

**3 Yr. Degree Course  
(Minor)  
based on NEP-2020  
HOME SCIENCE**



(Effective from Session 2025-26)

**(Batch: 2025-2028)**



**SAMBALPUR UNIVERSITY**

**JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019**

## COURSE AT A GLANCE (NEP-UG)

SUBJECT: HOME SCIENCE

ACADEMIC SESSION: 2025-28

### CORE-I COURSE

| Course Number | Semester | Course Title                                  | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------|-----------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I        | FOOD AND NUTRITION                            | P                                                | 4           | 100                        |
| Paper-II      |          | CHILD DEVELOPMENT                             | P                                                | 4           | 100                        |
| Paper-III     | II       | FAMILY RESOURCE MANAGEMENT                    | P                                                | 4           | 100                        |
| Paper-IV      |          | HOME SCIENCE EXTENSION EDUCATION              | P                                                | 4           | 100                        |
| Paper-V       | III      | INTRODUCTION TO TEXTILES                      | P                                                | 4           | 100                        |
| Paper-VI      |          | DYNAMICS OF COMMUNICATION                     | P                                                | 4           | 100                        |
| Paper-VII     |          | DEVELOPMENT IN LATE CHILDHOOD AND ADELOSCENCE | P                                                | 4           | 100                        |
| Paper-VIII    | IV       | MATERNAL AND CHILD NUTRITION                  | P                                                | 4           | 100                        |
| Paper-IX      |          | HUMAN PHYSIOLOGY                              | P                                                | 4           | 100                        |
| Paper-X       |          | FUNDAMENTALS OF CLOTHING AND FASHION DESIGN   | P                                                | 4           | 100                        |
| Paper-XI      | V        | MARRIAGE AND FAMILY STUDY                     | NP                                               | 4           | 100                        |
| Paper-XII     |          | FAMILY FINANCE AND CONSUMER STUDIES           | P                                                | 4           | 100                        |
| Paper-XIII    |          | COMMUNITY HEALTH AND NUTRITION                | P                                                | 4           | 100                        |
| Paper-XIV     | VI       | RESEARCH METHODOLOGY                          | NP                                               | 4           | 100                        |
| Paper-XV      |          | HOUSING AND INTERIOR DESIGN                   | P                                                | 4           | 100                        |
| Paper-XVI     | VII      | THERAPEUTIC NUTRITION                         | P                                                | 4           | 100                        |
| Paper-XVII    |          | EARLY CHILDHOOD CARE AND EDUCATION            | P                                                | 4           | 100                        |
| Paper-XVIII   |          | HOUSEHOLD ECONOMICS                           | P                                                | 4           | 100                        |

|             |      |                             |   |   |     |
|-------------|------|-----------------------------|---|---|-----|
| Paper-XIX   |      | RURAL DEVELOPMENT           | P | 4 | 100 |
| Paper-XX    | VIII | FABRIC CARE AND MANAGEMENT  | P | 4 | 100 |
| Paper-XXI   |      | FOOD SAFETY AND STANDARDS   | P | 4 | 100 |
| Paper-XXII  |      | EXCEPTIONAL CHILDREN        | P | 4 | 100 |
| Paper-XXIII |      | ENTERPRENURSHIP DEVELOPMENT | P | 4 | 100 |

## CORE-II/CORE-III COURSE

| Course Number | Semester<br>Core-II/<br>Core-III | Course Title                     | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------------------------------|----------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I/II                             | FOOD AND NUTRITION               | P                                                | 4           | 100                        |
| Paper-II      | III/IV                           | CHILD DEVELOPMENT                | P                                                | 4           | 100                        |
| Paper-III     | V/VI                             | FAMILY RESOURCE MANAGEMENT       | P                                                | 4           | 100                        |
| Paper-IV      | VII                              | HOME SCIENCE EXTENTION EDUCATION | P                                                | 4           | 100                        |
| Paper-V       | VIII                             | INTRODUCTION TO TEXTILE          | P                                                | 4           | 100                        |

## **CORE COURSE II/ III**

### **Minor (Paper-I) Semester I/II**

#### **Food and Nutrition**

##### **Course Outcome:**

- The students will get basic knowledge on food, nutrients and their contribution.
- The students will gain practical knowledge on market survey and locally available food stuffs from each food group.

##### **Learning Outcome:**

- The students will learn the basic concepts in food, nutrition and health.
- The students will gain an insight into the classification, functions, dietary sources, and daily requirements of various nutrients.
- The students will understand about different food groups and their nutritional contribution.
- The students will be aware of different methods of cooking along their advantages and disadvantages.

##### **Unit I: Basic Concepts in Food and Nutrition**

- Introduction to Food and Nutrition Science- Definitions (food, food science, food additive, fermented food, food fortification, functional food, nutrition, health, nutrients, nutritional status, optimal nutrition, nutrition security).
- Classification and Functions of Food- Physiological, psychological, and socio-cultural.
- Food Groups- Basic five and seven food groups, their nutritional contribution.
- Methods of Cooking- Different methods of cooking and their advantages and disadvantages: Dry methods - frying, sautéing, parching, roasting, grilling/broiling, toasting and baking. Moist methods - boiling, steaming, stewing, simmering, poaching, blanching, pressure cooking. Combination method- braising.

## **Unit II: Macro Nutrients**

- Carbohydrates- Introduction, classification, functions, dietary sources and daily requirements.
- Proteins- Introduction, classification, functions, dietary sources and daily requirements.
- Lipids- Introduction, classification, functions, dietary sources and daily requirements.

## **Unit III:Micro Nutrients**

- Fat Soluble Vitamins (A, D, E and K)- Introduction, functions, dietary sources, daily requirements and deficiency diseases.
- Water Soluble Vitamins (Thiamin, Riboflavin, Niacin, Folate, Vitamin B12 and Vitamin C)- Introduction, functions, dietary sources, daily requirements and deficiency diseases.
- Minerals (Calcium, Iron, Zinc and Iodine)- Introduction, functions, dietary sources, daily requirements and deficiency diseases.

## **Unit IV: Practical**

- Conduct a market survey (On-line/ offline of nearby locality) and prepare a list of food stuffs and food products of the following food groups:
- Cereals, Millets, Pulses, Fruits, Vegetables, Milk and Milk Products, Fish Meat and Poultry Products.
- Weights and Measures: Standardization of household measures for raw and cooked foods.
- Food preparations using different methods of cooking and understanding the principals involved in it - Dry heat-frying, broiling, parching, baking) and Moist heat-boiling, stewing, cooking under pressure:  
(One item from each method).
- Preparation of food exchange list of cereals/pulses/fruits/vegetables.

**Text Books:**

- *Srilakshmi. B, Food Science, New Age International (P) Limited Publishers.*
- *Srilakshmi. B, Nutrition Science, New Age International Pvt. Ltd.*
- *N. Shakuntala Manay, M. Shadaksharaswamy, Foods Facts and Principles, New Age International (P) Limited Publishers.*
- *Swaminathan. M, Advanced Text-Book on Food and Nutrition, Volume 1 and 2, The Bangalore printing and publishing co. LTD.*

**Reference Books:**

- *Bamji MS, Krishnaswamy K. Brahman GNV. Textbook of Human Nutrition, Oxford and IBH publish Co Pvt. Ltd.*
- *Norman. N Potter, Joseph H. Hotchkiss, Food Science, 5th edition, CBS Publishers, and Distributors.*
- *Mudambi S.R and Rajagopal M.V, Fundamentals of foods and Nutrition, New Age International Pvt. Ltd.*
- *Gopalan, C. Rama Sastry, B.V., and Balasubramanian, S.C., Nutritive value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad.*

**E-Resources:**

- <http://www.nutrition.gov>
- <http://www.usda.gov>
- <http://egyankosh.ac.in>
- <http://ecourses.icar.gov.in>

**Model Questions:**

1. Give an example of the fat-soluble vitamins. **(One word)**
2. Define Nutrition. **(Maximum 50 words)**

3. Discuss about the classification of carbohydrate. **(Maximum 250 words)**
4. Explain the classification and functions of food. **(Maximum 800 words)**

## **Minor (Paper-II) Semester III/IV**

### **Child Development**

#### **Course Outcome:**

- Students will be able to understand the crucial aspects of child development.
- Students will understand about the developmental patterns of child development.

#### **Learning Outcome:**

- The students will gain an insight on scientific methods of studying child development.
- The students will be aware of the stages of prenatal development and factors affecting pre- natal development.
- The students will understand the developmental patterns during early childhood years (0- 5years).
- The students will gain practical knowledge on development tasks in childhood.

#### **Unit I: Fundamentals of Child Development:**

- Child Development- Meaning, definition, principles, stages, and methods of studying child development.
- Prenatal Growth and Development - Meaning, significance and stages of prenatal growth and development, conception, period of ovum, period of embryo and period of foetus.
- Prenatal Environmental Influences- Maternal age, nutrition, drugs, irradiation, alcohol, smoking, maternal emotions, maternal health, Rh factor, diseases and birth hazards.

#### **Unit II: Developmental Milestones (During First Five Years of Child's Life):**

- Physical Development- Physical growth cycles, body size, body proportions, bones, teeth, muscles and fat, development of the nervous system.
- Motor Development – Meaning, principles and sequence of motor development.
- Speech Development – Meaning, pre-speech forms of communication, essentials in learning to speak, major tasks in learning to speak and speech disorders.

### **Unit III: Developmental Milestones (During First Five Years of Child's Life):**

- Emotional Development - Meaning, common emotional patterns, and characteristics of childhood emotions.
- Social Development – Meaning, process and importance of early social experiences, factors influencing social development.
- Cognitive Development - Meaning and importance, factors influencing cognitive development.

