M.D. UNIVERSITY, ROHTAK

(NAAC Accredited 'A+' Grade)

SCHEME OF STUDIES AND EXAMINATION

B.TECH (Mining Engineering)

SEMESTER 3rd AND 4th

Scheme effective from 2020-21

COURSE CODE AND DEFINITIONS:

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional Core Courses
LC	Laboratory Courses
MC	Mandatory Courses
PT	Practical Training
S	Seminar
TH	Theory
Pr	Practical

General Notes:

1. Mandatory courses are non credit courses in which students will be required passing marks in internal assessments.
2. Students will be allowed to use non programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
3. Students will be permitted to opt for any elective course run by the department. However, the department shall offer those electives for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. To run the elective course a minimum of 1/3rd students of the class should opt for it.

Scheme of Studies and Examination
B.TECH (Mining Engineering) – 3rd Semester
w.e.f. 2020-21

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	External Examination	Practical	Total	
1	Engineering Science Course	ESC-MN-301G	Mathematics – III	3	0	0	3	3	25	75		100	3
2	Professional Core Course	PCC-MN-303G	Mining Geology - I	3	0	0	3	3	25	75		100	3
3	Professional Core Course	PCC-MN-305G	Elements of Mining	3	0	0	3	3	25	75		100	3
4	Engineering Science Course	ESC-MN-307G	Thermodynamics	3	0	0	3	3	25	75		100	3
5	Engineering Science Course	PCC-MN-309G	Strength of Materials	3	0	0	3	3	25	75		100	3
6	Professional Core Course	PCC-MN-311G	Surveying-I	3	0	0	3	3	25	75		100	3
7	Professional Core Course	LC-MN-313G	Mining Geology - I Lab	0	0	3	3	1.5	25	-	25	50	3
8	Professional Core Course	LC-MN-323G	Strength of Materials Lab	0	0	3	3	1.5	25		25	50	3
9	Professional Core Course	LC-MN-325G	Surveying Lab-I	0	0	3	3	1.5	25		25	50	3
10	Mandatory Courses	MC-317G	Constitution of India	2	0	0							
TOTAL CREDIT								**22.5**				**750**	

Scheme of Studies and Examination
B.TECH (Mining Engineering) – 4th Semester
w.e.f. 2020-21

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	External Examination	Practical	Total	
1	Engineering Science Course	ESC-MN-302G	Numerical Methods	3	0	0	3	3	25	75		100	3
2	Professional Core Course	PCC-MN-304G	Mining Geology-II	3	0	0	3	3	25	75		100	3
3	Professional Core Course	PCC-MN-306G	Mine Development	3	0	0	3	3	25	75		100	3
4	Engineering Science Course	ESC-MN-308G	Fluid Mechanics	3	0	0	3	3	25	75		100	3
5	Engineering Science Course	ESC-MN-310G	Industrial Electronics	3	0	0	3	3	25	75		100	3
6	Professional Core Course	PCC-MN-312G	Surveying-II	3	0	0	3	3	25	75		100	3
7	Professional Core Course	LC-MN-314G	Mining Geology-II Lab	0	0	4	4	2	25		25	50	3
8	Professional Core Course	LC-MN-316G	Fluid Mechanics Lab	0	0	3	3	1.5	25		25	50	3
9	Professional Core Course	LC-MN-318G	Industrial Electronics Lab	0	0	3	3	1.5	25		25	50	3
10	Professional Core Course	LC-MN-320G	Surveying-II Lab	0	0	3	2	1	25		25	50	3
		TOTAL CREDIT						**24**				**800**	

ESC-MN-301G # Mathematics – III

L	T	P
3	0	0

Internal Assessment: 25
External Examination: 75
Total: 100
Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation;

UNIT-II

Duhamel's principle for one dimensional wave equation. Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables.

UNIT-III

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Continuous random varibales and their properties, distribution functions and densities, normal,
exponential and gamma densities.Bivariate distributions and their properties, distribution of sums
and quotients, conditional densities, Bayes' rule.

UNIT-IV

Basic Statistics, Measures of Central tendency: Moments, skewness and Kurtosis - Probability
distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three
distributions, 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, Tests for

single mean, difference of means, and difference of standard deviations. Test for ratio of variances – Chisquare test for goodness of fit and independence of attributes.

