

Chhattisgarh Swami Vivekanand Technical University, Bhilai

SCHEME OF TEACHING & EXAMINATION

BE (Metallurgical Engineering) IV Semester

| Sl. No. | Board of Study | Subject Code | Subject | Periods per week | | | Scheme of Exam | | | Total Marks | Credit L+(T+P)/2 |
|--------------|---------------------|--------------|---|------------------|----------|-----------|----------------|------------|------------|-------------|------------------|
| | | | | L | T | P | Theory/ Pract. | | | | |
| | | | | | | | ESE | CT | TA | | |
| 1 | Appl. Mathematics | 338451(14) | Numerical Analysis | 4 | - | - | 80 | 20 | 20 | 120 | 4 |
| 2 | Electrical Engg. | 338452(24) | Electrical Technology & Electronics | 4 | 1 | - | 80 | 20 | 20 | 120 | 5 |
| 3 | Metallurgical Engg. | 338453(38) | Testing of Materials | 3 | 1 | - | 80 | 20 | 20 | 120 | 4 |
| 4 | Metallurgical Engg. | 338454(38) | Principles of Extractive Metallurgy | 3 | 1 | - | 80 | 20 | 20 | 120 | 4 |
| 5 | Metallurgical Engg. | 338455(38) | Fuels, Furnaces and Refractories | 3 | 1 | - | 80 | 20 | 20 | 120 | 4 |
| 6 | Metallurgical Engg. | 338456(38) | Engineering Economics | 3 | 1 | - | 80 | 20 | 20 | 120 | 4 |
| 7 | Electrical Engg. | 338461(24) | Electrical Technology & Electronics Lab | - | - | 3 | 40 | - | 20 | 60 | 2 |
| 8 | Metallurgical Engg. | 338462(38) | Testing of Materials Lab | - | - | 3 | 40 | - | 20 | 60 | 2 |
| 9 | Metallurgical Engg. | 338463(38) | Non-Destructive Testing Lab | - | - | 3 | 40 | - | 20 | 60 | 2 |
| 10 | Metallurgical Engg. | 338464(38) | Fuels, Furnaces and Refractories Lab | - | - | 3 | 40 | - | 20 | 60 | 2 |
| 11 | Humanities | 338465(46) | Health, Hygiene & Yoga | - | - | 2 | - | - | 40 | 40 | 1 |
| 12 | | | Library | - | - | 1 | - | - | - | - | - |
| Total | | | | 19 | 6 | 15 | 640 | 120 | 240 | 1000 | 34 |

L: Lecture, T: Tutorial, P: Practical, ESE: End Semester Exam, CT: Class Test, TA: Teachers Assessment

Note (1): Duration of all theory papers will be of Three Hours.

Note (2): Industrial Training of six weeks is mandatory for B.E. student. It is to be completed in two parts. The first part will be in summer after IV sem. after which students have to submit a training report which will be evaluated by the college teachers during B.E. V SEM.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**

Branch: **Metallurgical Engineering**

Semester: **IV**

Subject: **Electrical Technology &
Electronics**

Code: **338452(24)**

Total Theory Periods: **40**

Total Tutorial Periods: **10**

Class Tests: **Two (Minimum)**

Assignments: **Two (Minimum)**

ESE Duration: **Three Hours**

Maximum Marks: 80 Minimum Marks: 28

Course Objectives:

1. To understand the operating principles of DC and AC motors
2. To understand the semiconductors and transistors and their applications
3. To understand electrical heating and welding techniques.

UNIT- I D.C. Motors – Operating principles, classification, characteristics, (Elect & Mechanical) starting method 3 point & 4 point starter, speed control -ward Leonard control braking Application.

UNIT-II 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- III 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-IV 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-V 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.
3. Welding process and technology – Raman and Eric N. Simons.

Reference books:

1. Basic electronics – V.K. Mehata (S.Chand & Co.).
2. Basic Electronics – Tata McGraw Hill.
3. Industrial Furnaces - Vol. I & II, W. Trinks and M. H. Mawhiney, (Wiley).

