IV SEMESTER

Engineering Mathematics – IV
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV (Mining Engineering)

Sl. No	Subject Code	Title	Teaching Department	Teaching Hours /Week			Examination				Credits
				Lecture	Tutorial	Practical	Duration (Hours)	SEE Marks	CIE Marks	Total Marks	
	17MAT41	Engineering Mathematics – IV	Mathematics	04			03	60	40	100	04
2	17MN42	Thermodynamics & Fluid Mechanics	ME/MN	04			03	60	40	100	04
3	17MN43	Mining Geology-II	MN	04			03	60	40	100	04
4	17MN44	Mine Mechanization-I	MN	04			03	60	40	100	04
5	17MN45	Mine Surveying-I	MN	04			03	60	40	100	04
6	17MN46	Drilling & Blasting Engineering	MN	03			03	60	40	100	03
7	17MNL47	Mining Geology Laboratory-II	Geology/MN	01		02	03	60	40	100	02
8	17MNL48	Mine Surveying Laboratory-I	MN	01		02	03	60	40	100	02
9	17KL/CPH39/49	Kannada/Constitution of India, Professional Ethics and Human Rights	Humanities	01			01	30	20	50	01
		TOTAL		**26**		**04**		**510**	**340**	**850**	**28**

ENGINEERING MATHEMATICS-IV
(Common to all Branches)

Course Code : 17MAT41	**CIE Marks : 40**
Contact Hours/Week : 04	**SEE Marks: 60**
Total Hours: 50	**Exam Hours:03**
Semester: IV	**Credits: 04(4:0:0)**

Course Objectives:
The purpose of this course is to make students well conversant with numerical methods to solve ordinary differential equations, complex analysis, sampling theory and joint probability distribution and stochastic processes arising in science and engineering.

MODULE	RBT Levels	No. of Hrs
MODULE-I **Numerical Methods**: Numerical solution of ordinary differential equations of first order and first degree, Taylor's series method, modified Euler's method. Runge - Kutta method of fourth order, Milne's and Adams-Bashforth predictor and corrector methods (No derivations of formulae-single step computation only).	**L1 & L2**	**10**
MODULE-II **Numerical Methods**: Numerical solution of second order ordinary differential equations, Runge-Kutta method and Milne's method. (No derivations of formulae-single step computation only). **Special Functions:** Series solution of Bessel's differential equation leading to $J_n(x)$-Bessel's function of first kind. Basic properties and orthogonality. Series solution of Legendre's differential equation leading to $P_n(x)$-Legendre polynomials. Rodrigue's formula, problems	**L3**	**10**
MODULE-III **Complex Variables:** Review of a function of a complex variable, limits, continuity, differentiability. Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties and construction of analytic functions. Complex line integrals-Cauchy's theorem and Cauchy's integral formula, Residue, poles, Cauchy's Residue theorem (without proof) and problems. **Transformations:** Conformal transformations-Discussion of transformations: $w= z^2$, $w= e^z$, $w = z + (1/z)(z \neq 0)$. Bilinear transformations-problems.	**L1 & L3** **L3**	**10**

MODULE-IV **Probability Distributions:** Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and normal distributions, problems. **Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient.	**L3**	**10**
MODULE-V **Sampling Theory:** Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. **Stochastic process:** Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability- simple problems.	**L3** **L1&L2**	**10**

Course Outcomes: On completion of this course, students are able to:

1. Solve first and second order ordinary differential equation arising in flow problems using single step and multistep numerical methods.
2. Illustrate problems of potential theory, quantum mechanics and heat conduction by employing notions and properties of Bessel's functions and Legendre's polynomials.
3. Explain the concepts of analytic functions, residues, poles of complex potentials and describe conformal and Bilinear transformation arising in field theory and signal processing.
4. Develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, information theory and design engineering.
5. Demonstrate testing of hypothesis of sampling distributions and illustrate examples of Markov chains related to discrete parameter stochastic process.

Question Paper Pattern:

Note:- The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 60.

