STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for

IVth Semester Diploma in Mining Engineering
(Effective from Session 2022-23 Batch)

THEORY

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test (CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Mine Surveying- I	2047401	03	03	10	20	70	100	28	40	03
2.	Rock Engineering & Ground Control	2047402	03	03	10	20	70	100	28	40	03
3.	Economics and Field Geology	2047403	03	03	10	20	70	100	28	40	03
4.	Mining Machinery – I	2047404	03	03	10	20	70	100	28	40	03
5.	Environment Studies	2047405	03	03	10	20	70	100	28	40	03
		Total : -	**15**				**350**	**500**			**15**

PRACTICAL

Sl. No.	SUBJECTS	SUBJECT CODE		EXAMINATION SCHEME					
			TEACHING SCHEME	EXAMINATION SCHEME	Practical (ESE)		Total Marks (PA+ESE)	Pass Marks in the Subject	Credits
			Periods per Week	Hours of Exam.	Internal (PA)	External (ESE)			
6.	Mine Surveying Lab.-I	2047406	04 50% physical 50% Virtual	03	15	35	50	20	02
7.	Rock Engineering & Ground Control Lab.	2047407	04 50% physical 50% Virtual	03	15	35	50	20	02
8.	Economics and Field Geology Lab.	2047408	02 50%physical 50% Virtual	03	15	35	50	20	01
		Total : -	**10**				**150**		**05**

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal Examiner (PA)	Marks of External Examiner (ESE)	Total Marks (PA+ESE)	Pass Marks in the Subject	Credits
9.	Geospatial Technology (TW)	2047409	02	07	18	25	10	01
10.	Mini Project and Seminar (TW)	2047410	02	07	18	25	10	01
	Course Under Moocs /Swayam/ Others (TW)	2047411	04	15	35	50	20	02
		Total : -	**08**			**100**		**04**
Total Periods per week Each of duration One Hour :- 33					**Total Marks :-**	**750**		**24**

MINE SURVEYING - I

Subject Code	Theory			No of Period in one session:42			Credits
	No. of Periods Per Week			Full Marks	:	100	03
2047401	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

NOTE: Internal marks will be allotted on the basis of two snap tests and 2 assignment of equal marks to be conducted by the faculty teaching the subject.

RATIONALE:

The important job functions of mine surveyor include the activities of detailed surveying, plotting of survey data and setting out works.

It is therefore essential to give emphasis on the development of skills on using various survey instruments and their application in underground mines for preparation plans & sections of workings. In addition, for providing basic principles of surveying and levelling, it is necessary to arrange appropriate field exercises and small projects.

OBJECTIVES:

Student will be able to

1. Acquire skills of using various survey instruments.
2. Develop skills of preparation of mine plan & section.
3. Understand and apply principles and method of survey to conduct subsidence survey.
4. Carryout and suggest the repairs needed to survey instruments.
5. Understand and apply various statutory provisions of regulation while preparing mineplan & section.

DETAILED CONTENTS:

UNIT	CONTENTS	Hrs
1.	**INTRODUCTION TO SURVEYING** Definition of surveying, objects of surveying, Plane and Geodetic surveying. Classification & Basic principles of surveying. Chain Surveying: Principle of chain surveying. Equipment's in chain surveying, cross staff, optical square its principle and use.Different operations in chain surveying, Ranging: direct & reciprocal ranging. Line ranger structure, principle of working and its use. Chaining: Chaining on flat & slopping ground, obstacle in chaining (No numerical). Errors in changing. Offsetting.	10
2.	**COMPASS SURVEYING** The Prismatic & Surveyors compass, their Comparison. Bearing of a line: Definitions: True & Magnetic Meridian; True and Magnetic bearings, Fore & Back bearings, Declination. Whole circle bearing system & Quadrantal Bearing system. Conversion of bearings from one system to other. Calculation of angles from bearings. Calculation of bearings from angles. Local attraction: Sources, detection & its elimination. Magnetic Dip & Magnetic declination. Calculation of True bearings. Traversing with compass: Closed and open traverse; Plotting a compass traverse; Checks for open & closed traverse; Closing error,	08

