SEMESTER VII

Program: B.Tech
Semester: Seven
Course: Mine Environmental Engineering
Course Code: 8PCCMiE401

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Course Learning Objective:

CLO 1: The students will have knowledge on spontaneous heating, mine fires, inundation and explosions.
CLO 2: To study about mine rescue and first aid.
CLO 3: The students will get practical knowledge about underground mine ventilation methods and planning.
CLO 4: The students will have deep knowledge about the mine accidents, disaster, disease and mine Safety with risk assessment, mitigation and management.

Course Outcome:

On the completion of the Course, the students will be able to:
CO1: Understand the basic concept of mine fire & spontaneous combustion with detection, control, dealing and prevention in underground mine.
CO2: Explain the causes & prevention of mine explosions like firedamp & coal dust explosion.
CO3: Gain knowledge of causes & prevention of inundation and uses of the rescue apparatus properly.
CO4: Analyze the causes of production of air born dust and its control as well as prevention and the standard of illumination at working place and other parts of the mine.

Course Content:

Topics	Hours
Unit 1:	**10**
Mine fires: Causes and classification of mine fires; Spontaneous combustion mechanism, stages of spontaneous combustion, susceptibility indices, factors affecting spontaneous combustion; Detection and prevention of spontaneous heating and accidental fires; Dealing with mine fires direct and indirect methods, fire stopping; Re-opening of sealed-off areas; Fires in quarries, Coal stacks and waste dumps.	
Unit II:	**6**
Mine explosions: Firedamp and coal dust explosions causes and prevention, explosive limits; Stone- dust and water barriers; Explosion in quarries over developed pillars; Investigation after an explosion.	
Unit III:	**8**
Inundation: Causes and prevention; Precautions and techniques of approaching old workings; Dewatering of waterlogged working, safety boring apparatus, pattern of holes; Design and construction of water dams. Rescue and recovery**:** Rescue equipment and their uses, classification of rescue apparatus; Resuscitation; Rescue stations and rescue rooms; Organization of rescue work; Emergency preparedness and response system.	
Unit IV:	**6**
Air borne reparable dust: Generation, dispersion, measurement and control; Physiological effects of dust, dust-related diseases. Illumination: Cap lamps; Layout and organization of lamp rooms; Standards of illumination; Photometry and illumination survey; Lighting from main and other sources.	

Suggested Reading:

1. *Elements of Mining Technology Vol II, D.J.Deshmukh, Central Techno Publication, Nagpur*
2. *Mine Environment & Ventilation, G.B.Misra, Oxford University Press, Calcutta*
3. *Mine Disaster & Mine Rescue, M.A. Ramlu, Oxford University Press, Calcutta*

Program: B.Tech
Semester: Seven
Course: Mine Environmental Engineering Lab
Course Code: 8PCCMiE401P

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List of Experiment:

1. Detection of Methane using flame safety lamp.
2. Demonstration of whirling hygrometer and determination of relative humidity using whirling hygrometer.
3. Demonstration of Kata thermometer and determination of cooling power by Kata thermometer.
4. Demonstration of various ventilation devices.

Program: B.Tech
Semester: Seven
Course: Environmental Aspects of Mining
Course Code: 8PCCMiE402

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Course Learning Objective:

CLO 1: To understand the sustainable development & environmental laws.
CLO 2: To develop knowledge of water pollution dues to mining activities and its effect & treatment.
CLO 3: Student will be to understand the air pollutions dues to mining activities and its effect & treatment.
CLO 4: Students will be able to concept of Corporate Social Responsibility &Mine closure.

Course Outcome:

On the completion of the Course, the students will be able to:
CO1: Understand the sustainable development and environmental as well as ecological conservation along with mining activities.
CO2: Learn the composition of mine and atmospheric air and the source of pollutants of air, water and sound.
CO3: Apply the knowledge on control of pollution of water and its treatment for purification using important parameters such as-BOD, COD and DO.
CO4: Apply the knowledge on environmental impact assessment of the project and laws related to land acquisition and rehabilitation as well as mine closure and corporate social responsibility.

