

Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. V Semester**

**Mining Engineering**



**Rajasthan Technical University, Kota**

Effective from session: 2019 – 2020



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI3-01: Remote Sensing and GIS

Credit : 2  
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)  
End Term Exam : 2 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Remote Sensing Process:</b> Introduction to Remote Sensing, data acquisition and processing, sensor systems, applications, Radiation (EMR) and its characteristics, Radiation principles, Planck's Law Electromagnetic, Stefan's Law, properties of solar radiant energy, at atmospheric windows	6
3	<b>Physical Basis of Remote Sensing:</b> Interaction in the atmosphere, nature of atmospheric interaction, atmospheric effects of visible, near infrared thermal and microwave wavelengths, spectral characteristics of individual leaf interaction at ground surface, interaction with soils and rocks, effects of soil moisture, organic matter, particles, size and texture, interaction with vegetation, vegetation canopies, effect of leaf pigments, cell structure, radiation geometry	5
4	<b>Platform and Sensors:</b> Multi concept in remote sensing, general requirements of a platform, balloon aircraft, satellite platforms sun-synchronous orbits, sensors for visible near infra-red wavelengths, profilers, images, scanners, radiometers, optical mechanical and push button scanners, spectral, spatial, radiometric and temporal resolution, IFOV, FOV, geometric characteristics of scanners, V/H ratio, comparison of satellite/aerial platforms and sensors and remote sensing data products, land sat and TM, SPOT, IRS, ERS etc	5
5	<b>Visual &amp; Digital Image Processing:</b> Remote Sensing Data Products, Elements of visual Image Interpretations, Generation of Thematic Maps, Digital Image Processing System, Image Enhancement, Image Transformation, Image Classification.	3
6	<b>Geographical Information System:</b> Difference between image processing system geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitisers, raster and vector data storage, hierarchical data, network systems, relational database, data management, conventional database management systems, spatial database management, data manipulation and analysis, reclassification and aggregation, geometric and spatial operation on data management and statistical modeling, Applications and Modern Trends of GIS in various natural resources and engineering applications	6
<b>Office of Deans Academic Affairs</b>		<b>Total 26</b>

Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-02: Mine Ventilation

Credit : 2  
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)  
End Term Exam : 2 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Mine Gases:</b> Occurrence, properties, detection, measurement and monitoring; Methane layering; Methane drainage.	3
3	<b>Heat and Humidity:</b> Sources; Geothermic Gradient, Different ways of expressing humidity, measurement, Effect and control of heat and humidity in mines; Climatic conditions, Comfort Conditions and assessment; Cooling power of mine air; refrigeration and Air conditioning	3
4	<b>Air Flow in Mine Workings:</b> , Reynold's number; Laminar and turbulent flow; Pressure losses due to friction and shock resistances; Pressure across the mine; Equivalent orifice of the mine; Resistances in series and parallel; Air quantity requirements; Leakages; Splitting in underground workings, Forcing and exhaust ventilation; ascensional and descensional ventilation, Homotropical and Antitropical ventilation; Central and boundary ventilation. Network analysis, ventilation of dead ends	4
5	<b>Ventilation:</b> Necessity and standard of ventilation, Laws of ventilation, rules and regulations, Chezy's and Atkinson's equation, Thermodynamics of ventilation and determination of pressure volume diagram.	2
6	<b>Natural Ventilation:</b> Mechanism; Estimation and measurement of natural ventilation pressure; Restarting and Reversal of natural ventilation, motive column, natural ventilating pressure and problems on these.	2
7	<b>Mechanical Ventilation:</b> Mine fans: Types, Construction and working, Characteristics and suitability, Pressure developed, series and parallel operations; characteristic curves, Installation and testing; Reversal of air flow.	2
8	<b>Auxiliary Ventilation:</b> Types of Auxiliary Ventilation: Forcing, Exhaust, Overlap, Reversible and Line Brattices System. Booster Fans, Purpose of Booster Fans, Disadvantage of Booster Fans, Critical Pressure of Booster Fan, Pressure required to be developed by Booster Fan, Installation of Booster Fans, Auxiliary fans- Types, construction, characteristics, location and installation; Comparison of booster and auxiliary fans, Air ducts; Risk of re-circulation	3
9	<b>Ventilation Devices:</b> Stopping, doors, air locks, Fan drift, evasee and their design, air crossings, regulators and boosters for the regulation of air flow- Construction, location installation and their effect on the air flow in the panel and the entire mine; Risk of re-circulation; Controlled re-circulation for ventilating extensive mine workings.	2



