### Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Scheme of teaching and examination**

**B.E. IV Semester Metallurgical Engineering**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Board of Study</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Periods per week</th>
<th>Scheme of Exam</th>
<th>Total Marks</th>
<th>Credit</th>
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<td>P</td>
<td>ESE</td>
<td>CT</td>
<td>TA</td>
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<tr>
<td>1</td>
<td>Electrical Engg.</td>
<td>338411 (24)</td>
<td>Electrical Technology &amp; Electronics</td>
<td>4</td>
<td>1</td>
<td>-</td>
<td>80</td>
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<tr>
<td>2</td>
<td>Appl. Mathematics</td>
<td>338412 (14)</td>
<td>Numerical Analysis</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>80</td>
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<tr>
<td>3</td>
<td>Metallurgical Engg.</td>
<td>338413 (38)</td>
<td>Testing of Materials</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>80</td>
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<tr>
<td>4</td>
<td>Metallurgical Engg.</td>
<td>338414 (38)</td>
<td>Material Science &amp; Metallography</td>
<td>3</td>
<td>1</td>
<td>-</td>
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<tr>
<td>5</td>
<td>Metallurgical Engg.</td>
<td>338415 (38)</td>
<td>Metallurgical Thermodynamics &amp; Kinetics</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>80</td>
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<td>6</td>
<td>Metallurgical Engg.</td>
<td>338416 (38)</td>
<td>Engineering Polymers &amp; Composites</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>80</td>
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<td>7</td>
<td>Electrical Engg.</td>
<td>338421 (24)</td>
<td>Electrical Technology &amp; Electronics Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
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<td>8</td>
<td>Metallurgical Engg.</td>
<td>338422 (38)</td>
<td>Testing of Materials Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
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<td>9</td>
<td>Metallurgical Engg.</td>
<td>338423 (38)</td>
<td>Material Science &amp; Metallography Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
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<tr>
<td>10</td>
<td>Metallurgical Engg.</td>
<td>338424 (38)</td>
<td>Non-Destructive Testing Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
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<tr>
<td>11</td>
<td>Humanities etc.</td>
<td>300425 (46)</td>
<td>Health, Hygiene and Yoga</td>
<td>-</td>
<td>-</td>
<td>2</td>
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<tr>
<td>12</td>
<td>Library</td>
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<td>1</td>
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<td><strong>Total</strong></td>
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<td>19</td>
<td>6</td>
<td>15</td>
<td>640</td>
<td>120</td>
<td>240</td>
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</tbody>
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Unit-1
D.C. Motors – Operating principles, classification, characteristics, (Elect & Mechanical) starting method 3 point & 4 point starter, speed control -ward Leonard control braking Application.

Unit – 2
A.C. motors -
(a) Construction and operating principles or three phase induction motor, equivalent circuit, Torque slip characteristics, Star delta starter.
(b) Three phase synchronous motor- working principles, starting, application.
(c) Single phase Induction Motor fractional horse power motors, their applications

Unit – 3
Semiconductors and Transistors – Intrinsic and extrinsic semiconductors, PN junction diodes, zener diode, junction transistors PNP and NPN transistors and their working in CB CE and CC configurations, Half wave and Full wave rectifier circuits using semiconductors, Basic amplifier circuit.

Unit – 4
Electric Heating – Modes of transfer of heat, Classification of electrical heating method. Resistance heating, Infrared heating Arc furnaces Induction heating, High frequency eddy current heating, Dielectric heating, choice of frequency.

Unit – 5
Electric welding – Resistance welding, electric arc welding, ultrasonic welding, electron beam welding, laser beam welding Requirements of good weld. Preparation or work electrodes, Electric welding equipment.

Text Books:
1. Electrical Technology Vol-I & II B.L. Theraja
2. Basic Electronics – Theraja

Reference Book
1. Basic electronics – V.K. Mehata (S.Chand & Co.)
2. Basic Electronics – Tata McGraw Hill
Unit – 1  **Solution of Algebraic and Transcendental equations:**
Erraors, Bisection, Regular-Falsi, secent, Newton-Raphson methods, Lin-Bairstow's method, Graeffe root squaring method.