Course Content:

Topics	Hours
Unit 1:	**8**
Introduction: Sustainable development, environmental carrying capacity - concepts & principles; Environmental impacts of mining and associated activities**.** Ecology: Introduction to ecology, ecosystem structures and functions.	
Unit II:	**8**
Air pollution: Atmospheric composition and meteorology; Sources of air pollution–point and non-point; Emission factors; Control measures– extraction, suppression and consolidation of dust. Noise and vibration: Basic concepts, sources, monitoring and control measures.	
Unit III:	**10**
Water pollution: Global hydrological cycle; Self-purification mechanism ,sources of water pollution, important parameters–pH, turbidity, oil &grease, nitrates, DO, BOD, COD; Eutrophication, de oxygenation, acid mine drainage and heavy metal pollution– preventive and control measures. Land environment: Land degradation due to mining; Physical and biological reclamation.	
Unit IV:	**6**
Environmental administration: Laws related to mining environment; EIA of mining projects. Land Acquisition &Revenue: Concepts: Related laws and regulations. Corporate Social Responsibility: Concepts and principles. Mine closure: Concepts and principles.	

Suggested Reading:

1. *Mine Environment & Ventilation, G.B.Misra, Oxford University Press, Calcutta*
2. *Environmental Impact of Mining and Mineral Processing,*Ravi Jain
3. *Hand Book of Methods in Environment Studies, S.K.Maiti, ISM*
4. *Environment Management In Mining Area, Dr.N.C.Saxena*

Program: B.Tech
Semester: Seven
Course: Mining Machinery II
Course Code: 8PCCMiE403

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Course Learning Objective:

CLO 1: The students will get exposure towards the material handling methods and systems and its principle to convey the minerals or materials from mines, plants and workshops.
CLO 2: The students will have practical knowledge about underground machineries, ropes, pit-top and pit-bottom layouts.
CLO 3: Enables students about the conveyor system and its advancement.
CLO 4: To understand riding system and aerial system

Course Outcome:

On the completion of the Course, the students will be able to:
CO1: Learn the basic concept of mine machinery for selecting the suitable machines and solving the excavating, loading & transportation problems in mine.
CO2: Explain the designing the open pit and layout of the haulage system and construction of bunker for storage of coal.
CO3: Understand the knowledge on wining system &choosing of appropriate conveying system and its control in the mine.
CO4: Apply the knowledge of construction &installation of aerial ropeway and man ridding system and its statutory provision.

Course Content:

Topics	Hours
Unit 1:	**10**
Construction and operation of blast hole drills, rippers, shovels ,hydraulic excavators, scraper, dragline, dumpers, wheel loaders, dozers, graders, surface miners, BWE, spreader, stacker &reclaimer. High capacity belt conveyors– constructional detail and selection procedures. Aerial ropeways–classification, layout and constructional features. Classification, application and constructional features of crushers, breakers and feeders.	
Unit II:	**8**
Surface and Underground Layout Pit top and pit bottom circuits. Surface structures. Surface handling systems – coal and ore handling plants. Storage bunkers. Railway siding. Pit bottom layouts. Winding Drum and friction winding, headgears, headgear pulleys, cages and skips, suspension gear, keps and guides.	
Unit III:	**8**
Steam and electric winders, safety devices in winders, duty cycle. Automatic winding. Multilevel winding. Trackless Haulage Types of conveyors and their sequence control. High angle conveyor. Free steered vehicles - shuttle cars, LHD, SDL and low profile dump trucks (LPDT).	
Unit IV:	**6**
Aerial Ropeways Types, construction and installation. Loading, unloading and angle stations, Man-riding Systems Statutory Provisions.	