	Graphical adjustment of closing error.	
3.	**PLANE TABLE SURVEYING** Introduction, Plane table and its accessories, Temporary adjustments of Plane table, centering, levelling, orienting the plane table by method of back sighting by method of magnetic needle. Methods of plane tabling Radiation, Intersection, Traversing, Resection method. Advantages & disadvantages of plane table survey, Errorsin plane table survey.	08
4.	**LEVELLING** Definitions of the terms used in Levelling. Concept of datum, Back sight, Foresight stations, change point, height of instrument. Dumpy and tilling level Construction and temporary adjustments. Levelling staff, their types. balancing of back sight and Fore sight distances. Holding and reading the staff, simple and differential levelling, and booking of readings. Reduction of levels by Collimation system and by Rise & fall system. arithmetic check, computation of missing readings.	07
	Classification of levelling: Differential, Reciprocal, and Fly levelling, Profile levelling, cross sectioning. Plotting of a profile and cross section. Difficulties in levelling, common mistakes in levelling. Permanent adjustments of Dumpy & Tilling level. Automatic level (General idea only) Study and use of level Auto set level, Temporary adjustments.	04
5.	**CONTOURING** Introduction and concept, definitions, purpose, Characteristic of Contour line, contour interval, factors affecting contour interval, Horizontal equivalent. Methods of Locating contours Direct method, Indirect method. Interpolation of contours by estimation, arithmetical and by graphical method. Plotting of contour maps. Uses of contour map.	05
	Total	42

REFERENCE BOOKS :

Author	**Title**	**Publisher**
T. P. Kanetkar & S. V. Kulkarni	Surveying and levelingVol. I & II	Pune Vidyapith Griha Prakashan Pune.
B.C. Punmia	Surveying-I & II	
Amarjit Aggarwal.	Surveying & Levelling	Tata International Publication, Delhi- 51

ROCK ENGINEERING & GROUND CONTROL

Subject Code 2047402	Theory			No of Period in one session:42			Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

The Diploma holder in Mining and Mine surveying must have knowledge of Rock engineering as the underground opening are subject to accumulation of stress which make opening unstable, therefore he must understand the kind of support required to stabilize the opening. He also required to work as technical asst. in various Technical and Research Institutes, therefore he must have knowledge of different properties of rock and procedure of determining the properties of rock in laboratory and insides the mine. The mining engineer should have knowledge of Rock burst, bumps, precautions measure and methods of prediction etc.

COURSE OUTCOMES:

After undergoing the course of study the student shall be able to

1. Classify to rock mass.
2. Identify the kind of support required to the excavation.
3. Conduct different laboratory test to determine properties of rock.
4. Carryout monitoring, predict and supervise and carryout preventivemeasures for rock burst, bumps etc.
5. Carryout and supervise roof bolting and stitching operation.

Unit	Content	Hours
1.	**ORIGIN of SOIL & ITS FORMATION** Weathering, Post Depositional changes, Sediment erosion, Transport and Deposition, Rock and Mineral Stability.	2
2.	**SOIL as THREE PHASE SYSTEM** Weight and Volume relationship, Inter relationship between three phase elements, Density and unit weight relationship	2
3.	**PERMEABILITY and SEEPAGE** Darchy's Law, Effective Permeability, Laboratory determination of permeability (Falling and Constant Head),Seepage force and different heads, Quick Sand condition	2
4.	**SHEAR STRENGTH of EARTHPRESSURE THEORIES** Coulomb's Law of shear strength, Direct and tri axial shear test, Rankine's theory of earth pressure, Active, passive and earth pressure at rest, Simple application on Cohesionless backfills.	3
5.	**STABILITY of SLOPES** Finite and infinite Slopes, Factor of safety and slip surfaces, Method of slices for c-ϕ soil, Friction circle method, Tailor's and Bishop method, Stability number, Application to opencast mining.	3
	Group B	
1.	**INTRODUCTION TO ROCK MECHANICS** Concept of stress and strain in rock,stress due to weight of strata, verticallateral stresses. Stress due to tectonic and orogenic force, Residual stresses, Induced stresses. Field stresses Introduction to elementary rock mass classification based on strength, hardness, RQD, Wieniawski RMRclassification.	4

