Final

DIPLOMA CURRICULUM OF MINING ENGNEERING (SECOND YEAR) (4th Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research Kolkata
Block – FC, Sector – III, Salt Lake City, Kolkata – 700106

Vetted by:
Domain experts from Polytechnics of Odisha

State Council for Technical Education & Vocational Training
Near Raj Bhawan, Unit-VIII, Bhubaneswar, Odisha

Table of Contents

PROGRAMME TITLE: MINING ENGINEERING

SEMESTER – IV

SL. No	Category of Course	Code No	Course Title	Teaching Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme Core	MIEPC202 (TH:1)	Mine Survey -II	**MIEPC 203**	3	0	0	70	30	-	-	100	3
2		MIEPC204 (TH:2)	Mine Ventilation		3	0	0	70	30	-	-	100	3
3		MIEPC206 (TH:3)	Mine Machinery II	**MEPC 209**	3	0	0	70	30	-	-	100	3
4		MIEPC208 (PR:1)	Mine Survey -II Lab		0	0	4	-	-	15	35	50	2
5		MIEPC210 (PR:2)	Mine Ventilation Lab		0	0	4	-	-	15	35	50	2
6#		MIEPC212 (PR:3)	Mine Machinery II Lab		0	0	4	-	-	15	35	50	2
7	Programme Elective	MIEPE202 (TH:4)	(A) Underground Coal Mining (B) Mining Technology (C) Environmental studies		3	0	0	70	30	-	-	100	3
8		MIEPE204 (TH:5)	(A) Special Underground Mining (B) Mine Legislation and General Safety – I (C) Advanced Mine Survey		3	0	0	70	30	-	-	100	3
9	**Minor Project**	PR202 PR:4	MINOR PROJECT		0	0	4	-	-	30	70	100	2
10	**Mandatory**	AU202	Essence of Indian knowledge and tradition		2	0	0	-	-	0	0	0	0
TOTAL					**17**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**23**

TH:1- MINE SURVEY –II

L	T	P		Course Code: MIEPC202 (Th 1)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

Before starting the actual mining operation, it is essential for mining engineer to first survey the piece of land where mining operation is contemplated. This is not possible without the knowledge of mine surveying.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Comprehend the principle of tachometry and its applications in measurement of distance.
- Explain the principle of triangulation & trilateration.
- Explain principles of correlations by different methods.
- Define various terms in connection with cove setting, laying out of curves by different methods.
- Explain different methods of stope surveying, transfer of stope faces to mine Plan.
- Explain the basic principle of global positioning systems & total station.

COURSE CONTENT DETAILS:

Unit No.	Topics for practice	Time Allotted (Hrs.)
I	**Tachometry:** Stadia and its principle, Diaphragm, reticules, tacheometer, instruments constants, Height and distance from stadia intercepts, tangential systems, movable hair method.	**10**
II	**Triangulation and Trilateration:** Triangulation and trilateration method. Triangulation survey primary, secondary and tertiary colliery triangulation. Reconnaissance survey. Measuring angle, types of theodolite used in triangulation survey. Methods of base line measurement using E.D.M. Tape correction. Triangulation station of permanent nature.	**10**
III	**Correlation of surface and underground survey: D**irect correlation by traversing and optical methods, Orientation by wires in two shafts, Correlation by mines in vertical shafts, Co-planning/ alignment, weissbach triangle, weis-quadrilateral methods, precise magnetic correlation.	**10**
IV	**Setting out curves: E**lements of curves, Designation of curves, simple, compound and reverse curves, Setting of surface and underground curves by chords and offsets, chords and angle, tangent and offset, plate layers method, Various setting out by chain and one theodolite, two theodolites, Super elevation, transition and vertical curves.	**9**
V	**Stope Surveying: T**ape triangulation, instrumental survey, Stope face, Preparation of stope planes, plotting the stope station, plotting of stope face to	**6**

	the mine plan. Area of extraction by Planimeter and calculation of triangle thereof. **G.P.S. and Total Station**: Basic principles of global positioning system and total station, Introduction to DGPS.	
	Total	**45**

REFERENCES:

1. Surveying Vol I, E. Mason.
2. Surveying and Levelling, T.P. Kanetkar, 2008.
3. Geodetic Surveying Vol I, David Clerk, CBS Publishers, 2018.
4. Mineral Economics, Sinha and Sharma, CBS Publishers, 2019.