- The question paper will have **ten** full questions carrying equal marks.
- Each full question consisting of **20** marks.
- There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

Text Books:

1. *B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.*
2. *E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.*

Reference books:

1. *N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers,7th Ed., 2010.*
2. *B.V.Ramana: "Higher Engineering M athematics" Tata McGraw-Hill, 2006.*
3. *H. K. Dass and Er. RajnishVerma: "Higher Engineerig Mathematics", S. Chand publishing, 1st edition, 2011.*

THERMODYNAMICS AND FLUID MECHANICS
[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV (Mining Engineering)			
Course Code	17MN42	**CIE Marks**	**40**
Number of Lecture Hours/week	04	**SEE Marks**	**60**
Total Number of Lecture Hours	50	**Exam Marks**	**03**
Credit = 04			

Course objectives:

This course will enable students to:

- To understand basic principles and basic concepts of Thermodynamics.
- To understand Principles of Fluid mechanics
- To understand working principles of compressor.
- To understand the working principles of pumps, flow through pipes

Modules	Teaching Hours
MODULE- 1:Basic Concepts of Thermodynamics and Energy	
Basic concepts of Thermodynamics: Thermodynamic system, classification of thermodynamic system. Thermodynamic property-extensive and intensive properties. Thermodynamic state, thermodynamic process. Reversible, irreversible process, Quasi-static process. Thermodynamic equilibrium, zeroth law of thermodynamics. **Energy**: classification, stored energy and energy in motion. Work and heat-definition, work done at the moving boundary. Comparison between work and heat.	**10 Hours**
MODULE- 2: Laws of Thermodynamics and Air Compressors	
I and II Laws of Thermodynamics: I and II Laws of thermodynamics: Statements, cyclic processes, numerical problems. **Air Compressors:** Single stage and multistage reciprocating air compressors on surface and in underground mines. Expression for work done during single stage air compression with and without clearance volume. Volumetric efficiency. Simple numerical problems on single stage compressors only.	**10 Hours**
MODULE- 3: Fluid Mechanics and Fluid Flow Measurements	
Fluid Mechanics: Definition and properties of Fluids, ideal and real fluid units, systems of measurement. Fluid properties-density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension and capillarity, vapour pressure and cavitation, **Fluid flow measurements**: Venturimeter, Orifice meter. Flow through orifices and notches. Loss of head due to friction in pipes. Discharge measurements in pipes.	**10 Hours**

MODULE- 4: Fluid Statistics and Buoyancy	
Fluid Statistics: pressure, atmospheric pressure, gauge and absolute pressure, measurement of pressure, piezometer tube, double column u-tube manometer, differential and inverted U-tube measurements, Bourdon's pressure gauge, diaphragm pressure gauge and dead weight pressure gauge. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined planes, curved surface submerged in liquid.	**10 Hours**
Buoyancy: definition, center of buoyancy, metacenter and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of metacentric height experimentally and theoretically.	
MODULE- 5: Fluid Dynamics	
Fluid Dynamics: Introduction to equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation, assumptions, hydraulic gradient line and total energy line. Numerical Problems.	**10 Hours**

Course outcomes:

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

- Able to understand basic concepts of Thermodynamics
- Enables to solve problem related to work & heat
- Able to understand principle and operation of reciprocating compressor.
- Able to understand pumps &flow through pipes
- Able to understand basic principles of Fluid mechanics

TEXT BOOKS:

1. **"Engineering thermodynamics",** Nag P.K., Tata McGraw Hill publications. 2nd Ed. 2002

2. **"A Text Book of Fluid Mechanics and Hydraulic Machines,"** R.K.Bansal. Laxmi publications. 2006

REFERENCE BOOKS:

1. **"Fundamentals of Classical Thermodynamics**", Van Wylengordenet. Al, John Wiley Intl. publications, New York. Thermodynamics. 2000

2. **"Thermal Engineering,"** R.K.Rajput, laxmi publications, New Delhi. 2002

3. **"Hydraulics and Fluid Mechanics,"** Modi P.N. and Seth, S.M., Standard Publishers, New Delhi. 1999.