2.	**ROCK MASS PROPERTIES** Strength Properties: Compressive strength, Tensile Strength, Shear Strength, Flexural Strength. Strength Indices- Point Load Strength index, Impact Strength index, Protodyakanov's strength index. Rebound hardness, in situ stress by flat jack Material Characteristics: Brittle material,Ductile material, Elastic material, Plastic material. Time dependent properties: creep, Creep curve, factors contributing Creep. Deformation, weatherability.	6
3.	**ROCK TESTING** Uniaxial compressive strength, Tensile strength – Brazilian test, Bending test. Shear strength test- punch shear test,Direct shear test on Rock cube, Triaxial method. Determination of strength indices- point load strength index, Protodyakanov's strength index, impact strength index.	4
4.	**ROCK BRUST AND BUMPS** Rock burst, Bumps, causes controlling measures, factors affecting proneness to rock burst/Bumps. Pillar Design- factors considered. Pillar design by tributary area approach, determination of factor of safety	4
	Group C	
5.	**MONITORING GROUND MOVEMENT** Classification of field instrumentation forground control and rock mechanics studies. Closure meters: Telescopic closure meter, Tape closure meter/ extensometer, and Remote indicating closure meter. Borehole Extensometer: Rod type; Magnetic type. Stress Meter, Bolt meter, Rock Bolt Pull Out Tester, Load Cell. Their application, working principle Construction etc.	6
6.	**GROUND CONTROL** Theories of mechanics of strata behavior:Dome or arch theory, Beam theory. Function of roof bolts. Principle of Action Roof Bolts. Varieties of Roof Bolts: Slot and Wedge, Expansion shell Grouted Roof Bolts, Resin Roof Bolts. Anchorage Testing of Roof Bolts. Bolt density. Code of practice for roof bolting in underground mines. Roof stitching, Principle of Roof stitching, Cable Bolting.	6

REFERENCE BOOKS :

Author	Title	Publisher
D.J. Deshmukh	Elements of Mining Technology Vol	Central techno publication, Nagpur
S.K. Das	Modern Coal mining Technology	Mintech publication Bhubaneshwar.
B.S. Verma	The elements of mechanics of mining ground	Tuhin & Co. Lucknow
Dr. B.P. Verma	Rock Mechanics for Engineers.	Khanna Publication Delhi.

ECONOMICS AND FIELD GEOLOGY

Subject Code 2047403	Theory			No of Period in one session:42			Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Material that needs to be explored comprises rocks and minerals. It is essential for engineers to have knowledge of mining geology

COURSE OUTCOMES:

After undergoing the course of study, the student shall be able to

1. Identify landforms in field
2. Explain the relation of landforms for mineral deposit and mining activity
3. Outline stratigraphy of India and mineral deposits
4. Identify the fossils
5. Explain the principle of formation of mineral deposit
6. Describe mode of occurrence, distribution and uses of ores.
7. Investigate minerals in field using geological, geophysical, geochemicalmethod of prospecting
8. Mark the mineral prospect zone using remote sensing techniques.
9. Delineate suitable site for dam and reservoir and tunnel

Unit	Content	Hours
1.	**Geomorphology** Definition of landform Forces changing the landforms Endogenetic Exogenetic landforms produced by mass movement Fluvial landforms Aeolian landforms Glacial landforms coastal landforms landform produced by groundwater	**05**
2.	**Paleontology** Definition of fossil Mode of preservation of fossil Uses of fossils Classification of animal and plant kingdom Morphology and geological range ofoccurrence of animal fossils - order Foraminifera (Phylum protozoa), class corals (Phylum Coelenterata), phylum brachiopod,	**07**