TH:2- MINE VENTILATION

L	T	P	Total Marks: 100	Course Code: MIEPC204 (Th 2)	
3	0	0		**Theory Assessment**	
Total Contact Hours				End Term Exam	70
Theory		: 45Hrs		Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

The provision of proper ventilation is very essential for any underground mining operation. As a mining Engineer, one should have the thorough knowledge of types of ventilation, methods of air crossing, types of fans etc.

COURSE OUTCOMES:

- Describe different types of natural ventilation and laws of mine air friction.
- Describe different methods of air crossings and distribution.
- Illustrate different types of fans, fan characteristics, Mine characteristics and selection of fans.
- Identify different locations of booster fan, auxiliary ventilation and its advantages and disadvantages.
- Explain different ways of pressure survey, quantity survey & quality survey, leakage of air in mines.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Natural Ventilation**: Objective of ventilation. Define geothermic gradient. Definition of natural ventilation and factors affecting natural ventilation, Different types of Barometer, Kata thermometer, Sources of moisture content of mine air. Effects of heat and humidity, Natural ventilation, motive column, Laws of mine air friction and solve problems.	**9**
II	**Air Crossing and distribution**: Ventilation stopping, air crossing, ventilation door, brattice partition, Different types of ventilation, Accessional and declensional ventilation, Homotropal and Antitropal ventilation, Boundary ventilation, Central and combined ventilation, Splitting of air current and solve numerical problems on splitting. Air locks at pit top.	**9**
III	**Mechanical Ventilation**: Construction and principle of operation of centrifugal flow fans, Fan laws & calculate fan efficiency and capacity, Installation of mine fan with reversal arrangement. Fan drift, fan drive, evasee and diffusers. Fan characteristics and mine characteristics, Methods of output control of mine fans. Forcing fan vs. exhaust fan	**9**
IV	**Booster fan and its Effects: I**nstallation, location and purpose & disadvantages of booster fan. **Auxiliary Ventilation: S**ystems of auxiliary ventilation, Advantages and disadvantages of auxiliary ventilation.	**9**

V	**Ventilation Survey**: Methods of pressure survey using barometer, gauge and pitot tube with manometer, Method of measurement of cross-sectional area, Method of velocity measurements by using anemometer, velometer, pitot- static tube, smoke & cloud method, Determination of percentage of oxygen, methane, carbon monoxide, SO_2 and H_2S by using multigas detector. **Leakage of air in Mines**: Causes and preventive measures of leakage of air in mines.	**9**
	Total	**45**

REFERENCES:

1. Mine Ventilation, G B Mishra, OUP India Publishers, 1989.
2. Elements of Mining Technology Vol. 2, D. J. Deshmukh, Denett & Co., 9th edition, 2016
3. Coal Mine Practices, E. Mason
4. Mine Ventilation, L C KAKU, Lovely Prakashan, 2020.
5. Universal Mining School Volume, T. S. Southern Ltd, 1883.
6. SME Mining Engineering Hand Book Vol.I & II, 2nd Edition, Society for Mining, Metallurgy, and Exploration; A.B. Cummins, I.A Given, 2nd edition, 1992.

TH:3- MINE MACHINERY – II

L	T	P	Total Marks: 100	Course Code: MIEPC206 (Th 3)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PC	

RATIONALE:

There are various types of machines and equipment used in mining operations. As a mining engineer, it is necessary for them to understand about the Machinery used during mining. This course is very helpful, which discusses about Mine Machinery, which were not details in Mine Machinery-I course.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Describe various underground face machineries and their applicability.
- Describe various opencast machineries and their applicability.
- Describe various types of pump and their applicability.
- Describe various types of bore hole pumps and their applications.
- Elaborate details about various pipes and valves used in mines.

COURSE CONTENT DETAILS:

Unit No.	Topics for practice	Time Allotted (Hrs.)
I	**Underground Face Machineries:** Electric coal drill, Constructional features, operation, principle and use of electric coal drill, Types of drill rods & drill bits used in electric coal drill, Constructional features and operation principle of gathering arm loader, scraper loader, side discharge loader, load and haul loader, Jack hammer drill and air leg rock drill. Road header and Shearer loader.	**12**
II	**Opencast machineries: C**onstructional features of surface miner, dragline, shovel and backhoe, bucket wheel excavator, Dumper, dozer, scraper and road grader.	**6**
III	**Mine Pumps:** Mine pumps, Constructional features, working & use of ram pumps, Constructional features, Principle of centrifugal and turbine pumps and their applicability, Balancing the axial thrust of turbine pumps, Characteristic curves for turbine pumps, Constructional features and working principle and use of roto pump (screw pump), Constructional features & working principle of sinking pump, Suspension in shaft.	**12**
IV	**Bore hole pump:** Constructional features and working of bore hole pump, Installation of bore hole pump.	**6**
V	**Pipes and valves:** Types of pipes and valves used in Mines, Constructional features of various type of valves, Different types of pipe joints. Describe Pipe line layout.	**9**
	Total	**45**