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

**3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)**

<b>10</b>	<b>Ventilation Survey:</b> Purpose, Ventilation survey, pressure-quantity survey (P/Q survey), Organisation of P/Q survey, instruments, procedure, tabulation and calculation, Preparation and interpretation of ventilation plans.	<b>1</b>
<b>11</b>	<b>Illumination:</b> Introduction, Light Intensity, Mean spherical candle power, Mean horizontal candle power, Illumination, Lumen, Luminous efficiency, Reflection. General lighting arrangements, Standards for mine lighting, Important guidelines with respect to luminance, Mine lighting and its effects on accidents, production and health, Miner's Cap lamp construction, maintenance and use, Lamp room.	<b>3</b>
<b>Total</b>		<b>26</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-03: Surface Mining

Credit : 3  
3L+0T+0P

Max. Marks: 150(IA:30, ETE:120)  
End Term Exam : 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Applicability:</b> Applicability, advantages and limitations of surface mining.	3
3	<b>Basic Parameters:</b> Size of mine area, Pit depth; Annual production and life of mine; Bench height, width and slope, Pit slope; Cut-off grade; Stripping ratio, Determination of mine parameters.	3
4	<b>Opening of Deposits:</b> Box cut, site selection and driving, Formation of benches. Trenches, Driving of entry and opening trenches; lying of communication routes, Different methods of opening up the deposits	3
5	<b>Overburden Removal:</b> Systems of overburden removal and disposal; Site selection for disposal, Design of waste dumps, Overcasting, haulage and combination methods.	3
6	<b>Layouts:</b> Basic layouts for flat, horizontal, inclined and steep deposits; Strip mining layouts; Layout for hilly deposits. Management of layouts (Pushback operation for rearrangement of existing layouts)	5
7	<b>Blast hole drilling:</b> Types of drilling equipment, Selection of Drills; Drilling concepts - Operation and performance, Drilling patterns, Inclined drilling, Computation of Productivity of Drill Machines; Control of dust.	3
8	<b>Blasting:</b> Choice of explosive; Blast round design, Blasting calculation for charges, Mode and points of initiation; Sequence of blasting and delay interval; Multi row blasting, Blast hole deviation, Inclined hole blasting; Fragmentation monitoring; Secondary blasting; Blasting hazards - noise, ground vibration, fly rock, dust & air over pressure and their remedial measures	4
9	<b>Excavation Machinery:</b> Different Types of Excavators used in Open Pits; Shovel, Dragline, Hydraulic Excavators, Multi Bucket Excavators, Front end loaders, Selection criteria, Their Construction, Operation, Suitability and Applicability; Calculation of Their Productivity.	4
10	<b>Transportation:</b> Rail, Road, Pipe line, Conveyors and aerial ropeway transportation systems; Their Suitability, limitations and comparative study; Computation of Their Productivity, Optimization of shovel- dumper combination; Computerized truck dispatch system; Haul road design, construction and safety measures, Steep angle conveyor, high angle conveyor, in pit crushing and conveying.	5
11	<b>Reclamation:</b> Different Types, Applicability, Planning.	2
12	<b>Drainage:</b> Assessment of water make; Drains, sumps and pumping systems; Pre-drainage through diversion channels and boreholes.	3
13	<b>Storage:</b> Stockpiling and blending. Spreaders. Reclaimers	2
	<b>Total</b>	<b>41</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-04: Underground Coal Mining

Credit : 3

Max. Marks: 150(IA:30, ETE:120)

3L+0T+0P

End Term Exam : 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Introduction:</b> Origin of Coal, Theories of Coal Formation, Classification of Coal, Distribution of Coal in India, Indian Coal Mining Industry; Coal Seam and its Classification, Coal Seam Structures and Abnormalities like Faults, Joints, Cleats, Folds etc., Characteristic of roofs, floors and associated rocks, Factors influencing choice of methods; Classification of mining systems-their relative merits and application. Global and Indian status of different underground coal mining methods. Trend of change in technology of mining coal vis-vis demand	7
3	<b>Bord And Pillar Method:</b> Important Terminology, Size and Shape of The Pillar, Galleries, Division of mine area into panels on district and level patterns, Size of Panel, Panel System and Without Panel System of Development, Development of panels by drivage of group of headings to strike, dip and rise with V, diagonal and straight fronts, Mechanised B&P development, Cutting, drilling, blasting, loading and transportation; Support, ventilation, drainage and lighting, manpower, Cycle of operations, layouts	8
5	<b>Depillaring:</b> Problems in Depillaring, Preparatory Arrangements, Depillaring of panels with V, straight and diagonal fronts. Conventional and mechanized depillaring schemes with emphasis on coal, water, air routes and supports. Pillar Extraction Techniques, Depillaring by Stowing, Depillaring by Caving Methods, Depillaring by continuous miner, Dangers Associated with Depillaring	8
5	<b>Longwall Mining:</b> Important Terminology, Types of Longwall Faces and Their Choice, Merits and Demerits of Longwall Mining, size of panel, development of panel with single and multiple heading gate roads, various orientations of longwall face, single and double unit longwall, Longwall Advancing Method, Longwall Retreating Method, Length of Longwall Faces, Rate of Face Advance, Double Unit Longwall Faces, Extraction of longwall panels with conventional and fully mechanized methods, length of face, daily advance, cycle of operations, Face organisation, scheduling and layouts with special reference to coal, water and air routes, Gate, goaf and face area support in conventional and fully mechanised longwalls	8
6	<b>Thick/steeply inclined/Thin Seam Mining:</b> Problem in Mining of Thick Seams, Choice of Thick Seam Mining Methods, Inclined Slicing, Horizontal Slicing, Diagonal Slicing, Transverse Slicing, Sublevel Caving, Blasting Gallery Method and wide-stall method, Cable-Bolting Method of Thick Seam Extraction. Winning of thin seams – methods, equipment and associated problems.	6
7	<b>Room And Pillar Mining:</b> Suitability, Different methods viz. Vermelles Method, Slant Method, Sublevel Method, Coal Saw Method, Performance and limitations of the method, Mechanisation	3
<b>Total</b>		<b>41</b>