4. "Thermodynamics &Fluid Mechanics", B.E.T, A.Venkatesh, Universities Press. 2008

5. "An Introduction to Thermodynamics", Y.V.C.Rao, Wiley Eastern, 1993.

6. **"Fluid mechanics",** by Ramamrutham

	MINING GEOLOGY – II [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – IV (Mining Engineering)**		
Course Code	17MN43	**CIE Marks**	**40**
Number of Lecture Hours/week	04	**SEE Marks**	**60**
Total Number of Lecture Hours	50	**Exam Marks**	**03**
	Credit = 04		

Course objectives:

This course will enable students to:

- To be familiar with application of geology in Mining Engineering.
- To gain knowledge of various aspects of Economic Geology &various processes of formation of Mineral Deposits.
- To know the occurrence & distribution of Minerals in India.
- To learn various methods of prospecting.

Modules	Teaching Hours
MODULE- 1:Application of geology in Mining Engineering	
Application of geology in Mining Engineering: Classification of Geology- Pure & Applied Geology, Mining Geology, Delineation of deposits, Limits of Economic Mining, Role of Mine Geologist, Geological Work in Operating Mine	**08 Hours**
MODULE- 2:Economic Geology & Mineral Deposits	
Economic Geology: Definitions, Scope of economic geology, classification of mineral deposits – ore mineral, gangue minerals and tenor of ores. **Mineral Deposits:** Study of Various processes of formation of mineral deposits- Magmatic, Hydrothermal, Weathering, Sedimentation, Sublimation, Evaporation, Oxidation and Supergene enrichment and Metamorphic deposits.	**10 Hours**
MODULE- 3: Occurrence & Distribution of Minerals in India	
Occurrence & Distribution of Minerals in India: Iron, Copper, Lead, Zinc, Chromite, Gold, Manganese, Beach sand, Diamond, Radio-active minerals- Uranium, Radium, Rubidium, Stroncium, Refractory minerals, Ceramic minerals and Building stones.	**10 Hours**
MODULE- 4: Coal, Petroleum and Natural Gas	
Coal: Definitions, physical and chemical properties, variations and ranks of coal. Important constituents of coal, origin of coal, structural features of coal seams, Chief characteristics of Indian coals. Important coal fields of India. **Petroleum & Natural gas:** Meaning, Origin, Composition, Accumulation, Structural features, Migration of petroleum and natural gas, Major oil fields of India.	**10 Hours**
MODULE- 5: Exploration Geology& Mining Geology	
Exploration Geology: Definition, Principles of mineral exploration, stages of mineral Exploration.Prospecting: definition, types- Geological, Geophysical and geo-chemical methods. Remote sensing techniques for prospecting. Factors involved in planning and drilling in detail exploration. Core drilling and core recovery.	

Mining Geology: Methods of sampling, assaying and estimation of ore reserves. Guides for location of ore deposits with particular reference to structural and stratigraphic guides. Geological field work, Methods of surface, sub-surface mapping, Interpretation and use of field data.	**12 Hours**

Course outcomes:

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

- The students will be able to identify, formulate and solve the problems of economic minerals.

- The students learn to use the techniques, skills, and modern engineering tools necessary for geophysical and geochemicalprospecting.

TEXT BOOKS:

1. "**Mining Geology** ", Module-I & II, Mckinistry, , Asia Publication. 2nd Ed. 2005.
2. **"Economic Mineral Deposits,"** Module-III, IV &V, Bateman A.M John Wiley and sons, 2nd Ed. 1999.
3. A Text Book of Geology:- P.K.Mukharjee
4. Engineering and General Geology:- Parbin Singh

REFERENCE BOOKS:

1. **"Ore Deposits of India",** Gokhale&Rao T.C., Thompson press. India, Faridabad.1999.
2. **"Courses in Mining Geology",** Arogyaswamy, Oxford & IBH Pvt. Ltd.3rd Ed. 1999.
3. **"A Handbook of Economic Geology"**, A.K.Sen & P.K.Guha, Modern Publishers, Calcutta, 1981.
4. **"Geological Prospecting & Exploration"** by V.M.Kreiter, MIR Publishers, Moscow, 1968.
5. **"Geology of India & Burma"** by M.S.Krishna.
6. **"India's Mineral Resources"** by S. Krishnaswamy.
7. **"Petroleum Geology"** by Levorson.

