Syllabus of

UNDERGRADUATE DEGREE COURSE

Mining Engineering

Rajasthan Technical University, Kota

Effective from session: 2021 – 2022

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

2nd Year - IV Semester: B.Tech. (Mining Engineering)

4MI2-01: Advanced Engineering Mathematics-II

Credit : 2   **Max. Marks: 100(IA:30, ETE:70)**
2L+0T+0P   **End Term Exam : 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Basic concepts of probability, conditional probability, Baye's theorem. Random variable: Discrete and Continuous random variables, Joint distribution, Marginal distribution, Probability distribution function, Conditional distribution. Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis. Binomial, Poisson and Normal distribution and their properties	13
3	Basic concept of variance, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	12
	Total	**26**

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SYLLABUS
2nd Year - IV Semester: B.Tech. (Mining Engineering)

4MI1-03/3MI1-03: Managerial Economics and Financial Accounting

Credit : 2   Max. Marks: 100(IA:30, ETE:70)

2L+0T+0P   End Term Exam : 2 Hours

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic Economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	2
3	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory**- Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	5
6	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
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SYLLABUS
2nd Year - IV Semester: B.Tech. (Mining Engineering)

4MI1-02/3MI1-02: Technical Communication

Credit : 2   Max. Marks: 100(IA:30, ETE:70)

2L+0T+0P   End Term Exam : 2 Hours

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	**Technical Writing, Grammar and Editing-** Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	**Advanced Technical Writing-** Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
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SYLLABUS

2nd Year - IV Semester: B.Tech. (Mining Engineering)

4MI3-04: Fluid Mechanics

Credit : 2   **Max. Marks: 100(IA:30, ETE:70)**
2L+0T+0P   **End Term Exam : 2 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Hydrostatics**: Fluid Properties, Measurement of liquid pressure. Pascal's law fluid pressure on plane and curved stationery surface, Centre of pressure, Principal applications (preliminary) in simple gales and tanks	5
3	**Fluid motion**: type and patterns, velocity and acceleration of fluid, continuity equation, elementary concept of velocity potential. Stream function and flow nets. Euler's equation of motion. Euler's equation of motion, integration of Euler's equation to give Bernoulli's equation for compressible and incompressible fluids. Integration of Euler's equation to give Bernoulli's equation for compressible and incompressible fluids, applications of Bernoulli's equation.	6
4	**Impulse momentum equation:** introduction, momentum correction factor force on pipe bends. Flow through sharp edged orifices, flow through mouth pieces (steady flow condition).	5
5	**Discharge measurement in pipes and open channels:** Venturimeter, orificemeter. Nozzle and Pitot tube (steady flow condition). Flow over weirs, and notches (steady flow condition)	2
6	**Flow through pipes:** Various types. Velocity distribution. Loss of head due to friction. Minor losses, hydraulic gradient, pipes in series and parallel. Open channel flow: Various types, flow equation, geometrical properties of sections. Most economical section. Introduction of specific energy and force	4
7	**Open Channel Flow**: Various types, flow equations, geometrical properties of sections, Most economical section. Introduction of specific energy and force.	3
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4MI4-05: Electrical Engineering

Credit : 2   Max. Marks: 100(IA:30, ETE:70)
2L+0T+0P   End Term Exam : 2 Hours

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**D.C. Machines**: Characteristics curves of d. c. generators and motors. Application of motors for different uses, starting and speed control of motors	3
3	**Transformers**: Phasor diagram and equivalent circuits, regulation efficiency and their determination, open circuit, short circuit and sumpeners's test	4
4	**Induction Motors**: Poly phase induction motors- Starters, equivalent circuit, effect of rotor resistance, torque slip curves, speed control by rotor resistance, pole changing and cascading, use in industry; Single –phase induction motor- starting methods	6
5	**Alternators**: Elementary idea of armature winding- calculation of induced e. m. f. factors affecting generating e. m. f. open circuit, short circuit and load characteristics. Voltage regulation and its determinations by synchronous impedance methods, synchronizing	6
6	**Synchronous Motors**: Methods of starting, power angle characteristics of cylindrical rotor machine, operation of synchronizing motor as a condenser and as a reactor. Application in Industries	6
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4MI4-06: Strata Control