Course Outcomes:

Upon completion of this course, students will be able to solve field problems in engineering involving PDEs. They can also formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall,
2003 (Reprint).
4. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

PCC-MN-303G # Mining Geology - I

L	T	P
3	0	0

Internal Assessment: 25
External Examination: 75
Total: 100
Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction

Branches and scope of geology in mining; weathering of rocks, geological time scale; plate tectonics

Mineralogy

Mineralogy; physical, chemical and optical properties of minerals; polymorphism, isomorphism and crystallography

UNIT-II

Petrology

Petrology; formation, texture, structure and classification of various types of rocks;

UNIT-III

Structural Geology

Structural features of rocks; folds, faults, joints and unconformities;

UNIT-IV

Remote Sensing

Remote sensing; nature of electromagnetic radiation, electromagnetic spectrum and energy; Remote sensing platforms and sensor's characteristics, advantages and limitations of remote sensing in various fields of mining engineering.

References:

1. A Text Book of Engineering and General Geology. Singh Parbin. 3rd Ed. Katson publisher, Ludhiana.
2. A Text Book of Applied Engineering Geology. Maruthesha Reddy M T. New Age International. 2013.
3. A Text Book of Geology, Mukherjee P K. The World Press Pvt. Ltd. Calcutta. 2010.
4. Principles of Engineering Geology. Bangar K.M. Standard Publishers. Delhi, 1995.

PCC-MN-305G # Elements of Mining

L	T	P
3	0	0

Internal Assessment: 25
External Examination: 75
Total: 100
Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction

Mineral resources of Rajasthan, India and World; Mining of important economic minerals in India; Various terms used in mining; Stages in the life of the mine, Introduction to unit operations, Economical, Social, Environmental and Health impacts of Mining.

Fundamentals of Prospecting

Prospecting: Reconnaissance; principles and methods of prospecting - pit, shaft, trench and boreholes; Principle, method, Work schedule and application of Geologic, Geophysical, Geochemical, Electrical, Electromagnetic, Gravity methods of prospecting, Sampling techniques; planning a prospecting programme Application of Remote Sensing and GIS in mineral prospecting.

Unit-II

Fundamentals of Exploration

Exploration: Boring, Principles of boring, Selection of sites for boreholes; Surface layout of boring; Details of equipment, Core recovery, Borehole logging; Maintenance of records; Deflection of boreholes; Difficulties inboring; Fishing tools and their uses; Methods of exploratory drilling for oil; Interpretation of borehole data

Unit--III

Explosives & Blasting

Explosives: Classification and comparative properties of explosive; Modern explosives, Mechanisms of rock blasting; Blasting devices; Electric and non -electric methods; Delay blasting techniques; Priming; Charge distribution; Blasting with cut and solid blasting, General application and uses; Safety considerations.

Unit--IV

Development of Deposits

Pre mining, mining and post-mining: ancillary mining operation, Types of entries to mineral deposits – Shaft, Incline, Adit –applicable conditions- limitations. Basic concepts of surface and underground mining, Comparison of underground and surface mining.

References:

1. High Technology in Drilling and Exploration. Chugh C. P. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Diamond Drilling. Chugh C.P. Oxford & IBH Publisher.
3. Introductory Mining Engineering. Howard & Hartman L. John Willey & Sons
4. Engineering Rock Blasting Operations. Bhandari S. A .A. Balkema Publisher. USA
5. Principles & Practices of Modern Coal Mining. Singh R. D. New Age International Pvt. Ltd. New Delhi.

ESC-MN-307G # Thermodynamics

L	T	P
3	0	0

Internal Assessment: 25
External Examination: 75
Total: 100
Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Basic Concepts & definitions

Thermodynamics and its importance, Macroscopic and Microscopic view point, Concept of Continuum, Thermodynamic System, Surrounding and Boundary, Control Volume approach and Systems approach, Equilibrium – Thermal ,Chemical, Mechanical and thermodynamic, Pure Substance, Property – Intensive and Extensive, State, Path, Process and Cycle. Point Function and Path Function, Quasi Static Process and processes like Isobaric, Isochoric, Isothermal, Polytropic Process, Temperature and different scales, Zeroth Law of Thermodynamics, Energy, sources of energy; forms of energy, Energy transfer by work and forms of work ; free Expansion, Energy transfer by heat ; Adiabatic Process, Equations of state, Ideal gas Equation-; Specific gas constant and Universal Gas Constant

UNIT-II

First Law of Thermodynamics

Relation between Heat and Work- Joules Constant, First law of thermodynamics for a cyclic process, First law of thermodynamics for a closed system undergoing a process, Conservation principle, First Law of Thermodynamics applied to open system – Steady Flow Energy Equation, Perpetual motion Machine of First kind, Application of first law of thermodynamics to closed system or Non flow Process, Application of first law of thermodynamics to Open Systems like Steam Nozzle, Boiler, Steam Turbine, Pump, Heat Exchanger, Throttling Process – Joules Thompson Coefficient and its significance