### **Unit IV: Practical**

- Assessing developments (physical/motor/emotional/social/cognitive/speech) using different methods of child study – interview schedule / observation schedule / anthropometry/ psychometry tests.
- Assessment of existing knowledge, attitudes and practices of parents and field functionaries (ANM/anganwadi workers/teachers) related to developmental milestones of children (any five samples).
- Plan and develop activities for children to facilitate motor and cognitive development through preparation of learning materials such as posters/charts/ toys etc.
- Plotting growth monitoring chart for children from one to five years and its interpretations. **Text Books:**

- *Hurlock E.B. - Child Development; New Delhi; McGraw Hill.*
- *Hurlock E.B. - Developmental Psychology; New Delhi; McGraw Hill.*
- *Chowdhury, A - Text Book on Child Development and Family Relations, New Delhi: Academic Excellence.*
- *Panda K.C. - Elements of Child Development; Kalyani Publishers.*
- *Kuppuswamy B -Text Book of Child Behavior and Development; India; Konark Publishers Pvt. Ltd.*

**Reference Books:**

- Jaya N., and Rajammal P.D. - A Text Book of Child Development. New Delhi: McMillan Publishers.
- Mussen P.H., Conger J.J, Kagan J. - Child Development and Personality; New York; Harpers and Row publishers.
- Weiner I.B., Elkind D. - Child Development: A Core Approach; John Wiley & Sons Inc.
- Papalia, Olds & Feldman - Human Development; McGraw Hill Humanities / Social Sciences/ Language.

**E Resources:**

- <https://www.choc.org/primary-care/ages-stages/3-years/>
- <https://www.betterhealth.vic.gov.au/health/>
- <https://raisingchildren.net.au/preschoolers/development/development>.
- <https://www.cdc.gov/ncbddd/childdevelopment/facts.html>
- <https://www.all4kids.org/news/blog/why-the-first-5-years-of-child>

**Model Questions:**

1. Period of ovum lasts for \_days. **(One word)**
2. Explain about the principles of child development? **(Maximum 50 words)**
3. Discuss about the stages of prenatal development? **(Maximum 250 words)**
4. Discuss about the factors affecting the physical growth and development in children. **(Maximum 800 words)**

## **Minor (Paper-III) Semester V/VI**

### **Family Resource Management**

#### **Course Outcome:**

- Students will be oriented about the available human and non-human resources in the family and their management.
- Students will learn the importance of judicious management of resources and their conservation techniques for sustainability.

#### **Learning Outcome:**

- The students will gain an insight on family resource management and its application. LO2: The students will be aware of the management process.
- The students will learn about judicious utilization of resources management for conservation and sustainability.
- The students will get practical knowledge on event planning and management.

#### **Unit I: Resource Management in Family Setting**

- Family Resource Management- Concept, definition and scope of family resource management.
- Resources- Meaning, classification and characteristics of family resources, factors affecting utilization of resources.
- Decision making- Types of decisions, steps of decision making.

#### **Unit II: Motivating Factors in Management and Management Process:**

- Motivating Factors in Management- Motivation in management, theories of motivation,  
Maslow's hierarchy of needs theory
- Motivating Factors- Values, goals and standards, interrelatedness of values, goals, and standards.
- Management Process- Definition and steps in management process: planning, organizing, controlling and evaluating, qualities of a good home maker.

#### **Unit III: Resource Conservation:**

- Money- Types of income, supplementing family income.

- Time- Concept and steps in time management, factors to be considered in making time and activity plan.
- Energy-Efforts, fatigue, work simplification techniques and Mundel's classes of change.
- Space – Meaning, importance, functional storage space management.

#### **Unit IV: Practical**

- Conduct a SWOC analysis of self/organization.
- Event planning for departmental activity (Celebration of any special day/seminar/workshop).
- Decision making through management games (Chess/tug of war/UNO).
- Plan and evaluate time activity chart for one day. **Text Books:**
- *Seetharaman P., Batra S. and Mehra P., Family Resource Management, CBS Publishers & Distributors, New Delhi.*
- *Nickell, P and Dorsey, J.M., Management in family living, CBS Publishers, and Distributors.*
- *Gross I.H and Crandall E.W., Management for Modern Families.*
- *Home Management–Education Planning Group, Arya publishing house, Delhi.*

#### **Reference Books:**

- *Vergese, Ogale and Srinivasan, Home Management.*
- *Mann M.K., Home Management for Indian Families.*
- *Biswal, G.E., Family Resource Management. Himalaya Publishing House.*
- *Mallick P., Text book of Home Science.*
- *Devdas and Jaya, Introduction to Home Science.*

#### **E-Resources:**

- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=8x0nJkh/R0vHkX1U70Z/CQ==>.
- <https://nios.ac.in/media/documents/srsec321newE/321-E-Lesson-10.pdf>
- [https://www.brainkart.com/article/Definition-and-Concept-of-Family-Resource-Management\\_33507/](https://www.brainkart.com/article/Definition-and-Concept-of-Family-Resource-Management_33507/) **Model Questions:**

1. ----- is the first process in the management process. **(one word)**

2. Write the meaning and types of decision making in a family. **(maximum 50 words)**
3. Describe the work simplification process. **(maximum 50 words)**
4. Discuss about the concept, definition, and scope of Family Resource Management. **(maximum 800 words)**

## **Minor (Paper-IV) (With/Without Research)**

### **Semester VII**

## **Home Science Extension Education**

#### **Course Outcome:**

- To enrich students about relevance of extension education and its application.
- To understand about the application of extension teaching methods for teaching and training purpose.

#### **Outcome Learning:**

- The students will be enriched with the principle and behavioral changes brought about by extension education.
- The students will understand extension education in community development.
- The students will be aware of the methods of teaching in extension education.
- The students will learn about the educative materials preparation of for different training purposes and get experience of various extension organizations.

#### **Unit I: Introduction to Extension Education:**

- Definition, needs, objectives and scope of extension education.
- Philosophy and principles of extension education.
- Behavioral changes through extension education.

#### **Unit II: Role of Home Science Extension Education in Community Development:**

- Meaning, definition and areas of community development. Home science extension education and its inter-relationship with community development.

- Role & qualities of Home Science extension workers.
- Home Science Extension Programmes- Mission Shakti, MGNREGA, National Mission for empowerment of women, ICDS, Green India Mission (GIM).

### **Unit III: Teaching Methods in Extension Education:**

- Classification of Extension Teaching Methods- Individual, group and mass methods. individual methods: farm and homevisits, office calls, telephone calls, personal letters.
- Group Methods- Method demonstration, campaign, puppetry, general meeting result demonstration, group discussion, tours, field trips, lecture, seminar, and workshop, advantages and disadvantages.
- Mass Methods- Leaflets and folders, exhibition, circular letter, radio, television, bulletins, story film show, and news articles, advantages & disadvantages.

### **Unit IV: Practical**

- Prepare a leaflet/poster on various issues related women, children and environment.
- Prepare a project report within one thousand words on women/children/environment.
- Prepare a flow chart on the steps of method demonstration by extension worker.
- Visit to Mission Shakti centers/ NGO and prepare a report (Objectives, Functions, Achievements)

#### **Text Books:**

- V. K Dubey, Indira Bishnoi, *Extension Education and Communication*, New Age International Publishers.
- S. V Supe, *An Introduction to Extension Education*, Oxford and Publishing Co. Pvt. Ltd
- Nibedita Mishra and Gayatri Biswal, *Text Book of Home Science Extension Education*, Recent Edition.

### **Reference Books:**

- *Text book of Home Science- Premlata Mallick.*
- *Education and Communication for Development*, O.P Dahama, O.P. Bhatnagar.

### **E-Resources:**

- <https://Timesagriculture.Com/Role-Of-Home-Science-Extension-In-Education/>
- <https://www.researchgate.net/publication/>
- <https://Alhafeezcollege.Org/Alfz/Assets/Uploads>
- <https://www.rohtasmahilacollegessm.ac.in/wp-content/uploads/sites>
- <https://www.egyankosh.ac.in/bitstream/123456789/53665/3/block-1.pdf>

### **Model Questions:**

- Q.1- The term extension education is derived from\_\_\_\_(one word)
- Q.2- What are the qualities of extension worker. (Answer maximum 50 words)
- Q.3- Explain about the method demonstration. (Answer maximum 250 words)
- Q.4- Define extension education and discuss about the principles of extension education. (Answer maximum 800 words)

## **Minor (Paper-V) (With/Without Research)**

### **Semester- VII**

## **Introduction to Textiles**

### **Course Outcome**

- Students will develop an idea about different textile fibers.
- Students will develop the skills to analyse yarn construction techniques.

### **Learning Outcome:**

- The students will learn about classification, usage and production of textile fibres.
- The students will know the manufacturing process and yarn construction techniques.
- The students will gain an insight on techniques of fabric construction, dyeing and printing.
- The students will be enriched about different types of dyeing and printing techniques.

### **Unit I: Introduction to Textile Fibres:**

- Definition of textile fibres, terminology and classification of textile fibres.
- Production, Manufacturing Process, Properties and usage of fibres- Natural fibre (cotton, silk and wool).
- Production, Manufacturing Process, Properties and Usage of Fibres- Man-made fibers (rayon (Viscose), polyester, nylon).

**Unit II: Yarn Construction**

- Types and Classification of Yarns- Simple, ply yarns, cord yarns, novelty yarns. twist in yarn:  
“s” and “z” twist.
- Staple yarn formation.
- Woolen and worsted yarn formation process.
- Chemical spinning (wet, dry, melt)

**Unit III: Techniques of Fabric Construction**

- Weaving- Meaning, essential weaving operation, classification of weaves (plain, basket, ribbed, twill, satin, sateen)- structure, properties, usages.
- Dyeing and Printing Methods – Raw stock dyeing, skein-dyeing, piece dyeing, cross dyeing, tie-die, batik dyeing, printing methods – direct printing, block printing, stencil printing and printing by machine.