REFERENCES:

1. Electrical equipment in Mine, H. Cotton, Newnes Publishers, 1955.
2. Winning and Working of Iron Ore, R.J Desmukh and D.J. Desmukh, Published by Amravati D J Deshmukh 1967.
3. Elements of Mining Technology VOL III, D.J.Desmukh, NAGPUR DENETT Publishers, 2014.

PR:1- MINE SURVEY -II LAB

L	T	P	Total Marks: 50	Course Code: MIEPC208 (Pr 1)	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

Mine surveying is important to Mining engineers. In this course, fundamentals of Mine Survey are discussed. In the field of mining, it is required to have measurements, calculations and mapping at all stages from prospecting to exploitation and utilizing mineral deposits by both surface and underground working. In this course, advanced equipment like Tacheometry, GPS and DGPS along with the uses of Autocad and software in Mine planning are practiced.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Identify the working of about Tacheometer and Tacheometry.
- Demonstrate various components of GPS, DGPS and their uses.
- Use total station in calculations of various components in mining field.
- Apply computational tools and software in Mine planning.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	Fix triangulation and measurement of peripheral and hub angles. Base line measurement applying all corrections and plotting by co-ordinates.	**4**
II	Determine the north, Setting of curves by Total Station and Theodolites.	**4**
III	Correlate underground and surface survey during survey camp.	**4**
IV	Measurement of Horizontal & Vertical angles, measurement of distance by Total Station.	**4**
V	Mining lease boundary survey using Total Station, Base line fixation using Total Station.	**4**
VI	Coordinate point shifting and reference point shifting by Total Station.	**4**
VII	Fixation of control point by 02 traversing (both Horizontal and Vertical control points) with Total Station and auto level.	**4**
VIII	Topographic survey & existing features, Area and Volume calculation using software.	**4**
IX	GPS Survey.	4
X	Preparation of plan and section using AUTOCAD.	**8**
XI	DGPS Survey.	**8**
XII	Reserve calculation of Ore.	**8**

	Total	**60**

REFERENCES:

1. Surveying Vol I, E. Mason.
2. Surveying and Levelling, T.P. Kanetkar, 2008.
3. Geodetic Surveying Vol I, David Clerk, CBS Publishers, 2018.
4. Mineral Economics, Sinha and Sharma, CBS Publishers, 2019.

PR:2- MINE VENTILATION LAB

L	T	P	Total Marks: 50	Course Code: MIEPC210 (Pr 2)	
0	0	4		**Practical Assessment**	
Total Contact Hours				End Term Exam	15
Practical		: 60Hrs		Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

Proper ventilation is very essential for any underground mining operation. As a mining Engineer, one should have the practical exposure to different types of mechanical ventilators, different measuring instruments and air leakage protecting devices used in mines. This course deals with different types of ventilation aspects.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Explain the uses of stationary and storrow's hygrometer in calculation of relative humidity.
- Calculate cooling power of air with help of kata thermometer.
- Illustrate different types of fans, fan characteristics and selection of fans.
- Explain the uses of Regulators and Air locks in different parts of mine.
- Calculate velocity of air with the help of vane anemometer.
- Explain different ways of pressure survey, quantity survey & quality survey.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	Determine the relative humidity by stationary hygrometer.	**4**
II	Determine the relative humidity by storrow's hygrometer.	**4**
III	Determine the cooling power of mine air using Kata thermometer.	**4**
IV	Study and sketching of air crossing.	**4**
V	Study & use of Vane Anemometer.	**4**
VI	Study & use of Digital Anemometer.	**4**
VII	Study of constructional features of axial flow fan.	**4**
VIII	Determination of fan characteristic curve.	**4**
IX	Study and sketching of regulator &airlocks.	**8**
X	Study and use of Pitot static-tube measurement of quantity of air flow.	**8**
XI	Study of constructional features of centrifugal fans and reversal arrangement.	**12**
	Total	**60**

REFERENCES:

1. Mine Ventilation, G B Mishra, OUP India Publishers, 1989.
2. Elements of Mining Technology Vol. 2, D. J. Deshmukh, Denett & Co., 9th edition, 2016
3. Coal Mine Practices, E. Mason

4. Mine Ventilation, L C KAKU, Lovely Prakashan, 2020.
5. Universal Mining School Volume, T. S. Southern Ltd, 1883.
6. SME Mining Engineering Hand Book Vol.I & II, 2nd Edition, Society for Mining, Metallurgy, and Exploration; A.B. Cummins, I.A Given, 2nd edition, 1992.