Second Law of Thermodynamics

Limitations of first law of thermodynamics, Thermal Reservoir - Source and Sink, Concept of Heat Engine, Heat Pump and Refrigerator, Second law of thermodynamics – Kelvin Planck and Clausius Statements. Equivalence of Clausius and Kelvin Planck Statement, Reversible and Irreversible Process. Causes of Irreversibility, Perpetual Motion Machine of Second Kind, Need of Carnot theorem and its corollaries, Carnot cycle, Thermodynamic Temperature Scale and its equivalence with Ideal Gas Scale Entropy: Clausius Inequality, Clausius Theorem, Entropy is Property of a system, Isentropic Process, Temperature Entropy Plot and

its relationship with heat interactions, Entropy Principle, Entropy change During a Process. Interpretation of concept of entropy

UNIT-III

Thermodynamic Relations

Reciprocal Relation, Cyclic Relation Property relations, Maxwell Relations, TdS equations, Heat capacity relations, Volume Expansivity, Isothermal Compressibility, Clausius-Clapeyron Equation

Availability: High grade and Low Grade Energy, Available and Unavailable Energy, Dead State, Available energy with respect to a process and a cycle, Decrease of Available Energy When heat is transferred through a finite temperature Difference, Second Law efficiency

Properties of Pure Substance:Pure substance and Phase changes: Phase change processes of pure substance, Property diagrams for phase change process (T-v, T-s and p-h diagrams), Understanding of Steam Table and Mollier chart with suitable examples.

UNIT-IV

Compressors

Reciprocating Air Compressor: Single stage compressor – computation of work done, isothermal efficiency, effect of clearance volume, volumetric efficiency, Free air delivery, Theoretical and actual indicator diagram

Multistage compressors: Constructional details of multistage compressors, Need of multistage, Computation of work done, volumetric efficiency, Condition for maximum efficiency, Inter cooling and after cooling (numerical), Theoretical and actual indicator diagram for multi stage compressors

Rotary Air Compressors: Classification, Difference between compressors and blowers, Working and constructional details of roots blower, Screw type and vane type compressors

Power cycles

Vapour Power cycle:Carnot cycle and its limitations as a vapour cycle, Rankine cycle with different turbine inlet conditions, Mean temperature of heat addition, Methods to improve thermal efficiency of Rankine cycle – Reheat cycle and Regeneration Cycle.

Gas Power cycles:Assumptions of Air Standard Cycle, Otto cycle, Diesel Cycle and Dual cycle, Brayton Cycle, Sterling Cycle and Ericsson Cycle and Lenoir cycle and Atkinson cycle

References:

1. Thermodynamics: An Engineering Approach. Yunus A. Cengel and Michael A Boles, 7th Ed. TMH
2. Basic Engineering Thermodynamics by Rayner Joel, Longman Publishers Engineering
3. Engineering Thermodynamics. P Chattopadhyay, 2nd Ed. Oxford University Press India
4. Thermodynamics. P K Nag. 5th Ed, TMH
5. Thermodynamics. Onkar Singh, New Age International
6. Thermodynamics. C P Arora, TMH

PCC-MN-309G # Strength of Materials

L	T	P	Internal Assessment:	25
3	0	0	External Examination:	75
			Total:	100
			Hours:	3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Moment of Inertia

Area moment of Inertia, Principal Axes and Principal Moment of Inertia, , Parallel Axis theorem, Polar moment of Inertia.

Stresses and Strains: Definition – Stress, Strain, Hooke's law, elastic limit, uni-axial, bi-axial and tri-axial stresses, tensile & compressive stresses, shear stress, Principal stresses and strains, Mohr's circle.

Elastic Constants: Poisson's ratio, Modulus of elasticity, Modulus of rigidity, Bulk Modulus, yield stress, Ultimate stress. Factor of safety, state of simple shear, relation between elastic constants, volumetric strain, volumetric strain for tri-axial loading,

deformation of tapering members, deformation due to self –weight, bars of varying sections, composite sections, thermal stress and strain.

UNIT-II

Shear Force and Bending Moment in Beams

Axial force, shear force and bending moment diagrams for statically determinate beams including beams with internal hinges for different types of loading, relationship between rates of loading, shear force and bending moment.

Stresses in Beams

Theory of pure bending, Assumptions, Flexural formula for straight beams, moment of resistance, bending stress distribution, section modulus for different sections, beams for uniform strength, Flitched beams.

Direct and Bending Stresses: Core of sections, Chimneys subjected to wind pressure. Shear Stress in Beams: Distribution of shear stress, across plane sections used commonly for structural purposes, shear connectors.