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MINE MECHANIZATION –I
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV (Mining Engineering)

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Course Code	17MN44	CIE Marks	40
Number of Lecture Hours/week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Marks	03

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Credit = 04

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Course objectives:
This course will enable students to:

- To choose proper transportation system for shaft, incline and roadways in underground mines depending on the geo-mining conditions of the mineral deposit.

- To analyze the basic element of haulage systems and winding systems in mining industry.

- To learn the construction and working of various haulage system and winding system.

Modules	Teaching Hours
MODULE- 1:Principles,Generation, Distribution & Utilization of Compressed air and Introduction to Mine Transport Systems	
Compressed Air: Definition- Air pressure, Laws governing compression & expansion of gases (derivation & simple problems), Specific heat of gas. **Generation & Distribution of compressed air**: Transmission and distribution of compressed air in mines, loss of compressed air. **Utilization of compressed air:** Jack hammer, Rocker shovel, Air turbines & Reciprocating compressed air engine. **Introduction to Mine Transport Systems**: Elements of Mine haulage system and classification, Techno economic indices of Mine haulage system.	**10 Hours**
MODULE- 2:Ropes & Rope haulage systems	
Ropes: Types and details of construction of different types of ropes and their respective uses in mines, selection, care and storage of ropes, socketing - split, cone & inter locking wedge; rope splicing, safety factor for ropes used in winding. Numerical problems. **Rope haulage systems:** Different types- direct, endless, main & tail, gravity and Ariel ropeways. Limitations, applications merits & demerits of different haulages. Numerical problems.	**10 Hours**
MODULE- 3: Conveyors and Locomotives	
Conveyors: Types of conveyors-belt, scraper chain, shaker, high angle conveyor, cable belt, rope belt and steel plate, its limitations and their applications, problems on calculation of power requirement and capacity of conveyors, Numerical Problems. **Locomotives:** Types-Diesel, Electric battery, Trolley wire, its limitations and their applications. Numerical problems.	**10 Hours**

MODULE- 4: Winding systems in Mines	
Winding systems in Mines: Elements of winding system, types- drum, friction, electric, compressed air, koepe winding and multirope winders, method of balancing the loads, numerical problems. Skip and cage winding. Winding from different levels in a shaft.	**10 Hours**
MODULE- 5: Breaking system of winders and Study of layouts for Mine transportation	
Breaking system of winders: Mechanical, Electrical and Automatic breaking system of winders, Safety devices on winders**.** **Study of Layouts for Mine transportation:** Study of respective layouts for all the systems of transportation. Study of pit top and pit bottom layouts. Track laying and maintenance.	**10 Hours**

Course outcomes:

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

- Apply knowledge of mine machinery for understanding, formulating and solving transportation problems in undergroundmine.

- Acquire knowledge and hands-on competence in applying the concepts in the design and development of transportation systems.

TEXT BOOKS:

1. **"Elements of mining technology Vol III",** D.J.Deshmukh, Vidyasewa prakashan, Nagpur, 7th Ed. 2000 Module-I to V.
2. **"Mine pumps haulage & winding", S. Ghatak, Coalfield Publishers, Asansol, 1ˢᵗ Ed. 1995.Module-II to V.**

REFERENCE BOOKS:

1. **"Coal Mining Practice",** I.C.F.Stathem, The Caxton publishing Company Ltd, 2000.
2. "**Universal Mining School reports Vol I and Vol II,"** Cardif, Great Britain **1999**.
3. "**Mine Transport",** Karerlin, Orient Longmans, 1967.
4. **"Mining Machinery"** by S.C.Walker.
5. **"Coal Mining Practice"** by Stathum.
6. **"Deep Mined Coal Industry Advisory Committee"**

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MINE SURVEYING – I

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV (Mining Engineering)

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Course Code	17MN45	CIE Marks	40
Number of Lecture Hours/week	04	**SEE Marks**	60
Total Number of Lecture Hours	50	**Exam Marks**	03

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Credit = 04

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Course objectives:

This course will enable students to:

- To measure distance and directions by chain, compass and plane table surveying.

