CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Scheme of Teaching and Exam

Metallurgical Engineering

Sem. III

S. No.	Board of Study	Subject Code	Subject	Periods per week			Scheme of Exam			Total Marks	Credit L+(T+P)/2
							Theory/ Pract.				
				L	T	P	ESE	CT	TA		
1	Civil Engg.	338311 (20)	Mechanics of Solids & Fluids	3	1	-	80	20	20	120	4
2	Applied Mathematics	300311 (14)	Mathematics – III	4	1	-	80	20	20	120	5
3	Applied Geology	338313 (13)	Geology of Minerals	4	-	-	80	20	20	120	4
4	Applied Chemistry	338314 (11)	Chemical Characterization of Materials	3	1	-	80	20	20	120	4
5	Metallurgical Engg.	338315 (38)	Ore Dressing	3	1	-	80	20	20	120	4
6	Metallurgical Engg.	338316 (38)	Fuels & Refractories	3	1	-	80	20	20	120	4
7	Applied Chemistry	338321 (11)	Chemical Characterization of Materials Lab	-	-	3	40	-	20	60	2
8	Applied Geology	338322 (13)	Geology of Minerals Lab	-	-	3	40	-	20	60	2
9	Metallurgical Engg.	338323 (38)	Ore Dressing Lab	-	-	3	40	-	20	60	2
10	Metallurgical Engg.	338324 (38)	Fuels & Refractories Lab	-	-	3	40	-	20	60	2
11	Humanities etc.	300325 (46)	Value Education	-	-	2	-	-	40	40	1
12			Library	-	-	1	-	-	-	-	-
Total				**20**	**5**	**15**	**640**	**120**	**240**	**1000**	**34**

L-Lecture, T-Tutorial,
P-Practical, ESE- End sem. Exam, CT-Class Test,
TA- Teacher's Assessment,

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Semester: **B.E. III Sem.** Branch: **Metallurgical Engg.**
Subject: **Mechanics of Solids & Fluids** Code: **338311(20)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Examination: **80**
Minimum number of Class tests to be conducted: **Two**

Section – A
Mechanics of Solids

Unit –I **Friction and Lubrication-** Laws of Friction for dry and Lubricated Surfaces, Journals and pivots, Rolling Friction.
Resilience: Shock, Stress due to change of temperature.
Columns and struts – Long and short colums, euler's and Rankine's formula, combined axial and bending stress**.**
Riveted and welded joints:- Analysis of riveted joints in structures, efficiency of joints, design of joints as per codes, introduction to welded joints.

Unit - II **Theories of elastic failures:** Maximum Principal stress Principle strain total energy theories, maximum shear stress theory, maximum distortion energy theory.

Section – B
Fluids Mechanics

Unit - III **Physical Properties of Fluids:** Specific weight, density, viscosity.

Hydrostatic Law:- Pressure Measurement by manometers, Pressure on curved and plane surface, center of pressure.

Unit - IV Steady and Unsteady Flow, uniform and Non-Uniform flow. Continuity equation for one-dimensional Flow.

Application of Bernoullis Equation. Total energy line.

Unit - V Hydraulic Grade line, Losses in Pipes, Friction Loss, Darcy- weisbach Equation, Friction Factor, flow through pipes, Minor losses, Bends, Expansion etc. Transmit ion of power through pipe.

Types; of Pumps and Parameters for selection of pumps, in series and parallel.:

Books Recommended :

1. Fluid Mechanics – by Dr. A.K. Jain
2. Fluid Mechanics – by Modi and Seth

Reference Books

1. Mechanics of Solids - By Popov
2. Strength of Material - By Timoshenko

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Semester: **B.E. III Sem.**

Branch: **Metallurgical, Civil, Mechanical, Mining, Chemical, Bio Medical Engg**

Subject: **MATHEMATICS-III**

Code: **300311 (14)**

Total Theory Periods: **50**

Total Tutorial Periods: **12**

Total Marks in End Semester Exam. : **80**

Minimum number of class test to be conducted: **02**

UNIT - 1 FOURIER SERIES **(No. of periods 8+2)**

Euler's Formula, Functions having points of discontinuity, Change of interval, Even & Odd functions, Half range series, Harmonic analysis.