Course outcome:

1. Students will learn about the basic laws of AC and DC motors thereby can select the methods and methodology for specific applications.
2. Semiconductors and transistors play a major role in modern technologies, so an updated knowledge will be helpful to the students.
3. The basic principles of electrical heating processes will help the students for many metallurgical applications.
4. The knowledge of welding will also help in developing new welding processes as well as novel manufacturing techniques.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**

Branch: **Metallurgical Engineering**

Subject: **Numerical Analysis**

Semester: **IV**

Code: **338451(14)**

Total Theory Periods: **40**

Total Tutorial Periods: **10**

Class Tests: **Two (Minimum)**

Assignments: **Two (Minimum)**

ESE Duration: **Three Hours**

Maximum Marks: 80 Minimum Marks: 28

Course Objectives:

1. To introduce the standard methods and algorithms for the numerical solution of algebraic equations and system of algebraic equations.
2. To introduce the standard methods and algorithms for the numerical solution of Ordinary Differential equations and system of differential equations.
3. To introduce the standard methods and algorithms for the solution of difference equations.

UNIT-I Solution of Algebraic and Transcendental equations: Errors, Bisection, Regular-Falsi, secant, Newton-Raphson methods, Lin-Bairstow's method, Graeffe root squaring method.

UNIT-II Solution of simultaneous Algebraic equations: Gauss-elimination, Gauss-Jordan's. Cou'ts triangularisation method, Gauss-seidel iteration method.

UNIT-III Numerical Solution of ordinary Differential Equation: Picards method, Taylor's series method, Euler's method, modified method, Runge-Kutta method, Predictor-Corrector methods, Milne's method.

UNIT-IV Simultaneous first order Differential Equations: Picards, Runge-Kutta methods, second order differential equation, Boundary value problems, finite difference method.

UNIT-V Difference Equations: Formation, order, linear difference equations, C.F., P.L., Reducible to linear forms, Simultaneous difference equations with constant coefficients.

Text Books:

1. Numerical methods in Engg. & Science – by B.S. Grewal.
2. Calculus of finite differences and – by Gupta and Malik "Krishna Prakashan" Numerical Analysis

Reference Books:

1. Numerical methods using MATLAB – by Steven C. Chapra
2. Numerical methods – by S. S. Sastry

Course Outcomes:

1. The students will be aware of the use of numerical methods in modern scientific computing and will be familiar with finite precision computation.
2. The students will be able to find the Numerical Solutions of algebraic equations and system of algebraic equations.
3. The students will be able to find the Numerical Solutions of ordinary differential equations and system of ordinary differential equations.
4. The students will be able to find the solution of difference equations.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**

Branch: **Metallurgical Engineering**

Semester: **IV**

Subject: **Testing of Materials**

Code: **338453(38)**

Total Theory Periods: **40**

Total Tutorial Periods: **10**

Class Tests: **Two (Minimum)**

Assignments: **Two (Minimum)**

ESE Duration: **Three Hours**

Maximum Marks: 80 Minimum Marks: 28

Course Objectives:

1. To know about principles and procedures of various destructive and non-destructive testing methods of metals and alloys.
2. To understand how the test results can be utilized for engineering applications.
3. To know the metal failure mechanisms and the methodology of failure analysis.
4. To know the quality and standard of products by testing and failure analysis.

