations, Passing pointers to a function, Operations on pointers, Pointer Arithmetic, Pointers and arrays, Arrays of pointers.	9
IV	Structures: Need and Difference with Arrays, Passing to a function, Arrays of Structures, Arrays within Structures, Unions, type def, Pointer to structure. Preprocessor Directives.	9
V	File structures: Definitions, concept of record, file operations: Storing, creating, retrieving, updating Sequential, relative, indexed and random access modes Elementary Graphics: Drawing a point, line, circle, rectangle, ellipse, outputting text etc. in different colours, sizes & patterns.	9
<b>Total</b>		45

#### **Text and Reference Book/s:**

1. **“Teach Yourself C”** - Herbert Schildt , pub. Tata McGraw Hill
2. **“C : The Complete reference”** - Herbert Schildt, pub. Tata McGraw Hill
3. **“Let Us C”** - Y. Kanetkar, pub. bpb
4. **“C Programming”** - E.Balagurusamy, Tata McGraw Hill

## IV Semester B. E. (Mining Engineering)

**Course Code:** MN405  
**Title of the Course:** Strength of Materials

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Unit	Contents	Hrs.
I	<p>Mechanical Properties: Type of force distribution, concepts of stress and strain, stress-strain behaviour of ductile and brittle material in uniaxial state of stress, Elastic, plastic and strain hardened zones in stress-strain relation, elastic constants, relation between elastic constants, hardness, impact strength, brief description of common testing machines.</p> <p>Uniaxial State of Stress: Uniaxial loading and deformation, simple cases of statistically indeterminate problems under axial loading, temperature change etc. Composite bars in tension and compression, temperature stresses in composite rods.</p> <p>Thin Walled Pressure Vessels: Stress in thin cylinders and thin spherical shells subjected to internal pressure, wire winding of thin cylinders.</p>	9
II	<p>Biaxial State Stress: State of stress in two dimensions, differential equation of equilibrium, transformation of stresses principal stresses, and principal planes, Maximum shear stress, Mohr's circles.</p> <p>Stresses Due to Torsion: Torsion of circular sections assumptions and derivation of relation between torsional moment, shear stress and angle of twist, torsional stress in solid and circular sections. Torsion in thin walled hollow sections, closely coiled helical springs, combined &amp; twisting.</p>	9
III	<p>Axial Force, Shear Force And Bending Moment Diagrams: Concept of free body diagrams, types of load, determinations of axial force, shear force and bending moment at a section, axial force, SF and DM diagrams in beams and simple frames. Differential relation between shear force and bending moment. Relation between load and shear force.</p>	9
IV	<p>Stresses in Beams (Bending and Shear): Bending stresses in simple beams, assumptions and derivation of simple bending theory, relation between bending moment, bending stress and curvature. Homogeneous and composite beams, carriage springs.</p> <p>Cement: Different types, manufacturing and uses; Grouting, Guniting and Shotcreting.</p>	9
V	<p>Deflection of Beams: Derivation of differential equation of moment curvature relation, differential equation relating deflection and moment shear and load deflection of simple beams by integration method.</p> <p>Stability of Columns: Concept of stability derivation of Euler formulae for bars, various conditions, limitations of Euler formula, tangent modulus theory, eccentrically loaded columns and secant formula.</p>	9
<b>Total</b>		45

### Text cum Reference Books:

1. Mechanics Of Solid (Vol-1 & 2) by Dr. H.J. Shaha And S.B. Junarkar
2. Strength Of Material by J.P. Den Hartog
3. Strength Of Material by Spriger
4. Strength Of Material by Shaha And Kurve
5. Strength of Materials by S. Ramamrutham, Publishers Dhanpat Rai & Co., 2008

6. Strength of Materials by R K Rajput, Publishers S Chand & Company, New Delhi
7. Strength of Materials by Dr R K Bansal, Publishers Laxmi.

#### IV Semester B. E. (Mining Engineering)

**Course Code:** MN406  
**Title of the Course:** Statistical & Numerical Methods

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	4	3	10	10	80	100

Unit	Contents	Hrs.
I	Solution of non-linear algebraic and transcendental equations; Newton-Raphson, iterative, false position and bisection methods; generalized Newton's method for multiple roots. Solution of linear simultaneous equations by Gauss elimination, Gauss-Jordan, Grout's triangularization, Jacobi and Gauss-Seidel methods.	9
II	Numerical solution of first order ordinary, differential equations by Picard's, Taylor's, Euler's, modified Euler's, Runge-Kutta and Milne's methods. Solution of simultaneous first order and second order ordinary differential equations by Runge-Kutta and Milne's methods. Solution of boundary value problems by finite difference methods.	9
III	Random variable, distribution function of continuous and discrete random variables, mathematical expectation, generating function; Moments, Skewness and Kurtosis.	9
IV	Binomial, Poisson, normal Distribution, Correlation and regression, Correlation by rank, regression plane	9
V	The forward difference operator $\Delta$ , Factorial polynomial. Methods of expressing only polynomial in factorial polynomial Shift operator E, Missing terms. Newton's forward interpolation formula, Backward difference operator, Newton's backward interpolation formula. Lagrange's interpolation for unequal intervals, Numerical differentiation, Numerical integration, Difference equation.	9
<b>Total</b>		<b>45</b>