UNIT - 2 LAPLACE TRANSFORM **(No. of periods 8+2)**

Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT - 3 PARTIAL DIFFERENTIAL EQUATION **(No. of periods 8+2)**

Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT - 4 COMPLEX VARIABLES **(No. of periods 8+2)**

Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue, Evaluation of real definite integrals.

UNIT - 5 STATISTICS **(No. of periods 8+2)**

Random variables, Discrete & continuous probability distributions, Expectation, Mean & Standard Deviation, Moments & moment generating function, Distributions- Binomial, Poisson and Normal distributions.

TEXT BOOKS: -

1. Higher Engg. Mathematics by Dr. B.S. Grewal– Khanna Publishers.
2. Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons.

REFERENCE BOOKS: -

1. Advanced Engg. Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
2. Applied Mathematics by P.N.Wartikar & J.N. Wartikar. Vol- II– Pune Vidyarthi Griha Prakashan, Pune.
3. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Semester: **B.E. III Sem.** Branch: **Metallurgical Engg.**
Subject: **Geology of Minerals** Code: **338313 (13)**
Total Theory Periods: **50** Total Tutorial Periods: **Nil**
Total Marks in End Semester Examination: **80**
Minimum number of Class tests to be conducted: **Two**

Unit – 1
General Geology: Solar System; A brief idea of the Origin and Age of the Earth, Interior of the Earth-Internal Structure, Seismic Data and Pressure with in the Earth, General idea about Volcanoes and Earthquake.

Unit – II
Mineralogy: Physical Properties of Minerals; Classification of various Rock Forming Minerals, Introduction and Preliminary study of Principle Rock Forming Mineral Groups; Quartz, Feldspar, Mica, Pyroxenes, Amphibole, Garnet, Feldspathoids.

Unit – III
Petrology: Definition, Origin and Classification of Igneous, Sedimentary and Metamorphic Rock, Texture and Structure of Igneous, Sedimentary and Metamorphic Rock, Petrographic Description of Igneous, Sedimentary and Metamorphic Rock.

Unit – IV
Economic Geology – I: Introduction and Scope of the subject, Fundamental Terms and there Definition, Processes of Ore Formation, Distribution and Utilization of Ore including Coal and Petroleum Deposits of India.

Unit – V
Economic Geology – II: Mode of Occurrence, Origin, Distribution, Association, and Industrial uses of important Metallic (Al, Au, Cu, Cr, Fe, Mn, Sn, Pb and Zn) and Non- Metallic Mineral (Diamond, Mica, Gypsum, Dolomite, Manganese, Corundum, Kyanite, Calcite, Sillimanite, Andalusite, Tourmaline, Barite. Beryl, Fluorite, and Asbestos.)

Books Rcommended book:

1. Text Book of Geology – G.B. Mahapatra
2. Text book of Engineering Geology – Prabir Singh
3. Principles of Mining Geology – V.M. Banar

Reference book :

1. Physical Geology - G.B. Mahapatra
2. Rutley's element of mineralogy – C.V. Grible
3. Petrology – Turnes/Gilbert
4. Igneous and metamorphic petrology – Turner
5. Ignous and metamorphif petrology – winter
6. Economic Geology economic mineral deposite – Omeshwar Prasad

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Semester: **B.E. III Sem.** Branch: **Metallurgical Engg.**
Subject: **Chemical Characterization of Materials** Code: **338314 (11)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Examination: **80**
Minimum number of Class tests to be conducted: **Two**

Unit –1 **Numerical Problems based on all types of analysis**.
Fundamentals of Quantitative analysis and theoretical Principles.
Sampling, Classification of errors & their minimization. Accuracy & Coefficient of Variation. Common Techniques of Classical methods of analysis. Chemical & Ionic Equilibria, Acids & Bases.

Unit – 2 **Volumetric & Gravimetric analysis**
Neutralization titration, Redox titration Complexometry, Theory of indicators.
Purity of precipitate. Fractional Precipitation Organic Precipitations.

Unit –3 **Electro Analytical Methods**
Potetiometry, Conductometry, Coulormetry, pH measurement.

Unit –4 **Separative Techniques**
Solvent Extraction. Chromatography. Ion exchange.

Unit –5 **Optical methods of Analysis**
Absorption Methods: Visible U.V. && I.R. Spectrophotometry. Atomic absorption Spectroscopy.
Emission methods; Emission spectrography. Flame Photometry. Fluorimetry.