- UNIT-I** Materials Testing: Importance and application of testing methods, Role of specifications and standards for materials; Tension Test: Principle of stress and strain measurement, Yield stress, Proof stress, Ultimate tensile stress, Flow curve, Engineering and true stress-true strain curve; Necking phenomenon and conditions of necking; Universal testing machine; Numerical problems on test data; Bend test; Measurement of ductility and formability.
- UNIT-II** Torsion Test: Types of Torsion failures, Torque, Twisting movement for Torsion, General equation for Torsion, Determination of strength of a solid and hollow shaft; Hardness test: Principles and machines used – Brinell, Vickers, Rockwell, Scleroscope and micro hardness testing.
- UNIT- III** Fracture: Types of fracture, theoretical cohesive strength of metal, Griffith theory of Brittle fracture, Metallographic aspects of fracture; Impact Test – Izod and Charpy Notched bar impact tests, Transition temperature; Metallurgical factors affecting ductile to brittle transition.
- UNIT-IV** Fatigue and Creep Testing – Basics of fatigue phenomenon; S – N curve and corrosion fatigue; Fatigue testing; Signification of Creep; Testing procedure; Creep curve and its interpretation; Stress-rupture test, Metallurgical and mechanical factors affecting creep and fatigue failures.
- UNIT-V** Non-destructive testing: Importance, scope, advantages and limitations – Dye penetrant, Radiography, Magnetic particle, 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:

1. Testing and Inspection of Engineering Materials- Davies, Taroxall and Wiscosil
2. Mechanical Testing of Metallic Materials: D. A. Beument.
3. Engineering Materials Science: C. W. Richards
4. Non Destructive testing: Louis Cartz, ASM International Materials Park.
5. Destructive testing: ASM International Materials Park.

Course outcome:

1. The students will be able to understand the concept of material testing and its usage as a means of quality control in all products of the manufacturing industries.
2. The students will be able to do the failure analysis and recommend the remedial measures.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**

Branch: **Metallurgical Engineering**

Semester: **IV**

Subject: **Principles of Extractive Metallurgy**

Code: **338454(38)**

Total Theory Periods: **40**

Total Tutorial Periods: **10**

Class Tests: **Two (Minimum)**

Assignments: **Two (Minimum)**

ESE Duration: **Three Hours**

Maximum Marks: 80 Minimum Marks: 28

Course Objectives:

1. To understand the basic principles of extraction of metals.
2. To understand the processes: Pyro, Hydro and Electro metallurgy.
3. To understand the metal extraction and refining.

- UNIT-I** Overview of Extractive Metallurgy processes; Pyrometallurgy, Hydrometallurgy and Electrometallurgy; Thermodynamic and Kinetic Principles of metal extraction; Ellingham diagrams, Electrochemistry; Formation and function of slag and their calculations.
- UNIT-II** Calcinations; Roasting; Predominance Area Diagram, Roasting Practices, Smelting, Metallothermic reduction of oxides, Smelting Furnaces, Matte Smelting, Reduction of Halide by another element, Halide Metallurgy and Halogenisation, Pyrometallurgical processes using vacuum.
- UNIT- III** Hydrometallurgy: Leaching; Theory of Leaching; Role of oxygen in leaching operation; Bacterial and microbial leaching; Contact reduction of metals in aqueous solutions; Gaseous reduction of metals in aqueous solutions; Kinetic aspects of gaseous reduction; Ion exchange, Solvent Extraction and Electrolysis.
- UNIT-IV** Electrometallurgy: Structure of solvent media; Electrolysis of aqueous solution; Electrolysis of fused salts; Electrolysis of low temperature nonaqueous systems; Cell design; Electroplating; role of energy in metal extraction.
- UNIT-V** Basic approaches of refining, preparation of pure compounds; Purification of crude metals produced in bulk; Numerical problems relevant to Pyro, Hydro and Electrometallurgical processes.

Text Books:

1. Principles of Extractive Metallurgy: A. Ghosh & H.S. Ray, IIN Publications, Calcutata 1984.
2. Principles of Extractive Metallurgy: Rosenquist, T., McGrawhill-Kogakusha International – 1983

Reference Books:

1. Unit Processes of Extractive Metallurgy: Pehalke, R.D. Elsevier, 1973.
2. Theory of Metallurgical Processes: Volsky, A. and Sergievskaya, E.,MTH publishers, Moscow, 1971.
3. Extraction of Non-ferrous Metals: Ray, Shridhar and Abraham, Associated East- West 3.Press Pvt. Ltd. Madras – 1985.
4. Process Selection in Extractive Metallurgy: Hayes, Peter, SRA Publications Calcutta.