	classgastropod (phylum Mollusca and class trilobite Morphology and geological range of occurrence plant fossils-Glassopteris, gangamopteris, Ptilophillum	
3.	**Stratigraphy** Principles of stratigraphy Standered stratigraphic and time scaleTectonic divisions of India Stratigraphy of India Stratigraphic succession, lithology, distributionand economic mineral deposits of Precambrian basement in Singhbhum and Dharwar, Stratigraphic succession, lithology, distribution and economic mineral deposits of Cuddapah supergroup, Vindhyan supergroup and Gondwana super group	**08**
4.	**Economic Geology** Definition of ore, gangue, tenor Process of formation of ore deposits morphology of principal type of ore deposits Classification of ore deposits Origin, mode of occurrence, distribution anduses of gold, iron, copper, manganese, chromium, Aluminum, Lead, Zinc and Petroleum Metallogenic provinces of India Ore deposit through geological time in India	**08**
5.	**Exploration & Prospecting** Definition of prospecting and exploration Geophysical prospecting Geochemical prospecting Geobotanical prospecting Remote sensing techniques for exploration	**06**
6.	**Engineering Geology** Geological investigation for site selection of damand reservoir, tunnel, hill slope and rock cutting	**02**
7.	**Geology Mapping** Features of geological maps Topography Lithology Geological structure Signs and symbols Field equipment for Geological mapping Features of toposheet Method of collection of samples Completion and tracking of outcrop	**06**

REFERENCE BOOKS :

Author	Title	Publisher
Praveen Singh	Engineering and General Geology	Catson Educational Series
Umeshwar Prasad	Economic Mineral Deposit	CBS Publisher, New Delhi
D K Todd	Ground Water Hydrology	Willey and Sons, New York
K R Karanth	Hydrology	Tata Mcgraw Hills, New Delhi
P.K. Mukherjee	A text book of Geology	The world press pvt. Ltd. Calcutta.
A Laberson	Geology of Petroleum	
M B Dobrine	Introduction of Geophysical Prospecting	Mcgraw Hills
F.H. Lahee	Field Geology	

MINING MACHINERY – I

Subject Code 2047404	Theory			No of Period in one session:42			Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

A large number of mining machineries are used in the mine right from the winding of men and material through shafts, transport of material, wire, power for drilling, cutting and loading of coal on the faces. Pumping operations are also essential to deal with accumulation of water in underground workings. A mining engineer should be aware of the types of machineries available for these operations, their principles of operations and suitability of these equipment's under different conditions, so that they can supervise the selection, installation and day-to-day operation and elementary maintenance of these equipment's.

COURSE OUTCOMES:
After undergoing the course of study the student shall be able to

1. Have general knowledge of electrical supply system
2. Understand basic principles of motors, transformers, instruments etc.
3. Connect above equipment's to supply.
4. Understand and implement different units and standards of measurements.
5. Understand the working of I.C. Engines
6. Understand the working of different types of compressors.
7. Select appropriate engineering materials required for various machinescomponents.
8. Supervise installation, maintenance of ropes and attachments; safeoperation and understand the methods of dealing with breakdowns.

Unit	Content	Hours
1.	**Electric Circuit** ➢ Resistance, Current, Voltage, Work, Power andEnergy Ohm's Law ➢ AC Current – Three phase & Single phase Storage Batteries- Constructing & working	04
2.	**Electrical Machine** ➢ DC Machine: Construction & principles of operating, Magnetization and load characteristics of series, shunt and compound generators and motors. Motor starter, speed control and their field of applications. ➢ AC Motors: Construction and principles of operation, types of transformers, Efficiency and Regulations, Auto transformer ➢ Single phase Transformer: Construction and principles of operation, types of transformers, Efficiency and Regulations, Auto transformer	06
3.	**Power Supply System** ➢ Transmission & distributing of Electrical power by overhead lines and cables Types of cables, layout of underground cables, shaft cables protection system and switchgear for mines like Relays, circuit breaker and fuses. ➢ Earthling and types of earthling Indian Electricity Rules General and with special reference to mines.	04
4.	**Engineering Materials** ➢ Chemical composition, properties and uses of following ferrous Metals: Cast iron, steel, Wrought iron, manganese steel, nickel steel, chromium steel, nickel- chromium steel, stainless steel. ➢ Nonferrous: Aluminium, copper, nickel, bronze, brass, copper nickel alloys, Aluminium alloys etc.	04