UNIT-III

Torsion:

Torsion of circular shafts- solid and hollow, stresses in shafts when transmitting power, shafts in series and parallel.

Strain Energy: Resilience, Proof Resilience, strain energy stored in the member due to gradual, sudden and impact loads, Strain energy due to shear, bending and torsion.

UNIT-IV

Deflection of Beams

Deflection of Cantilever, simply supported and overhangs beams using double integration and Macaulay's Method for different types of loadings

Thin Cylindrical and Spherical Shells: Cylinders and Spheres due to internal pressure, cylindrical shell with hemi spherical ends

Columns and Struts

Buckling load, Types of end conditions for column, Euler's column theory and its limitations, Rankine and Johnson formula.

References:

1. Strength of Materials. R. Subramanian, Oxford University Press. 3rd Ed 2016
2. Strength of Materials. Ryder, Macmillan
3. Mechanics of Materials. James M. Gere and Barry J. Goodno, Cengage Learning, 6th Ed, 2009
4. Mechanics of Materials. Gere and Timoshenko, 2nd Ed CBS

5. Strength of Materials. Basavrajaiah and Mahadevappa, Khanna Publishers, New Delhi
6. Elements of Strength of Materials. Timoshenko and Youngs, Affiliated East -West Press
7. Mechanics of Materials by Beer. Jhonston, D Ewolf and Mazurek, TMH Pvt Ltd., New Delhi
8. Mechanics of Structures. S.B. Junnarkar. Charotar Publication
9. Mechanics of Materials. S.S. Ratan. Tata McGraw Hill Pvt. Ltd
10. Introduction to Solid Mechanics. Shames, PHI
11. Strength of Materials. Nag and Chandra, Wiley India
12. Strength of Materials. S. Ramamrutham, Dhanpat Rai Pvt. Ltd
13. Strength of Materials. W. Nash, Schaum's Outline Series, McGraw Hill Publication, Special Indian

PCC-MN-311G # Surveying-I

L	T	P
3	0	0

Internal Assessment: 25
External Examination: 75
Total: 100
Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction

Definition, principles, objectives, classification, technical terms, uses and necessity of surveying. Units of measurement, surveying measurement and errors, type of errors and their corrections (including numerical), corrections for wrong scales, accuracy and precision, stages of survey operations.

Chaining, Ranging and offsetting: Definitions, Principles, Types, Instruments required, methods, obstacles (including numerical), sources of errors, conventional signs and symbols.

Electronic Distance Measurement: Working Principles, types, applications in surveying

UNIT-II

Measurement of Directions and Angles

Basic definitions, meridians, bearings, magnetic and true bearings, compasses,

prismatic and surveyor's, temporary adjustments, declination, dip, local attraction

Types of traverse, procedures, control establishments, Conversion of WCB into RB and vice-versa, Traverse Survey and Computations of interior angles of a closed Traverse.

Adjustment of closing error, correction for local attraction.

Levelling and its application

Introduction to levelling, basic terms and definitions, types of instruments, construction and use of dumpy level, auto level, digital level and laser level in construction industry, principle axes of dumpy level, temporary and permanent adjustments

Booking and reduction of levels, plane of collimation (HI) and rise-fall methods, computation of missing data, distance to the visible horizon, corrections due to curvature and refraction, reciprocal levelling, Numerical problems

Differential levelling, profile levelling, fly levelling, check levelling, precise levelling, sources of errors, difficulties in levelling work, corrections and precautions in levelling work.

UNIT-III

Plane Tabling, Contouring, Area and Volume

Plane Table Surveying: Definition, principles, accessories required for plane table surveying, merits and demerits, temporary adjustments, Different methods of plane table surveying, Errors in plane table surveying, Use of telescopic alidade.

Contouring: definitions, contour interval, equivalent, uses and characteristics of contour lines, direct and indirect methods of contouring. Grade contour: definition and use. Area: Area of an irregular figure by trapezoidal rule, average ordinate rule, Simpson's 1/3 rule, various coordinate methods.

Planimeter: types including digital planimeter, area of zero circle, uses of planimeter.

Volume: Computation of volume by trapezoidal and prismoidal formula, volume from spot levels, volume from contour plans.

UNIT-IV

Theodolite Traversing

Various parts and axis of transit, technical terms, temporary and permanent adjustments of a transit, horizontal and vertical angles, methods of repetition and reiteration.

Different methods of running a theodolite traverse, Latitudes and departures,

rectangular coordinates, traverse adjustments by Bowditch's, transit and modified transit rules, Gales Traverse Table, Numerical Problems.