Unit – 2  **Solution of simultaneous Algebraic equations:**

Unit – 3  **Numerical Solution of ordinary Differential Equation:**

Unit – 4  **Simultaneous First order Differential Equations:**
Pricards, Runge-Kutta methods, second order differential equation, Boundary value problems, finite difference method.

Unit – 5  **Difference Equations:**
Formation, order, linear difference equations, C.F., P.L., Reducible to linear forms, simultaneous difference equations with constant coefficients.

**Text Books and Reference:**

2. Calculus of finite differences and - by Gupta and Malik " Krishna Prakashan"

Numerical Analysis
Unit-1

Plastic deformation of metals – Lattice defects, deformation by slip and twinning, critical resolved shear stress for slip, yield point phenomenon, strain hardening

Failures – Types and their characteristics, nucleation of cracks and their propagation, theoretical cohesive strength of metals, Griffith theory of brittle failure, dislocation theory of fracture, ductile of brittle transition.

Unit – 2

Material Testing – Importance and application of testing methods, role of specifications and standards for materials.

Tensile Test – Flow curve, engineering and true stress – true strain curve, yield stress and proof stress, universal tensile testing machine and tensometer, principle of stress and strain measurement, bend test, measurement of ductility and formability.

Unit – 3

Hardness test – Principles and machines used – Brinnel, Vickers, Rockwell, Scleroscope and micro hardness testing.

Impact Test – Izod and Charpy Notched bar impact test, Metallurgical factors affecting brittle to ductile transition.

Unit – 4


Unit – 5

Non-destructive testing – Importance, scope, advantages and limitations – Dye penetrant, radiographic, magnetic, ultrasonic and electrical methods of testing and their application.

Text Books
1. Mechanical Metallurgy – George E. Dieter
2. Testing of Metallic Materials – A V K Suryanarayan

Reference Books
4. Non Destructive testing - Bac Gonnagle.
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C.G.)

Subject: Material Science And Metallography  Code: 338414 (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 – 1 Atomic Arrangement in Materials
Atomic packing Crystal Systems, Crystal Structures of metals, Packing efficiency,
Crystallographic planes and directions, Miller Indices, Crystal Imperfections, point and line
defects.

Unit – 2 Bonding in Metals
Wave mechanical model of atoms, Inter atomic forces in atomic aggregates, ionic Band,
Covalent Band, Metallic Bond and Vander wall Bond.

Unit – 3 Steels and Cast irons
Iron Carbon Diagram, Classification, microstructure and mechanical properties of plain
carbon steels, Classification, microstructure and mechanical properties of cast irons.

Unit – 4 Modern Materials
Biomaterials, Materials for Aerospace Applications, Military Materials, Smart and Intelligent
Materials, Shape Memory Alloys, Rapidly Solidified Materials, Superalloys and magnetic
materials, Some important non-ferrous alloys.

Unit – 5 Microscopic and macroscopic Examination of metals
Study of Metallurgical Microscope, Cold Mounting and Hot Mounting of Metallic samples,
Polishing and Etching techniques, Microstructural features, Interpretation of microstructure
and details of microstructures. Corelation between Microstructure of a metal and its
mechanical properties.

High Temperature Microscopy: - Necessity, importance and associated details.

Books Recommended.

Text Books
1. Material Science and Engg. - V. Raghavan
2. Material Science - Van Vlack

Reference Books
1. Physical Metallurgy - V. Raghvan
4. Metallurgy for Engineers - E.C. Rollason
5. Metals Handbook - ASM Publication
7. Metal News - Indian Institute of Metals
Unit - 1  Basic Concepts
Brief review of first and second law of thermodynamics and their applications.
Third law of thermodynamic equilibrium statement experimental proof: theory of specific hearts.

