SCHOOL OF ENGINEERING
SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

MIA 701-MINE MACHINERY-III

MIA 701	MINE MACHINERY-III	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

- To understand the functioning of winding engines and other winding accessories
- To study surface and pit bottom layouts, various coal face machinery
- To study the design and construction details of excavating & transporting equipments used in surface mines.
- To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

Course outcomes:

- The students will have the knowledge on functions of winding engines, winding accessories, pit-top and bottom mine circuits. They will also know about working of various coal face machinery, and design & constructional details of excavating and other prominent machinery used in surface mines.

UNIT 1: FACE MACHINERY (8 Hours)

Coal and rock Drilling, their constructional details, their applications, operation and maintenance, jumbo drill machines, introductiontocoalcuttingmachine.

UNIT 2: LOADING AND TRANSPORTATION (8 Hours)

Rocker shovel, gathering arms loaders, LHD and SDL machines- their construction and operation and maintenance, cavo loader, shuttle car and underground trucks, its construction, operation and application.

UNIT 3: CUTTER LOADERS (10 Hours)

Different types of cutter loaders suitable for long wall and short wall faces, their constructions, operation and maintenance, winning methods different types of continuous miner & road headers their suitability, construction, operation and maintenance , mechanics of rock cutting, rock cutting tools and their performance.

UNIT 4: COMPRESSED AIR (8 Hours)

Basic concept, compression process, working and constructional features of single stage and multistage compressor, unloading arrangement of compressor, layout of pipelines, transmission of compressed air, testing of compressor, safety features ofcompressor

UNIT 5: USE OF ELECTRICITY IN MINES (8 Hours)

Flame proof enclosures & intrinsically safe apparatus, underground cables, drill panel, gate end box, circuit breakers, remote control (pilot circuit), installation of underground substation, earth leakage protection, cable joining, Electrical signaling provisions of IER related to mines.

Reference books:

1. Elements of Mining Vol. III by D. J. Deshmukh
2. UMS Booklet
3. Winningand Working of Coal: R. T. Deshmukh & D. J. Deshmukh
4. Modern Coal Mining Practices : R. D.Singh

5. LongwallMining : Syd. S.Chaing & Peng
6. Mine Winding & Transport byS.C.Walker

MIA 701	**MINE MACHINERY-III**	**0L:0T:1P**	**1 credits**	**2 Hrs/Week**

LIST OF EXPERIMENTS:

1. Study of LHD.
2. Study of SDL.
3. Study of Continuous Miner.
4. Study Of Jumbo Drill.
5. Study of Coal Cutting Machine.

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MIA-702 STRATA CONTROL

MIA-702	**STRATA CONTROL**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course objectives:

· Knowledge of underground excavation ; stability around the excavation, subsidence and stress around the excavation

· To comprehend the rock mass classification and support system for underground excavation

· To monitor and predict subsidence and underground disasters

· To design single and multiple opening and support system for underground excavations

Course outcomes: At the end of the course the student will be able to:

· To be familiar with the types of underground excavation and to stabilize the excavation.

· Support the rock mass based on different properties of rock.

· Ability to estimate the subsidence and monitor the disasters.

· To design an opening and support system for underground.

UNIT 1 (10 Hours)

SUPPORTS -Timber & steel supports, Examination of roof, Roof bolting, roof stitching, method of supporting roadways. Supporting under different conditions viz. Pit bottom, crossing, junctions, faulted area, longwall faces, depillaring areas andstopingareas, supportloads.SSR, CTR, Supportplan, Supportwithdrawal.

UNIT 2 (8 Hours)

POWERED SUPPORTS - their principles of operation, Classification, designation, constructional features and applications, Hydraulic fluids.

UNIT 3 (6 Hours)

STOWING -Principal methods of stowing, their relative merits and applicability, Hydraulic stowing, Pneumatic stowing, Mechanical stowing, Hand packing, face arrangements, pipe wear, pipejams.

UNIT 4 (10 Hours)

STRATA CONTROL -Theories of ground movement, Rock pressure due to Narrow and Wide excavation, Front abutment and back abutment, Failure of roof and floor, measurement of strata movement, rock burst, bumps, gas outbursts, pot holes.

UNIT 5 (8 Hours)

SUBSIDENCE-Theories of subsidence, damage and loss due to subsidence, vertical and lateral movements and their estimation, angle of fracture and angle of draw, factors affecting subsidence, subsidence control, protection of surface structures, design of protection pillars including shaft pillars. Pot holes.