**Text and Reference Books:**

1. Engineering Mathematics by C N Tembhekar and P D Shobhane
2. Higher Engineering Mathematics by Dr. B. S. Grewal
3. Numerical methods for scientific and engg computation by M K Jain, Iyengar and R K Jain
4. A Text book of Engineering Mathematics by N P Bali and Manish Goyal

## IV Semester B. E. (Mining Engineering)

**Course Code:** MN407  
**Title of the Course:** Mining Geology-II Laboratory

Course Scheme					Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
0	0	3	3	2	25	25	50

Sr. No.	Name of the Practical's to be performed
1	Megascopic identification of economic minerals.
2	Megascopic identification of fossils.
3	Three points bore hole problem and Thickness of rock formation problem.
4	On the basis of the given well data prepare the water table map of the area. Mark the direction of ground water flow and ground water conditions.
5	Discuss the hydrogeological condition of the area and mark a suitable site for a well.
6	Demarcate the area in which we can get flowing water wells. What type of ground water well will come across the well shown in the figure? Discuss the ground water condition at well site.
7	Location of major coal fields in India and outline map of physiographic division.
8	Location of important metallic and non-metallic mineral deposits on outline map of India.
9	Coal seam problem no. 1 on map. Coal seam problem no. 2 on map.
10	Draw ground water surface contours of 10 m interval, discuss the hydrogeological conditions of the area and give the most suitable site for well.

### Reference Book/s:

1. A Text Book of Geology : P.K. Mukherjee
2. Principles of Engineering Geology : K.M. Bangar
3. Engineering Geology Manual : B.S. Satyanarayana Swami
4. Principles of Petrology : G.W. Tyrell
5. Geological Maps : G.W. Chiplunkar
6. Physical & Engineering Geology : S.K. Garg

## IV Semester B. E. (Mining Engineering)

**Course Code:** MN408  
**Title of the Course:** Mine Surveying- I Laboratory

Course Scheme					Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
0	0	3	3	2	25	25	50

Sr. No.	Name of the Practical's to be performed
1	A) To measure distance between station A and B by direct ranging. B) To measure distance between station A and B by indirect ranging.
2	A) To determine distance between station A and B when vision is free and obstructed. B) To determine distance between station P and R when vision and chaining both obstructed.
3	To observe the magnetic bearing of a close traverse by prismatic compass.
4	Building traversing by prismatic compass.
5	To determine elevation of given points by simple levelling.
6	A) Longitudinal and cross sectional levelling. B) Contouring.
7	Plane table survey by radiation method.
8	Study of theodolite and to measure a horizontal angle by repetition method.
9	To find out multiplying constant (f/i) and additive constant (f + d) of the instrument.
10	To determine reduce level of a given object at higher elevation by measuring vertical angle.

**Reference Book/s:**

1. Surveying Volume I, II, III by Dr. B. C. Punmia
2. Surveying Volume I and II by Dr T. P. Kanetkar and S V Kulkarni

**IV Semester B. E. (Mining Engineering)**

**Course Code:** MN409  
**Title of the Course:** Mining Machinery- I Laboratory

Course Scheme					Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
0	0	3	3	2	25	25	50

Sr. No.	Name of the Practical's to be performed
1	Study of pit-bottom layout.
2	Study of pit-top layout.
3	To study different types of safety devices used on rope haulages.
4	To study cage suspension gear arrangement.
5	Study of aerial ropeway system.
6	To study armoured face chain conveyor.
7	To study torque time diagram for friction winder.
8	To study torque time diagram for drum winder.
9	Study of electrical braking on winder.
10	To study ward Leonard system of speed control.

**Reference Book/s:**

1. Mine Transport by N. T. Karelin
2. Mine Hoisting : M. A. Ramlu, Oxford & IBH, 1996
3. Underground Mining Methods Handbook: Hustrulid

## IV Semester B. E. (Mining Engineering)

**Course Code:** MN410  
**Title of the Course:** Programming in C Language Laboratory

Course Scheme					Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Periods/week	Credits	TW	POE	Total
0	0	3	3	2	25	25	50

Sr. No.	Suggestive List of Practicals
1	Tracing a few typical flow charts for problem-solving
2	Elementary Codes demonstrating basic arithmetic operations.
3	Use of Control Statements: a. if, if...else, nested if b. for, nested for c. while, do...while d. switch...case
4	Codes showing use of one-, two- & three-dimensional arrays
5	Use of pointers & pointer arithmetic
6	Use of string handling functions
7	Structures, arrays of structures & arrays within structures
8	Use of various important pre-processor directives including macros, #define, #include directives
9	Creating, storing & retrieving binary & text files
10	Drawing elementary geometric shapes

### Recommended Books:

1. *“Teach Yourself C”* - Herbert Schildt , pub. Tata McGraw Hill
2. *“C : The Complete reference”* - Herbert Schildt, pub. Tata McGraw Hill
3. *“Let Us C”* - Y. Kanetkar, pub. bpb
4. *“C Programming”* - E.Balagurusamy, Tata McGraw Hill

**Note:** Syllabus for the V to VIII Semester courses shall be prescribed in due course of time.