- To compute areas and volumes.

- To be familiar with various types of leveling instruments, temporary adjustment of leveling instruments and to learn various methods of determination of RL.

- To use theodolite instrument to measure angle.

Modules	Teaching Hours
MODULE- 1: Introduction to Surveying and Measurements of Distance and Directions	
Introduction: Plane & Geodetic survey, classification of survey, objectives, principles, types & uses of chain, tape, compass& plane table survey. **Distance:** Distance measurements using chain, compass & Electronic Distance Measurements (EDM) instruments. **Directions:** Meridians, azimuths and bearings, declination, computation of angles using compass & introduction to total station.	**10 Hours**
MODULE- 2:Leveling	
Leveling: Principles and basic definition, types of levels – including modern level (Auto, Tilting & Precise level), fundamental axis and parts of dumpy level, temporary adjustments, sensitiveness of bubble tube, curvature and refraction correction (Theory & problems). Reduction of levels – height of instrument method – raises & fall method (Theory & problems), transfer of levels from surface to underground, errors and its precautions.	**10 Hours**
MODULE- 3: Triangulation & Contouring	
Triangulation Survey: Principles, classification, steps in triangulation survey, base line measurements and corrections, base networks, Problems. **Contouring:** Contour, contour interval and characteristics, methods – direct and indirect, interpretation – arithmetic and graphical method, uses of contours.	**10 Hours**
MODULE- 4: Computation of Areas and Volumes	

Computation of Areas: General methods for regular & irregular boundaries, area computed from map measurements, construction & uses of planimeter. Problems **Computation of Volumes:** General methods of calculation of volumes for Embankments and cuttings, spot levels, volume from contour plans & capacity of reservoirs & volume of borrow pits. Problems	**10 Hours**

MODULE- 5: Introduction to Theodolite and Traversing

Theodolite: Definition and terms, parts, temporary adjustments, horizontal and vertical angles, miscellaneous operations, errors. **Traversing:** Principles of Traversing, open traverse and closed traverse using chain, compass and theodolite. Balancing of traverse - Bowditch& transit rule.	**10 Hours**

Course outcomes:

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

- The students will be able to apply technical knowledge on linear measurements by chain, tape, compass and plane tablesurveying.

- The students will possess ability to identify, formulate, and solve engineering problems in leveling.

- The students will possess ability to determine angles using theodolite.

- The students will possess ability to use the techniques, skills and modern engineering tools necessary for minesurveying.

TEXT BOOKS:

1. **"Surveying Vol I"** B.C.Punmia, Laxmi publications, 1999 (Module-I to V).
2. "**Mine Surveying Vol I"** Ghatak, Coal Field Publishers1998 (Module-I to V).

REFERENCE BOOKS:

1. "**Surveying Vol I,"** S.K.Duggal, Tata McGraw Hill Publications, New Delhi, 2000
2. **"Elementary Plane and Mine Surveying,"** V.Borshch, Kompowets, Bfedarer M .Kolesnikova, Mir publications,Moscow, 1986.
3. Plan & Geodetic Surveying for Engg. By Late David Clark, Vol-2.
4. Hand Book of Mine Surveyors by S.Ghatak.
5. Surveying &Levelling By P.B.Shahani, Vol-I.
6. Surveying by S.K.Duggal, Vol-I

DRILLING AND BLASTING ENGINEERING
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV (Mining Engineering)

Course Code	17MN46	CIE Marks	40
Number of Lecture Hours/week	03	**SEE Marks**	60
Total Number of Lecture Hours	40	**Exam Marks**	03

Credit = 03

Course objectives:

This course will enable students to:

- To understand the basic concepts of drilling and blasting.
- To gain knowledge on various types of explosives and accessories, and their applicability in blasting.
- To understand the safety measures that are required for storing and handling of explosives.
- To understand the mechanics of blasting and its effects on environment.