**Unit IV: Practical**

1. Fiber identification: Identification of natural and manmade fibers by following three methods - microscopic test, burning test.
2. Characteristics of Fabric (following standards): Fabric count using pick glass
3. Printing of fabrics using:
  - i. Direct style - Block, stencil and screen
  - ii. Resist style - Tie and dye, batik
4. Weaves- Prepare sample weave on plain, basket, ribbed, twill, satin, sateen.

**Text Books:**

- *Textiles- Fiber to fabric (6<sup>th</sup> Edition) by Corbman P.B. (1985). Gregg Division /Mc Graw Hill Book Co, US.*
- *Advanced Drafting and Draping by Manmeet Sodhia. New Delhi.*
- *Household Textiles & Laundry Work by Durga Deulkar. Atma Ram & Sons, New Delhi.*

#### **Reference Books:**

- *Essentials of Textiles (6<sup>th</sup> Edition) by Joseph, M.L. Holt, Rinehart and Winston Inc, Florida.*
- *Textile Science by Vilensky G. CBS Publishers and Distributors, Delhi.*
- *Understanding Textiles by Tortora, G. Phyllis. Mc Millanm Co. USA.*
- *Textbook of Fabric Science: Fundamentals to finishing by Sekhri S. (2013). PHI Learning, Delhi.*

#### **E-Resources:**

- <https://csauk.ac.in/wp-content/uploads/2022/08/Textile-fiber-NEW.pdf>
- <https://gphisar.ac.in/wp-content/uploads/2022/09/TEXTILE-FUNDAMENTALS.pdf>
- <https://nios.ac.in/media/documents/srsec321newE/321-E-Lesson-23.pdf> □ <https://egyankosh.ac.in/bitstream/123456789/92831/1/Unit-8.pdf>

#### **Model Questions:**

- 1 is known as queen of fiber. **(One Word)**
- 2- Short note on classification of weaving. **(Maximum 50 words)**
- 3- Discuss about the steps of chemical finishing process. **(Maximum 250 words)**
- 4- Explain about the cotton fibers and discuss about the preparation of cotton fibers. **(Maximum 800 words)**

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## COURSE AT A GLANCE (NEP-UG)

SUBJECT: **BOTANY**

ACADEMIC SESSION: **2025-28**

### CORE-I COURSE

| Course Number | Semester | Course Title                             | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------|------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I        | Microbiology and Phycology               | P                                                | 4           | 100                        |
| Paper-II      |          | Analytical Technique in Plant Science    | P                                                | 4           | 100                        |
| Paper-III     | II       | Cell Biology                             | P                                                | 4           | 100                        |
| Paper-IV      |          | Mycology and Phytopathology              | P                                                | 4           | 100                        |
| Paper-V       | III      | Archegoniate                             | P                                                | 4           | 100                        |
| Paper-VI      |          | Anatomy of Angiosperms & Economic Botany | P                                                | 4           | 100                        |
| Paper-VII     |          | Genetics                                 | P                                                | 4           | 100                        |
| Paper-VIII    | IV       | Basic Molecular Biological               | P                                                | 4           | 100                        |
| Paper-IX      |          | Plant Ecology & Phytogeography           | P                                                | 4           | 100                        |
| Paper-X       |          | Plant Systemic                           | P                                                | 4           | 100                        |
| Paper-XI      | V        | Reproductive Biology of Angiosperm       | P                                                | 4           | 100                        |
| Paper-XII     |          | Basic Plant Physiology                   | P                                                | 4           | 100                        |
| Paper-XIII    |          | Basic Plant Biotechnology                | P                                                | 4           | 100                        |
| Paper-XIV     | VI       | Basic Plant Metabolism                   | P                                                | 4           | 100                        |
| Paper-XV      |          |                                          |                                                  | 4           | 100                        |
| Paper-XVI     | VII      |                                          |                                                  | 4           | 100                        |
| Paper-XVII    |          |                                          |                                                  | 4           | 100                        |
| Paper-XVIII   |          |                                          |                                                  | 4           | 100                        |
| Paper-XIX     |          |                                          |                                                  | 4           | 100                        |
| Paper-XX      | VIII     |                                          |                                                  | 4           | 100                        |
| Paper-XXI     |          |                                          |                                                  | 4           | 100                        |
| Paper-XXII    |          |                                          |                                                  | 4           | 100                        |
| Paper-XXIII   |          |                                          |                                                  | 4           | 100                        |

### CORE-II/CORE-III COURSE

| Course Number | Semester<br>Core-II/<br>Core-III | Course Title               | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------------------------------|----------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I/II                             | Microbiology and Phycology | P                                                | 4           | 100                        |
| Paper-II      | III/IV                           | Cell biology               | P                                                | 4           | 100                        |
| Paper-III     | V/VI                             | Basic Plant Physiology     | P                                                | 4           | 100                        |
| Paper-IV      | VII                              |                            | P                                                | 4           | 100                        |
| Paper-V       | VIII                             |                            | P                                                | 4           | 100                        |

**CORE COURSE II/III**  
**Minor (Paper-I) Semester I/II**  
**MICROBIOLOGY AND PHYCOLOGY**

**Course Objectives:**

To introduce the diverse group of microorganisms and their habitat relationship  
To learn the discovery, nature and multiplication of virus particles.  
To know the characteristics, growth and physiology of bacteria and their role in agriculture, health and industry.  
To learn the general characteristics and ecological distribution of bacteria, algae and Cyanobacteria and their immense importance to the mankind.  
To have knowledge about the habitats, distribution and diversity of algae in the soil, freshwater and marine environments

**Course Outcomes:**

The students learn about the diverse nature of microbes and their interaction with other organisms  
The students certainly get the opportunities to learn the basics of the nature and impact of viruses.  
The students shall be able to understand the potential of various microbes and the approaches to use them for human welfare  
The students would be able to identify the important microbes including bacteria, Cyanobacteria, and algae available in local environments and understand their beneficial roles.  
The students shall learn about the immense potential the algal resources and understand the methods of cultivation and use of algae. □ Unit-I:

Learning Outcome: The learners are able to identify diverse group of microorganisms, general features of viruses and their economic importance.

The microbial world, microbial nutrition, growth and metabolism.

Viruses: Discovery, nature, physicochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroid's and prions; replication (a general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV). Economic importance of viruses. Vaccine production, role in research, medicine and diagnostics. Viral plant diseases- symptoms, effect and control □

Unit-II:

Learning Outcome: The students understand the growth, physiology and economic importance of bacteria and Cyanobacteria. □ Bacteria: - Discovery, general characteristics, types- Archaeobacterial, Eubacteria, Mycoplasma and Spheroplasts, Cell structure, inclusions, nutrition, reproduction- vegetative, asexual and recombination (conjugation, transformation transduction). Economic importance of bacteria with reference to their role in agriculture, medicine and industry.

**Cyanobacteria:** - Ecology, occurrence, cell structure, heterocyst, reproduction, economic importance; role in biotechnology. Morphology and life-cycle of No stock. General characteristics of prochlorophyceae, Evolutionary significance of Prochloron.

**Unit–III:** Learning Outcome: The students able to grasp the general characteristics, ecological distribution and economic importance of algae and Chlorophyte.

Algae:- General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigments, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction. Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only up to groups); Role of algae in the environment, agriculture, biotechnology and industry. □ □ Chlorophyta:- General characteristics, occurrence, range of thallus organization, cell structure and reproduction. Morphology and life-cycles of Chlamydomonas, Volvox, Oedogonium and Coleochaete.

#### **Unit-IV:**

Learning Outcome: The students will able to understand the general characteristics, ecological distribution and economic importance of algae and Cyanobacteria.

Charophyta:- General characteristics; occurrence, morphology, cell structure and lifecycle of Chara; evolutionary significance

Xanthophyta:- General characteristics; occurrence, morphology and life-cycle of Vaucheria.

Phaeophyta:- Characteristics, occurrence, cell structure and reproduction. Morphology and life-cycles of Ectocarpus and Fucus.

Rhodophyta:-General characteristics, occurrence, cell structure and reproduction. Morphology and life-cycle of Polysiphonia.

#### **Practicals:**

**9. Electron micrographs/Models of viruses–T-Phage and TMV, Line drawings/Photographs of Lytic and Lysogenic Cycle.**

**10. Types of Bacteria to be observed from temporary/permanent slides/photographs.**

**11. Examination of bacteria from bacterial culture by Gram ‘staining method.**

**12. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule (live materials and photographs).**

**13. Bacterial growth measurement by turbidometry.**

**14. Hemocytometry**

**15. Colony counting using colony counter**

**16. Phycology: - Study of vegetative and reproductive structures of Nostoc, Chlamydomonas (electron micrographs), Volvox, Oedogonium, Coleochaete, Chara, Vaucheria, Ectocarpus, Fucus and Polysiphonia, Prochloron, Diatoms through, temporary preparations and permanent slides**

### **Textbooks:**

- Singh, V., Pandey, P.C., and Jain, D.K. (2017). *Microbiology and Phycology*, Rastogi Publication, Meerut.
  - Pandey BP(2022). *Botany for B.Sc. Students (Archigoniates & Plant Architecture)*, S. Chand publication, New Delhi
  - Dubey RC & Maheshwari DK (2021) *A text book of Microbiology*, S. Chand publication, New Delhi
  - Pandey BP(2023). *Botany for B.Sc. Students Semester I, NEP 2020*; S. Chand publication, New Delhi
- Reference Books:**
- Lee, R.E. (2008). *Phycology*, Cambridge University Press, Cambridge. 4th edition.
  - Prescott, L.M., Harley J.P., Klein D. A. (2010). *Microbiology*, McGraw-Hill, India. 8th edition.
  - Kumar, H.D. (1999). *Introductory Phycology*. Affiliated East-West Press, Delhi.
  - Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A., Minorsky P.V., Jackson R.B. (2008). *Biology*, Pearson Benjamin Cummings, USA. 8th edition.
  - Pelczar, M.J., Chan, E.C.S., Krieg, N.R. (2011) *Microbiology*, 8th edition, Tata McGraw-Hill Co, New Delhi.
  - Willey, Sherwood and Christopher. *Laboratory exercises in Microbiology*. McGraw-Hill, India. 9th edition.
  - Vasistha B.R. (2017) *Botany for Degree student, Algae*, S. Chand Publication, New Delhi.
  - Mishra B.K. (2018) *Microbiology and Phycology*, Kalyani Publishers, New Delhi.