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-05: Mine Surveying II

Credit : 2  
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)  
End Term Exam : 2 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Correlation:</b> Methods of correlation of surface and underground surveys through - adits, inclines, and shafts ; Correlation by magnetic needle; Precautions and accuracy, Surveying for tunnels and open pits, Use of Gyro theodolite	3
3	<b>Triangulation Surveying:</b> Definition; Reconnaissance; Selection of signals and stations; Triangulation system with primary, secondary and tertiary orders; Measurement of base line and angles; Booking of observations; Auxiliary stations; Satellite stations; Computation; Calculation of coordinates; Errors and their distribution and plotting	6
4	<b>Stope and face surveying:</b> Theodolite in stope surveying; Auxiliary telescope, Tape triangulation; Traversing; Radiation and other methods, Hanging compass	2
5	<b>Plans and Sections:</b> General and legal requirements of mine plans; types of plans; Symbols used in mine plans; preparation of plans & sections; Plotting of traverse; limits of accuracy Planimeter and its uses; Enlargement & reduction of plans. Use of ediograph, and pentagraph, Mines Regulations concerning above topics.	2
6	<b>Errors:</b> Sources, classification and relative importance of errors, Most probable value; Probable error and weight; Limits of errors in drift surveys.	2
7	<b>Photogrammetry and Aerial Surveying:</b> Terrestrial and aerial photogrammetry; Flight planning, Photo-theodolite & its construction; Method of field work and plotting from horizontal photographs with determination of elevations; Elementary perspective as applied to aerial photographic surveying, Applications in mine surveying.	4
8	<b>Field Astronomy:</b> Important definitions; Determination of Azimuth by astronomical observations	3
9	<b>Subsidence Surveying:</b> Construction and layout of subsidence monitoring stations. Subsidence measurements.	1
10	<b>Borehole Surveying:</b> Laser Types, characteristics and mining applications of Laser.	1
11	<b>Modern Surveying Techniques:</b> Electronic distance measuring equipment; Geodimeter, Tellurometer, Total Station, Distomat, Global Positioning System, Softwares	2
<b>Total</b>		<b>27</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-06: Rock Mechanics

Credit : 2  
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)  
End Term Exam : 2 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Status of Rock Mechanics:</b> Role and status of rock mechanics in mining engineering; Definitions & terms used in Rock Mechanics.	1
3	<b>Stresses and Strains:</b> Stresses in two and three dimensions; Stress tensors; Principal stresses; Stress invariants; Displacements and strains; Stress- Strain relations; Equilibrium and compatibility equations.	1
4	<b>Stress State:</b> Stress distribution around narrow and wide openings (single and multiple).	1
5	<b>Geological Investigation of Rock mass:</b> Classification, identification and survey of joints; Basic geological description of rock mass; Graphical representation of joint systems; Geophysical investigation of rock mass; Rock mass classification- RQD, RSR, RMR, Q-system	4
6	<b>Rock Indices:</b> Specific gravity, hardness, porosity, moisture content, permeability, swell index, slake durability, thermal conductivity, point load strength index, protodyakonov strength index, impact strength index.	3
7	<b>Mechanical Properties of Rocks:</b> Compressive, tensile and shear strengths; Modulus of elasticity; Poisson's ratio and tri-axial strength; Field and laboratory determination. Determination of in-situ strength and in situ stresses – methods and instrumentation	4
8	<b>Deformation and related instrumentation:</b> Measurement of rock movements and interpretation of data; Load cells, convergence recorders, bore hole extensometers and borehole cameras. In-situ and induced stresses and their measurement. Basics of numerical methods in geomechanics with applications. Theories of rock failure. Elastic and time dependent properties of rocks,	4
9	<b>Slopes:</b> Types of slope failure; slope failure Analysis; Factors affecting slope stability; slope Reinforcement; Monitoring of slopes, waste dump Stability, Slope stability radar.	2
10	<b>Caving:</b> Mechanics of caving. Caveability of rocks. Induced caving	2
11	<b>Subsidence:</b> Mechanics of surface subsidence; Theories of subsidence. Factors affecting subsidence; Sub-critical, critical and super-critical widths of extraction; Discontinuous and continuous subsidence; Subsidence monitoring, prediction, control and management.	2
12	<b>Rock Bursts:</b> Rock bursts and bumps; Mechanism of occurrence, prediction and control	2
<b>Total</b>		<b>27</b>