Modules	Teaching Hours
MODULE- 1: Principles of Drilling & Drill Bits	
Principles of drilling: Principles of rock drilling, drillability, drillability index, factors affecting the drillability. Mechanics of drilling.Selection of drills, care of drills.Energy correlation of drills. **Drill Bits:** Various types of drill bits and their design aspects. Study of bit life, factors affecting the bit life. Thrust feed and rotation, alignment and deviation in drilling	**08 Hours**
MODULE- 2:Explosive	
Explosives: Historical Development, properties of explosives, Low and High explosives, ANFO, slurries, Emulsion explosives, heavy ANFO, permitted explosives, testing of permitted explosives, bulk explosives system-PMS, SMS.	**08 Hours**
MODULE- 3: Firing of Explosives & Blasting Methods	
Firing of Explosives: Safety fuses, Detonating cord and accessories, Detonators, Exploders. Electric firing and non-electric firing, Electronic Detonators, NONEL blasting. **Blasting Methods:** Preparation of charge, stemming and shot firing. Choice and economical use of explosives, misfires, blown out shots, incomplete detonation, their causes, prevention and remedies.	**08 Hours**
MODULE- 4: Handling of Explosives	
Handling of Explosives: Surface and underground transport of explosives, bulk transport in quarries. Storage and handling of explosives. Magazines, accidents due to explosives. Precautions and safety measures during transportation. Substitutes for explosives and their applications-Hydrox, Cardox, Hydraulic coal burster, Airdox, pulsed infusion shot firing.	**08 Hours**
MODULE- 5: Mechanics of Blasting & Effects of Vibration	

Mechanics of Blasting: Factors affecting rock breakage, Crater theory and its applications, theories of rock breakage using explosives. Theory of shaped charge, detonation pressure, coupling, shock waves impedance, critical diameter etc. calculation of charge and powder factor. **Effects of Vibration:** Vibrations due to blasting and damage criteria, controlled blasting methods, design of blasting, air overpressure and fly rock. Economics of blasting.	**08 Hours**

Course outcomes:

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

- Ability to select drilling equipment for drilling in mines under various conditions.
- Ability to select explosives and accessories for mine specific blasting.
- Ability to handle explosives and other accessories with safety.
- Ability to understand the mechanics of blasting which in turn helps in blasting design.

TEXT BOOKS:

1. **"Explosives and Blasting Practices in Mines,"** S.K. Das, Lovely Prakashan, Dhanbad, 1993.(Module I-V)
2. **"Explosives and Blasting Techniques,"** G.K. Pradhan, Minetech Publication, 1996. .(Module I-V)

REFERENCE BOOKS:

1. **"Surface Mining"**, G.B. Mishra, Module 1, Dhanbad Publishers, Dhanbad, 1978.
2. **"Rock Fragmentation by Blasting,"** B.Mohanty, Module 4, A.A. Balkema, Rotterdam, 1996.
3. **"Advances in Drilling and Blasting"** V.R. Sastry, Module 1 and 2, Allied Publishers Ltd., 1993.
4. **"Principles of Rock Drilling"** U.M. Rao Karanam and B.Mishra, Module 1 and 2 Oxford and IBH, 1998.
5. **"Drilling and Blasting of Rocks"**, Carlopez Jimeno, etal. Module 7, A.A. Balkema, Rotterdam, Brook fields, 1995.
6. **"Engineering Rock Blasting operations"**, Sushil Bhandari, Module 3 and 6, , A.A. Balkema, Rotterdam, Brook fields, 1997

MINING GEOLOGY LABORATORY – II				
[As per Choice Based Credit System (CBCS) scheme]				
SEMESTER – IV (Mining Engineering)				
Course Code	**17MNL47**	**CIE Marks**		**40**
Number of Lecture Hours/Week	**03 (1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**		**60**
		Exam Hours		**03**
Credit = 02				

Course objectives:

This course will enable students to:

- Able to identify the various structural and mineralogical aspects of ore and rock forming minerals by Microscope.