## **Minor (Paper-II) Semester III/IV**

### **CELL BIOLOGY**

#### **Course Objectives:**

To understand the basic components of prokaryotic and eukaryotic cells and the role of various macromolecules in the cells.

Understand how the formation of cytoskeleton.

To have an understanding on nucleic acids as the genetic material;

To learn the basic mechanism of replication of nucleic acids.

Understand how cells undergo mitosis & meiosis.

## Course Outcomes

Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.

Students will understand the components of cell wall & cytoskeleton

Students will understand how these cellular components are used to generate and utilize energy in cells.

Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes.

□ Students will understand the cellular components underlying mitotic and meiotic cell division.

## Unit-I

**: Learning Outcomes:** Students will understand the origin, growth and basic components of cell, cell wall & cytoskeleton.

**The Cell:** Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory). Unique features of plant cells

**Plasmodesmata:** Structure, role in movement of molecules & macromolecules, comparison with gap junctions.

**Plant Cell wall:** Chemistry, structure and function. □ **Cytoskeleton:** The concept, structure and roles of microtubules, microfilaments and intermediary filament.

**Unit-II:** Learning Outcomes: Students will recognize composition of Plasma Membrane and origin, structure, function of cell organelles.

□ **Plasma Membrane:** Overview of membrane structure and function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis.

□ **Cell organelles:** Endoplasmic Reticulum, Golgi apparatus, Lysosomes & Plant Vacuole.

**Unit-III:** Learning Outcomes: Students will realize the importance of photosynthesis and cellular respiration

**Cell organelles:** Chloroplast, Mitochondria and Peroxisomes: Structural organization & Function.

**Biogenesis & semiautonomous nature of mitochondria and chloroplast.**

**Nucleus:** Structure-nuclear envelope, nuclear pore complex, nuclear lamina & Function

**Unit-IV:** Learning Outcomes: Students will understand the cellular units (DNA&RNA) underlying mitotic and meiotic cell division

**Nucleolus:** Structure and function of nucleolus, Chromatin organization, its packaging role of nuclear matrix in chromosome organization and function, matrix binding proteins

**Nucleic acids:** Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA

**Cell division:** Eukaryotic cell cycle, different stages of mitosis and meiosis. Cell cycle, Regulation of cell cycle. Practical:

1. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo discolour

2. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf.
3. Counting the cells per unit volume with the help of hemocytometer. (Yeast/pollen grains).
4. Study the phenomenon of plasmolysis and deplasmolysis.
5. Study of different stages of mitosis and meiosis using acetocarmine and aceto-orcin method from Onion root tip and bud respectively.
6. To find out the mitotic index.

**TextBooks:** □ **Rastogi, V. B. (2016). Introductory Cytology, Kedar Nath & Ram Nath, Meerut**

□ **Verma PS & Agarwal VK (2022) Cell Biology (Cytology, Biomolecules and Molecular Biology) S Chand Publication, New Delhi.**

□ **Gupta, P. K. (2017). Biomolecules and Cell Biology, Rastogi Publication, Meerut.**

□ **Kumar S. (2023). Cell biology, Pragati prakashan, Meerut**

*Reference Books:* □ *Sahoo, K. (2017) Biomolecules and Cell Biology, Kalyani Publishers, New Delhi.*

□ *Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012) Biochemistry: A short course, 2nd ed., W.H. Freeman*

□ *Nelson, D.L. and Cox, M.M. (2008) Lehninger Principles of Biochemistry, 5th Edition, W.H. Freeman and Company.*

□ *Cooper, G.M. and Hausman, R.E. 2009 The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.*

□ *Kumar HD, Molecular Biology 2ed Vikas Publication*

□ *Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco*

## **Minor (Paper-III) Semester V/VI**

### **BASIC PLANT PHYSIOLOGY**

#### **Course Objectives**

- About the mechanism and physiological activities in plants.
- On nutrient uptake and translocation to different plant parts.
- On the nature and physiological roles of various plant hormones on plant growth and development.
- On the physiological requirements for plant morphogenesis and flowering
- On the role of light responsive pigments in plant morphogenesis. Course Outcomes

□ The governing principles behind various physiological processes in plants.

About various uptake and transport mechanisms (water and solutes) in plants and the factors governing these processes.

The role of various plant hormones, signaling compounds, and stress responses.

The skills to manipulate the plant hormones in plants for desired morphological and physiological responses.

The climatic and physiological requirements for molecular signalling of plants for growth, differentiation, maturity. Unit-I:

Learning Outcome: The learners shall have the knowledge on importance of water for basic physiological processes of plants.

Structure and properties of water; pH and buffers; cellular buffering systems; Cell water Potential and its components, plasmolysis and imbibition, soil water potential.

Water absorption by roots, aquaporins, path way of water movement, symplast, apoplast, trans-membrane pathways.

Ascent of sap—cohesion-tension theory. root pressure; water movement to leaves.

Transpiration: Processes; mechanism of stomatal movement; factors affecting transpiration; guttation.

Translocation in the phloem: experimental evidence in support of phloem as the site of sugar translocation. Pressure—flow model; phloem loading and unloading; source—sink relationship.

## **Unit-II:**

Learning Outcome: The students shall know about the nutrient uptakes and hormonal regulation of plant growth and metabolism.

□ Mineral nutrition: essential and beneficial elements, macro and micronutrients, mineral deficiency symptoms, chelating agents.

□ Nutrient Uptake: Transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, Symport and antiport.

□ Plant growth regulators: Auxin: Biosynthesis, transport, distribution and function

□ Gibberellins: Biosynthesis, transport, distribution and function

□ Cytokini: Biosynthesis, transport, distribution and function

□ Absciscic acid: Biosynthesis, transport, distribution and function

□ Ethylene: Biosynthesis, transport, distribution and function

### Unit-III:

Learning Outcome: The students shall know about photosynthesis and storage of metabolites by plants.

- ☐ Photosynthesis: General concept; photosynthetic apparatus; photosynthetic pigments and photo systems; Red drop and Emerson's enhancement effect.
- ☐ Primary photochemical reactions: photon, exciton and electron transfer
- ☐ Non-cyclic electron flow: role of tyrosine and phaeophytin in, quinine cycle, oxygen evolving complex and water splitting .Cyclic electron flow :process and function ;role of ferredox in-quinone reductase
- ☐ C<sub>3</sub>, C<sub>4</sub> and CAM pathways of carbon fixation. ☐ Photorespiration ☐ Synthesis and Catabolism of Sucrose and Starch.

### Unit-IV:

Learning Outcome: The learners shall have the skill to understand the photo morphogenesis.

- ☐ Physiology of flowering: Photoperiodism, flowering stimulus, floral meristems, external and internal factors of flower evocation; florigen concept; ABC model of floral organ identity; chemical signals for floral evocation.
- ☐ Seed dormancy: causes, effects, breaking of seed dormancy.
- ☐ Senescence: Types and causes, biochemical basis
- ☐ Phytochrome: Discovery, chemical nature, role of phytochrome in photo- morphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.

### Practical:

**1. Determination of osmotic potential of plant cell sap by plasmolytic method. 2. Determination of water potential of given tissue(potato tuber) by weight method. 3. Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf. 4. Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte. 5. To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces). 6. To study the phenomenon of seed germination (effect of light). 7. To study the induction of amylase activity in germinating barley grains. 8. To demonstrate suction due to transpiration. 9. Measurement of relation between transpiration and transpiring surface 10. Measurement of cuticular resistance to transpiration. 11. Measurement of primary photochemical reactions by fluorescence. Text Books:**

**☐ Pandey and Sinha (2011).Plant Physiology, Vikash Publishing House, New Delhi ☐ Jain VK Fundamental of Plant physiology, 20th ed. Schand publication, New Delhi**

### Reference Books:

- ☐ Sinha, R.K.(2015). Modern Plant Physiology, Narosa Publishing House, New Delhi.

- Hopkins, W.G. and Huner, A. (2008). *Introduction to Plant Physiology*. John Wiley and Sons. U.S.A. 4th edition.
- Taiz, L., Zeiger, E., MØller, I.M. and Murphy, A(2015). *Plant Physiology and Development*. Sinauer Associates Inc. USA. 6th edition.
- BajracharyaD.(1999). *Experiments in Plant Physiology-A Laboratory Manual*. Narosa Publishing House, New Delhi.
- Salisbury, F. B. and Ross, C. W. *Plant Physiology* Wadsworth Publishing Company, California
- Sahoo, A.C. (2018). *Outlines of Plant Physiology* Kalyani Publishers, New Delhi.