Use of theodolite for various works such as prolongation of a straight line, setting out an angle, bearing measurements. Omitted measurements, Problems in using theodolite traversing, errors in theodolite traversing;

Trigonometrical Levelling: Problems on one plane and two plane methods,

Tachometric surveying

Principle, purpose, uses, advantages and suitability of tacheometry, different methods of tacheometry, stadia formula, Stadia diagram and tables. Sub-tense bar method.

Application in plane table and curve setting.

Radial Contouring.

References:

1. Surveying & Leveling. Vol. I & Vol. II. Kanetkar T.P. & Kulkarni S.V. Pune Vidyarthi Griha Prakshan. Latest edition
2. Surveying. Vol. I & Vol. II. Punmia B.C. & Jain A.K. Laxmi Publication. Latest edition
3. Remote Sensing & Image Interpretation. Lillesand T.M. & Kiefer R.W. John Wiley & Sons. Latest edition

LC-MN-313G **Mining Geology – I Lab**

L	T	P
0	0	3

Internal Assessment: 25
External Examination: 25
Total: 50
Hours: 3 Hrs

Practicals based on the theory subject.

LC-MN-323G **Strength of Materials Lab**

L	T	P
0	0	3

Internal Assessment: 25
External Examination: 25
Total: 50
Hours: 3 Hrs

Practicals based on the theory subject.

LC-MN-325G **Surveying Lab - I**

L	T	P
0	0	3

Internal Assessment: 25
External Examination: 25
Total: 50
Hours: 3 Hrs

Practicals based on the theory subject.

ESC-MN-302G **Applied Numerical Technique & Computing**

L T P	Internal Assessment: 25
3 0 0	External Examination: 75
	Total: 100
	Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

ERRORS IN NUMERICAL CALCULATIONS Introduction, Numbers and their accuracy, Absolute, relative and percentage errors and their analysis, General error formula.

INTERPOLATION AND CURVE FITTING Taylor series and calculation of functions, Introduction to interpolation, Lagrange approximation, Newton Polynomials, Chebyshev Polynomials, Least squares line, curve fitting, Interpolation by spline functions.

UNIT-II

NUMERICAL DIFFERENTIATION AND INTEGRATION Approximating the derivative, Numerical differentiation formulas, Introduction to Numerical quadrature, Newton-Cotes formula, Gaussion Quadrature. SOLUTION OF NONLINEAR EQUATIONS Bracketing methods for locating a root, Initial approximations and convergence criteria, Newton-Raphson and Secant methods, Solution of problems through a structural programming language such as C or Pascal.

UNIT-III

SOLUTION OF LINEAR SYSTEMS Direct Methods, Gaussian elimination and pivoting, Matrix inversion, UV factorization, Iterative methods for linear systems, Solution of problems through a structured programming language such as C or Pascal.

EIGEN VALUE PROBLEMS Jacobi, Given's and Householder's methods for symmetric matrices, Rutishauser method for general matrices, Power and inverse power methods.

UNIT-IV

SOLUTION OF DIFFERENTIAL EQUATIONS Introduction to differential equations, Initial value problems, Euler's methods, Heun's method, Runge-Kutta methods, Taylor series method, Predictor-Corrector methods, Systems of differential equations, Boundary valve problems, Finite-difference method, Solution of problems through a structured programming language such as C or Pascal.

PARTIAL DIFFERENTIAL EQUATIONS, EIGENVALUES AND EIGENVECTORS Solution of hyperbolic, parabolic and elliptic equations, The eigenvalue problem, The power method and the Jacobi's method for eigen value problems, Solution of problems through a structural programming language such as C or Pascal.

Text Books:

1. Numerical Methods for Mathematics, Science and Engineering by John H.Mathews, PHI New Delhi.
2. Applied Numerical Methods – Carnahan, B.H., Luthar, H.A. and Wilkes, J.O., Pub.- J.

Wiley, New York

References:

1. Numerical Solution of Differential Equations, by M.K. Jain, Published by Wiley Eastern, New York.
2. Introductory Methods of Numerical Analysis by S.D. Sastry, Published by Prentice Hall of India.
3. Numerical Methods – Hornbeck, R.W. , Pub.- Prentice Hall, Englewood Cliffs, N.J.

