15MAT41 ENGINEERING MATHEMATICS-IV

Sub Code : 15MAT41	**IA Marks : 20**
Hrs/week : 04	**Exam Hours : 03**
Total Hrs : 50	**Exam Marks : 80**

TO BE TAKEN FOR MATHEMATICS BOARD

15MN42 THERMODYNAMICS AND FLUID MECHANICS

Sub Code : 15MN42	**IA Marks : 20**
Hrs/week : 04	**Exam Hours : 03**
Total Hrs : 50	**Exam Marks : 80**
Credit = 04	

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.

Buoyancy: definition, center of buoyancy, metacenter and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of metacentric height experimentally and theoretically.**10** H**ours**

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** H**ours**

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 Wylengorden et. 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

15MN43 MINING GEOLOGY – II

Objectives: Learn about Importance of Mining Geology, Types of Rocks, Structures, Geological Disturbances in Rocks and their Effects on rock Structures

Sub Code: 15MN43	**IA Marks:20**
Hrs/week:04	**Exam Hours:03**
Total Hrs.:50	**Exam Marks:80**
Credit = 04	

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: Prospecting & Exploration Geology

Prospecting: Definition, types- Geological, Geophysical and geo-chemical methods. Remote sensing techniques for prospecting.

Exploration Geology: Definition, Principles of mineral exploration, stages of mineral Exploration, Factors involved in planning and drilling in detail exploration. Core Drilling and Core recovery. Methods of sampling, assaying and estimation of ore reserves. Guides for location of ore deposits with particular reference to

structural and stratigraphical guides. Geological field work, Methods of surface, sub-surface mapping, Interpretation and use of field data. **12 Hours**

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.

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.

15MN44 MINE MECHANIZATION –I

Objectives: Learn about Various Mining Machineries pertaining to Entry and Exit of Men, Material, Calculation of Power Required for Various Transporting Systems.

Sub Code: 15MN44	**IA Marks: 20**
Hrs/week: 04	**Exam Hours: 03**
Total Hrs. : 50	**Exam Marks: 80**
Credit= 04	

MODULE- 1: Principles, Generation, Distribution & Utilization of Compressed air

Compressed Air: Definition- Air pressure, Laws governing compression & expansion of gases (derivation & simple problems), Specific heat of gas.

Generation & Distribution of compressed air: Sources of power for compressors-Rotary & Centrifugal compressors, 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. **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.

Rope haulage systems: Elements of Mine haulage system and classification, Techno economic indices of Mine haulage system, Rope haulage: Different types- direct, endless, main & tail, gravity, Limitations, applications merits & demerits of different haulages, numerical problems. **10 Hours**

MODULE- 3: Mine transportation

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.

Locomotives: Types-Diesel, Electric battery, Trolley wire, its limitations and their applications. **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, Duty cycle, Numerical problems.

Breaking system of winders: Mechanical, Electrical and automatic breaking system of winders, Safety devices on winders. **10 Hours**

MODULE- 5: Study of layouts for Mine transportation

Study of Layouts for Mine transportation: Study of respective layouts for all the systems of transportation. Study of pit top and pit bottom layouts. Skip and cage winding. Winding from different levels in a shaft.

10 Hours

TEXT BOOKS:

1. **"Elements of mining technology Vol III", , D.J.Deshmukh, Vidyasewaprakashan, 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"

15MN45 MINE SURVEYING – I

Objectives: Learn the Basics of Surveying, Types of Surveying and their Usage in Practical Applications.

Sub Code : 15MN45	**IA Marks : 20**
Hrs/week : 04	**Exam Hours : 03**
Total Hrs : 50	**Exam Marks :80**
Credit = 04	

MODULE- 1: Introduction and Linear Measurements

Introductions : Definition of surveying, Classifications of surveying, basic principles of surveying, differences between plan and map, Errors - Sources, classification and preventions, accuracy and precision in surveying.

Linear measurements: Types of chain and tape, types of linear measurements: chaining, optical, EDM devices; Ranging - direct and indirect. Measurement of distances on surface and in underground mines, error and corrections in chaining with numerical problems. **10 Hours**

MODULE- 2: Chain Surveying

Chain Surveying: Definition, Purpose and Principles, types of offsets, setting out of right angles, obstacles (theory and problems), working principles and uses of optical square, prism square and cross staff.