**3 Yr. Degree Course  
(Minor)  
based on NEP-2020  
CHEMISTRY**



(Effective from Session 2025-26)

**(Batch: 2025-2028)**



**SAMBALPUR UNIVERSITY**

**JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019**

## COURSE AT A GLANCE (NEP-U.G.)

SUBJECT: CHEMISTRY

ACADEMIC SESSION: 2025-28

### CORE-I COURSE

| Course Number | Semester | Course Title                                                                                                               | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I        | Atomic Structure, Periodicity of elements and Chemical Bonding                                                             | P                                                | 4           | 100                        |
| Paper-II      |          | Fundamental Organic Chemistry                                                                                              | P                                                | 4           | 100                        |
| Paper-III     | II       | States of matter, and Ionic equilibrium                                                                                    | P                                                | 4           | 100                        |
| Paper-IV      |          | Chemical thermodynamics, equilibrium, and Colligative property                                                             | P                                                | 4           | 100                        |
| Paper-V       | III      | Acids and Bases, Metallurgy, Chemistry of main group elements                                                              | P                                                | 4           | 100                        |
| Paper-VI      |          | Chemistry of halogen, oxygen and sulphur containing organic compounds                                                      | P                                                | 4           | 100                        |
| Paper-VII     |          | Phase equilibrium, Chemical dynamics, catalysis and surface chemistry                                                      | P                                                | 4           | 100                        |
| Paper-VIII    | IV       | Coordination Chemistry, Chemistry of d- and f-block elements, Inorganic Reaction Mechanism and electron transfer reactions | P                                                | 4           | 100                        |
| Paper-IX      |          | Natural Products, Heterocyclic Compounds, Nitrogen containing compounds and Polynuclear Hydrocarbons                       | P                                                | 4           | 100                        |
| Paper-X       |          | Conductance, electrochemistry, electrical properties of atoms and molecules                                                | P                                                | 4           | 100                        |
| Paper-XI      | V        | Organic Spectroscopy                                                                                                       | P                                                | 4           | 100                        |
| Paper-XII     |          | Basic quantum chemistry, Molecular & electronic spectroscopy, and photochemistry                                           | P                                                | 4           | 100                        |
| Paper-XIII    |          | Chemistry of Organometallic Compounds                                                                                      | P                                                | 4           | 100                        |
| Paper-XIV     | VI       | Chemistry of Biomolecules                                                                                                  | P                                                | 4           | 100                        |

|             |      |                                                                                     |    |   |     |
|-------------|------|-------------------------------------------------------------------------------------|----|---|-----|
| Paper-XV    |      | Solid and porous materials, and magnetochemistry and power cells                    | P  | 4 | 100 |
| Paper-XVI   | VII  | Analytical Methods of Chemistry                                                     | NP | 4 | 100 |
| Paper-XVII  |      | Polymer Chemistry                                                                   | P  | 4 | 100 |
| Paper-XVIII |      | Green Chemistry                                                                     | P  | 4 | 100 |
| Paper-XIX   |      | Oxidation, Reduction, Reagents, Rearrangements and Name Reactions                   | NP | 4 | 100 |
| Paper-XX    | VIII | Quantum chemistry & Statistical Thermodynamics                                      | NP | 4 | 100 |
| Paper-XXI   |      | Chemical group theory, electronic spectra of metal complexes, and nuclear chemistry | P  | 4 | 100 |
| Paper-XXII  |      | Pericyclic reactions, Photochemistry and Retrosynthesis                             | P  | 4 | 100 |
| Paper-XXIII |      | Research Methodology for Chemistry                                                  | NP | 4 | 100 |

## CORE-II/CORE-III COURSE

| Course Number | Semester<br>Core-II/<br>Core-III | Course Title                                                   | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------------------------------|----------------------------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I/II                             | Atomic Structure, Periodicity of elements and Chemical Bonding | P                                                | 4           | 100                        |
| Paper-II      | III/IV                           | Fundamental Organic Chemistry                                  | P                                                | 4           | 100                        |
| Paper-III     | V/VI                             | States of matter, and Ionic equilibrium                        | P                                                | 4           | 100                        |
| Paper-IV      | VII                              | Chemical thermodynamics, equilibrium, and Colligative property | P                                                | 4           | 100                        |
| Paper-V       | VIII                             | Acids and Bases, Metallurgy, Chemistry of main group elements  | P                                                | 4           | 100                        |

## CORE COURSE II/ III

### Minor (Paper-I) Semester I/II

#### Atomic Structure, Periodicity of elements and Chemical Bonding

| Course Title                                                   | Code | Credits | Credit distribution |           |
|----------------------------------------------------------------|------|---------|---------------------|-----------|
|                                                                |      |         | Lecture             | Practical |
| Atomic Structure, Periodicity of elements and Chemical Bonding |      | 04      | 03                  | 01        |

#### Course Objectives:

To provide the fundamental knowledge on the structure of atom, which is a necessary pre-requisite in understanding the nature of chemical bonding in compounds. Various types of periodic properties and bonding have been reviewed to strengthen students for grasping this tricky topic and effectively tackle exam questions. The basics of acid-base titrimetric analysis has been incorporated in order to develop the analytical skills of the students.

#### Course Outcomes:

1. Solve the conceptual questions using the knowledge gained by studying the quantum mechanical model of the atom.
2. Learn the various atomic properties of atoms and their variations in the periodic table.
3. Gain the idea of different types of bondings and their associated properties.
4. Understand the theory and applications of various acid-base titrations.

### SYLLABUS

(C L P = 3 3 0; Total Hours = 15 x 3 = 45) **UNIT – I (12 Hours)**

#### Atomic structure:

Rutherford's nuclear model of atom, Bohr's theory and the origin of hydrogen spectrum,

Sommerfeld's extension of Bohr's theory, de-Broglie equation, Heisenberg's Uncertainty Principle and its significance. Postulates of wave mechanics, Derivation of Schrödinger's wave equation for hydrogen atom, significance of  $\psi$  and  $\psi^2$ . Radial and angular wave functions, Radial function plots, radial probability distribution plots, angular distribution curves. Shapes of s-, p-, d- and f-orbitals, Relative energies of orbitals. Slater's rule and its limitations, Quantum numbers and their significance. Pauli's Exclusion Principle, Hund's rule of maximum spin multiplicity and Aufbau principle.

## **UNIT – II (10 Hours)**

### **Periodicity of elements:**

Introduction to long form periodic table, Cause of periodicity, Division of elements into s-, p-, d- and f-blocks. Atomic radius, ionic radius, covalent radius and Van der Waals radius. Periodic trends in ionic and covalent radii. Ionization energy, electron affinity, electronegativity, and their variations in the periodic table. Applications of electronegativities. Pauling's/Mulliken's scale of electronegativity, Sanderson's electron density ratio.

## **UNIT – III (10 Hours)**

### **Chemical Bonding-I:**

**Ionic Bond**-General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Lattice energy, Born-Haber cycle and its application, Born-Landé equation, Madelung constant, importance of Kapustinskii equation for lattice energy. Solvation energy, Covalent character in ionic compounds, polarizing power and polarizability, Fajan's rules and consequences of polarization.

## **UNIT – IV (13 Hours)**

### **Chemical bonding-II:**

**Covalent Bond**-Valence shell electron pair repulsion (VSEPR) theory, shapes of the following simple molecules and ions containing lone pairs and bond pairs of electrons:  $\text{CH}_4$ ,  $\text{H}_2\text{O}$ ,  $\text{NH}_3$ ,  $\text{PCl}_3$ ,  $\text{PCl}_5$ ,  $\text{SF}_6$ ,  $\text{ClF}_3$ ,  $\text{I}_3^-$ ,  $\text{BrF}_2^+$ ,  $\text{PCl}_6^-$ ,  $\text{ICl}_2^-$ ,  $\text{ICl}_4^-$ ,  $\text{NH}_4^+$ ,  $\text{PO}_4^{3-}$  and  $\text{SO}_4^{2-}$ . Valence Bond theory (Heitler-London approach). Hybridization, equivalent and non-equivalent hybrid orbitals. Ionic character in covalent compounds: Dipole moment. Percentage ionic character from dipole moment and electronegativity difference, Molecular orbital diagrams of homo- & hetero-diatomic molecules ( $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{C}_2$ ,  $\text{B}_2$ ,  $\text{F}_2$ ,  $\text{CO}$ ,  $\text{NO}$ ) and their ions. Calculation of bond order. Concept of bent rule.

**Metallic bond:**

Concept of metallic bond, The free electron model, The valence bond model, The band model (molecular orbital approach), semiconductor and insulators.

**Hydrogen bond:**

Concept of hydrogen bond, nature of hydrogen bonding, consequences of hydrogen bonding and its importance.

**Lab Work****Credit-01**

(C L P = 1 0 1; Total Hours = 15 x 2 = 30)

(Laboratory periods: 30 Hours, 15 classes of 2 hours each)

**List of experiments**

1. Calibration and use of apparatus
2. Preparation of solutions of different Molarity/Normality.
3. Estimation of oxalic acid using standard NaOH solution
4. Estimation of sodium carbonate using standard HCl.
5. Estimation of carbonate and hydroxide present together in a mixture.
6. Estimation of carbonate and bicarbonate present together in a mixture.

**Text Books:**

1. B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Vishal Publishing Co., 33<sup>rd</sup> Ed., 2017.
2. A. J. Elias, The Chemistry of the p-Block Elements-Syntheses, Reactions and Applications, University Press (India) Pvt Ltd., 2009.
3. G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons, 1989. **Reference Books:**
  1. J. D. Lee, Concise Inorganic Chemistry, Wiley India, 2010.
  2. B. E. Douglas, D. H. McDaniel, J. J. Alexander, Concepts and Models of Inorganic Chemistry, John Wiley & Sons, 1994.
  3. P. W. Atkins, T. L. Overton, J. P. Rourke, M. T. Weller, F. A. Armstrong, Shriver and Atkins Inorganic Chemistry, 5th Edition, Oxford University Press, 2010.