Course Outcomes:

1. The graduates are expected to work independently in any metal extraction industry.
2. To have the ability to design an extraction system, within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability.
3. The graduates are expected to possess ability to function on multi-disciplinary teams.
4. The graduates are expected to possess ability to identify, formulate and solve engineering problems.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**

Branch: **Metallurgical Engineering**

Semester: **IV**

Subject: **Fuels, Furnaces and Refractories**

Code: **338455(38)**

Total Theory Periods: **40**

Total Tutorial Periods: **10**

Class Tests: **Two (Minimum)**

Assignments: **Two (Minimum)**

ESE Duration: **Three Hours**

Maximum Marks: 80 Minimum Marks: 28

Course Objectives:

1. To understand the primary energy resources and classification of fuels.
2. To understand the properties of coal and processing of coal.
3. To understand the properties, manufacturing and industrial applications of refractory materials.
4. To understand the design and construction of different industrial furnaces.

- UNIT-I** Primary energy resources of the world and India; Classification of fuels: Solid, Liquid and Gaseous, Primary and Secondary fuels; Coal: Rank, Coking and Non-coking coals; Characterization of coal properties: Caking and Swelling indices, Calorific Value, Proximate and Ultimate analysis; Coal washing and blending; Washability curves.
- UNIT-II** Carbonization of coal: Coke making and by-products; Producer gas; Water gas; Natural gas; LPG; Blast furnace gas; Coke oven gas; LD gas; Operational features of modern Coke ovens; Testing and properties of coke; Petroleum coke and its utilization in Metallurgy.
- UNIT- III** Classification of refractories; Raw materials; Manufacture; Testing and properties of heavy and special refractories: Silica, High alumina, Magnesite, Chrome, Chrome Magnesite, Dolomite, Forsterite, Carbon and insulating refractories, Carbide nitride refractories; Advanced refractories.
- UNIT-IV** Selection of refractories for metallurgical applications: Coke, Blast furnace, LD converter, Copper converter, Heat treatment furnaces and Electric arc furnace; Refractory industry in India; Testing of Refractories, Factors deciding the choice of refractory for a particular furnace and its parts.
- UNIT-V** Classification: Based on heating methods, application wise and temperature ranges; Mechanism of combustion, ignition temperature; Evolution of heat and flame temperature; Available heat; Heat losses in furnaces: Heat balance and furnace efficiency; Types of drafts; Natural; Induced and forced; Chimney height calculation; Waste heat recovery.

Text Books:

1. Elements of Fuels, Furnaces and Refractories by O. P. Gupta.
2. Fuels, Furnaces, Refractories and Pyrometry by A. V. K. Suryanarayana, (B. S. Pub.).
3. Fuels and Combustion by Samir Sarkar, Universities Press (India) Pvt. Ltd., Hyderabad, India.

Reference Books:

1. Industrial Furnaces - Vol. I & II, W. Trinks and M. H. Mawhiney, (Wiley)
2. Refractories, M. L. Mishra.
3. Refractories: Production and Properties by J. H. Chesters.
4. Fuels, Furnaces and Refractories by J. D. Gilchrist.

Course Outcomes:

1. Students will be able to learn the chemical synthesis and characterization of fuels with reference to physical and chemical properties.
2. Students will be able to learn mechanism of combustion processes, techniques and related furnaces.
3. Students will be able to get the combined knowledge of inorganic chemistry, physical chemistry, chemical kinetics, transport phenomena, and interfacial engineering.
4. Students will be able to learn different types of refractories and their related properties and applications.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**

Branch: **Metallurgical Engineering**

Semester: **IV**

Subject: **Engineering Economics**

Code: **338456(38)**

Total Theory Periods: **40**

Total Tutorial Periods: **10**

Class Tests: **Two (Minimum)**

Assignments: **Two (Minimum)**

ESE Duration: **Three Hours**

Maximum Marks: 80 Minimum Marks: 28

Course Objectives:

1. Prepare the students for Industry
2. To provide them the fundamental concepts of organizational and financial managements.
3. To train them compatible to project areas and also development of communication & professional attitude.
4. Finally to provide environment for learning professional ethics.