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-07: Rock Fragmentation

**Credit : 2**  
**2L+0T+0P**

**Max. Marks: 100(IA:20, ETE:80)**  
**End Term Exam : 2 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	Present status of drilling and blasting practices in India and abroad: Methods of drilling	3
3	Different types of machines; Hydraulic drills; Long hole drilling; Novel methods of drilling; Choice of drills	3
4	Variables in drilling; Machines of drilling; Drillability of rocks	3
5	Study of bit life, cost of drilling, hole diameter, pull down weight, joints etc. in relation to BHD and rock characteristic; Trouble shooting; Diagnosis of problems in drilling	3
6	Emerging trends in explosives, initiating system and blasting techniques; Mechanics of blasting	2
7	Blast round design & influence of controllable and non controllable parameters on blasting	3
8	Fragmentation assessment and monitoring, Instrumentation and software application for design of blast round, monitoring and assessment of rock fragmentation	3
9	Deep hole blasting, Hot hole blasting, Stemming plug	2
10	Blasting damages – Micro and macro level damages due to blasting; Ground vibrations, flyrock and air over pressure	2
11	Wall control, Blast casting; Demolition blasting, Nuclear blasting; Destress blasting; Safety during blasting	2
	<b>Total</b>	<b>27</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-21: Computer Application in Mining

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

<b>Contents</b>	
1.	Computer programming for mining problem with C++
2.	Introduction to different hardware application related to mining
3.	Introduction to Mine planning by DATAMINE
4.	Introduction to Mine planning SURPAC
5.	Introduction to BLASTWARE software
6.	Calculation of production tonnage of an opencast mine for contractual billing with Total station & Datamine
7.	Introduction of "VENT" software of simulation of ventilation network of a mine
8.	Introduction to "FRAGLYST 2.0" software
9.	Introduction to "SINET" software of design of U/g mine ventilation system
10.	Introduction to "PSYCHRO" software
11.	Introduction to "AWQEFA" software
12.	Introduction to "FLAC/ FLAC 3D software
13.	Introduction to "N-Fold" software
14.	Introduction to "GALENA" software related to slope stability
15.	Introduction to "Solid works" software



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-22: Mine Ventilation

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

#### Contents

1. Different gases found in coalmines, metal mines and their permitted limits as per the mining regulations. Effect of these gases when found in excess
2. Various types of Methanometers used in mines and their selection criteria
3. Various types of CO-detectors used in mines and their selection criteria
4. Measurement of relative humidity with the help of various types of hygrometer
5. To find the effect of heat, humidity and air velocity with the help of Kata-thermometer
6. Various air circuits with resistance in series and parallel
7. Calculation for the installation of main ventilation fan and its reversal arrangement
8. Design the evasee of ventilation fan in different working conditions
9. Designing auxiliary ventilation system and their comparative performance
10. Measurement of air velocity with the help of anemometer, velometer etc, measurement of temperature, pressure etc
11. To prepare complete ventilation plan and indicating air direction and other ventilation devices as per the regulation in various colour codes
12. Air conditioning problem
13. Ventilation survey problem
14. Auxiliary fan problem
15. Networking problems



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-23: Mine Surveying II

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

#### Contents

1. Various methods of correlation and its practical applicability assuming the underground mining conditions
2. Gyroscope and its use in correlation
3. Measurement of Base-line for triangulation survey in difficult ground conditions
4. Triangulation of a hilly terrain
5. Various stope surveying methods
6. Planimeter and calculation of areas with its help
7. Determination of elevation from aerial photographs
8. Determination of azimuth by observation star at equal altitude
9. Problems on dip-strike, bore-hole, faults & drifts
10. Exercise with the help of EDM, Total station
11. Exercise with the help of GPS, and other latest instruments
12. Exercise of triangulation in flat & large area
13. Study and problem with Pentagraph
14. Preparation and preservation of plans
15. Problems related to errors