PR:3- MINE MACHINERY -II LAB

L	T	P	Total Marks: 50	Course Code: MIEPC212 (Pr 3)	
0	0	4		**Practical Assessment**	
Total Contact Hours				End Term Exam	15
Practical		: 60Hrs		Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

It is imperative that a Mining Engineer should be thoroughly conversant with various types of machine used in mining operations.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Prepare an electrical switch board to control 2 light points & 1 plug points.
- Describe circuit breakers and draw circuit diagram of gate-end box and drill panel.
- Describe different types of protective system and Relays.
- Distinguish different types of cables used for mining purpose
- Explain the uses of Megger check and continuity of windings.

COURSE CONTENT DETAILS:

Expt No.	Content	Time Allotted (Hrs.)
I	Study of Centrifugal Pumps.	**4**
II	Study of Turbine Pumps.	**4**
III	Study of Roto Pump.	**4**
IV	Study of Sinking Pump.	**4**
V	Study of electric coal drills & its accessories.	**4**
VI	Study of Jack Hammer Drill with air leg.	**4**
VII	Study & plotting of characteristics curve of Turbine pump.	**12**
VIII	Study of scrapper loader.	**8**
IX	Model Development of Gathering arm loader.	**8**
X	Study of scrapper & shaker conveyor.	**8**
	Total	**60**

REFERENCES:

1. Electrical equipment in Mine, H. Cotton, Newnes Publishers, 1955.
2. Winning and Working of Iron Ore, R.J Desmukh and D.J. Desmukh, Published by Amravati D J Deshmukh 1967.
3. Elements of Mining Technology VOL III, D.J.Desmukh, NAGPUR DENETT Publishers, 2014.

TH:4(a)- UNDERGROUND COAL MINING

L	T	P		Course Code: MIEPE202A (Th 4)	
3	0	0			
Total Contact Hours			**Total Marks: 100**	**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PE	

RATIONALE:

As a Mining Engineer, one should know different methods of underground working in coal mining and operational principles. This course deals with the aspects of Underground Coal Mining.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Explain different mining methods and working of B.P. method and its development and depillaring, precautions against fire and water and B.P. layout.
- Explain long wall method.
- Describe elementary idea about thick seam mining and horizon mining.
- Explain hydraulic and pneumatic stowing along with support and roof control in Mines.
- Describe Subsidence due to Mining.

COURSE CONTENT DETAILS:

Unit No.	Topics for practice	Time Allotted (Hrs.)
I	**Introduction to Underground Coal Mining: Diff**erent methods of mining Underground Coal Mining Methods. **Bord and Pillar Method: V**arious application of Bord and Pillar method, Various layouts of Bord & Pillar method. Depillaring method with stowing and caving. Precautions against fire and water during and after depillaring, Various machineries used in working face, contiguous seam, working of contiguous seams, working of seams above and below goaved out area, advantages and disadvantages of Bord & Pillar method.	**9**
II	**Longwall Method:** Longwall advancing and retreating methods, Single unit and double unit face, Cyclic and non-cyclic L/W layouts, Mechanized longwall working with armoured flexible conveyor, shield support and shearer loader.	**9**
III	**Thick seam Mining: T**hick seams, Thick seam Mining, layouts of horizontal slicing, incline slicing, blasting gallery and sublevel caving. **Horizon Mining:** Conditions, advantages, disadvantages and limitations of Horizon Mining, Layout of Horizon Mining.	**9**
IV	**Hydraulic and Pneumatic stowing**: Hydraulic stowing, Pneumatic stowing. **Support and roof control in Mines:** Properties of various types of roof & roof behaviour, Pressure arch theory in B&P and longwall working, Testing of roof, Support system in Mines construction, principle of operation application and load bearing capacity assessment.	**9**
V	**Subsidence due to Mining**: Angle of draw, Factors of subsidence, critical area of extraction, Factors affecting subsidence, Precautionary measures against damage due to subsidence, Shaft pillar. **Shaft Sinking: V**ertical shaft and inclined shaft; Shape and size of shaft, location of	**9**

	shaft. Sinking through normal ground. State shaft plumbing, Sinking through difficult ground, cementation, freezing, mechanized shaft sinking, sinking upward, widening and deepening of shafts.	
	Total	**45**