4. P. Chndra, C. Gupta, Chemical Dynamics and Coordination chemistry, 1<sup>st</sup> Ed., 2022.
5. A. K. Das, M. Das, Fundamental Concepts of Inorganic Chemistry, 1st Edition, Volume CBS Publishers & Distributors Pvt. Ltd., 2014.
6. J. E. Huheey, E. A. Keiter, R. L. Keiter, O. K. Medhi, Inorganic Chemistry- Principles of Structure and Reactivity, Pearson Education, 2009.
7. D. C. Harris, C. A. Lucy, Quantitative Chemical Analysis, 9<sup>th</sup> Ed, Freeman and Company, 2016.

### **Minor (Paper-II) Semester III/IV**

### **Fundamental Organic Chemistry**

| Course Title                  | Code | Credit | Credit Distribution of the course |           |
|-------------------------------|------|--------|-----------------------------------|-----------|
|                               |      |        | Lecture                           | Practical |
| Fundamental Organic Chemistry |      | 04     | 03                                | 01        |

#### **Course Objectives:**

To provide the fundamental knowledge on organic chemistry in order to comprehend other organic chemistry courses in coming semesters with greater depth. The purpose of this core paper is to review the basic concepts of electron displacement and the chemistry of aliphatic and aromatic hydrocarbons. Stereochemistry is also introduced to help to student to visualize the organic molecules and their spatial arrangement in three dimensional spaces and hands on experience on detection of organic molecules.

#### **Course Outcomes:**

1. Understanding the basic concepts of electronic displacement phenomena in organic molecules, various bond breaking processes and types of organic reactions.
2. Fundamental knowledge on symmetry and asymmetry aspect of organic molecules and their spatial arrangements in two-dimension and three-dimension with their stereochemistry.
3. Learning the synthesis, structure and stability of unsaturated hydrocarbons, understanding the concept of aromaticity and chemical reactions of unsaturated hydrocarbons and aromatic hydrocarbons.
4. Knowledge on selection of suitable solvent for purification and separation of organic compounds and detection of various elements present in it.

## Syllabus

### Lecture-Credit-03 (45 Hrs)

#### Unit-I:

##### Basics of Organic Chemistry (11 hrs)

Electronic Displacements: Inductive, electrometric, resonance and mesmeric effects, hyper conjugation and their applications in dipole moment; organic acids and bases; their relative strength. Hemolytic and heterolysis fission with suitable examples. Curly arrow rules; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and relative stability of carbocation's, carbanions, free radicals and carbines.

Introduction to types of organic reactions with suitable examples: Addition, Elimination, Substitution, Rearrangement and Pericyclic reactions.

Carbon-carbon sigma bonds, chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Corey-House Reactions, Free radical substitutions: Halogenation –relative reactivity and selectivity.

#### Unit-II:

##### Stereochemistry (13 hrs)

Concept of Chirality/Asymmetry, Geometrical isomerism and Optical Isomerism: Optical Activity, Specific Rotation. Determination of Relative and absolute configuration in chiral molecules using D/L, R/S, cis/trans,

Syn/Anti and E/Z descriptors using C.I.P rules. Representation by Fischer Projection, Newman and Sawhorse Projection formulae in molecules containing one and two chiral-centers. Enantiomers, Distereoisomers, meso-structures, Racemic mixture and their resolution.

Stability and Conformational analysis: types of cycloalkanes and their relative stability, Baeyer strain theory, Conformational analysis of alkanes (ethane and n-butane): Relative stability with energy diagrams. Energy diagrams of cyclohexane: Chair, Half chair, boat and twist boat forms.

#### Unit-III:

##### Chemistry of Unsaturated Hydrocarbons (13 hrs)

Carbon-Carbon Pi Bonds: Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/AntiMarkownikoff addition), mechanism of oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, syn and antihydroxylation (oxidation), 1,2- and 1,4-addition reactions in conjugated dienes and Diels-Alder reaction; Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

#### **Unit–IV:**

##### **Chemistry of Aromatic Hydrocarbons (8 hrs)**

Aromaticity: Hückel's rule, aromaticity in benzenoid and non-benzenoid compounds, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples.

Electrophilic aromatic substitution with mechanism: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the functional groups.

#### **LAB WORK- Credit-01 (15 classes of 2 hours each)**

##### **List of Experiments**

1. Detection of extra elements (N, Cl, Br, I and S) in organic compounds by Lassaigne's test.
2. Functional group tests for alcohols, phenols, carbonyl and carboxylic acid groups in known organic compounds.
3. Separation and purification of any one component of following binary solid mixture (Benzoic acid/*p*-Toluidine; *p*-Nitrobenzoic acid/*p*-Aminobenzoic acid; *p*-Nitrotoluene/*p*-Anisidine) based on the solubility in common laboratory reagents/solvents like water (cold, hot), ethanol (cold, hot), dil. HCl, dil. NaOH, dil. NaHCO<sub>3</sub> etc.
4. Determination of melting point and boiling point of different organic compounds

##### **Text Books:**

1. R. T. Morrison, R. N. Boyd, S. K. Bhattacharjee, Organic Chemistry, 7<sup>th</sup> Ed., Pearson Education India, 2010.
2. A. Bahl, B. S. Bahl, Advanced Organic Chemistry, 5<sup>th</sup> Ed., S. Chand, 2012.
3. B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchell, Vogel's Textbook of Practical Organic Chemistry, 5<sup>th</sup> Ed., Pearson Education India, 2003.

##### **Reference Books:**

1. T. W. Graham Solomons, C. G. Fryhle, S. A. Snyder, Solomons' Organic Chemistry, Global Ed., Wiley, 2024.
2. J. Clayden, N. Greeves, S. Warren, Organic Chemistry, 2<sup>nd</sup> Ed., Oxford Publisher, 2012.
3. R. K. Bansal, Organic Reaction Mechanism, 3<sup>rd</sup> Ed., Tata McGraw-Hill Publications, 1998.
4. D. Nasipuri, Stereochemistry of Organic compounds, 4<sup>th</sup> Ed., New Age International Publisher, 2020.

5. P. Sykes, A Guidebook to Mechanism in Organic Chemistry, 6<sup>th</sup> Ed., Pearson Education, 2003.
6. F. A. Carey, R. J. Sundberg, Advanced Organic Chemistry, Part-A and Part-B, 5<sup>th</sup> Ed., Springer 2007.
7. N. K. Vishnoi, Advanced Practical Organic Chemistry, 3<sup>rd</sup> Ed., Vikas Publishing House, 2009.
8. O. P. Agarwal, Advanced Practical Organic Chemistry, Krishna Prakashan, 2014.
9. V. K. Ahluwalia, R. Aggarwal, Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, Universities Press, 2004.
10. H. T. Clarke, A Handbook of Organic Analysis: Qualitative and Quantitative, 4<sup>th</sup> Ed., CBS Publishers, 2021.

## Minor (Paper-III) Semester V/VI

### States of matter, and Ionic equilibrium

| Course Title                            | Code | Credit | Credit distribution |           |
|-----------------------------------------|------|--------|---------------------|-----------|
|                                         |      |        | Lecture             | Practical |
| States of matter, and Ionic equilibrium |      | 04     | 03                  | 01        |

#### Course Objectives:

The objective of this course is to develop basic and advance concepts regarding gases and liquids. It aims to study the similarity and differences between the two states of matter and reasons responsible for these. The objective of the practical is to develop skills for working in physical chemistry laboratory. The student will perform experiments based on the concepts learnt in Physical Chemistry-I course.

#### Course outcomes:

1. Derive mathematical expressions for different properties of gas and liquid and understand their physical significance.
2. Apply the concepts of gas equations and liquids while studying other chemistry courses and understand the importance of pH in every-day life.
3. Understand different lattice systems and apply working principles of XRD for understanding crystal structure by powder and single crystal method.

4. Handle stalagmo meter and Ostwald viscometer properly and determine the density of aqueous solutions.  
Data reduction, interpretation using numerical and graphical methods.

## **SYLLABUS**

### **Lecture-Credit 03 (45 hours)**

#### **Unit-I: Gaseous state (13 hour)**

Kinetic molecular model of a gas, Collision frequency, Collision diameter, Collision cross section, Mean free path and viscosity of gases, including their temperature and pressure dependence, Relation between mean free path and coefficient of viscosity, Maxwell distribution of molecular velocities (no derivation); average, root mean square and most probable velocities and average kinetic energy, Law of equipartition of energy, Behavior of real gases: Deviations from ideal gas behavior, Causes of deviation from ideal behavior, Vander

Wall equation and its application, Compressibility factor  $Z$ , and its variation with pressure for different gases, Critical Phenomenon and critical constant derivation.

#### **Unit-II: Liquid state (10 hour)**

Qualitative treatment of the structure of the liquid state; physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Capillary action in relation to cohesive and adhesive forces, Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases.

Qualitative discussion of structure of water.

#### **Unit- III: Solid state (12 hour)**

Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analyses of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals (stoichiometric and non- stoichiometric).

#### **Unit-IV: Ionic equilibria (10 hour)**

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono- and diprotic acids. calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications. Solubility and solubility product of sparingly soluble salts and its application.

### **LAB WORK**

#### **Credit 01 (15 classes of 2 hours each) List of experiments:**

1. Determine the surface tension by (i) drop number (ii) drop weight method.
2. Study the variation of surface tension of detergent solutions with concentration and determination of CMC
3. Determination of viscosity of aqueous solutions of (i) polymer (ii) ethanol and (iii) sugar at room temperature.
4. Study the variation of viscosity of sucrose solution with the concentration of solute.
5. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base.
6. Preparation of buffer solutions of different pH (i) Sodium acetate-acetic acid (ii)
7. Ammonium chloride-ammonium hydroxide
8. Determination of dissociation constant of a weak acid.
9. Determination of solubility product of  $\text{PbI}_2$  by titrimetric method.