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - V Semester: B.Tech. (Mining Engineering)

### 5MI4-24: Rock Mechanics

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

#### Contents

1. Preparation of core samples as per ISRM standards
2. Determination of compressive strength and point load index of given rock samples
3. Measurement of Schmidt rebound hardness and its application
4. Determination of slake durability index of given rock samples
5. Determination of elastic properties of given rock samples
6. Determination of tensile strength of given rock samples of by Brazilian test
7. Determination of shear strength and triaxial properties of rock
8. Measurement of core recovery and RQD from the various data collected
9. Determination of RMR of given field data
10. Determination of Protodykonov index of given rocks
11. Determination of impact strength index
12. Determination of Schmidt hammer rebound number of various rocks
13. Determination of moisture contents of various rocks
14. Measurement of insitu stress with Flatjack
15. Determination of triaxial properties of various compositions of spoil dumps



Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. VI Semester**

**Mining Engineering**



**Rajasthan Technical University, Kota**

Effective from session: 2019 – 2020



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI3-01: Professional Ethics and Disaster Management

Credit : 2

2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)

End Term Exam : 2 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	Effect of Technological Growth and Sustainable Development	2
3	Profession and Human Values: Values crisis in contemporary society. Nature of values. Psychological Values, Societal Values and Aesthetic Values. Moral and Ethical values	4
4	<b>PROFESSIOAL ETHICS:</b> 1. Professional and Professionalism-Professional Accountability, Role of a professional, Ethic and image of profession. 2. Engineering Profession and Ethics-Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world. 3. Professional Responsibilities-Collegiality, Loyalty, Confidentially, Conflict of Interest, Whistle Blowing	10
5	<b>DISASTER MANAGEMENT:</b> Understanding Disasters and Hazards and related issues social and environmental. Risk and Vulnerability. Types of Disasters, their occurrence/ causes, impact and preventive measures: <b>Natural Disasters:</b> Hydro-meteorological Based Disasters like Flood, Flash Flood, Cloud Burst, Drought, Cyclone, Forest Fires; Geological Based Disasters like Earthquake, Tsunami, Landslides, Volcanic Eruptions. <b>Man made Disasters:</b> Chemical Industrial Hazards, Major Power Break Downs, Traffic Accidents, Fire Hazards, Nuclear Accidents. Disaster profile of Indian continent. Case studies. Disaster Management Cycle and its components	10
<b>Total</b>		<b>27</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-02: Underground Mine Hazards

Credit : 2  
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)  
End Term Exam : 2 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Fires:</b> Classification of fires; Causes, detection, monitoring and control of surface and underground fires; fire extinguishers, Preventive measures; Fire fighting – direct methods, sealing off and intersection, fire fighting organisations Monitoring of atmosphere behind sealed- off areas; Precautions to be taken before reopening. Methods of reopening, Case histories	6
3	<b>Spontaneous Heating:</b> Physical and chemical characteristics of coal liable to spontaneous heating, Mechanism, susceptibility indices, Incubation period and its determination, Causes, detection, monitoring and control of spontaneous heating in underground mines, on surface and in coal stacks and dumps; Incubation period; Preventive measures	5
4	<b>Explosions:</b> Types, causes and mechanism of firedamp and coal dust explosions; limits of explosibility, inflamaability and factor affecting these, sources of initiation, Preventive measures; Water spraying, Stone dusting, stone-dust and water barriers; Investigations after an explosion; Case histories	5
5	<b>Mine Rescue and Recovery work:</b> Different types of rescue equipment- constructional features, functions and uses; Test on rescue apparatus; Rescue stations and rescue room; Organisation of rescue work. Fresh air base and its advancing. Rescue rules. Recovery and first-aid appliances; Training of personnel and organization of rescue station; Rescue and recovery work in connection with mine fire, explosions and other conditions. Safety chamber	5
6	<b>Mine Inundation:</b> Causes and precautionary measures, Precautions to be taken while approaching old workings and while working under water bodies; Burnside boring apparatus; Design and construction of bulk head doors, water dams and barriers; Recovery of flooded mines; Dewatering of old working; Water blast: dangers and precautions, Enquiry Report Preparation	5
<b>Total</b>		<b>27</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-03: Dimensional Stone Technology