REFERENCES:

1. Coal Mining, S. Mathur, Sahyog Publishers, 2008.
2. Elements of Mining Technology VOL III, D.J.Desmukh, Nagpur Denett Publishers, 2014.
3. Modern Coal Mining, S.K. Das, Lovely Prakashan, 1994.
4. Advanced Coal Mining, RT Deshmukh & B.Borovjev
5. Universal Mining School Volume, T. S. Southern Ltd, 1883.
6. Coal Mine Ground Control, S S Peng, Society for Mining Metallurgy; 3rd edition, 2008.
7. SME Mining Engineering Hand Book Vol.I & II, 2nd Edition, Society for Mining, Metallurgy, and Exploration; A.B. Cummins, I.A Given, 2nd edition, 1992.
8. Strata Control in Mineral Engineering by Z. T., Bieniawski, 1987.

TH:4(b)- MINING TECHNOLOGY

L	T	P	Total Marks: 100	Course Code: MIEPE202B (Th 4)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PE	

RATIONALE:

The student of Mining must be aware of the Mineral Industry in the country and the Departments, which deal with mineral exploration, exploitation, safety, conservation and control of the mining industry. All technical definitions and terminologies connected with above are included here, as the students at this stage must be acquainted with these to cope up with the contents at later stage. Blasting is an important operation in all the mining operations. Knowledge of all the types of explosive, their properties and selection for different conditions/situation types of detonator/fuses etc is a must for them. Also it is essential for a mining engineer to understand systems of support of the mine workings. These all aspects have been included in this course.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- State various organizations engaged in coal and noncoal mining, their role and functions.
- Identify various technical terms, operations involved in coal & noncoal mining.
- Describe the properties of explosives, procedure of conducting shot firing operation in underground coalmines with due regards to safety.
- Explain the procedure of erection of temporary supports in underground coalmines.
- Discuss the major method of extraction of coal used in underground coal mines, their conditions of applicability.

COURSE CONTENT DETAILS:

Unit No.	Topics for practice	Time Allotted (Hrs.)
I	**Introduction to Mineral & Important Mining Organizations:** Definition of minerals, Uses of important minerals mined, Important Organizations involved like DGMS, IBM, GSI, CIL, MECL, CIMFR, CMPDIL etc their role and functions.	**6**
II	**Mining Terminology and Definition:** Common terminologies used in coal mining, Common terminologies used in metal mining, Common terminologies used in mine ventilation and environment, Common terminologies used in mine supports, Simple definition, explanation, purposes and sketches	**9**

III	**Explosives and Accessories:** Common explosive bases, Properties of Explosives, High Explosive and Low explosive, their comparison. Permitted explosives their types, composition, properties, uses, advantages and disadvantages. Brand names of some commonly used explosive of each type. A detonator, common types of detonators, plain detonators, instantaneous and delay action detonators their construction, uses, comparison etc. low tension and high-tension detonators, Safety fuses, detonating cords, detonating relays. Exploders	**6**
IV	**Shot Firing:** Drilling patterns for shot firing on machine cut face, in stone drift etc., Shot Firing tools, Face preparation for shot firing, Preparation of priming charge, charging of hole in coal and rock in underground working only, Direct and inverse initiation, shot firing circuits, procedure of shot firing of holes in gassy mine, precautions. Simultaneous & delay firing, Solid blasting, conditions to be satisfied before doing solid blasting, advantages of solid blasting, drilling patterns used with solid blasting	**9**
V	**Safety in Shot firing operation**: Explosive required for blasting in coal/rock. Powder factor, detonator factor. Precaution to improve blasting results. Misfires, causes, remedy and method of relieving dealing with misfires, blown out shots, blown through shots causes and precautions. Purpose of stemming, Stemming materials used for shot firing, water ampoules for stemming. Storage of explosives, Magazines Disposal of outdated explosives.	**6**
VI	**Introduction to coal mining method**: Classifications of method of working, Board & Pillar , Open cast method. Long wall. Applicability condition for selection of each methods of working. Layout of each method. Advantages & disadvantages	**9**
	Total	**45**

REFERENCES:

1. G.K. Pradhan Explosive and Blasting Techniques Publisher 1996 1993 S.K. Das
2. Explosives and Blasting Techniques Mintech publication Bhubaneshwar. Lovely prakashan Dhanbad.
3. D.J. Deshmukh Elements of Mining Technology Vol.- I 1995 Central techno publication, Nagpur