Text Books :

1. Chatwal – Anand – Instrumental Methods of Chemical Analysis.
2. B.K. Sharma – Instrumental Methods of Chemical Analysis.
3. I. Vogel's – Text book of Quantitative Inorganic Analysis.

Reference Book:

1. B. Stuart – Modern Infrared Spectroscopy
2. G.E. Johnson, H.E. Taylor and R.K. Skogerboe- Analytical Chemistry.
3. I.M. kolthoff and P.J. Elving – Treatice on analytical Chemistry.
   Part-I Volume – 4
4. Wilson and Wilson's – Comprehensive analytical Chemistry Vol- II A
5. T. Meites and L Meites – Analytical Chemistry.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (CG)

Semester: **B.E. III Sem.** Branch: **Metallurgical Engg.**
Subject: **Ore- Dressing** Code: **338315 (38)**
Total Theory Periods**: 40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **80**
Minimum number of class test to be conducted: **02**

UNIT -1 Mineral deposits of India ad status of mineral dressing Industries.

Scopes and objectives of Ore – dressing sampling of ore by different methods. Economic justification of ore-dressing operations. Theory of communication, Liberation of Minerals:- Primary, Secondary and special crushing units, and their relative advantages and drawbacks. Theory of ball mill operation, effect of ball load, critical speed etc. Rod mills, Tub e mills, pot mills, pot mills and pebble mills. Open and closed circuit grinding. Liners used in grinding mills. Laws of crushing and grinding. Energy relationship and work index. Effect of beneficiation and concept of optimum grind. Ore microscopy and its use.

UNIT -2 Sizing :-

Sizing scales. Various types of screens, screen analysis. Laboratory sizing, screen efficiency. Factors affecting performance of screens. Industrial sizing methods.
Classification- Sizing and sorting classifiers.

UNIT -3

Movement of solids in fluids. Stoke's law and Newton's law. Terminal velocity and its relation with size. Relation between Time and velocity. Relation between distance traveled and velocity. Free and hindered settling ratio. Quantifying ore- dressing operation. Ratio of concentration, Recovery, Selectivity index and Economic recovery Metallurgical accounting.

UNIT - 4 Jigging and Tabling: -

Mechanism, types of units, and factors affecting the operations. Applications. Magnetic; and electrostatic separation- principles, units and operations. Dry and wet methods. Applications to beach sands.

UNIT – 5 Flotation and heavy media separation:-

Principal requirements, different processes as applied to metallic ores and coals. Complete physical and chemical aspects of Flotation. Application of flotation to concentration of copper, Lead, Ainc and other important ores. Efficiency of flotation, factors affecting flotation.
Indian Ore- dressing practices. Simplified flow sheets with reference to Indian deposits like those of Cu, Pb, Zn, Fe, and coal.

Text Books : **1.** Principles of Mineral Dressing – A.M. Gaudin
2. Mineral Processing Technology – B.A. Wills

Reference Book : **1.** Mineral Dressing – Taggaart
2. Ore- Dressing – S.K. Jain

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Semester: **B.E. III Sem.** Branch: **Metallurgical Engg.**
Subject: **Fuels & Refractories** Code: **338316 (38)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Examination: **80**
Minimum number of Class tests to be conducted: **Two**

Unit - I Origin and types of coal' properties, testing and storage of coal; characteristics of Indian coal deposits; preparation, selection and blending of coals; metallurgical coke, manufacture, specifications, testing and properties; low temperature carbonization; by – products of coking . Details of Coke Ovens in Indian Integrated Iron and Steel Plants. Fuel for Sponge Iron Plants.

Unit – II Liquid fuels, their properties, testing and metallurgical applications. Oil refineries in India.

Unit - III Gaseous fuels, their properties, testing and metallurgical application, manufacture of producer gas and water gas. Cole Oven Gas, Blast Furnace Gas and natural Gas. Factors affecting the choice of fuels.

Unit – IV Acid, basic and neutral refractories, their composition and properties; Methods of production ;of fire clay, silica, magnesite, chrome- magnesite, dolomite and insulation bricks; special refractories; selection of refractories for metallurgical applications.

Unit – V Refractory industry in India. Testing of Refractories, Factors deciding the choice of refractory for a particular furnace and its parts.