Suggested Reading:

1. *Voll-II, D.J. Deshmukh, Central Techno Publication, Nagpur*
2. *Mine pump, haulage, winding, Ghatak, Coal Field Publisher Asansol.*

Program: B.Tech
Semester: Seven
Course: Mine Legislation and Safety I
Course Code: 8PCCMiE404

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Course Learning Objective:

CLO 1: The students will have knowledge on various acts, rules and regulations relating to the mineral industry.
CLO 2: Student will also know about accidents, diseases and mine safety.
CLO 3: To study various acts, rules and regulations relating to the mineral industry.
CLO 4: Students will be acquainted with rules, laws and order for running a mine.

Course Outcome:

On the completion of the Course, the students will be able to:
CO1: Understand the knowledge on implementation of provisions of mines act related to Mine, Open cast working, underground working, Relay, Shift, Serious bodily injury, Provisions for health and safety, Provisions regarding leave with wages.
CO2: Apply knowledge of legislation in mines for the implementation of mine rules, various committee & provisions related to First Aid.
CO3: Learn the various duties & responsibilities of mine managers, Asst/under Managers, Overman, foreman and surveyor.
CO4: Explain the implementation of the safety management plan to reduce the accident and various type of mine accident.

Course Content:

Topics	Hours
Unit 1:	**8**
Mines Act 1952: Important definition: Adolescent, adult, child, Employed, Mines, Mineral, Open cast working below ground & above ground working, Relay, Shift, Reportable Injury, Serious bodily injury, owner, agent, manager, chief inspector & District Magistrate. Provisions regarding leave with wages, committees, Notice to be given of accident, Notices of certain diseases, Hours & Limitations of Employment; Provisions regarding health & safety, Drinking water, Conservancy, medical appliances. Power of Inspector when employment of person is dangerous, Power of chief inspector to prohibit employment in certain case, power of government to appoint court of enquiry, power of central government regarding making of rules, regulation & bye laws etc, penalty & procedure.	
Unit II:	**8**
Mines Rules 1955 (Amended up-to- date): Important Definition, Provision regarding committee, provision regarding court of inquiry, certifying surgeon, Medical Examination of person employed/ to be employed in mines, Provision of workmen inspector & safety committee, Provisions related to health & sanitation and provisions related to First Aid & medical appliances, first aid room, first aid station and welfare amenities, Registers, Notices & returns etc. Hours and limitations of Employment - leave with wages - with wages and over time.	
Unit III:	**8**
Coal Mines Regulations 2017(Amended up-to- date): Definitions, Important provisions regarding returns; notices and records; Examination, Certificate of competency and of Fitness; Inspectors and Mine officials; Plans and sections including schedule; Duties & responsibilities of Mine management, contractors, manufacturers, officials, competent person and workmen, Important provisions regarding Means of access & egress, winding in shaft, & haulage, Provisions regarding mine working, precautions against danger from fire, dust, gas and water, Important provisions regarding mine ventilation, Important provisions regarding explosives & shot firing, Provisions regarding extraction of methane from working coal mine or abandoned coal mine, Important provisions regarding lighting & safety lamps, machinery plant & equipment, miscellaneous etc.	
Unit IV:	**6**
Metalliferous Mines Regulations 1961 (Amended up-to- date): Important definitions regarding retruns, notices and records, examination & certificates of competency and of fitness , Inspector and Mine officials; Duties & responsibilities of workmen , competent persons and officials etc. Mine plans and sections. Means of Access and egress ladder and Ladder ways under M.M.R. Transport of men and material by Haulage mine working, precautions against dangers from gas and water Mine ventilation, mine lighting and safety equipment and types of fences (Miscellaneous).	