- To be able to designate the megascopic features of Ore Minerals and Rock minerals.
- Determinations of Dip & Strike of strata.

- Able to gain the knowledge of Geophysics & Bore hole based Problems.

- Ore reserve estimation of limited and unlimited boundaries.

Part-A

I. Microscopic studies of Rock Forming Minerals

Experiment No. 01: Study of optical properties, Texture, Alteration and Identification of Rock forming Minerals.

II. Megascopic Studies of Ore Minerals

Experiment No.02: Physical properties, Chemical composition, Mode of occurrence, distribution and uses of Iron, Manganese, Copper, Lead, Chromium, Aluminum etc.

III. Determinations of Dip & Strike

Experiment No. 03: To determine the true dip, when two apparent dips are known.

Experiment No. 04: To determine the amount of apparent dip, when true dip and the direction of apparent dips are given.

Experiment No. 05: To determine the direction of apparent dip, when true dip and amount of apparent dips are known

Part-B

IV. Thickness based Calculations

Experiment No. 06: On Horizontal Ground

Experiment No. 07: On Slope Ground

Experiment No. 08: Slope against the direction of dip.

V. Geophysics & Bore hole based Problems (3 points problem)

Experiment No. 09: Electrical resistivity survey

Experiment N0.10: On Ground Level

VI. Estimation of ore reserves

Experiment No. 11: Bedded deposits, Vein deposits and load deposits

Course Outcomes:

On the completion of this laboratory course, the students will be able to:

- To identify, formulate, and solve engineering problems in Microscopic studies of Rock Forming Minerals and Megascopic Studies of Ore Minerals
- To possess ability to identify, formulate, and solve engineering problems in Dip & Strike determination, Geophysics & Bore-hole and ore reserve estimation.

Scheme of Examination:

ONE question from part -A: 40 Marks
ONE question from part -B: 40 Marks
Viva -Voice: 20 Marks

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**   100**
**   Total :   Marks**

MINE SURVEYING LABORATORY-I
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV (Mining Engineering)

Course Code	17MNL48	CIE Marks	40
Number of Lecture Hours/Week	03 (1 Hour Instruction + 2 Hours Laboratory)	SEE Marks	60
		Exam Hours	03

Credit = 02

Course objectives:

This course will enable students to:

- Study about different instruments used in surveying
- Study about chain traversing, compass traversing and plane table traversing.
- Study about handling of leveling instrument and determination of RL
- Study about handling of theodolite and to measure the angles.
- To determine co-ordinates of points.

I. Demonstration of Mine Surveying Instruments such as clinometer, abney level, box sextant, ediograph, pentagraph, ceylonghat tracer and planimeter.

II. Chain and cross staff Survey

   a) Setting of regular polygon using chain and tape.

   b) Cross Staff Survey

III. Compass Survey

   a) Setting of regular polygon using compass and tape.

   b) Compass Traversing

   c) Inaccessible Distance

IV. Plane table methods.

   a) Radiation methods

   b) Intersection Method

V. Reduction of levels.

   a) R.L by H.I.Method and Rise and Fall Method

   b) Profile Levelling

VI. Theodolites traversing and co-ordinate calculation.

Balancing of the traverse.(closed traverse- Bowditch and Transit Rule)

Course outcomes:

On the completion of this laboratory course, the students will be able to:

- The students will be able to do linear measurements by chain, tape, compass and plane table surveying.
- They will possess the ability to identify, formulate, and solve engineering problems in leveling.

Scheme of Examination:

Note: 1) All the above experiments are to be conducted
2) Two experiments are to be performed by the students in the examination

ONE question from part -A:	**40 Marks**
ONE question from part -B:	**40 Marks**
Viva -Voice:	**20 Marks**
Total :	**100 Marks**