**Credit : 3**  
**3L+0T+0P**

**Max. Marks: 150(IA:30, ETE:120)**  
**End Term Exam : 3 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Resources</b> of Marble, Granite, Slate, Sandstone and Limestone as Dimensional stones in India vis a vis world, uses, marketing, export., Geological, mineralogical and physico-mechanical properties of dimensional stones, Criteria for selection of dimensional stone deposit. Procedure for obtaining mining lease and preparation of project proposal.	10
3	<b>Mining:</b> Conventional mining of Sandstone, Limestone, Marble and Granite; Recent developments- wire saw including blind cut technique, chainsaw, belt saw, hydraulic splitting, flame jet cutting, water channeling etc; Blasting techniques in dimensional stone mines: various types of explosives used, controlled blasting for providing horizontal & vertical cut; Splitting by swelling material Insitu splitting technique used in compact limestone (Kota stone) for utilization of waste as dimensional stone. Various types of loaders cranes and hydraulic excavator used in dimensional stone mines; Quarry layouts. Hole making technique using hole-finder and laser beam. Application and development of diamond tools, formation of stone block and their handling	16
4	<b>Processing:</b> Dressing- Mono block dresser; Sawing- gang saws, circular saws; Preparation and mounting of blades/discs and segments; slab repair by resin Polishing - Manual, Mechanical; Various types of polishing machines; Abrasives- type, use and selection, shaping; Tile preparation; Automatic tiling plant, slurry handling and treatment including water supply. Multiwire technology;	8
5	Environmental impacts of mining and processing of dimensional stones; Secondary use of quarried land and waste of the industry;	3
6	Land reclamation, Environmental management plan, Environment Protection measures	3
<b>Total</b>		<b>41</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-04: Underground Metalliferrous Mining

Credit : 3  
3L+0T+0P

Max. Marks: 150(IA:30, ETE:120)  
End Term Exam : 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Introduction</b> - Historical development; present status of metal mining industry in India and world, Trend of mining non-coal deposit in India during the last ten years; Geographical distribution of important economic non-coal mineral in India.	3
3	<b>Overview of various stoping Methods:</b> Definitions of important terms used in underground metal mining methods Classification of different stoping methods, Factors influencing selection of stoping methods	3
4	<b>Development:</b> Opening of deposits – shafts (vertical and inclined), declines and adits. Cross-cuts. Division of orebody into levels and blocks. Level interval. Variables affecting the choice of mode of access, Driving of raises – conventional and raise boring machines methods, Introduction to Raise boring and introduction to tunnel boring	7
5	<b>Open Stoping Method:</b> Overhand, Underhand and Breast stoping methods; Open stoping; Vertical, Crater Retreat method; Sub level stoping, Room and Pillar method, Pillar Recovery Methods Stull mining; Shrinkage; Blast hole and their variations	9
6	<b>Caving stoping methods:</b> Sublevel caving, Block caving, Top slicing and their variations spontaneous and induced. Dilution and recovery. Productivity	8
7	<b>Supported stoping methods:</b> Timber, Post pillar; Cut and fill and their variations; Square set; Different types of support used.	6
8	<b>Support Systems:</b> Unit supports and mass support systems, Pillars; Back fill, Cable bolting, Steel Rock bolts, Grouting, Shotcreting etc., code of timbering rules	4
<b>Total</b>		<b>41</b>





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-05: Mining Machinery II

Credit : 2  
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)  
End Term Exam : 2 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Winding I:</b> Head gear arrangement, Shaft fittings and head gear design;, rigid and rope guides; cages types & Construction, their suspension arrangements, Location of winding engine. Electric winders, winding drums, types of construction, duty cycle, Methods of counterbalancing loads; Torque- time & power- time diagram; Pit top and pit bottom arrangements, Types of koepe Winder, Advantages and disadvantages , Koepe wheel, floating platforms	5
3	<b>Winding II:</b> Mechanical and electrical braking; Electrical & Electronic methods of speed control, Safety devices on winders - depth indicators, Detaching hooks, over speed and overwind preventors, keps, slow banking and other safety devices, Ward Leonard control; Automatic winding;, Multi rope winding, Winding from different horizons, two winders working in the same shaft, winding with side by side and up and down sheaves. Skips types & Construction, their suspension arrangements. Design calculation for different types of winding systems; Signalling system used in winding	5
4	<b>Loader And Transporting Machine:</b> 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. Layout of faces for working with power loaders under varied conditions	6
5	<b>Cutter Loaders:</b> Basic principles of cutting and ploughing. Different types of cutter loaders suitable for long wall and short wall faces, their constructions, operation and maintenance, different types of road headers and continuous miners, their construction, operation and conditions of applicability, Mechanics of rock cutting, rock cutting tools and their performance. Layout of faces working with cutter loaders	5
6	<b>Mine Pumps:</b> Sources of mine water types of pumps, construction, characteristics and operation, maintenance and selection, pump fittings, Design, installation and maintenance of pumping systems. Series and parallel operations of pumps.	5
<b>Total</b>		<b>27</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-06: Mining Geology III