Suggested Reading:

1. *Central Government, Mines Act 1952, Lovely Prakashan, Dhanbad*
2. *Central Government, Mines Rules 1955, Lovely Prakashan, Dhanbad*
3. *Central Government, Coal Mines Regulation 1957, Lovely Prakashan, Dhanbad*
4. *Central Government, DGMS Circulars, Lovely Prakashan, Dhanbad*

PROFESSIONAL ELECTIVE (ANY ONE OF THE FOLLOWING SUBJECTS)

Program: B.Tech
Semester: Seven
Course: Dimensional Stone Mining
Course Code: 8PECMiEEL401

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Course Learning Objective:

CLO 1: The course is designed to help the student in understanding the different methods to mining and processing also extraction methods of dimensional stone.
CLO 2: They can know about various properties of dimensional stone and various machines to use for extraction of dimensional stone.
CLO 3: After learning this course the students should be able to understand the different method to mining and processing also extraction methods of dimensional stone.
CLO 4: To know the hazard of dimension stone mining.

Course Outcome:

On the completion of the Course, the students will be able to:
CO1: Apply knowledge on small scale & dimensional stone mining for understanding, formulating and solving problems related with small scale mining.
CO2: Apply skill on selecting the equipments and cutting tools as per physical properties of material fordesigning and development of small scale mine.
CO3: Apply knowledge of extraction of dimension stone.
CO4: Apply the skill on preventive measures for the hazard caused due to dimension stone mine.

Course Content:

Topics	Hours
Unit 1:	**8**
Introduction: Definition, historical use of natural stones. Geology and occurrences: Classification of dimensional stones, composition, chemical and geo-chemical properties, various standards for normalization of dimensional stones. Mining of dimensional stones: Various techniques of dimensional stones mining–block mining and slab mining; Manual mining; Mechanized mining–line drilling, in-situ sawing by wire saw, chain saw, portable circular saw, flame cutting.	
Unit II:	**8**
Cutting/Sawing tools: Tool carrier–circular steel blade, steel wire rope, chain jib saw ,physical and mechanical properties, elastic properties, tension etc.; Cutting tools– diamond segments, diamond pearls/ bits, tungsten bits etc.; Process of manufacture, ingredients, brazing /fitting, wearing pattern and control; Cost of cutting. Handling of blocks and slabs: Equipment used derrick crane, front loaders, fork-lifts, mobile cranes, trucks and trailers.	
Unit III:	**8**
Quarrying machines for dimensional stones: Portable circular saw, wire saw, chain saw, line drills–special design features of the machines, techniques of use and maintenance. Production monitoring: Recovery, waste generation, productivity, inherent defects, measurement and corrective actions, cost evaluation. Environmental issues: Management of solid waste, slurry waste, soil and water; Protection and rehabilitation.	
Unit IV:	**10**
Health, safety and welfare: Protective care from abrasive dust, personal safety and welfare. Application, processing and architecture in dimensional stone: Application–flooring, roofing, cladding, stairs, paving, facets; Processing and polishing –various techniques for sawing of blocks, shaping of edges, polishing and calibration; Fixing and installation–techniques of fixing of dimensional stones in various applications like flooring, cladding, faces, stairs, roofing and paving; Care and maintenance of dimensional stones–techniques for post fixing care and maintenance of dimensional stones in various applications.	

Suggested Reading:

1. *Hand Book On Safety In Mines & Dimension Stone Quarries, Mines Group Vocational Training Society, Hospet*
2. *A Text-Book Of Ore And Stone Mining (1894) By Sir Clement Le Neve Foster*

Program: B.Tech
Semester: Seven
Course: Rock Excavation Engineering
Course Code: 8PECMiEEL402

L	T	P	C
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Course Learning Objective:

CLO 1: The students will get familiarity about rock mechanics properties, rock cutting technology and excavating machines.
CLO 2: To understand the rock mechanics, rock cutting technology, rock cutting tools and rock excavating machine.
CLO 3: Student get introduced with the rock mass classification and mechanism of rock reinforcement and the typical and special methods of rock reinforcement.
CLO 4: After this module the student will be able to understand various rock cutting machine and their techniques

Course Outcome:

On the completion of the Course, the students will be able to:
CO1: Apply knowledge of rock mechanics in designing rock structuresand excavation in civil and mining engineering projects.
CO2: Apply knowledge of rock mechanics in drilling techniques, mechanism and its performance in underground and surface drilling
CO3: Apply knowledge on fragmentation by explosives; advances in explosives and their selection criteria for rock excavation; blast design for surface excavations and optimization.
CO4: Apply knowledge on interaction of rock and cutting tools as well as selecting different types of underground and opencast machines such as ploughs, shearers, road headers, continuous miners and tunnel boring machines, shovel, draglines etc.

