### CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

**Scheme of Teaching and Exam**

**Metallurgical Engineering**

**Sem. III**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Board of Study</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Theory/ Pract.</th>
<th>Total Marks</th>
<th>Credit</th>
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<tbody>
<tr>
<td>1</td>
<td>Civil Engg.</td>
<td>338311 (20)</td>
<td>Mechanics of Solids &amp; Fluids</td>
<td>80 20 20 120</td>
<td>4</td>
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<tr>
<td>2</td>
<td>Applied Mathematics</td>
<td>300311 (14)</td>
<td>Mathematics - III</td>
<td>80 20 20 120</td>
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<td>3</td>
<td>Applied Geology</td>
<td>338313 (13)</td>
<td>Geology of Minerals</td>
<td>80 20 20 120</td>
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<td>4</td>
<td>Applied Chemistry</td>
<td>338314 (11)</td>
<td>Chemical Characterization of Materials</td>
<td>80 20 20 120</td>
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<td>5</td>
<td>Metallurgical Engg.</td>
<td>338315 (38)</td>
<td>Ore Dressing</td>
<td>80 20 20 120</td>
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<td>6</td>
<td>Metallurgical Engg.</td>
<td>338316 (38)</td>
<td>Fuels &amp; Refractories</td>
<td>80 20 20 120</td>
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<td>7</td>
<td>Applied Chemistry</td>
<td>338321 (11)</td>
<td>Chemical Characterization of Materials Lab</td>
<td>40 - 20 60</td>
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<td>8</td>
<td>Applied Geology</td>
<td>338322 (13)</td>
<td>Geology of Minerals Lab</td>
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<td>338323 (38)</td>
<td>Ore Dressing Lab</td>
<td>40 - 20 60</td>
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<td>338324 (38)</td>
<td>Fuels &amp; Refractories Lab</td>
<td>40 - 20 60</td>
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<td>Humanities etc.</td>
<td>300325 (46)</td>
<td>Value Education</td>
<td>40 40</td>
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<td>640 120 240 1000</td>
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</table>

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.)

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 columns, 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
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)


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:

REFERENCE BOOKS:
3. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH.
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

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 Recommended 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. Igneous and metamorphic petrology - winter
6. Economic Geology economic mineral deposite - Omeshwar Prasad
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 
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  Separateive Techniques 

Unit – 5  Optical methods of Analysis 
Spectroscopy. 

Text Books :

Reference Book:
1. B. Stuart – Modern Infrared Spectroscopy
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.
UNIT - 1 Mineral deposits of India ad status of mineral dressing Industries.

UNIT - 2 Sizing :-

UNIT - 3

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.


Reference Book : 1. Mineral Dressing – Taggaart
2. Ore- Dressing – S.K. Jain
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:  
2. A. Rashid Chesti, Refractories. Prenticae- Hall of India private ltd.

Reference Book  
1. Gilchrist, J.D. fuels & Refractories, Macmillan, 1963  
4. Efficient use of fuels, HMSO London 1953
List of Experiments.

1. Determination of Calcium & Magnesium by EDTA
2. Determination of Copper in Copper alloy by iodometry.
3. Determination of Manganese 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.
9. To determine max of a solution of Cobalt chloride.
10. Separation of Metal Cations using paper Chromatography. Estimation of Ni by DMG.

Text Books:

Reference Book:
1. B. Stuart – Modern Infrared Spectroscopy
4. Wilson and Wilson's – Comprehensive analytical Chemistry Vol- II A
5. T. Meites and L Meites – Analytical Chemistry.
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 Recommended 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
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6. Economic Geology economic mineral deposite - Omeshwar Prasad
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (CG)

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
4. Grinding of ore, using Ball mill
5. Concentration of ore with the help of willfrey 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.


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

1. Determination of flash & fire point of given oil by pensky martin.
2. Determination 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 refractories
7. Determination of spelling resistance of Refractories
10. Determination of Volatile matter in coal
11. Determination of Ash content of coal.
12. Determination of Refractoriness under load.

Text Books:
2. A. Rashid Chesti, Refractories. Prenticae- Hall of India private ltd.

Reference Book
1. Gilchrist, J.D. fuels & Refractories, Macmillan , 1963
4. Efficient use of fuels, HMSO London 1953
UNIT – I

?? STUDY OF BASIC HUMAN OBJECTIVES: Everlasting solution ¼ ½ prosperity ¼ ½ trust in self and others ¼ ½ and coexistence ¼ ½ 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 guarantee 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 ¼ and co-existence ¼ 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 ¼ and COEXISTENCE ¼ 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 and consciousness aspects of Nature, Four distinct synergetic orders in Nature - Padaarth Awastha ¼ Pran Awastha ¼ Jiv Awastha ¼ and Gyan Awastha ¼ 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 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 ¼ and Universal Organised System ¼ ¼ to synergetic order ¼
- Transition from synergetic disorder ¼ to synergetic order ¼
- Evaluation of Understanding, work and behaviour.

REFERENCES
1. Jeevan Vidya Camp notes
2. An Introduction to Jeevan Vidya by Shri A. Nagaraj