Reference Books:

1. Strata control in mines Chaing & Peng
2. Winning and Working of Coal R. T. Deshmukh & D. J. Deshmukh
3. Modern Coal Mining Practices R. D. Singh
4. D.G.M.S. Circulars (Tech.) 1995onwards
5. Longwall Mining Syd. S. Chaing & Peng

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MIA-702	**STRATA CONTROL**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

List Of Experiments :

1. Study of Timber and Steel types of Supports.
2. Study of Roof Bolting.
3. Study Of Powered support.
4. Study of Theories of Subsidence.
5. Study of Hydraulic and Pneumatic Stowing.
6. Study of Theories of Ground Movement.
7. Study of Angle of Fracture.

Program Elective - IV

MIA 703(A)-MINE DISASTERS

MIA 703(A)	**MINE DISASTERS**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:

· To understand the causes of mine fire and spontaneous heating.
· To know how to tackle the mine disasters like mine fire and inundation.
· To understand the lighting in underground and open cast mine.
· To understand the rescue and recovery operation in a mine.

Course outcomes:

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

⌜ An ability to know the causes of mine fire and spontaneous heating.
· An ability to tackle the mine disasters like mine fire and inundation.
· An ability to design the lighting in underground and open cast mine.
· An ability to carry out the rescue and recovery operation in a mine.

UNIT-1 (8 Hours)

Spontaneous Combustion Mechanism, causes, susceptibility indices, detection, preventive measures and control. Incubation period and its determination.

UNIT-2 (8 Hours)

Mine Fires Classification of fires, causes, detection, preventive measures. Dealing with underground and surface fires. Firefighting– directmethods,sealingoffand inertisation.

UNIT-3 (8 Hours)

Explosions Mechanism, causes, characteristics, preventive and control measures of firedamp and coal dust explosions. Investigation after explosion.

UNIT-4 (8 Hours)

Reopening of Sealed-off Area Monitoring of atmosphere behind sealed-off area. Precautions to be taken before reopening. Methods of reopening.

UNIT-5 (10 Hours)

Inundation Causes and preventive measures. Precautions to be taken while approaching old water-logged workings and while working under water bodies. Safety boring apparatus. Dewatering procedure. Design and construction of water dams and barriers.

Reference Books:

1. Mine Disasters and Mine Rescue- M.A.Ramlu
2. Mine Disasters- G.B. Mishra

MIA-703(B) MINING INDUCED SUBSIDENCE ENGINEERING

MIA-703(B)	**Mining induced subsidence engineering**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:
The mine subsidence is a common phenomena in any underground coal mining operations. The subsidence prediction, causes and analysis and preventive measures to be taken form an important role in coal mining operations. The subsidence impact on surface structures, governing laws to subsidence control, instrumentation and monitoring techniques and to minimize such effects need to be emphasized.

Course Outcome:
The subsidence of mined out areas. The mechanism of failure of strata after creating the voids and filling the mine voids with different materials need to be addressed to monitor the ground movement.

UNIT-1 (10 Hours)
Introduction: strata movement at the mining horizon, convergence in mine working, factors influencing convergence in mine working. subsidence mechanism; Zones of movement in the ovelying beds, veritical and horizontal movements, subsidence trough, angle of draw, angle of break sub-surface subsidence.

UNIT-2 (9 Hours)
Types of subsidence – non-effective width, sub-critical, super-critical width.
subsidence prediction: different methods of surface subsidence prediction - graphical, analytical, profile function, empirical and theoretical models.

UNIT-3 (6 Hours)
Theories of subsidence, sub-surface subsidence due to mining.
Mining damage to building, industrial installations, railway lines, pipes cannels, etc.

UNIT-4 (7 Hours)
Rock kinematics, Extent of movement in the overlying beds.
calculation of ground movement over time. types of stress on structures stress-strain behavior of soils. Different standards suggested for mining and ground in respect of subsidence.

UNIT-5 (10 Hours)
Special Methods of Mining tocontrol subsidence. Prediction and nomograms of subsidence.
Time influence and impact on structures: influence of item on subsidence, examplr from long wall and board and pillar working.

Reference Books:

1. Mining Induced Subsidence Engineering-Kolymbas, Dimitrios
2. Mining Induced Subsidence Engineering-Gattinoni, Paola, Pizzarotti, Enrico, Scesi, Laura
3. Mining Induced Subsidence Engineering -Dimitrakopoulos,

OPEN Core Elective-III MIA-704(A) MINING ECONOMICS

MIA-704(A)	**MINING ECONOMICS**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:

- Gain knowledge on role of mineral industry in national economy, national mineral policy, financial management and cost accounting applicable to mining industry.
- Comprehend sampling, classification of ore reserves and resources.
- Learn various methods of ore reserve estimation and mine valuation.
- Evaluate the economic feasibility of a mining project.