Course Content:

Topics	Hours
Unit 1:	**6**
Scope and importance: Rock excavation engineering in mining and construction industries; physico-mechanical and geotechnical properties of rocks Vis-à-vis excavation method; selection of excavation method.	
Unit II:	**6**
Drilling: Mechanics of rock drilling; design and operating parameters of surface and underground drilling; evaluation of drill performance; drill ability of rocks; mechanism of bit wear; bit selection; problems of drilling; economics of drilling.	
Unit III:	**10**
Blasting: mechanics of rock fragmentation by explosives; advances in explosives and their selection criteria for rock excavation; blast design for surface excavations and optimization; advanced blast initiation systems; blast performance evaluation; cast blasting; techno economic and safety aspects of surface and underground blasting; advances in blast design for underground excavations; contour blasting; computer aided blast designs; review of tunnel blasting techniques in recent advances.	
Unit IV:	**8**
Rock Cutting: theories of rock tool interaction for surface excavation machinery- rippers, bucket wheel excavators, continuous surface miners; theories of rock tool interaction for underground excavation machinery- ploughs, shearers, road headers, continuous miners and tunnel boring machines; selection criteria for cutting tools; Advanced rock cutting techniques- high pressure water jet assisted cutting.	

Suggested Reading:

1. *Theory and Technology of Rock Excavation,Zou, Dingxiang*
2. *Rock Fragmentation by Blasting by B Mohanty*
3. *Principles of Rock Drilling by U M Rao Karanam and B Mishra*
4. *Rock Blasting: Effects and Operations by Pijush Pal Roy*

L	T	P	C
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Program: B.Tech
Semester: Seven
Course: Design of Open Pit Mines
Course Code: 8PECMiEEL403

Course Learning Objective:

CLO 1: This course discusses the geological model and its purpose of linking the regional physical geology and the events that lead to the formation of the ore body to a mine-scale description of the setting.
CLO 2: Discusses the distribution and nature of the overburden soils and rock types at the site, including the effects of alteration and weathering.
CLO 3: Aware about the new techniques to design open cast mines and analyze the surface mining parameters.
CLO 4: Learn about the different hazard in open pit

Course Outcome:

On the completion of the Course, the students will be able to:
CO1: Explain the knowledge of planning process of open pit mine& reserve estimation.
CO2: Analyze the pit design and synthesis of short term planning and to control and influence production scheduling processes.
CO3: Understand the development of infrastructural facilities such as communication, power supply, beneficiation plants and mineral handling plants etc. and able to design various kind of open pit working.
CO4: Apply knowledge on Controlling of opencast mining induced hazards- rock fall, fly rock, blast vibration, noise and mine dusts.

Course Content:

Topics	Hours
Unit 1:	**8**
Preliminary evaluation of deposits, different stages of exploration, drilling for grade and geo-technical information. Calculation of reserves, Collection of planning information.	
Unit II:	**8**
Optimal size and output different stages of development, design of pit layout and method of advance. Selection of open cast equipments and equipment scheduling, Design for unit operations, rock breaking, excavation, transportation, storage and dumping.	
Unit III:	**8**
Development of infrastructural facilities-communication power supplies, illumination, dewatering and other maintenance services, Site selection for mineral handling/ beneficiation plant.	
Unit IV:	**6**
Control of opencast mining induced hazards- rock fall, fly rock, blast vibration, noise and mine dusts. Planning for reclamation of mined out area.	