Credit : 2   Max. Marks: 100(IA:30, ETE:70)
2L+0T+0P   End Term Exam : 2 Hours

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Strata and ground movements:** Strata conditions before and after mining operations – Theories of mechanics of Strata behaviour, Strata pressure redistribution in and around Bord and pillar and long wall workings. Surface Movements and Deformation during Bord and pillar and Longwall Mining	4
3	**Subsidence:** Causes and impact, Mechanics and theory of subsidence, Angle of draw and angle of fracture, factors affecting subsidence, Protective measures, Subsidence measurements, Estimation of vertical and lateral movements, Subsidence monitoring and prediction, Sub-critical, critical and super-critical widths of extraction	5
4	**Supports:** Necessity, Materials used, Classification of supporting Systems, Applicability of various types of supports, Size and Shape of supports, Rigid and Yielding props, constructional details of Friction and Hydraulic props, Principle of roof bolting, stitching – Merits and demerits of bolting, Self advancing powered supports, Method of setting various supports at different locations, Systematic Supporting, Clearance of roof Collapse, withdrawal of supports	6
5	**Stowing:** Applicability conditions, classification, advantages & limitation, factors influencing and description of various methods of goaf stowing, Surface and underground arrangements and precautions with stowing, Sand gathering methods- manual, shovel, pontoon, pumping of sand slurry, transportation of sand, mixing chambers, hydraulic profile, face arrangements. Pneumatic and hydraulic stowing, their applicability, merits and demerits. Comparison of Various Mining Methods. Paste filling.	5
6	**Mine Openings:** Stress distribution around narrow and wide openings. Extent of failure around mine openings. Determination of size of opening and extent of failure. Determination of shape and size of pillars in coal and hard rock mines, shaft pillars, barrier pillars	5
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SYLLABUS
2nd Year - IV Semester: B.Tech. (Mining Engineering)

4MI4-07: Mining Geology – II

Credit : 2
2L+0T+0P

Max. Marks: 100(IA:30, ETE:70)
End Term Exam : 2 Hours

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Structural Geology:** Structural features of rocks, attitude of rocks; Folds and faults- definition, mechanism, classification, recognition and impact in mining; Joints, definition, classification and impact in mining; Unconformities, outlier and inlier. Stereographic plotting of geological features	6
3	**Stratigraphy:** Introduction, standard stratigraphic scale, principle of stratigraphic correlation; Geology of India in brief; Review of major geological formations of minerals of India. Geology of Rajasthan with emphasis on economic importance; Precambrian stratigraphy of Rajasthan, Central India, Bihar, Orrisa, Eastern and Western Ghats, and South India; Middle and late Proterozoics i.e Cuddapah, Vindhyan and its equivalents; Gondwana system	6
4	**Economic Geology:** Definition of ore, gangue, tenore and grade and classification of mineral deposits; Study of occurrence, shape, form, size, mineral composition and texture of various process generated mineral deposits; Controls of localization of mineral deposits	8
5	**Engineering Geology and Hydrogeology:** Criteria of site selection for shaft, incline, tunnels, dams and wells; Introduction to hydrogeology and its impact on mining	5
	Total	26

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2nd Year - IV Semester: B.Tech. (Mining Engineering)

4MI4-08: Mine Development

Credit : 2   Max. Marks: 100(IA:30, ETE:70)
2L+0T+0P   End Term Exam : 2 Hours

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to primary and secondary mine development.**	1
3	**Mine Entries:** Choice, location and size of mine entries- shafts, inclines, declines and adits; their merits and applicability	4
4	**Mine Structures:** Construction and layouts of structures - Shaft insets, ore and waste bins, skip-pockets, engine chambers, ore passes, chutes, garages, grizzlies and sumps	5
5	**Shaft Sinking:** Conventional methods; Preparatory arrangement; Drilling, blasting, loading and hoisting of muck; Lining, ventilation, drainage and lighting; Sinking through loose, fractured, flowing and water bearing ground; Widening and deepening of shafts; Shaft boring; staple shaft	6
6	**Drifting:** Conventional methods, different types of drilling patterns, blasting, loading, transport of muck, support, ventilation, drainage and lighting; Drifting through loose, fractured, flowing and water bearing ground; Drifting by road headers and tunnel boring machines. Cross- measure drifts and laterals	5
7	**Stope Development**: Conventional methods of raising and winzing; Modern methods of Raising - Raise climbers, Long hole raising and Raise borers; Slot preparation	4
	Total	26

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2ⁿᵈ Year - IV Semester: B.Tech. (Mining Engineering)

4MI4-09: Mine Surveying– I

Credit : 3   **Max. Marks: 100(IA:30, ETE:70)**
3L+0T+0P   **End Term Exam : 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Principle and purpose of plane surveying**	1
3	**Chain Surveying**: Instrument for chaining, Direct & indirect ranging. Methods of chain along plane & sloping ground, Base line, check line, Tie line, Offset, Chain angle & recording in field book	3
4	**Compass Surveying**: True & Magnetic meridian, whole circle bearing & quadrantal bearing system, construction & use of Prismatic & Surveyor Compass, Local attraction	3
5	**Level and leveling** : Definition of various terms used in leveling. Types of Bench mark and their uses. Construction and use of Dumpy and Tilting levels, Leveling staves. Temporary adjustment of Dumpy level. Simple, differential leveling, fly leveling, longitudinal and cross sectioning, plotting of profile leveling. Determination of level by line of collimation and rise and fall method, Arithmetical checks. Level book and record keeping, leveling difficulties and errors in leveling	7
6	**Theodolite:** Various types; Principles of construction; Temporary and permanent adjustments; Measurement of horizontal angles; Tubular and trough compass.	5
7	**Traversing:** Theodolite traversing; Closing error and its adjustment; Calculation of coordinates; Problems in traverse surveying; Area of closed traverse; Omitted measurements and their calculations	4
8	**Tacheometric Surveying:** Principles; Types of tacheometer; Additive and multiplying constants; Tangential tacheometry; Anallactic lens; General procedure for field work; Degree of accuracy.	5
9	**Mine Levelling:** Shaft plumbing and measurement of depth of shaft; Subsidence survey; Underground levelling and grading, Giving and maintaining direction & gradient for inclined shaft, slopes, levels and tunnels; Maintaining alignment	5
10	**Curve Ranging:** Definition; Elements of curves; Degree of curvature; Different methods of setting out curves (apex accessible and apex inaccessible); Underground curve laying;	3
11	**Contouring:** Definitions; Characteristics of contours; Tacheometric Contouring - Fieldwork, Interpolation of contours; Plotting and interpretation of contours	3
	Total	**40**