5.	**Machines** ➢ Internal Combustion Engine: Classification, Otto cycle, Diesel cycle. Two stroke & four stroke petrol engine. Two stroke & four stroke Diesel engine. Different systems like fuel injection, fuel ignition for petrol & diesel engines. ➢ Air compressor: Classification, Definitions of different terms such as inlet pressure, discharge pressure, capacity, theoretical power, break power, free air delivery. ➢ Compressor efficiencies, Working of reciprocating Compressor. Single stage & multistage. Linter ➢ cooling, After cooling, Conditions of maximum efficiency, Uses of compressed air (no derivation ➢ and proof of formula.) Rotary compressor: Roots blower, vane type blower, screw compressor, turbo blower, turbo compressor, centrifugal & axial flow compressor (no derivation of formula.) Brakes & Clutches: Breaks: Classification, Construction & working of block brakes, internal expanding brakes, hydraulic brakes, vacuum brakes (no numerical problems) Clutches : Construction & working of plate clutches, cone clutches, centrifugal clutch, claw clutch (no numerical problems) ➢ Hydraulics & Hydraulic machines: Properties of fluid, components of hydraulic circuits and their symbols, constructional details and working of hydraulic of shaper and hydraulic press. ➢ Types of pumps. Working principle of centrifugal pump, working principle of reciprocating pump. Uses of pumps in mining industry.	14
6.	**WIRE ROPES** ➢ Classification of different types of wire ropes, Stranded rope, Non stranded rope, Different types of stranded rope, Different types of Non stranded rope, Lays of rope, Different definition like Space factor, static load, dynamic load, factor of safety. ➢ Selection of wire rope, Care and maintenance in ropes, Types of deterioration in the ropes ➢ Testing of wire ropes. ➢ Types of Rope capping, White metal capping (cone socket type capel), Wedge type capping (Reliance rope capel), Capping with split capel and rivets (Split capel), Recapping, Rope splicing procedure	10

REFERENCE BOOKS:

Author	Title	Publisher
Edward Huges	Electrical Technology	
H. Cotton	Electrical Technology	C.B.S. Publisher
B.L. Theraja	Electrical Technology	S.Chand
Malvino	Electronic Principles	
P.L.Ballaney	Thermal Engineering	
Avner	Engineering Metallurgy	Mcgraw Hill

ENVIRONMENT STUDIES

Subject Code 2047405	Theory			No of Period in one session:42			Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Course Contents:

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and nonrenewable resources:

a) Natural resources and associated problems

Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people.

Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.

Mineral Resources: Use and exploitation, environmental effects ofextracting and using mineral resources, case studies.
Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, case studies.

Energy Resources: Growing energy needs, renewable and non- renewable energy sources, use of alternate energy sources, casestudies
Land Resources: Land as a resource, land degradation, man induceslandslides, soil erosion, and desertification.

b) Role of individual in conservation of natural resources.

c) Equitable use of resources for sustainable life styles.

Unit 3: Eco Systems

- Concept of an ecosystem
- Structure and function of an ecosystem.
- Producers, consumers, decomposers.
- Energy flow in the eco systems.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of thefollowing eco systems:
- Forest ecosystem
- Grass land ecosystem
- Desert ecosystem.
- Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT 4: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, national and local level.
- India as a mega diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitats loss, poaching of wild life, manwildlife conflicts.
- Endangered and endemic spaces of India.
- Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT 5: Environmental Pollution

Definition Causes, effects and control measures of:

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid waste Management: Causes, effects and control measures of urbanand industrial wastes
Role of an individual in prevention of pollution case studies
Disaster management: Floods, earth quake, cyclone and land slides

Unit 6: Social issues and the Environment

- Form unsustainable to sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, water shed management
- Resettlement and rehabilitation of people; its problems and concerns, casestudies
- Environmental ethics: issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclearaccidents and holocaust, case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environment protection Act
- Air (prevention and control of pollution) Act
- Water (prevention and control of pollution) Act
- Wildlife protection act
- Forest conservation act
- Issues involved in enforcement of environmental legislations
- Public awareness