Suggested Reading:

1. *Open Pit Mine Planning and Design,William A. Hustrulid,Mark Kuchta*
2. *Open Pit Mine Planning and Design , William A*

Program: B.Tech
Semester: Seven
Course: Vocational Trainee Report II
Course Code: 8PROJMiE401

L	T	P	C
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Course Learning Objective:

CLO 1: To provide training in mines for gaining thorough understanding of all the theoretical knowledge.
CLO 2: Gaining practical experience is an important aspect of the mining engineering programme having many characteristic features of its own.
The students will have insight about mining methods and techniques.
CLO 3: The outcome at the place of work is always much more than what can be learned in the class room.
CLO 4: To provide the students an opportunity to express their skills, academic knowledge, practical experience and ability to analyze problems.
CLO 5: To provide the students an opportunity to express their skills, academic knowledge, practical experience and ability to analyze problems.

Course Outcome:

On the completion of the Course, the students will be able to:
CO 1: Mining graduates would be equipped with managerial skill which would be useful to them for achieving their program educational outputs.

Report Content:

1. Study of History of Mine – Note name of the Owner, Agent, Manager, SafetyOffice
2. Study of Mine geological information
3. Study of Mine Plans and Sections
4. Study of Surface features related to Mine
5. Study of method of working
6. Study of method of blasting
7. Study of Transportation system and layouts
8. Study of Ventilation systems and layouts
9. Study of Drainage system
10. Study of Pit top and Pit bottom layouts.
11. Study of man Power plan
12. Develop the Lamp room layout and Magazine Layout
13. Draw the charts depicting instructional items related to Mining subjects

Vocational Training in a Surface / Underground Mine of minimum 30 (Thirty) days to be taken at the end of Semesters.

Program: B.Tech
Semester: Seven
Course: Seminar in Executive Communication
Course Code: 8HSMC401

L	T	P	C
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Course Learning Objective:

CLO 1: To develop a general knowledge of the basic theories of human communication in rhetorical, group, and interpersonal settings.
CLO 2: To develop the basic understanding of the principles and techniques of persuasion in interpersonal, group, and public speaking contexts.
CLO 3: To develop an ability to successfully apply the above knowledge in actual small group, interviewing, business, public speaking, and interpersonal situations. The ability to write well-worded and persuasive resumes and other business communication. Also, the ability to write a valid and well-supported analysis of communication problems encountered in real-world situations.
CLO 4: To develop an understanding of how the perception of both verbal and non-verbal messages influences culture, behavior, and action of life itself.

Course Outcome:

On the completion of the Course, the students will be able to:
CO 1: Develop an understanding of the process of oral communication
CO 2: Develop critical thinking and analytical skills.
CO 3: Improve listening, note taking and observational skills
CO 4: Become more knowledgeable about audience centered speaking
CO 5: Develop message generating and delivery skills
CO 6: Become more knowledgeable about current speaking strategies and practices and new media research strategies

Course Content:

Topics	Hours
(Activity Based)	**24**
WORKSHOPS ➢ Debate ➢ Extempore ➢ Group Discussion ➢ Panel Discussion ➢ Presentation-Paper & Oral ➢ Reports: Survey Report, Project Report, Case Study	

Suggested Readings:

1. *Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11th Reprint. Tata McGraw-Hill. New Delhi*

2. *Swets, Paul. W. 1983. The Art of Talking So That People Will Listen: Getting Through to Family, Friends and Business Associates. Prentice Hall Press. New York*
3. *Lewis, Norman. 1991. Word Power Made Easy. Pocket Books*
4. *Sen , Leena .Communication Skills ; Eastern Economy Edition*
5. *David Green. Contemporary English Grammar, Structure & Composition ; MacMillan*
6. *Dictionary; Oxford*
7. *Dictionary ; Longman*

Websites

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- *www.dictionary.cambridge.org*
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- *www.wikipedia.org/wiki/english_grammar*