TH:4(c)- ENVIRONMENTAL STUDIES

L	T	P		Course Code: MIEPE202C (Th 4)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PE	

RATIONALE:

Due to the developments of different kinds of technological innovations, the Environment is in danger. Environment in which all are living needs to be maintained and living standards need to be improvised. The degradation of environment due to industrial growth is very much alarming. It is mainly due to pollution, which is beyond permissible limits in respect of air, water, industrial waste, noise etc. Environmental Studies course is a must for every student budding engineer.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Discuss various types of natural resources and associated problems.
- Identify the concept of biodiversity and it's conservation.
- Identify the causes of environmental pollution.
- List various social issues and the environment.
- Explain the relationship between human population and the environment.

COURSE CONTENT DETAILS:

Unit No.	Topics for practice	Time Allotted (Hrs.)
I	**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 of extracting and using mineral resources. Food Resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity. Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies. Land Resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.	**12**
II	**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 opt in	**9**

	values. Biodiversity at global, national and local level. Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.	
III	**Environmental Pollution:** Definition Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Disaster management: Floods, earth quake, cyclone and landslides.	**9**
IV	**Social issues and the Environment:** Urban problems related to energy, Water conservation, rain water harvesting, water shed management, Resettlement and rehabilitation of people; its problems and concern, Environmental ethics: issue and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies, Air (prevention and control of pollution) Act. Water (prevention and control of pollution) Act, Public awareness.	**9**
V	**Human population and the environment:** Population growth and variation among nations, Population explosion-family welfare program, Environment and human health, Human rights. Value education, Role of information technology in environment and human health.	**6**
	Total	**45**

REFERENCES:

1. Text book of Environmental studies, Erach Bharucha, UGC.
2. Fundamental concepts in Environmental Studies ,D.D .Mishra S. Chand and Co-Ltd.
3. Textbook of Environmental Studies, K.Raghavan Nambiar, SCITECH Publication Pvt. Ltd.
4. Environmental Engineering V.M.Domkundwar – Dhanpat Rai and Co.

TH:5(a)- SPECIAL UNDERGROUND MINING

L	T	P		Course Code: MIEPE204A (Th 5)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PE	

RATIONALE:

It is important for the Mining engineers to learn about various special methods practiced in underground mines. This course takes care of all such details.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Describe Bord & Pillar method using Continuous Miner.
- Identify mining in thick and thin seams.
- Explain hydraulic mining method.
- Describe the methods in underground coal gasification.
- Identify the basics of the highwall mining method.

COURSE CONTENT DETAILS:

Unit no.	Content	Time allotted (hrs.)
I	**Bord & Pillar method using Continuous Miner:** Formation and extraction of pillars by Bord & Pillar method using Continuous Miner - Split and Fender method, Wongawilli method, Rib pillar extraction method, Statutory provisions regarding formation and extraction of pillars by Bord & Pillar method using Continuous Miner, Machineries used in Bord and Pillar working using Continuous Miner– Continuous Miner, Shuttle Car/ Ram Car, Rock Bolters (Twin/ Quad Bolter etc.), Feeder Breaker, LHD – operational aspects only, Simple layouts of formation and extraction in Bord and Pillar method using Continuous Miner, Case studies of Bord & Pillar mining method using Continuous Miner in India	12
II	**Mining of thick and thin seams:** Problems of mining thick seams; Longwall based multi-slice methods: Inclined slicing, horizontal slicing and cross-slicing in ascending and descending sequence, Under winning methods: sub-level caving, integral caving, Longwall Top Coal Caving, Blasting Gallery Method, Problems in Mining thin seams, Equipment and methods for thin seam extraction.	9
III	**Hydraulic Mining of Coal:** Conditions suitable for hydraulic Mining of Coal, Hydraulic Mining Operation, Layout of workings for hydraulic mining of moderately thick seams.	9
IV	**Underground Coal Gasification (UGC);** Conditions suitable for Underground Coal Gasification, Basic principle and technology of underground coal gasification, Advantage and disadvantage of UCG, Scope of application of UCG in Indian conditions.	9
V	**Highwall Mining**: Introduction, Applicability and Method, Scope of application of Highwall Mining in Indian conditions	6
	Total	**45**

REFERENCES:

1. Singh, T. N., Underground winning of Coal, Oxford and IBH, New Delhi, 1992
2. Statham, I. C. F., Coal Mining Practice, Caxton eastern agencies, Calcutta, Reprint, 1964
3. Das, S. K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad, 1992
4. Singh, R. D., Principles & Practices of Modern Coal Mining, New Age International, New Delhi, 1997
5. Peng, S. S. and Chiang, H. S., Longwall Mining, John Willey and Sons, New York, 1992.