PCC-MN-304G # Mining Geology- II

L	T	P
3	0	0

Internal Assessment: 25
External Examination: 75
Total: 100
Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Stratigraphy & Indian Geology

Stratigraphy; its introduction, standard stratigraphic scale, principle of stratigraphic correction; geology of India in brief; fossil fuels;

UNIT-II

Economic Geology

Economic geology; ore, gangue, tenore and grade; classification of mineral deposits; occurrence, shape, form, size, mineral composition and texture of various process generated mineral deposits;

UNIT-III

Hydrogeology & Maps

Hydrogeology and its impact on mining; geological mapping, topographic maps; effects of topography on outcrops, computer based geological data plotting and preparation of map;

UNIT-IV

Sampling

Sampling and reserves estimation; mine sample reduction;

Prospecting and Exploration

Prospecting and exploration; definition' kind and degree of exploration; geological, geophysical, geo-chemical and remote sensing methods.

References:

1. A Text Book of Engineering and General Geology. Singh Parbin. Latest Ed. Katson publisher, Ludhiana.
2. A Text Book of Applied Engineering Geology. Maruthesha Reddy M T. New Age International. Latest edition
3. A Text Book of Geology. Mukherjee P K. The World Press Pvt. Ltd. Calcutta. Latest edition
4. Principles of Engineering Geology. Bangar K.M. Standard Publishers, Delhi, Latest edition

PCC-MN-306G # Mine Development

L	T	P	Internal Assessment:	25
3	0	0	External Examination:	75
			Total:	100
			Hours:	3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction

Introduction to primary and secondary mine development. Mine Entries: Choice, location and size of mine entries- shafts, inclines, declines and adits; their merits and applicability

Mine Structures

Mine Structures: Construction and layouts of structures - Shaft insets, ore and waste bins, skip-pockets, engine chambers, ore passes, chutes, garages, grizzlies and sumps

UNIT-II

Shaft Sinking

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

UNIT-III

Mine Development

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

UNIT-IV

Stope Development

Stope Development: Conventional methods of raising and winzing; Modern methods of Raising - Raise climbers, Long hole raising and Raise borers; Slot preparation.

References:

1. Introductory Mining Engineering. Howard & Hartman L. John Willey & Sons.
2. SME Mining Reference Handbook. Lowrie R. SME Publication. Latest edition
3. Underground Mining Methods. Hustrulid W A & Bullock R. SME Publication.

ESC-MN-308G # Fluid Mechanics

L	T	P
3	0	0

Internal Assessment: 25
External Examination: 75
Total: 100
Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Fluid properties and fluid statics

Fluid Definition and properties, Newton's law of viscosity concept of continuum, Classification of fluids

Fluid Statics: Definition of body and surface forces, Pascal's law, Basic hydrostatic equation, Forces on surfaces due to hydrostatic pressure, Buoyancy and Archimedes' principle.

Fluid Kinematics

Eulerian and Lagrangian approach to solutions; Velocity and acceleration in an Eulerian flow field; Definition of streamlines, path lines and streak lines; Definition of steady/unsteady, uniform/non-uniform, one-two and three dimensional flows; Definition of control volume and control surface, Understanding of differential and integral methods of analysis. Definition and equations for stream function, velocity potential function in rectangular and cylindrical co-ordinates, rotational and irrotational flows; Definition and equations for source, sink, irrotational vortex, circulation

UNIT-II

Fluid Dynamics

Integral equations for the control volume: Reynold's Transport theorem, equations for conservation of mass, energy and momentum, Bernoulli's equation and its application in flow measurement, pitot tube, venture, orifice and nozzle meters. Differential equations for the control volume: Mass conservation in 2 and 3 dimension in rectangular, Euler's equations in 2,3 dimensions and subsequent derivation of Bernoulli's equation; Navier-Stokes equations (without proof) in rectangular Cartesian co-ordinates; Exact solutions of Navier-Stokes Equations to viscous laminar flow between two parallel planes (Couette flow and plane Poiseuille flow)

UNIT-III

Real fluid flows

Definition of Reynold's number, Laminar flow through a pipe (Hagen-Poiseuille flow), velocity profile and head loss; Turbulent flows and theories of turbulence-Statistical theory, Eddy viscosity theory and Prandtl mixing length theory; velocity profiles for turbulent flows-

universal velocity profile, 1/7th power law; Velocity profiles for smooth and rough pipes. Darcy's equation for head loss in pipe (no derivation),Moody's diagram, pipes in series and parallel, major and minor losses in pipes.

UNIT-IV

Boundary Layer Flows

Concept of boundary layer and definition of boundary layer thickness, displacement, momentum and energy thickness; Growth of boundary layer, laminar and turbulent boundary layers, laminar sub-layer; Von Karman Momentum Integral equation for boundary layers (without proof), analysis of laminar and turbulent boundary layers, drag, boundary layer separation and methods to control it, streamlined and bluff bodies. Aerofoil theory: Definition of aerofoil, lift and drag, stalling of aerofoils, induced drag.