Methods of chain survey, booking and plotting, conventional symbols, cross staff survey. **10 Hours**

MODULE- 3: Compass Surveying

Compass Surveying: Angles, meridian and bearings (theory and problems). Principle, working and use of prismatic and surveyors (Dial) compass. Magnetic Dip and declination (theory and problems). Local attraction-determination and correction (Theory & problems), errors and preventions.

Methods of compass traversing - loose needle method and fast needle method. Advantages and disadvantage of compass survey, errors and its prevention. **10 Hours**

MODULE- 4: 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), Methods of leveling - geometrical, trigonometrically and physical method. Classification of leveling - simple and compound leveling, Fly leveling, check leveling, profile leveling, cross sectioning.

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- 5: Plane Table Survey and Contouring

Plane table survey: Equipments and accessories, advantages, disadvantages and limitations of plane table survey, orientation and method of orientation; Methods of Plane table survey - radiation, intersection and traversing, resection - two-point problem and three point problem (Bessel's graphical method), errors and its precautions.

Contouring: Contour, contour interval and characteristics, methods - direct and indirect, interpretation - arithmetic and graphical method, uses of contours **10 Hours**

TEXT BOOKS:

1. **"Surveying Vol I"** B.C.Punmia, Laxmi publications, 1999 (Module-I to V).
2. "**Mine Surveying Vol I"** Ghatak, Coal Field Publishers,1998 (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

15MN46 DRILLING AND BLASTING ENGINEERING

Objectives: Learn the Basics of Drilling and Blasting, Various Accessories used, Theory of Drilling and Blasting, Powder Factor, Charge Factor and their Importance, Drilling and Blasting at Various Conditions

Sub Code: 15MN46	**IA Marks :20**
Hrs/week: 04	**Exam Hours : 03**
Total Hrs: 50	**Exam Marks : 80**
Credit = 04	

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. **10 Hours**

MODULE- 2: Explosive

Explosives: Historical Development, properties of explosives, Low and High explosives, Liquid oxygen explosives (LOX), ANFO, Slurries, Emulsion explosives, Heavy ANFO, permitted Explosives, testing of permitted explosives, Bulk Explosives system-PMS, SMS. **10 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.

10 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. **10 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. **10 Hours**

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, et. al.,. Module 7, A.A. Balkema, Rotterdam, Brookfields, 1995.
6. **"Engineering Rock Blasting operations**", Sushil Bhandari, Module 3 and 6, , A.A. Balkema, Rotterdam, Brookfields, 1997

15MNL47 MINING GEOLOGY LABORATORY – II

Objectives: Learn about Importance of Mining Geology, Types of Rocks, Structures, Geological Disturbances in Rocks and their Effects on rock Structures in laboratory.

Sub Code : 15MNL47	**IA Marks : 20**
Hrs/week : 03	**Exam Hours : 03**
Total Hrs : 42	**Exam Marks : 80**
Credit = 02	

Part-A (Any one question 35 marks)

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 (Any one question 35 marks)

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

Part-C Viva Voce 10 marks

15MNL48 MINE SURVEYING LABORATORY-I

Objectives: Learn the Basics of Surveying, Types of Surveying and their Usage in Practical Applications in Laboratory.

Sub Code : 15MNL48	**IA Marks : 20**
Hrs/week : 03	**Exam Hours : 03**
Total Hrs : 42	**Exam Marks : 80**
Credit = 02	

Part-A (Any one question 35 marks)

1) Demonstration of mine survey instruments such as clinometer, abney level, box sextant, ediograph, pentagraph, Ceylon ghat tracer and planimeter.

2) Setting of regular figures using chain and tape.

a) Setting of pentagon

b) Setting of Hexagon

c) Setting of Octagon

3) Setting of regular figures using compass and tape.

a) Setting of pentagon

b) Setting of Hexagon

c) Setting of Octagon

d) Inaccessible Distance

Part-B (Any one question 35 marks)

4) Plane table methods.

a) Radiation methods

b) Intersection Method

c) Two point problem

d) Three point problem

5) Reduction of levels.

a)R.L by H.I.Method

b)R.L by Raise and Fall Method

Part-C Viva Voce 10 marks