TH:5(b)- MINE LEGISLATION AND GENERAL SAFETY -I

L	T	P		Course Code: MIEPE204B (Th 5)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PE	

RATIONALE:

Mining operations involve complex processes and mechanisms. Accidents may occur if appropriate safety measures are not taken care. It is very important for the mining engineer to be thoroughly conversant with various acts and rules framed for providing safety to workers.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Describe various aspects of Mines Act 1952.
- Describe various aspects of Mines Rule 1955.
- Describe various aspects of Coal Mines Regulations 2017.
- Describe various aspects of Mines Rescue Rules 1985.
- Describe various aspects of Indian Explosive Rules 2008.
- Describe various aspects of Central Electricity Authority 2010.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Mines Act 1952 & Mines Rules 1955** Mines Act: Important definition: Adolescent, adult, child, Employed, Mine, Open cast working, Relay, Shift, Serious bodily injury. Provisions under chapter V, Provision for health and safety. Provisions regarding leave with wages, Act 49 to 56 .Hours & Limitations of Employment, act 28 to 48.Mines rules: Provisions regarding health & sanitation, first aid and medical appliances. Mines Rules- Provisions connected with leave with wages and over time and welfare amenities. Employment of persons, Rule 46 to 52	**9**
II	**Coal Mines Regulations: Important definitions:** Duties and responsibilities of workman, competent person & officials. Provisions of Reg. 38, 39, 43, 44, 45, 46, 48, 56 Planes and sections Reg. 58, 59, 61, 63.Means of access & egress. Reg. 66 to 70 Provisions regarding winding in shaft Reg. 71 to 86. Transport of men & material Reg. 88, 89,90,91,92,93,94,95 mine working Reg. to 115 Precautions against dangers from the dust, gas & water .Reg. 116 to 128. Ventilation Reg. 130 to 149 Provisions regarding lighting and safety lamp. Reg. 150 to 158. Explosives & Blasting Reg. 158 to 180 Provisions regarding machinery, plant & equipment and important provisions under chapter on miscellaneous.	**9**

III	**Mine accidents** : Basic concept and their classification , accident costs, accident report, procedure for conducting an enquiry to ascertain the causes of accidents, procedure for investigating and reporting mine accidents, accident proneness, Industrial fatigue, fatality rate, frequency rate, severity rate, role of supervisor in accident prevention, statistical analysis of accidents, accident statistics- its need and method of data processing , Effect of accidents in productivity.	**9**
IV	**Mine Rescue rules 1985:** Explain Various provision MRR 1985	**9**
V	**Indian Explosive rule 2008** Discuss various provisions of Indian Explosive rules	**9**
	Tota	**45**

REFERENCES:

1 Mines Act, 1952.
2 Mines Rules, 1955.
3 Coal Mine Regulations, 2017.
4 Mines Rescue Rules, 1985.
5 Indian Explosive Rules, 2008.

TH:5(c)- ADVANCED MINES SURVEY

L	T	P		Course Code: MIEPE204C (Th 5)	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course : PE	

RATIONALE:

A Mining engineer entrusted with the responsibility of supervising mine survey works should be through conversant with the latest developments techniques employed in mine surveying.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Explain the fundamental concepts of Spherical Trigonometry.
- Describe the important ideas of File Astronomy.
- Explain the essential elements of Photogrametry.
- Describe the fundamental concepts of Global Positioning System.
- Explain the important notions of Total Station

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Spherical Trigonometry:** Common terms used in Spherical Trigonometry like Sphere. Great circle, Small circle, Side of a triangle, Angle of a Triangle, Spherical axes, Spherical Triangle, Right Angled Triangle, Rectangular to Spherical coordinates. Convergence of meridian and parallel of latitude.	**9**
II	**Field Astronomy:** Terms used in field astronomy like, Celestial Sphere, Celestial Latitude, Celestial Longitude, Azimuth, Hour angle, Declination, Altitude, Zenith, Nadir, Right Ascension, Celestial Meridian, Celestial Equator, Zenith Distance, Vertical Circle, Celestial Horizon. Astronomical Triangle etc. Astronomical coordinates for heavenly bodies. Apparent time, Meantime, Sidereal time, Standard Time, Relation between different types of times. Latitude , Longitude, Time and azimuth of a place.	**12**
III	**Element of Photogrammetry:** Photo theodolite, Camera axis, Picture Plane, Principal points, Focal Length, Nodal Point, Prospective centre, Principal Distance, Principal Plane, Print, Isocentre in terrestrial Photogrammetry. Fundamental principles behind stereo phtogrammetry. Vertical photograph, Tilted Photograph, Oblique photograph, Prospective projection, Explosure station, Flying height focal length, Principal Point, Nadir Point, Ground	**12**