Unit - 2  Criteria of Thermodynamics
Isothermal and adiabatic processes, combined statement of first and second laws, Gibbs and Helholtz free energy; important thermodynamic relationship including Maxwell's relation and thermodynamic equation of state.

Unit - 3  Single Component System.
Thermodynamic function of gases fugacity, thermodynamic function A condensed phases of metallurgical interest equilibria in two phase systems, Vant Hoff and Clausuis Clayperon equations; equilibria in three phase systems.

Unit - 4  Multicomponents System.
Concept of activity and standard states, Henrij's Low, Roult's law partial molar properties chemical potential and Gibbs Duhem equation and methods of its integration for binary system, equilibria in systems of metallurgical interest. Ellingham- diagram and phase relation, free energy composition diagrams and their applications in establishing simple phase diagrams.

Unit - 5  Chemical Kinetics -
Order and molecularity of reaction; Arrhenius equation.

Books Recommended:
1. "Introduction to Metallurgical thermodynamics" by D.R. Gaskell.
2. "Physical Chemistry of Metals" by Darken and Gurry".
3. "Metallurgical Thermodynamics by P.R. Khangaonkar ".
4. "Physical Chemistry of Metallurgical Processes" by Biswas and Bashforth."
5. "Metallurgical Thermo chemistry" by Kubaschusky and Evans.
Unit-1
Definition of polymers, Natural and synthetic polymers, polymerization reaction and its (mechanisms) types, Industrial polymers and their characterization, plastics and their types, properties of plastics like mechanical, thermal and electrical properties and their correlations with polymer structure, polymer crystallinity, elastomers their structure and properties, vulcanization.

Unit – 2
Thermoplastic commodity and engineering plastics. Fabrication methods for plastics like compression and injection moulding, transfer and extrusion moulding, casting, foamed plashes, fabrication of rubber & calendaring, dispersions, foam rubber, fabrication of special polymer products like polymer composites.

Unit – 3
Selection of plastic/polymeric materials - Methodology of selection, plastics for mechanical and structural applications, plastics for wear & friction, corrosion and electrical applications, polymer coating.

Unit – 4
Introduction and classification of composite materials, strengthening mechanisms in composites, matrix and reinforcement options for composites, reinforcing materials: fibers, whiskers and particles.

Unit – 5
Manufacture of glass fibers, fabrication of fiber-reinforced plastics and metal matrix, properties and application of composites.

Books Recommended:

Text Books
1. Materials Science & Manufacturing processes – D.Kumar, S K Jain & A K Bhargava, PHI

Reference Books

Reference Books
1. Testing of metallic Materials – Suryanarayan
List of Experiment: -

2. Speed Control of a DC Shunt Motor.
3. Load Test on a DC shunt/Compound Motor.
4. Load Test on a DC Shunt/Compound Generator.
5. Load Test on 3 phase induction motor.
6. Load test on 1 phase transformer.
7. Study of DC Shunt Motor Starter
8. Study of Star-Delta Starter.
9. To perform no load and blocked rotor test on 3-phase induction motor.
10. To perform open circuit and short circuit test on 3-phase alternator and find per unit reactance and voltage regulation.

Text Books:
1. Electrical Technology Vol-I & II B.L. Theraja
2. Basic Electronics – Theraja

Reference Book
1. Basic electronics – V.K. Mehata (S.Chand & Co.)
2. Basic Electronics – Tata McGraw Hill
List of Experiments:

1. Tensile test – Ductile Fracture, Brittle Fracture
2. Hardness test- Brinell hardness, Rockwell hardness, Vicker's diamond Pyramid method, shore or Rebound hardness test.
3. Impact test- Izod, Charpy
4. Compression test
5. Fatigue test
6. Creep test
7. Study of Universal testing machine
8. Spring test to determine the resilience property of spring
9. Cupping test – ductility Determination
10. Strut test- strength of Column