Compressible Fluid flow

Propagation of sound waves through compressible fluids, Sonic velocity and Mach number; Application of continuity , momentum and energy equations for steady state conditions; steady flow through nozzle, isentropic flow through ducts of varying cross-sectional area, Effect of varying back pressure on nozzle performance, Critical pressure ratio, Normal shocks, basic equations of normal shock, change of properties across normal shock

Reference:

1. Fluid Mechanics. Yunus A Cengel and John M Cimbala. Latest Ed. McGraw Hill.
2. Fluid Mechanics and Machinery. C S P Ojha, Chandramouli and R Berndtsson. Oxford University Press.
3. Introduction to Fluid Mechanics. Fox and McDonald.
4. Fluid Mechanics. R K Bansal.
5. Fluid Mechanics. Victor Streeter, Benjamin Wylie and K W Bedford. Latest Ed. McGraw Hill.
6. Fluid Mechanics. K. L. Kumar.
7. Introduction to Fluid Mechanics. James A. Fay.
8. Fluid Mechanics. B. M. Massey.
9. Mechanics of Fluids. Irving Shames.
10. Fluid Mechanics and Hydraulics. S. K. Ukarande. Ane Books Pvt. Ltd.

ESC-MN-310G

Industrial Electronics

L	T	P
3	0	0

Internal Assessment: 25
External Examination: 75
Total: 100
Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Semiconductor Devices

Diodes: Principles V-I characteristics and Application of: rectifier diode, zener diode, LED, photodiode, SCR V-I characteristics, UJT triggering circuit, turning-off of a SCR (preliminary discussion), basics of Gate Turn-off thyristor (GTO). Structure and V-I characteristics of Triac (modes of operation not needed) and Diac, Applications of Triac-Diac circuit. Characteristics and principle of Power BJT, power MOSFET, IGBT, comparison of devices, MOSFET/IGBT Gate driver circuit Comparison of SCR, Triac, Power BJT, power MOSFET, IGBT

Phase controlled rectifiers and Bridge inverters

Full wave controlled rectifier using SCR's(semi controlled, fully controlled) with R load only, Derivation of output voltage, Block diagram of closed loop speed control of DC motors, Necessity of inner current control loop, Basic principle of single phase and three phase bridge inverters , block diagrams including rectifier and inverter for speed control of AC motors (frequency control only).

UNIT-II

Operational amplifiers and 555 Timer

Operational amplifier circuits, Ideal OPAMP behaviour, common OPAMP ICs; Basic OPAMP circuits- Inverting amplifier, Non-inverting amplifier, Voltage follower (Buffer), Instrumentation Amplifier, Active first order filter: Low pass and high pass filter; Power Op Amps, Optical Isolation amplifier; 555 timer-Operating modes: monostable, astable multivibrator.

UNIT-III

Digital logic and logic families

Digital signals, combinational and sequential logic circuits, clock signals, Boolean algebra and logic gates. Integrated circuits and logic families: Logic Levels, Noise Immunity, Fan Out, Propagation Delay, TTL logic family CMOS Logic family, comparison with TTL family,

Flip flops: Set Reset(SR),Trigger(T), clocked F/Fs; Registers, decoders and encoders, Multiplexer and Demultiplexer, applications

UNIT-IV

Microprocessor and Microcontrollers

Overview of generic microprocessor, architecture and functional block diagram, Comparison of microprocessor and microcontroller, MSP430 architecture, assembly language programming, C compiler programming, basics of interfacing with external input / output devices (like reading external analog voltages, digital input output)

Applications of microcontroller: Temperature measurement, Speed Measurement using Proximity Sensor, Piezoelectric Actuator Drive

Motors

Review and comparison of DC motors and AC induction motors, Basic principles of speed control of AC induction motor, Basics of BLDC motor, Linear Actuator motor, Servo Motor, Motor Specifications, suitability of each motor for various industrial applications, Selection and sizing of motors for different applications. Applications for pumps, conveyors, machine tools, Microcontroller based speed control for Induction Motor.

References:

1. Power Electronics. M.H. Rashid. Prentice-Hall of India
2. Power Electronics. P S Bhimbra
3. Power Electronics. Vedam Subramanyam, New Age International
4. Power Electronics. Ned Mohan, Undeland, Robbins, John Wiley Publication
5. Electronic Devices and Circuits. Robert Boylestad and Louis Nashelsky, Prentice-Hall
6. Industrial Electronics and Control. S K Bhattacharya, S Chatterjee, TTTI Chandigarh
7. Modern Digitals Electronic. Jain R P, Tata. McGraw Hill, latest edition
8. Digital principal and Application. Malvino and Leach. Tata McGraw Hill, latest edition
9. Fundamentals of Microcontrollers and Embedded System. Ramesh Gaonkar, PENRAM
10. MSP430 Microcontroller Basics. John H. Davies, Newnes. Latest edition.