Unit 7: Human population and the environment

- Population growth and variation among nations
- Population explosion- family welfare program
- Environment and human health
- Human rights
- Value education
- HIV / AIDS
- Women and child welfare
- Role of information technology in environment and human health
- Case studies

Recommended Books:

1. Textbook of Environmental studies, Erach Bharucha, UGC
2. Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

MINE SURVEYING LAB.-I

Subject Code	Practical			No of Period in one session:56			Credits
	No. of Periods Per Week			Full Marks	:	50	
2047406	L	T	P/S	Internal (PA)	:	15	02
	—	—	04	External (ESE)	:	35	

RATIONALE:

The important job functions of mine surveyor include the activities of detailed surveying, plotting of survey data and setting out works.

It is therefore essential to give emphasis on the development of skills on using various survey instruments and their application in underground mines for preparation plans & sections of workings. In addition, for providing basic principles of surveying and levelling, it is necessary to arrange appropriate field exercises and small projects.

LIST OF PRACTICAL

1 To take the bearing of given lines and measure the included angles by the verniers of the dial.
2. To traverse the area by loose needle method with miner's dial.
3. To traverse a given area by fast needle method with miner's dial.
4. To sketch and describe a dumpy level.
5. Use and application of a micro-optic level.
6. Find out the reduced level of different points with a given datum.
7. To carry out differential levelling and check the work by the levelling.
8. To draw a longitudinal profile along with a chain line.
9. To draw a cross section across given chain line.
10. To draw a contour of given area by direct and indirect methods.
11. To conduct a complete subsidence survey in a given area.
12. To calculate the contours of required reduced level and to plot the subsidence workwith a suitable scale.
13. To sketch and describe a transit vernier theodolite.
14. To measure the horizontal angle by repetition method with a theodolite.
15. To measure the horizontal angle by reiteration method with a theodolite.
16. Study of mine plans & sections.

REFERENCE BOOKS :

Author	Title	Year of publication	Publisher
T. P. Kanetkar & S. V. Kulkarni	Surveying and leveling Vol. I & II	1995	Pune VidyapithGriha Prakashan Pune.
B.C. Punmia	Surveying-I & II		
Amarjit Aggarwal.	Surveying & Levelling	1992	H.Tata International Publication, Delhi- 51

ROCK ENGINEERING & GROUND CONTROL LAB.

Subject Code 2047407	Practical			No of Period in one session:56			Credits
	No. of Periods Per Week			Full Marks	:	50	02
	L	T	P/S	Internal (PA)	:	15	
	—	—	04	External (ESE)	:	35	

The Diploma holder in Mining and Mine surveying must have knowledge of Rock engineering as the underground opening are subject to accumulation of stress which make opening unstable, therefore he must understand the kind of support required to stabilize the opening. He also required to work as technical asst. in various Technical and Research Institutes, therefore he must have knowledge of different properties of rock and procedure of determining the properties of rock in laboratory and insides the mine. The mining engineer should have knowledge of Rock burst, bumps, precautions measure and methods of prediction etc.

1. Classify to rock mass.
2. Identify the kind of support required to the excavation.
3. Conduct different laboratory test to determine properties of rock.
4. Carryout monitoring, predict and supervise and carryout preventivemeasures for rock burst, bumps etc.
5. Carryout and supervise roof bolting and stitching operation.

PRACTICAL:

1. Sand bottle method of field density and void ratio
2. Determination of Plastic Limit, Liquid Limit and Shrinkage Limit
3. Falling head permeameter for permeability
4. Direct shear test for soil
5. Preparation of rock sample for laboratory testing.
6. Determination of uniaxial compressive strength of a rock sample.
7. Determination of tensile strength (Brazilian test) of a rock sample.
8. Determination of shear strength. of a rock sample.
9. Determination of point load strength index.
10. Determination of Protodyakonov strength index.
11. Determination of impact strength index.
12. Demonstration of use of flat jack for in-situ stress determination.
13. Demonstration of Closure Meters, Extensometer, Stress cells and Load Cells
14. Demonstration of various Rock bolts.
15. Study of anchorage testing of rock bolts.
16. Demonstration of cable bolting.