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4MI4-21: Electrical Engineering

Credit : 1   **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+2P

Contents
The practical will be as per the theory syllabus (4Mi4-05)

2nd Year - IV Semester: B.Tech. (Mining Engineering)

4MI4-22: Mine Computing lab -I

Credit : 1   **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+2P

Contents
1. Exercises related to Word processing: MS Word and Preparation of technical report
2. Exercises related to Word processing: MS Excel
3. Exercises related to Word processing: Powerpoint
4. Exercises related to Acrobat reader
5. Introduction to software packages related to mining
6. Introduction to Datamine software
7. Introduction to ore body modeling with Datamine software
8. Practical based on 'C' language
9. Programs related to calculate explosive quantity and powder factor
10. Program to determine distances and reduced levels of various points in tacheometry
11. Program to determine co-ordinates of surface mine survey
12. Program related to calculation of area of closed traverse
13. Program to calculate bucket capacity of a excavator for given production parameters
14. Program based on drill parameters: rate of penetration, drilling rate etc
15. Program related to contouring
16. Program related to trignometry

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SYLLABUS
2nd Year - IV Semester: B.Tech. (Mining Engineering)

4MI4-23: Mining Geology – II

Credit : 1.5   Max. Marks: 100(IA:60, ETE:40)
0L+0T+3P

Contents
1. Structural models under hand specimen.
2. Metallic minerals under hand specimen.
3. Non-metallic economic minerals under hands specimen
4. Plotting of geological section along given section line in the given geologic map.
5. Stereo-net plotting of ore body planes with the help of dip and strike data obtained by borehole drilling.
6. Find the apparent dip in given direction with the help of stereo-net.
7. Find the amount and direction of plunge of the ore body by given strike-dip data with the help of stereo-net.
8. Construction of Clinometers and Brunton compass.
9. Determination of volumetric joint count.
10. T.V.I calculation with the help of given data.
11. Calculation of specific yield of a well.
12. Calculation of a cone of depression.
13. Plotting of dip isogons.
14. Calculation of T/W ratio for dams (T= pressure of reservoir water tends to displace the dam horizontally & W = the weight of the dam which acts downwards and tends to key the dam in position, R= resultant forces)
15. Exercise related to problems associated with dams

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4MI4-24: Mine Development

Credit : 1   **Max. Marks: 100(IA:60, ETE:40)**

0L+0T+2P

Contents
1. Design a drift taking into consideration different options available for given set of conditions
2. Tunnel boring machine used in India and Abroad & various application parameters
3. Ordinary method of shaft sinking
4. Piling methods of shaft sinking and their applicability
5. Drop shaft methods of shaft sinking and their applicability
6. Designing the Cementation method of shaft sinking
7. Designing the Freezing method of shaft sinking for watery conditions
8. Alimak raise climber and procedure of driving a raise by it
9. VCR method (drop shaft) of raising in hard rock and fracture zone
10. Procedure of shaft deepening in a working mine upto 300mts depth
11. Shaft widening for raising the daily production from 1500 tonnes to 5000 tonnes in metal mines
12. Modern tunneling techniques
13. Raise borers
14. Cast iron tubbing - English & German tubbing
15. Various types of mine structures

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4MI4-25: Mine Surveying – I

Credit : 1.5   **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+3P

Contents
1. Ranging Direct and indirect and use of chain and tape
2. Chain surveying, field book recording and taking offsets for location details
3. Study of prismatic and surveying compass and taking bearings
4. Study of Dumpy level, Tilting level, temporary adjustment and R.L. calculations
5. Constructional details and measurement of horizontal angles with the help of vernier theodolites & its temporary adjustments
6. Traversing of given area with the help of vernier theodolite and its plotting with co-ordinate method
7. Constructional details and measurement of horizontal angles with the help of microptic theodolites & its temporary adjustments
8. Traversing of given area with the help of theodolite and its plotting with co-ordinate method
9. Determine the height of inaccessible points, distance between two inaccessible points with tacheometer
10. Exercise on tacheometric contouring and plotting of contour map for flat and hilly area
11. To prepare topographic map by co-ordinate plotting of given area at a scale of 1:1000, 1:2000 as per mining regulation
12. G.T. sheet and its application
13. Elements of a curve and design a curve for underground roadways meeting at an angle of 90, 120,150 degree etc
14. Use of theodolite in maintaining the gradient of drivage, laying of drainage system
15. Transferring of T. I. points level to B. M