Text Books :
1. Brane, J.S.s.K. King J.G., fuels, solids, liquids & gaseous E. Aronld Ltd. London
2. A. Rashid Chesti, Refractories. Prenticae- Hall of India private ltd.

Reference Book

1. Gilchrist, J.D. fuels & Refractories, Macmillan , 1963
2. Norton, Fo H. Refractories, McGraw- Hill, N.Y. 1958
3. Butt A Metallurgical problems McGraw-Hill, Book Company London 1943
4. Efficient use of fuels, HMSO London 1953

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Semester: **B.E. III Sem.** Branch: **Metallurgical Engg.**
Subject: **Chemical Chacterizating of Materials Lab** Code: **338321 (11)**
Total Practical Periods: **40**
Total Marks in End Semester Examination: **40**

List of Experiments.

1. Determination of Calcium & Magnesium by EDTA
2. Determination of Copper in Copper alloy by lodometry.
3. Determination of Maganess in Steel by Potentiometer.
4. Determination of Chromium in Steel by Potentiometer.
5. To determine the Conductivity of an Electrolytic solution by Conductometer.
6. Conductometric Titration of a Strong acid with strong base
7. Determine the molarity of HCL, pH – metrically provided M/10 NaOH.
8. Determination of Iron in a Iron ore by Spectrophotometrty.
9. To determine max of a slolution of Cobalt chloride.
10. Separtion of Metal Cations using paper Chromatography.Estimation of Ni by DMG.

Text Books :

1. Chatwal – Anand – Instrumental Methods of Chemical Analysis.
2. B.K. Sharma – Instrumental Methods of Chemical Analysis.
3. I. Vogel's – Text book of Quantitative Inorganic Analysis.

Reference Book:

1. B. Stuart – Modern Infrared Spectroscopy
2. G.E. Johnson, H.E. Taylor and R.K. Skogerboe- Analytical Chemistry.
3. I.M. kolthoff and P.J. Elving – Treatice on analytical Chemistry.
   Part-I Volume – 4
4. Wilson and Wilson's – Comprehensive analytical Chemistry Vol- II A
5. T. Meites and L Meites – Analytical Chemistry.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Semester: **B.E. III Sem.** Branch: **Metallurgical Engg.**
Subject: **Geology of Minerals Lab** Code: **338322 (13)**
Total Practical Periods: **40**
Total Marks in End Semester Examination: **40**

List of Experiments:

1. Megascopic description of Rock forming minerals (Non-metallic) and ore minerals. (metallic)

2. Petrographic description of Igneous, metamorphic and sedimentary rock.

Books Rcommended book:

1. Text Book of Geology – G.B. Mahapatra
2. Text book of Engineering Geology – Prabir Singh
3. Principles of Mining Geology – V.M. Banar

Reference book :

1. Physical Geology - G.B. Mahapatra
2. Rutley's element of mineralogy – C.V. Grible
3. Petrology – Turnes/Gilbert
4. Igneous and metamorphic petrology – Turner
5. Ignous and metamorphif petrology – winter
6. Economic Geology economic mineral deposite – Omeshwar Prasad

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (CG)

Semester: **B.E. III Sem.** Branch: **Metallurgical Engg.**
Subject: **Ore- Dressing Lab** Code: **338323 (38)**
Total Practical Periods**: 40**
Total Marks in End Semester Exam. : **40**

Practical: - Experiments based on the above syllabus.

List of experiments -

1 Crushing of ore, using Jaw crusher
2. Crushing of ore, using roll crusher
3. Grinding of ore, using Rod mill.
4. Grinding of ore, using Ball mill
5. Concentration of ore with the help of wilfley Table
6. Classification of ore using Akin's classifier
7. Concentration with the help of froth flotation cell
8. Study of thickener
9. Grinding of ore, using Pot mill
10. Study of Vibrating screens
11. Study of laboratory Jig.