REFERENCE BOOKS:

Author	Title	Publisher
D.J. Deshmukh	Elements of Mining Technology Vol I	Central techno publication, Nagpur
S.K. Das	Modern Coal mining Technology	Mintech publication Bhubaneshwar.
B.S. Verma	The elements of mechanics of mining ground	Tuhin& Co. Lucknow
Dr. B.P. Verma	Rock Mechanics for Engineers.	Khanna Publication Delhi.

ECONOMICS AND FIELD GEOLOGY LAB.

Subject Code	Practical			No of Period in one session:32			Credits
	No. of Periods Per Week			Full Marks	:	50	
2047408	L	T	P/S	Internal (PA)	:	15	01
	—	—	02	External (ESE)	:	35	

Material that needs to be explored comprises rocks and minerals. It isessential for engineers to have knowledge of mining geology.

COURSE OUTCOMES:
After undergoing the course of study the student shall be able to

1. Identify landforms in field
2. Explain the relation of landforms for mineral deposit and mining activity
3. Outline stratigraphy of India and mineral deposits
4. Identify the fossils
5. Explain the principle of formation of mineral deposit
6. Describe mode of occurrence, distribution and uses of ores.
7. Investigate minerals in field using geological, geophysical, geochemicalmethod of prospecting
8. Mark the mineral prospect zone using remote sensing techniques.
9. Delineate suitable site for dam and reservoir and tunnel

PRACTICAL:

1. Outcrop map preparation and interpretation. (Any Ten including Horizontal,Vertical and Inclined/Fault & fold outcrop)
2. Toposheet interpretation and preparation of geological map on toposheet(Jharia, Rani Ganj and Raajmahal coal fields)
3. Identification of ore mineral": Galena, Chalcopyrite, Magnetite, Hematite)
4. Identification of fossils: Trinobite, Gastropots, Glassopteries, Gangamopteris, foraminifera.
5. Identification of landforms in satellite image: Fluvial, Aeolian, Glacitr,Landform.
6. Interpretation of satellite image for Demarcation of outcrops of Vindhyan Supergroup, Cuddapah Supergroup, Singhbhum group on it

REFERENCE BOOKS:

Author	Title	Publisher
Praveen Singh	Engineering and General Geology	Catson Educational Series
Umeshwar Prasad	Economic Mineral Deposit	CBS Publisher, New Delhi
D K Todd	Ground Water Hydrology	Willey and Sons, New York
K R Karanth	Hydrology	Tata Mcgraw Hills, New Delhi
P.K. Mukherjee	A text book of Geology	The world press pvt. Ltd. Calcutta.
A Laberson	Geology of Petroleum	
M B Dobrine	Introduction of Geophysical Prospecting	Mcgraw Hills
F.H. Lahee	Field Geology	

GEOSPATIAL TECHNOLOGY (TW)

Subject Code 2047409	Term Work			No of Period in one session:32			Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal Examiner (PA)	:	07	
	—	—	02	External Examiner (ESE)	:	18	

To give emphasis on scientific and systematic exploitation of coal / minerals and to ensure sustainability of the resources, mining industry has realized the importance of technologies such as, Geospatial Technology for mining. Use of Geospatial Technology for mining has brought about a revolution by ensuring cost efficient and detailed studies of the concerned area. Geospatial Technology for mining help in creation of maps that are an amalgamation of all the information regarding the concerned area. Further, a system can be design to improve mine production efficiency, provide data query, information analysis and technical decision support for mine. It can be a Geospatial Technology integrated system based on AutoCAD that can support image-text interactive queries and automatic drawing. For this a basic knowledge of Geospatial Technology software and Auto CAD software is required.