Credit : 3  
3L+0T+0P

Max. Marks: 150(IA:30, ETE:120)  
End Term Exam : 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Geological Mapping:</b> Definition of map, scale of map, types, map symbols; Surface and underground geological mapping. Computer based geological data plotting and preparation of map	8
3	<b>Assaying:</b> Wet and dry methods, spectro-photometry, flame photometry and atomic absorption spectro-photometry	8
4	<b>Sampling and reserves estimation:</b> Definition of sampling, methods and importance in mining; Mine sample reduction; Quality control; Total Quality. Definition of reserve, classification and estimation by conventional and geo-statistical techniques. Role of geological parameters for physical scale and mathematical modeling for maintaining the slope	8
5	<b>Prospecting and Exploration:</b> Definition, kind and degree of exploration; Geological, geophysical, geo-chemical and remote sensing methods. Geological factors consider for excavation viz rock related factors, structures, seismicity, special effects of faults i.e fault act as a ground water barrier, ground water conduit, sub surface drains and influence of ground water flow systems on rock excavations	8
6	Study of important metallic, nonmetallic and fuel minerals of India. Their geographical distribution, mode of occurrence, economic importance giving emphasis on occurrences in Rajasthan. Metallic minerals i.e. Lead, Zinc, Copper, Iron, Nickel, Gold, Aluminum, Manganese, Tungsten, Uranium; Non-Metallic minerals i.e. Limestone, Talc, Rock-Phosphate, Gypsum, Kyanite, Marble, Granite, Sandstone, Garnet, Corundum, Diamond, Fluorite, Quartz, Feldspar, Calcite, Topaz, Kyanite, Olivine; Fuel minerals i.e. Coal, lignite and Petroleum. Definition, composition, properties, origin, theories of migration of petroleum, structural features of coal seams; Fuel mineral resources of Rajasthan.	8
<b>Total</b>		<b>41</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-07: Mine Safety Engineering

Credit : 2  
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)  
End Term Exam : 2 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>General:</b> Safety Philosophy, Development of industrial safety movement with special reference to mining, principles of Accident prevention, accident, injury, unsafe act, unsafe condition, reportable accidents, need for safety, Regulation: American (OSHA) and Indian Regulation, Arousing and maintaining safety, interest, publicity and propaganda for safety, safety drives and campaigns, appraisal of safety programmes, development of safe behaviour, safety standards.	5
3	<b>Accidents:</b> Theories & Principle of accidents, classification of accidents on different bases, Casualty, safety and productivity, cost of accident, computation of cost, utility of cost data, accident compensation and insurance, Accident proneness, frequency and severity rates, accident records and statistics, accident and incident analysis, purpose and procedure of accident reporting & Investigation, Identification of the key facts, corrective actions, classification of facts, Accident reports, corrective actions	6
4	<b>Safety organisation:</b> Safety Management Division of responsibility, Location of Safety function, size of safety department, safety committee – structure and functions, safety organisation, role of management, supervisor and workers, role of safety officer, qualification for safety specialist	5
5	<b>Safety Engineering:</b> Lay out and safety, maintenance and safety, job safety analysis, Incidental safety devices and methods, audio visual aids. statutory of provisions related to safeguarding of Machinery and working condition, Safety in Operation and Maintenance, safety instructions, Operational activities and hazards, starting and shut down procedures, safe operation of mining machines, work permit system, Safety in Storage and Emergency Planning Safety in storage, handling of chemicals and gases, storage layout, ventilation, emergency preparedness on site plan, off site plan, toxic hazard control	6
6	<b>Safety Education:</b> Vocational training as an aid of safety and productivity, techniques of training, lesson plan, training aids, training games, discussion methods, motivation of workers, Mine vocational training scheme, staff and institution facilities, training records and reports, appraisal of trainees, assessment and evaluation of training schemes	4
<b>Total</b>		<b>27</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-21: Underground Mine Hazards

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

<b>Contents</b>	
1.	Monitoring of sealed off areas and goaf fires.
2.	Soda ash fire extinguishers and its application
3.	Co <sub>2</sub> snow fire extinguishers and its application
4.	Dry chemical fire extinguishers and its application
5.	Reasons of spontaneous heating, its preventive measures etc in underground and at surface.
6.	Designing of stone dust barrier & water barrier in underground mines
7.	Exercise with self contained breathing apparatus
8.	Exercise with Filter type breathing apparatus
9.	Designing of rescue stations for different conditions
10.	Exercise on rescuscitation
11.	Design of water dams with their locations in mines.
12.	Burnside boring apparatus and its application.
13.	Mechanism of coal dust explosions
14.	Mechanism of firedamp
15.	Water blast: dangers and precautions