Text Books :
1. Principles of Mineral Dressing – A.M. Gaudin
2. Mineral Processing Technology – B.A. Wills

Reference Book :
1. Mineral Dressing – Taggaart
2. Ore- Dressing – S.K. Jain

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Semester: **B.E. III Sem.** Branch: **Metallurgical Engg.**
Subject: **Fuels & Refractories Lab** Code: **338324 (38)**
Total Marks in End Semester Examination: 4**0** Total Practical Periods: **40**

List of Practicals:

1. Determination of flash & fire point of given oil by pensky martin.
2. Determinati9on of flash & fire point of given oil by Able's apparatus.
3. Determination of viscosity using Redwood viscometer.
4. Study of distillation characteristics of given oil
5. Study of different types of Refractories
6 Segar Cone test for refeactories
7 Determination of spelling resistance of Refractories
8 Determination of Calorific value of a solid fuel using Bomb Calorimeter.
9 Determination of Calorific value of a liquid fuel.
10 Determination of Volatile matter in coal
11 Determination of Ash content of coal.
12 Determination of Refractoriness under load.
13 Determination of thermal conductivity of Refractories.

Text Books :
1. Brane, J.S.s.K. King J.G., fuels, solids, liquids & gaseous E. Aronld Ltd. London
2. A. Rashid Chesti, Refractories. Prenticae- Hall of India private ltd.

Reference Book

1. Gilchrist, J.D. fuels & Refractories, Macmillan , 1963
2. Norton, Fo H. Refractories, McGraw- Hill, N.Y. 1958
3. Butt A Metallurgical problems McGraw-Hill, Book Company London 1943
4. Efficient use of fuels, HMSO London 1953

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Semester: **B.E. III Sem.** Branch: Common to all Branches
Subject: **Value Education** Code: 300325(46)
Total Practical Periods: **24** Teacher's Assessment: 40 Mks
Minimum number of class test to be conducted: Two

UNIT – I

?? **STUDY OF BASIC HUMAN OBJECTIVES:** Everlasting solution ¼lek/kku½] prosperity ¼lef)½] trust in self and others ¼vHk;½] and coexistence ¼lgvfLrRo½ for balance in nature. Need and importance of aforesaid basic human objectives and how to achieve these.

UNIT – II

?? **CONCEPT AND UNDERSTANDING OF HUMAN HAPPINESS**

Meaning and concept of "happiness", incessant happiness, its relationship with gaurantee of physical needs, comforts, physical and sensory pleasures with its transient nature, misery; The only method to minimize incessant happiness : gaining right understanding about oneself, one's body, one's relationship with other human beings, Nature and total existence.

UNIT – III

?? **PROPER UNDERSTANDING** about the order in Nature ¼O;oLFkk½ and co-existence ¼lgvfLrRo½ at various levels, such as, I and my body, family, society, Nature and existence.

?? **UNDERSTANDING THE SELF :** Understanding human reality – I and my body, present understanding of the self, physical needs, relation with others and with Nature, gaining proper understanding of the self, discrimination between 'I' and my 'body', characteristics and the needs of 'I', of my 'body' and 'body' & 'I'.

UNIT – IV

?? **SYNERGATIC ORDER ¼O;oLFkk½ and COEXISTENCE ¼lgvfLrRo½ among HUMANS, IN NATURE & IN EXISTENCE** :

- Conceptual understanding of natural relations and consequent values, of family and relation therein, of society and role of engineers therein, overall excellence' : concept, its universal parameters and total human behaviour
- Inanimate ¼tM½ and consciousness ¼pr U;½ aspects of Nature, Four distinct synergetic orders in Nature - Padaarth Awastha ¼inkFk voLFkk½] Pran Awastha ¼ik.k voLFkk½] Jiv Awastha ¼tho voLFkk½] and Gyan Awastha ¼Kku voLFkk½] complementary supplementary evolutionary connection amongst above orders, identifying and implementing "Appropriate Technology".
- Synergetic order among interacting entities of Nature operating in all pervading changeless Shunya or Satta, Indivisible interconnectedness of Satta and Prakriti and its implications.

UNIT – V

?? **IMPLICATIONS OF PROPER UNDERSTANDING**

- Awakening ¼tkxfr½] the common goal of all human beings,
- promotion and perseverance of synergetic order and co-existence at all levels leading to incessant happiness.
- Natural manifestation of universal human values and thereby incessant happiness
- Undivided Society ¼vfoHkkT; lekt½ and Universal Organised System ¼lkoHkkSe O;oLFkk½
- Transition from synergetic disorder ¼v O;oLFkk½ to synergetic order ¼O;oLFkk½
- Evaluation of Understanding, work and behaviour.

REFERENCES

1. Jeevan Vidya Camp ¼f'kfoj½ notes
2. An Introduction to Jeevan Vidya by Shri A. Nagaraj