Course Outcomes:
After undergoing the course of study, the student shall be able to

1. Topographical & Physiographical mapping
2. Mineral mapping to identify potential mineral zones
3. Geological database creation
4. Map updation for mineral exploration
5. Surface mapping
6. Data Analysis and Report Generation
7. Assist in the preparation of blueprints and other engineering plans
8. Create precise 2- and 3-dimensional drawings

Suggestive Works:
Demonstration and Concept building: Introduction to Geospatial Technology, Hardware and Software requirements, Scanning of maps, Printing of maps, Geographic Data, SpatialData, Non-spatial Data input

1. Map Scale: Type and conversion, Vertical Exaggeration, Enlargement andreduction
2. Map Projection: Concept, Classification, Polyconic Projection, MercatorProjection
3. Representation of Statistical Data: Choropleths, Isopleths dots unimodal,two dimensional and 3 dimensional diagrams
4. Relief Representation Techniques: Profile identification and representationof land forms from toposheets
5. Demonstration of Raster and Vector model for representing geographicfeatures using Geospatial Technology
6. Demonstration of attributes and spatial data in Geospatial Technology
7. Preparation of Topographical sheet using Geospatial Technology
8. Preparation of Physiographicalmap using Geospatial Technology
9. Creation of geological database using Geospatial Technology
10. Surface mapping using Geospatial Technology
11. Data Analysis and Report Generation
12. Demonstration of CAD techniques for drawing

13. Draw rectangles and circles with cross-hatching and automaticdimensioning using Auto CAD Software
14. Demonstration of used of AutoCAD in mine design
15. Demonstration of common features for manipulation of 3D drawing in CAD
16. Preparation of CAD generated drawing

REFERENCE BOOKS:

RL Singh	Elements of Practical Geography	Kalyani Publishers.
BG Tamaskar & VM Deshmukh	Geographical Interpretation of Indian Topographical Maps	Orient Longman Ltd.
FE Croxton, DJ Cowden & S Klein	Applied General Statistics	Practice Hill India
K Ramamurti	Map Interpretation	Racks Printer
KK Gupta & VC Tyagi	Working with Maps Understanding Map Projection	Survey of India GIS by ESRI, 2003-2004, USA

MINI PROJECT AND SEMINAR (TW)

Subject Code 2047410	Term Work			No of Period in one session:32			Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal Examiner (PA)	:	07	
	—	—	02	External Examiner (ESE)	:	18	

In spite of theory concept students acquire, various industries also need to know their capacity to complete projects using their specific initiative. The importance of mini project includes, it gives a chance to use their brain and hands, students can share their knowledge, increase self-confident.

The small project and seminar allow students to experience solving real world problems, working with other people under deadlines and with often ambiguous guidance.

Mini projects for diploma students gives an edge over the race of recruitment to work hard to ensure a good career.

Course Outcomes:

After undergoing the course of study the student shall be able to

1. Use their technical knowledge to solve real world problems
2. Complete small projects using their specific initiative
3. Experience solving real world problems

Suggested broad areas for Project & Seminar:

1. Extraction of coal by different methods
2. Different development and depillaring method of Board and pillar method
3. Various longwall method based on direction of face advance, cyclic, non-cycling unit, double unit.
4. Indian Geological Formations, Prospecting and Exploration
5. Application of principles of mechanics and strength of materials for general and specialized engineering aspects connected with mining structures, machine mechanism or their parts
6. Conduct survey to plot positions of underground workings, establish underground bench marks incorporate on mine plan and prepare sections of underground workingsfor proper planning of production and excavation operations.
7. Conduct laboratory and insitu tests on rock mass, understand the kind of support required to stabilize the excavation, reinforce the excavation openingsby bolting/stitching and monitor the performance of support system
8. Maintain the adequate ventilation in underground workings and ensuresafe & comfortable working conditions inside the mine
9. Use and maintenance of mining machines for getting desired result
10. Concerned faculty can assign any project related to their courses of studies

STRATEGY OF IMPLEMENTATION:

Conducting Industrial visits to assign area for project and seminar.

COURSE UNDER MOOCS / SWAYAM / OTHERS (T.W)

Subject Code	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	50	02
2047411	L	T	P/S	Internal (PA)	:	15	
	—	—	04	External (ESE)	:	35	