	Nadir Point, Till, Principle plane, Principle Line, Isocentre, Azimuth of Principle Plane, Horizontal Point .Find out the scale of Photography.	
IV	**Global Positioning System:** Global Positioning System. Principle of working of the system in brief, Application of GPS in Mining Engineering.	**6**
V	**Total Station:** Different components of Total Station, Applications of Total Station in Mines.	**6**
	Tota	**45**

REFERENCES:

1. Surveying Volume –III, Dr. B. C. Punmia, Laxmi Publication, 1990.
2. Modern Concepts of Mine Surveying. Vol-II by Alam Chand, News Sketch Press, Dhanbad.

PR:4- MINOR PROJECT

L	T	P		Course Code: PR 202	
0	0	4			
Total Contact Hours				**Laboratory Assessment**	
Theory		: 60Hrs	**Total Marks: 100**	End Term Exam	30
				Progressive Assessment	70
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course	: Project

RATIONALE:

A Minor project is generally requires a larger amount of effort and more independent work than that involved in a normal assignment. It requires students to undertake their own fact-finding and analysis. The students will select the topic, perform and design work. Minor project is as preparation for the students to take on more responsibilities and bigger project in the future. It is a learning experience, which aims to provide students with the opportunity to synthesize knowledge from different areas of learning, and critically and creatively apply it to real life situations. The leadership quality, co-ordination of job and maintaining good communal harmony is an important factor of this type of activity.

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Plan a Minor Project
- Execute a Minor Project with team.
- Implement hardware/software/analytical/numerical techniques, etc. based on project requirements.
- Optimize time related works through sharing of work responsibility
- Develop cost awareness and utilization of fund.
- Prepare a technical report on the project.

GUIDELINES FOR MINOR PROJECT

Unit No.	Topic/Sub-Topic
I	○ Minimum three and maximum five students can form a group for the minor project.
II	○ Project type can include • Development of a simple prototype system/product. • Investigation of performance of some systems using experimental method • Analysis of components/systems/devices using suitable software • Investigation of optimum process/material for product development using market survey.

	• Solution for society/industry problems
III	○ Project domain may not be limited to the specific area / discipline.
IV	○ Project report to be prepared and submitted by the students with following components: 1. Title 2. Objectives 3. Relevance and significance 4. Methodology 5. Analysis-Simulation/experimentation/survey/testing etc. 6. Result and Discussion 7. Conclusion

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P		Course Code: AU 202	
2	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 30Hrs	**Total Marks: 100**	End Term Exam	0
				Progressive Assessment	0
Pre Requisite		**: Nil**			
Credit		**0**		Category of Course	: AU

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

LEARNING OUTCOMES:

After completion of the course, the students will be able to**:**

- Understand the foundational principles of Indian knowledge systems by exploring the Vedas, Upavedas, Vedangas, and their interrelation with ancient and modern disciplines.
- Develop an appreciation for the integration of traditional Indian practices with modern science, focusing on holistic health care, yoga, and sustainable living practices.
- Analyze case studies to evaluate the practical applications of Indian knowledge systems in modern technological and scientific domains, including AI and ML.
- Foster interdisciplinary thinking by bridging ancient wisdom with contemporary educational and technological frameworks.

DETAILED COURSE CONTENTS:

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Odisha	7
II	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Governmentto harness TK.	7

III	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 andRules 2004, the protection of traditional knowledge bill, 2016.	6
IV	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	4
V	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	6

REFERENCES:

1. Cultural Heritage of India- Course Material by V. Sivaramakrishna Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
2. Modern Physics and Vedant by Swami Jitatmanand, Bharatiya Vidya Bhavan.
3. The wave of Life by Fritzof Capra
4. Tao of Physics by Fritzof Capra
5. Tarkasangraha of Annam Bhatta, Inernational by V N Jha Chinmay Foundation, Velliarnd, Amaku,am
6. Science of Consciousness Psychotherapy and Yoga Practices by RN Jha Vidyanidhi Prakasham, Delhi, 2016