Text Books
1. Mechanical Metallurgy – George E. Dieter
2. Testing of Metallic Materials – A V K Suryanarayan

Reference Books
4. Non Destructive testing - Bac Gonnagle.
LIST OF EXPERIMENTS:

1. Preparation of sample for the study of microstructure.
2. Sulphur printing
3. Phosphorous printing
4. Study of crystal structure of Metals
5. Hot Mounting of metallic sample
6. Cold Mounting of Metallic sample
7. Study of Iron carbon diagram.
9. Determination of electrical conductivity of a non-ferrous metal
10. Determination of resistance of metal using LCR Bridge
11. Strain determination using strain gauges.

BOOKS RECOMMENDED.

TEXT BOOKS

1. Material Science and Engg. - V. Raghvan
2. Material Science - Van Vlack

REFERENCE BOOKS

1. Physical Metallurgy - V. Raghvan
4. Metallurgy for Engineers - E.C. Rollason
5. Metals Handbook - ASM Publication
7. Metal News - Indian Institute of Metals
List of Experiments:

1. Dye Penetration Test  
2. Radiographic Test  
3. Magnetic Test (Magna flux)  
4. Ultrasonic Test  
5. Electrical Methods  
6. Spark Test  

Reference Books  
Testing of metallic Materials – Suryanarayan
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Semester: IV Sem.  Branch: Common for all branches
Subject: HEALTH, HYGIENE & YOGA  Code: 300425 (46)
Minimum number of class tests to be conducted: Two  Teacher's Assessment: 40 Marks

UNIT- I

HEALTH & HYGIENE: Concept of health, Physical health and mental health and wellbeing and how to achieve these, longevity and how to achieve it, concept and common rules of hygiene, cleanliness and its relation with hygiene; Overeating and undereating, amount of food intake required, intermittent fasting; adequate physical labour, sleep; consumption of junk fast food vs nutritious food; fruits, vegetables cereals and qualities of each of these.

UNIT- II

INTRODUCTORY KNOWLEDGE OF COMMON STREAMS OF MEDICINAL CURE: History, development, basic concepts, modes of operation of Allopathy, Ayurved, Homoeopathy, Biochemic, Unani, Siddha, Accupressure, Accupuncture, Naturopathy, Yogic and Herbal system of medicines, Introduction of Anatomy and Physiology concerned.

UNIT- III

YOGASANS: Meaning and concept of Yoga, Yogasans and its mode of operation, How to perform Yogasans, Common Yogasans with their benefits, such as, Padahastasan, Sarvangasan, Dhanurasan, Chakrasan, Bhujangasan, Paschimottasan, Gomukhasan, Mayurasan, Matsyasasan, Maysyendrasan, Pawanmuktasan, Vajrasan, Shalabhasan, Sinhasan, Shashanksan, Surya Namaskar, Halasan, Janushirasan, Utshep Mudra,

UNIT- IV

YOGASANS FOR COMMON DISEASES: From Yogic Materia Medica with symptoms, causes, asans and herbal treatment.

Modern silent killers: High blood pressure, diabetes and cancer, causes and cure; Common health problems due to stomach disorders, such as, indigestion, acidity, dycentry, piles and fissures, arthritis, its causes, prevention and cure.

Asans for relaxation: Shavasan, Makarasans, Matsyasridasan, Shashanksan.

Asans to increase memory and blood supply to brain: Shirsh padasan, Shashanksan.

Asans for eye sight: Tratak, Neti Kriya.

Pranayam: Definition and types: Nadi Shodhan, Bhasnik, Shitakari, Bhramari useful for students.

UNIT V

CONCENTRATION: Concentration of mind and how to achieve it. Tratak Concentration on breath, Japa internal silence visualization in mental sky Concentration on point of light Concentration on feeling Concentration on figure

REFERENCES

(1) Yogic Materia Medica
(2) Asan, Pranayam and Bandh

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