UNIT-I Fundamental concepts of economics and its types; Engineering economics and its importance; Price determination; Demand; Elasticity of demand; Factors affecting the elasticity of demand; Supply; Relationship: Price and demand, Price and supply; Laws of returns; Production system; Productivity; Production and utility; Factors of production; GNP; GDP; Direct and indirect taxes.

UNIT-II Meaning and function of money and bank, Kinds of money; Trade cycle; Time value of money; Cash flows; Cash-flow diagram; Tools of engineering economics; Industrialization: Factory system of production, its advantages, limitations and problems; Small scale industries, Medium Scale industries, Large scale industries.

UNIT- III Micro economics analysis of price and quantity; Marginal pricing; Relationship between elasticity of demand, marginal cost and total cost; Forms of market; Inflation – causes of inflation, anti-inflationary system; Nominal and effective rates; Rate of return; Cost control and processes as applied to cost control; Benefit/Cost ratio; Interest, annuities and profit.

UNIT-IV Business – Definition, characteristics, classification, objectives; Private sector - Individual Ownership or Sole proprietorship, Partnership, Joint Stock Companies, Co-operative Societies, Joint Hindu Family Firms; Public Sector (State Ownership and Control) – Departmental organizations, Public corporations (or Statutory Companies), Government Companies; Joint Stock Company; Limited and unlimited liabilities; Financing by Banks and specialized institutions; Stock exchange and money market; Credit instruments; Shares and bonds.

UNIT-V Depreciation; Depreciation accounting methods of calculating depreciation; Break- even analysis – Definition, theory, calculation and tools for decision making; Replacement analysis – Definition, reasons for replacement, methods; Theory and Trial balance; Manufacturing and profit and loss accounts.

Text Books:

1. Engineering Economics – By Tarachand.
2. Industrial Organization and Engineering Economics, By T.R. Banga and S.C. Sharma.

Reference Books:

1. Industrial engineering and Management system, Dalela, Dr. Mansoor Ali.
2. Engineering Economics, Accounts and Management By S. Prasad.
3. Industrial Engineering & Management by O. P. Khanna.

Course Outcomes:

1. The graduates are expected to have ability to apply knowledge of management, costing and professional ethics.
2. To have ability to design a process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability.
3. To possess ability to identify, formulate and solve engineering problems.
4. They are expected to possess ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**
Branch: **Metallurgical Engineering**
Subject: **Electrical Technology & Electronics Lab**
Total Lab Periods: **36**
Maximum Marks: **40**

Semester: **IV**
Code: **338461(24)**
Batch Size: **30**
Minimum Marks: **20**

List of Experiments: (At least Ten experiments are to be performed by each student)

1. Magnetization Characteristics of a separately excited DC Machine.
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.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**
Branch: **Metallurgical Engineering**
Subject: **Testing of Materials Lab**

Total Lab Periods: **36**
Maximum Marks: **40**

Semester: **IV**
Code: **338462(38)**
Batch Size: **30**
Minimum Marks: **20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

1. To determine the tensile properties of ductile and brittle materials.
2. To determine hardness of materials by:
 - i) Brinell hardness Test,
 - ii) Rockwell hardness Test,
 - iii) Rockwell Superficial Hardness Test,
 - iv) Vickers Hardness Test and
 - v) Micro Vickers Hardness Test
3. To determine the impact strength of materials by:
 - i) Izod impact Test
 - ii) Charpy impact Test
4. Bend test.
5. Fatigue test.
6. Spring test.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**
Branch: **Metallurgical Engineering**
Subject: **Non-destructive Testing Lab**
Total Lab Periods: **36**
Maximum Marks: **40**