PCC-MN-312G # Surveying - II

L	T	P
3	0	0

Internal Assessment: 25
External Examination: 75
Total: 100
Hours: 3 Hrs

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Curves-Horizontal

Definitions of different terms, necessity of curves and types of curves

Simple circular curves and compound curves, office and field work, linear methods of setting out curves,

Angular methods of setting out curves, two theodolites and Rankine deflection angle method.

Reverse and transition curves, their properties and advantages, design of transition curves, shift, spiral angle. Composite curves office and field level. Setting out of curves by angular method, composite curves problems. Difficulties in setting out curves and solution for the same.

Curves-Vertical

Sight distance on a vertical curve

Tangent correction and chord gradient methods.

Sight distance on a vertical curve

UNIT-II

Setting out works

General horizontal and vertical control, setting out of foundation plan for load bearing and framed structure, batter board, slope and grade stakes, setting out with theodolite, setting out a foundation plans for building, sewer line, culvert, and use of laser for works; Setting out centre line for tunnel, transfer of levels for underground works. Project/route survey for bridge, dam and canal; Checking verticality of high-rise structures.

UNIT-III

Special Survey Instruments

Electronic Theodolite, Total Station: Principles, Types, Applications, Topographical Survey and Stake-out, Transferring data to and from other software's for further processing, advantages and limitations. Introduction to Site square, Penta Graph, Auto-set Level, Transit level, Special Compasses, Brunton Universal Pocket Transit, Mountain Compass Transit

UNIT-IV

Modern Methods of Surveying

Global Positioning System (GPS): Basic principles, GPS segments, receivers, computations of coordinates, Applications in surveying

Remote Sensing: Definition, basic concepts, electromagnetic radiation and spectrum, energy source and its characteristics, image acquisition and image interpretation. Application of remote sensing.

Global Information System (GIS): Geographical concepts and terminology, advantages, basic components of GIS, data types, GIS analysis, Applications of GIS.

Field Astronomy: Introduction, purposes, astronomical terms, determination of azimuth, latitude, longitude and time corrections to the observations.

Aerial photogrammetry: Introduction, Principle, Uses, Aerial camera, Aerial photographs, Definitions, Scale of vertical and tilted photograph, Ground Co-ordinates, Displacements and errors, Ground control, Procedure of aerial survey, Photomaps and mosaics, Stereoscopes, Parallax bar

Hydrographic Survey: Introduction, Organizations, National and International Maritime Hydrography, Hydrographic survey Methods, Lead lines, sounding poles, and single-beam, echo sounders.

Cadastral Surveying

Interpreting and advising on boundary locations, on the status of land ownership and on the rights, restrictions and interests in property. Legal requirements relating to property boundary surveys in India. Role of revenue department in maintaining survey records, introduction to local survey terminologies like tehsildar, 7/12, utara, namuna8, etc. Introduction to Survey of India Department; Department of Registration and Stamps of any state of India.

References:

1. Surveying & Leveling. Vol. I & Vol. II. Kanetkar T.P. & Kulkarni S.V. Pune Vidyarthi Griha Prakshan. Latest edition
2. Surveying. Vol. I & Vol. II. Punmia B.C. & Jain A.K. Laxmi Publication Pvt. Latest edition
3. Remote Sensing & Image Interpretation. Lillesand T.M. & Kiefer R.W. John Wiley & Sons. Latest edition

LC-MN-314G **Mining Geology – II Lab**

L	T	P
0	0	3

Internal Assessment: 25
External Examination: 25
Total: 50
Hours: 3 Hrs

Practicals based on the theory subject.

LC-MN-316G **Fluid Mechanics Lab**

L	T	P
0	0	3

Internal Assessment: 25
External Examination: 25
Total: 50
Hours: 3 Hrs

Practicals based on the theory subject.

LC-MN-318G **Industrial Electronics Lab**

L	T	P
0	0	3

Internal Assessment: 25
External Examination: 25
Total: 50
Hours: 3 Hrs

Practicals based on the theory subject.

LC-MN-320G **Surveying Lab - II**

L	T	P
0	0	3

Internal Assessment: 25
External Examination: 25
Total: 50
Hours: 3 Hrs

Practicals based on the theory subject.