#### **Text Books:**

1. P. W. Atkins, J. de Paula, Elements of Physical Chemistry, Oxford University Press, 6<sup>th</sup> Ed., 2006.
2. G. W. Castellan Physical Chemistry 4<sup>th</sup>Edn. Narosa 2004.
3. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co., New Delhi 2011.

#### **Reference books:**

1. Puri, Sharma & Pathania, Principles of Physical Chemistry, Vishal Publishing Co, 47<sup>th</sup> Edn., 2017.
2. R. G., Mortimer Physical Chemistry, Elsevier (Academic Press), 3<sup>rd</sup> Ed, 2008.
3. T. Engel & P. Reid Physical Chemistry, 3<sup>rd</sup> Ed. Pearson 2013
4. Kapoor K. L., Text Book of Physical Chemistry, McGraw Hill, 3<sup>rd</sup> Edn. 2017

## Minor (Paper-IV)

(With/Without Research)

### SEMESTER- VII

#### Chemical thermodynamics, equilibrium, and Colligative property

| Course Title                                                   | Code | Credit | Credit distribution of the course |           |
|----------------------------------------------------------------|------|--------|-----------------------------------|-----------|
|                                                                |      |        | Lecture                           | Practical |
| Chemical thermodynamics, equilibrium, and Colligative property |      | 04     | 03                                | 01        |

#### Course Objectives:

The learners should be able to apply principles and laws of thermodynamics to reversible and irreversible systems. In addition, they should be able to use spectroscopic data to calculate thermodynamic properties of ideal & real mixtures. In addition, understand the change in thermodynamic properties, equilibrium constants, partial molar quantities, chemical potential. Also able to identify factors affecting equilibrium constant using the principles and techniques of statistical thermodynamics.

#### Course outcomes:

By the end of the course, the students will be able to:

- Discuss the laws of thermodynamics and applications to natural phenomena.
- Acquire a strong foundation of partial molar properties, its variation with temp and pressure for different systems and able to apply on the thermodynamics of simple mixtures.
- Inculcate firm foundations in the fundamentals and application of chemical equilibrium, and  $\Delta G$  derive the relationship between different equilibrium constants.
- Understand the basic concept of Solutions of non-volatile solutes, colligative properties. Calculate various thermodynamic properties ( $\Delta H_{\text{neutralization}}$ ,  $\Delta H_{\text{hydration}}$  &  $C_v$ ) for chemical reactions using calorimeter.

## **SYLLABUS**

### **Lecture-Credit 03 (45 hours)**

#### **Unit-I: Chemical thermodynamics (10 hours)**

Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics. First law: Concept of heat,  $q$ , work,  $w$ , internal energy,  $U$ , and statement of **first law**; enthalpy,  $H$ , relation between heat capacities, calculations of  $q$ ,  $w$ ,  $U$  and  $H$  for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions. Thermochemistry: Heats of reactions: standard states; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions.

#### **Unit-II (12 hours)**

Carnot cycle, efficiency of heat engine, Carnot theorem; **Second Law**: Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; molecular and statistical interpretation of entropy. Calculation of entropy change for reversible and irreversible processes. **Third Law**: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. Free Energy Functions: Gibbs and Helmholtz energy; variation of  $S$ ,  $G$ ,  $A$  with  $T$ ,  $V$ ,  $P$ ; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters, inversion temperature, GibbsHelmholtz equation, Maxwell relations, thermodynamic equation of state.

#### **Unit-III : Systems of variable composition (13 hours)**

Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases. **Chemical equilibrium**: Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases, concept of fugacity. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient (vant Hoff's reaction). Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Free energy of mixing and spontaneity; thermodynamic derivation of relations between the various equilibrium constants  $K_p$ ,  $K_c$  and  $K_x$ . Le Chatelier principle (quantitative treatment) and its applications.

**Unit-IV Solutions and Colligative Properties (10 hours)** Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Thermodynamic derivation using chemical potential to derive relations between the four colligative properties: (i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure and amount of solute. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.

## **LAB WORK- credit 01 (15 classes of 2 hours each)**

### **List of experiments**

1. Determination of heat capacity of a calorimeter for different volumes using change of enthalpy data of a known system (method of back calculation of heat capacity of calorimeter from known enthalpy of solution or enthalpy of neutralization).
2. Determination of heat capacity of the calorimeter and enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3. Calculation of the enthalpy of ionization of ethanoic acid.
4. Determination of heat capacity of the calorimeter and integral enthalpy (endothermic and exothermic) solution of salts.
5. Determination of basicity/proticity of a polyprotic acid by the thermochemical method in terms of the changes of temperatures observed in the graph of temperature versus time for different additions of a base. Also calculate the enthalpy of neutralization of the first step.
6. Determination of enthalpy of hydration of copper sulphate.
7. Determination of heat of solution ( $\Delta H$ ) of oxalic acid/benzoic acid from solubility measurement.

### **Text Books:**

1. P. W. Atkins & J. de Paula, Elements of Physical Chemistry, Oxford University Press, 6<sup>th</sup> Ed., 2006.
2. D. A. McQuarrie, & J. D Simon. Molecular Thermodynamics Viva Books Pvt. Ltd.: New Delhi 2004.
3. K. L. Kapoor, Text Book of Physical Chemistry, , Mac Grow Hill, 3<sup>rd</sup>Edn. 2017
4. B. D. Khosla, V. C. Garg, & A. Gulati, Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi 2011.

### **Reference Books:**

1. T. Engel & P. Reid, Physical Chemistry 3<sup>rd</sup> Ed. Pearson 2013.
2. S.C. Kheterpal Pradeep's Physical Chemistry, Vol. I & II, Pradeep Publications 2011.
3. Puri, Sharma & Pathania, Principles of Physical Chemistry, Vishal Publishing Co, 47<sup>th</sup> Edn., 2017.

## Minor (Paper-V)

(With/Without Research)

### SEMESTER-VIII

#### Acids and Bases, Metallurgy, Chemistry of main group elements

| Course Title                                                  | Code | Credits | Credit distribution |           |
|---------------------------------------------------------------|------|---------|---------------------|-----------|
|                                                               |      |         | Lecture             | Practical |
| Acids and Bases, Metallurgy, Chemistry of main group elements |      | 04      | 03                  | 01        |

#### Course Objectives:

To provide the basic knowledge on general principles of acids and bases, principle of metallurgy and chemistry of s- and p-block elements. Students can learn about chronological developments of the concepts of acids and bases. It will help students to get aware of the pH scale and classify a substance as acidic, basic, or neutral based on their pH or hydrogen ion concentration. Students can achieve the knowledge regarding volumetric analysis and preparation of metal complex.

#### Course Outcomes:

1. Know how the various theories of acid and base, and understand the occurrence and purification of metals
2. Learn the different properties of s- and p-block elements
3. Understand the preparation and properties of inorganic polymers.
4. Achieve knowledge on how to standardize, estimate and prepare inorganic compounds/metal ions.

#### SYLLABUS

(C L P = 3 3 0; Total Hours = 15 x 3 = 45)

##### UNIT – I (10 Hours)

##### Acids and Bases

Different concepts of acids and bases: Arrhenius theory, Bronsted-Lowry theory, Lewis theory, The Lux Flood definition, The Usanovich definition, acids and bases in proton solvents, Concept of

conjugate acid and conjugate base, Concept of pH, Pearson's classification of Lewis acid and Lewis bases into Hard and Soft Acids and Bases (HSAB), HSAB principle, application of HSAB principle.

### **Principle of metallurgy**

Chief modes of occurrence of metals, Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent, electrolytic reduction, hydrometallurgy. Methods of purification of metals: electrolytic process, parting process, Van Arkel-de Boer process, Mond's process and Zone refining.

## **UNIT – II (12 Hours)**

### **Chemistry of s-Block Elements**

General characteristics: melting point, flame colour, reducing nature, diagonal relationships and anomalous behavior of first member of each group. Reactions of alkali and alkaline earth metals with oxygen, hydrogen, nitrogen and water. Common features such as ease of formation, thermal stability and solubility of the following alkali and alkaline earth metal compounds: hydrides, oxides, peroxides, superoxides, carbonates, nitrates, and sulphates. Complex formation tendency of s-block elements; structure of the following complexes: crown ethers and cryptates of Group I; Hydride and their classifications: ionic, covalent and interstitial, EDTA complexes of calcium and magnesium. Solutions of alkali metals in liquid ammonia and their properties.

## **UNIT – III (13 Hours)**

### **Chemistry of p-Block Elements**

Electronic configuration, atomic and ionic size, metallic/non-metallic character, melting point, ionization enthalpy, electron gain enthalpy, electronegativity, catenation, allotropy of C, P, S; inert pair effect, diagonal relationship between B and Si and anomalous behavior of first member of each group. interhalogen and pseudohalogen compounds, Structure, bonding and properties (acidic/basic nature, stability, ionic/covalent nature, oxidation/reduction, hydrolysis, action of heat) of the following:

- **Hydrides:** hydrides of Group 13 (only diborane), Group 14, Group 15, Group 16 and Group 17.
- **Oxides:** oxides of phosphorus, sulphur and chlorine

- **Oxoacids:** oxoacids of phosphorus and chlorine; peroxyacids of sulphur • **Halides:** halides of silicon and phosphorus

## UNIT – IV (10 Hours)

### Noble gases

Occurrence and uses, rationalization of inertness of noble gases, clathrates; preparation and properties of  $\text{XeF}_2$ ,  $\text{XeF}_4$  and  $\text{XeF}_6$ . Molecular shapes of noble gas compounds (VSEPR theory).

### Inorganic polymer

Preparation, properties, structure and uses of the following compounds: Borazine, Silicates, silicones, phosphonitrilic halides  $\{(\text{PNCl}_2)_n \text{ where } n = 3 \text{ and } 4\}$ , and concept of carbophosphazene.