Semester: **IV**
Code: **338463(38)**
Batch Size: **30**
Minimum Marks: **20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

1. Dye Penetration Test (DPT)
2. Magnetic Particle Test (MPT)
3. Ultrasonic Test (UT)
4. Radiographic Test (RT)
5. Eddy current Test (ECT)
6. Portable Non-Destructive Hardness Testing
 - a) Poldi Hardness Testing
 - b) Shore Scleroscope Hardness Testing
 - c) Ultrasonic Hardness Testing
 - d) Equotip Hardness Testing
 - e) Scratch Hardness Testing

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**
Branch: **Metallurgical Engineering**
Subject: **Fuels, Furnaces and Refractories Lab**
Total Lab Periods: **36**
Maximum Marks: **40**

Semester: **IV**
Code: **338464(38)**
Batch Size: **30**
Minimum Marks: **20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

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. Determination of Calorific value of a solid fuel using Bomb Calorimeter.
6. Study of different types of furnaces.
7. Determination of Volatile matter in coal
8. Determination of Ash content of coal.
9. Study of different types of Refractories
10. Determination of spalling resistance of Refractories
11. Determination of Refractoriness under load.
12. Determination of thermal conductivity of Refractories.
13. Seger Cone (Pyrometric Cone Equivalent) Test

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Engineering**
Branch: **Metallurgical Engineering**
Subject: **Health, Hygiene & Yoga**

Semester: **IV**
Code: **338465 (46)**

No. Of Periods: **2 Periods/Week**

Total Tutorial Periods: **NIL**

Maximum Marks: 40

Minimum Marks: 24

Course Objectives:

- 1 To provide understanding the importance of health.
- 2 To provide insight into the hygiene aspect & quality of life.
- 3 To study the concepts of various medical therapy.
- 4 To practice the various yogasans.
- 5 To provide knowledge about common diseases and its cure through yagasans and pranayam.
- 6 To develop concentration through various methods.

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 underrating, 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 Alopahy, Ayurved, Homoeopathy, Biochemic, Unani, Siddha, Accurpressure, Accupunture, 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, Matsyasan, Matsyendrasan, Pawanmuktasan, Vajrasan, Shalabhasan, Sinhasan, Shashankasan, Surya Namaskar, Halasan, Janushirasan, Utshep Mudra.

UNIT-IV YOGASANS FOR COMMON DISEASES: From Yogic MateriaMedica with symptoms, causes, asans and herbal treatment.

- **Modern silent killers:** High blood pressure, diabetes and cancer, causes and cure; Common health problems due to stomache disorders, such as, indigestion, acidity, dycentry, piles and fissures, artheritis, its causes, prevention and cure.
- **Asans for relaxation:**Shavasan, Makarasan, Matsyakridasan, Shashankasan.
- **Asans to increase memory and blood supply to brain:**Shirshpadasan, Shashankasan.
- **Asans for eye sight:**Tratak, NetiKriya .
- **Pranayam:** Definition and types: NadiShodhan, Bhastrik, Shitakari, Bhramari useful for students.

UNIT-V CONCENTRATION: Concentration of mind and how to achieve it. **Tratak (त्राटक)**. Concentration on breath, **Japa (जप)**, **Ajapajap (अजपाजप)**, internal silence (**अन्तर्मौन**), visualization in mental sky (**चिदाकाश धारणा**), Concentration on point of light (**ज्योति ध्यान**), Concentration on feeling (**भाव ध्यान**), Concentration on figure (**मूर्त्त ध्यान**).

Text Books:

Health, Hygiene & Yoga, Dr P B Deshmukh, Gyan Book Pvt Ltd. New Delhi.

Reference Books:

- (1) Yogic MateriaMedica
- (2) Asan, Pranayam and Bandh.