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-22: Dimensional Stone Technology

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

#### Contents

1. Marble & Granite deposits, types and potentials: Indian and Global scenario
2. Flowsheet of marble processing plant
3. Determination of physico-mechanical properties of various marbles and granites
4. Wire saw, Chain saw & and Belt saw its operational observation at nearby mines
5. Various methods of splitting of rock and its application
6. Gang saw and its operations for determination of rate of cutting for various dimensional stone
7. Various types of cranes used in dimensional stone mining and processing & their applicability
8. Various abrasives used in dimensional stone processing and their application
9. Jet flame technique for granite mining & observation in nearby industry
10. Blind cut and its comparison to other method
11. Design a mechanised marble quarry in hilly terrain for 200m X 200m lease area
12. Design a mechanized granite quarry for flat terrain deposit in a 9 hectares lease area
13. Design a mechanized flaggy lime stone (Kota stone) quarry for flat deposit of 150m X 150m lease area
14. Impact of various types of diamond beads in wire saw operation
15. Impact of various types of diamond segment in gang saw operation





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-23: Underground Metalliferrous Mining

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

#### Contents

1. Various terms, factors influencing selection of method of work and classification of underground methods
2. Designing sub-level stoping for a ore body width varying 10-15 mts
3. Application of blast hole stoping and its comparison with sub-level open stoping
4. Cut and fill methods used in different Indian deposits
5. Application of Vertical crater retreat method of mining in moderate strength of wall rocks
6. Sub-level caving and block caving methods for deeper deposits
7. Square-set stoping for excavation of manganese ore deposit
8. Application of leaching technique in ore mining
9. Stopping techniques used in excavation of gold deposit at deeper depth
10. Designing an under ground metalliferrous mine on given geological physico-mechanical properties of rock
11. Design of Post pillar method
12. Design of Shrinkage method
13. Problem for mining for greater depth
14. Design of block caving
15. Design Sub level top slicing



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-24: Mining Machinery II

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

#### Contents

1. Process of changing of winding rope and its requirement as per regulation
2. Designing direct rope haulage system in moderately dipping coal seam
3. Endless rope haulage and its designing aspects
4. Application of Mono cable and Bi-cable rope way & its designing parameters
5. Diesel locomotives and comparative application
6. Battery locomotives and comparative application
7. Trolley wire locomotives and comparative application
8. Suspension gear arrangement of the shaft
9. Different types of winding system and their comparative application
10. Application of various types of detaching hooks
11. Various types of guides in winding
12. Belt conveyors with their design parameters used in mines
13. Scraper chain conveyors with their design parameters used in mines
14. Shaker conveyors with their design parameters used in mines
15. Exhaust conditioner



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-25: Mining Geology III

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

#### Contents

1. Find the width of ore body with the help of outcrop observations in the following topographic conditions:
  - a. On horizontal ground
  - b. Slope of ground opposite to the dip of the ore body.
  - c. Ground slopping in the same direction as dip of the ore body.
2. Find out inclination and slope of ore body with the help of three-point method.
3. Determination of apparent dip of ore body from true-dip with the help of stereo-net.
4. Ore body outcrop completion in given geologic map.
5. Minerals under microscope.
6. Rocks under microscope.
7. Exercises related to ore reserve estimation.
8. Preparation of assay plan.
9. Determination of resistivity of ground/ sub surface rocks with the help of resistivity meter.
10. Determination of magnetism of ground/ sub surface rocks with the help of magnetometer.
11. Interpretation of Ariel photographs with the help of stereoscope.
12. Plotting of geologic sections with the help of surface geological plan of the area.
13. Interpretation of the satellite imagery.
14. Analysis of major oxide percentage with spectro-photometric.
15. Plotting of symbols in geologic map



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

3<sup>rd</sup> Year - VI Semester: B.Tech. (Mining Engineering)

### 6MI4-26: Mine Safety Engineering

**Credit : 1**  
**OL+OT+2P**

**Max. Marks: 50(IA:30, ETE:20)**  
**End Term Exam : 2 Hours**

#### Contents

1. To understand classification and causes of mine accidents.
2. To prepare an accident report for a mine accident.
3. To study principle and working of different personal protective equipment's.
4. To study the methods of recording accidents and statistical analysis.
5. To study various methods for arousing and maintaining safety, interest, publicity and propaganda for safety.
6. To carry out job safety analysis.
7. To understand various aids (techniques of training/lesson plan/training aids/training games) being used for an aid to safety.
8. Preparing a training scheme, staff and institutional facilities and assessment and evaluation of training schemes.