Course outcomes:

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

- An overall knowledge of mineral industry and related policy issues, basics of financial and cost accounting aspects.
- An ability to select proper sampling method and to classify the ore reserve and resources.
- An ability to compute ore reserve and value of a mining project.
- An ability to evaluate the economic feasibility of a mining project given the geological, mining and financial parameters.

UNIT 1: SAMPLING (10 Hours)

Methods of sampling, Errors in sampling, analysis of samples, estimation of grade and reserves Different types of reserves. Salting, precautions against salting.

UNIT 2: MINE VALUATION (8 Hours)

Different methods, Depreciation, Amortization and Redemption of capital, life and present value of a mine.

UNIT 3: FINANCIAL MANAGEMENT (8 Hours)

Methods of framing and financing industrial enterprises, Memorandum and articles of association, shares, debentures, dividends and interest. Break even chart and inventory control.

UNIT 4: INVESTMENT DECISIONS (10 Hours)

Discounted cash flow methods, non-discounted cash flow methods, advantages and disadvantages of them, internal rate of return, Net Present Value.

UNIT 5: BOOK KEEPING (6 Hours)

Preparation of Balance sheet, Profit and Loss Account.

REFERENCE BOOKS:

Mineral Economics , R.T. Deshmukh

SME Handbook, Vol. IMineral Economics , Sinha and Sharma

MIA-704(B) MINE HAZARD AND RESCUE

MIA-704(B)	**MINE HAZARD AND RESCUE**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:

- To understand the causes of mine fire and spontaneous heating.
- To know how to tackle the mine disasters like mine fire and inundation.
- To understand the lighting in underground and open cast mine.
- To understand the rescue and recovery operation in a mine.

Course outcomes:

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

- An ability to know the causes of mine fire and spontaneous heating.
- An ability to tackle the mine disasters like mine fire and inundation.
- An ability to design the lighting in underground and open cast mine.
- An ability to carry out the rescue and recovery operation in a mine.

Unit-1:Mine Fires : (10 Hours)

Causes of mine fires; spontaneous combustion - mechanism, susceptibility indices, factors affecting spontaneous combustion; detection and prevention of spontaneous heating; accidental fires – causes and prevention; dealing with mine fires - direct and indirect methods, fire stoppings; fires in quarries, coal stacks and waste dumps.

UNIT-2: Mine Explosions : (8 Hours)

Firedamp and coal dust explosions – mechanisms, causes and prevention; stone-dustandwaterbarriers; investigations after anexplosion.

UNIT-3 Inundation : (8 Hours)

Causes and prevention, precautions and techniques of approaching old workings; safety boring apparatus, pattern of holes; design and construction of water dams, shaft dams, emergency bulk heads, strengthening of dams**.**

UNIT-4:**Rescue And Recovery : (10Hours)**

Rescue equipment and their uses, rescue stations and rescuerooms; organization of rescueand recoveryareas, re-opening ofsealed-off workings Illumination in mines- it's effect on safety, efficiency and health ; common types of safety lamps & their uses and limitations, maintenance and examination of lamps, their charging, cleaning, lighting, re-lighting ; lamp room design and organization;

UNIT-5:Lighting from mains –(6 Hours)

different types of illumination devices; illumination of pit bottoms. main roads, faces, pump houses and haulage rooms; standards of illumination in underground and opencast mines Airborne respirable dust in underground mines - generation, dispersion, measurement and contro; classification, physiological effects, dust measurement, sampling of air-bone dust

Reference Books:

1. Mine Hazard And Rescue -M.A. Ramlu
2. Mine Hazard And Rescue -R.D. Singh
3. Mine Hazard And Rescue-D. J. Deshmukh

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MIA-705	**PROJECT STAGE-I**	**0L:0T:1P**	**10 credits**	**12Hrs/Week**

Course Preambles:

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources upholding ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Course outcomes:

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

- Present the project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

Project Work Phase - I: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

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MIA-706	**SELF STUDY/GD/SEMINAR**	**0L:0T:1P**	**1 credits**	**2 Hrs/Week**

Course Preambles:
The objective of the seminar is to inculcate self
skill, involve in group discussion and present and exchange ideas.
Each student, under the guidance of a Faculty, shall choose, preferably, a rece
relevant to the Course of Specialization.
- Carryout literature survey, organize the seminar content in a systematic manner.
- Prepare the report with own sentences, avoiding cut and paste act.
- Type the matter to acquaint with the use of Micro
facilities.
- Present the seminar topic orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit typed report with a list of references.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards.

Course outcomes: At the end of the course th eand become self
- Attain, use and develop knowledg in the field of engineering and other disciplines through independent learning and collaborative study.
- Identify, understand and discuss current, real
- Improve oral and written communication skills.
- Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
- Apply principles of ethics and respect in interaction with others.