### Lab Work

#### (Credit-01)

(C L P = 1 0 1; Total Hours =  $15 \times 2 = 30$ )

(Laboratory periods: 30 Hours, 15 classes of 2 hours each)

#### List of experiments

1. Standardization of sodium thiosulphate solution by standard  $\text{K}_2\text{Cr}_2\text{O}_7$  solution.
2. Estimation of copper using standard sodium thiosulphate solution (Iodometrically).
3. Estimation of available chlorine in bleaching powder iodometrically.
4. Preparation of Cuprous chloride ( $\text{Cu}_2\text{Cl}_2$ )
5. Preparation of Manganese(III) phosphate ( $\text{MnPO}_4 \cdot \text{H}_2\text{O}$ )
6. Preparation of Lead chromate ( $\text{PbCrO}_4$ )

### Text Books:

1. A. J. Elias, The Chemistry of the p-Block Elements-Syntheses, Reactions and Applications, University Press (India) Pvt Ltd., 2009.
2. J. D. Lee, Concise Inorganic Chemistry Wiley India, 5<sup>th</sup> Edn., 2008.
3. J. E. Huheey, E. A. Keiter, R. L. Keiter, Inorganic Chemistry – Principles of structure and reactivity, Pearson Education, 4<sup>th</sup> Ed. 2002.

**Reference Books:**

1. A. K. Das, Fundamentals of Inorganic Chemistry, Vol. I, CBS Publications, 2<sup>nd</sup> Ed., 2010.
2. S. Prakash, G. D. Tuli, S. K. Basu, R. D. Madan, Advanced Inorganic Chemistry, Vol. I, 7<sup>th</sup> Ed., S. Chand & Company Pvt. Ltd., 2021.
3. Puri, Sharma, Kalia, Principles of Inorganic Chemistry, Vishal Publication Co., 33<sup>rd</sup> Ed., 2017.
4. D. E. Shriver, P. W. Atkins, Inorganic Chemistry, Oxford University Press, 5<sup>th</sup> Ed., 2010.
5. G. L. Miessler, P. J. Fischer, D. A. Tarr, Inorganic Chemistry, 5<sup>th</sup> Ed., Pearson, 2014.
6. J. Mendham, Vogel's Quantitative Chemical Analysis, 6<sup>th</sup> Ed., Pearson, 2009.  
V. K. Ahluwalia, S. Dhingra, A. Gulati, College Practical Chemistry, University Press, 2005.

**3 Yr. Degree Course  
(Minor)  
based on NEP-2020  
ECONOMICS**



(Effective from Session 2025-26)

**(Batch: 2025-2028)**



**SAMBALPUR UNIVERSITY**

**JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019**

## COURSE AT A GLANCE (NEP-UG)

SUBJECT: ECONOMICS

ACADEMIC SESSION: **2025-28**

### CORE-I COURSE

| Course Number | Semester | Course Title                                                           | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------|------------------------------------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I        | Basic Economy I                                                        | NP                                               | 4           | 100                        |
| Paper-II      |          | Indian Economy I                                                       | NP                                               | 4           | 100                        |
| Paper-III     | II       | Basic Economics II                                                     | NP                                               | 4           | 100                        |
| Paper-IV      |          | Indian Economy II                                                      | NP                                               | 4           | 100                        |
| Paper-V       | III      | Microeconomics I                                                       | NP                                               | 4           | 100                        |
| Paper-VI      |          | Macroeconomics I                                                       | NP                                               | 4           | 100                        |
| Paper-VII     |          | Mathematical Methods for Economics I                                   | NP                                               | 4           | 100                        |
| Paper-VIII    | IV       | Microeconomics II                                                      | NP                                               | 4           | 100                        |
| Paper-IX      |          | Macroeconomics II                                                      | NP                                               | 4           | 100                        |
| Paper-X       |          | Statistical Methods for Economics                                      | NP                                               | 4           | 100                        |
| Paper-XI      | V        | Development Economics I                                                | NP                                               | 4           | 100                        |
| Paper-XII     |          | Mathematical Methods of Economics II                                   | NP                                               | 4           | 100                        |
| Paper-XIII    |          | History of Economics Thought/ Money and Banking/ Economy of Odisha     | NP                                               | 4           | 100                        |
| Paper-XIV     | VI       | Introductory Econometrics/ Public Economics I/Development Economics II | NP                                               | 4           | 100                        |
| Paper-XV      |          | Computational Methods in Economics /Environmental Economics            | NP                                               | 4           | 100                        |
| Paper-XVI     | VII      | Quantitative Methods                                                   | NP                                               | 4           | 100                        |
| Paper-XVII    |          | Research Methodology                                                   | NP                                               | 4           | 100                        |

|             |      |                                     |    |   |     |
|-------------|------|-------------------------------------|----|---|-----|
| Paper-XVIII |      | BASIC ECONOMIC PRINCIPLES           | NP | 4 | 100 |
| Paper-XIX   |      | Economics of Growth and Development | NP | 4 | 100 |
| Paper-XX    | VIII | Microeconomics iii                  | NP | 4 | 100 |
| Paper-XXI   |      | Macroeconomics III                  | NP | 4 | 100 |
| Paper-XXII  |      | Public economics II                 | NP | 4 | 100 |
| Paper-XXIII |      | Economics of Social Factor          | NP | 4 | 100 |

## CORE-II/CORE-III COURSE

| Course Number | Semester<br>Core-II/<br>Core-III | Course Title       | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------------------------------|--------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I/II                             | Basic Economics I  | NP                                               | 4           | 100                        |
| Paper-II      | III/IV                           | Indian Economy I   | NP                                               | 4           | 100                        |
| Paper-III     | V/VI                             | Basic Economics II | NP                                               | 4           | 100                        |
| Paper-IV      | VII                              | Indian Economy II  | NP                                               | 4           | 100                        |
| Paper-V       | VIII                             | Money and Banking  | NP                                               | 4           | 100                        |

## **CORE COURSE II/III**

### **Minor (Paper-I)**

#### **Semester I/II**

##### **Course Description**

##### **Basic Economics I**

This course is designed to expose the students to the basic principles of how the economy works at the microeconomic level with some basic concepts like markets, and consumer choice. in macroeconomics. The emphasis will be on thinking like an economist and the course will illustrate how microeconomic concepts can be applied to analyze real-life situations. This course also discusses the preliminary macroeconomic concepts associated with the determination and measurement of aggregate macroeconomic variables like savings, investment, and GDP.

##### **Course Outcomes (COs)**

1. To expose the students to the introductory micro and macro-economic concepts.
2. To explain how to think like an economist and illustrate how microeconomic concepts can be applied to analyses of real-life situations.
3. To introduce preliminary macroeconomic concepts associated with the determination and measurement of aggregate macroeconomic variables like savings, investment, and GDP.
4. To examine the circular flow of income and expenditure in a 2, 3, and 4-sector economy.

##### **Unit I: Exploring the Subject Matter of Economics, Markets and Welfare**

The Ten Principles of Economics: How people make decisions; Working of the economy as a whole; Thinking Like an Economist: The Economist as Scientist – The scientific method: Observation, Theory and more observation; Role of Assumptions; Economic Models; Why economists disagree; Graphs in Economics; The Market Forces; Markets and Competition; The Demand and Supply curves – Market vs Individual curves, Shifts in Demand and Supply Curves; Market Equilibrium and changes therein; Price Elasticity of Demand – determinants and computation; Income and Cross Elasticity of Demand; The Price Elasticity of Supply – determinants and computation; Consumer and Producer Surplus.

*LO: Upon completion of this module, students will get a basic idea about the basic underlying principles followed in economics and get a formative perspective to concepts of elasticity of demand and supply.*

##### **Unit II: Theory of Consumer Choice**

The Budget Constraint; Preferences – representing preferences with indifference curves; Properties of Indifference Curves; Two extreme examples of indifference curves; Optimization – Equilibrium; Change in equilibrium due to changes in income, changes in price; Income and Substitution Effect; Derivation of Demand Curve; Three applications – Demand for Giffengoods, Wages and Labour Supply, Interest rate and Household saving.

*LO: Upon completion of this module, the students can understand the problem of choice and decision-making by consumers and have a vivid understanding of optimization and equilibrium.*

##### **Unit III: Basic Concepts in Macroeconomics**

Macro vs. Micro Economics; Limitations of Macroeconomics; Stock and Flow variables, Equilibrium and Disequilibrium, Partial, and General Equilibrium Statics – Comparative Statics and Dynamics; National Income Concepts – GDP, GNP, NDP, and NNP at market price, factor cost, real and nominal; Disposable Personal Income.

*LO: Upon completion of this module, the students will be introduced to concepts of macroeconomic variables and the basic concept of National Income Accounting.*

## **Unit IV: Measurement of Macroeconomic Variables**

Output, Income and Expenditure Approaches; Difficulties of Estimating National Income; National Income Identities in a simple 2-sector economy and with government and foreign trade sectors; Circular Flows of Income in 2, 3 and 4-sector economies; National Income and Economic Welfare; Green Accounting.

**LO:** Upon completion of this module, the students will be familiarized with the estimation of National Income and understand the circular flow of income and expenditures in a closed and open economy.

**Text Book:**

- ✓ Gregory N Mankiw: *Principles of Economics*, 6<sup>th</sup> Edition, Cengage Learning India Private Limited, New Delhi
- ✓ Gregory N. Mankiw (2010): *Macroeconomics*, 7<sup>th</sup> edition, Cengage Learning India Private Limited, New Delhi
- ✓ Government of India (2012): *National Accounts Statistics Sources and Methods*, CSO, MOSPI

**Reference Book:**

- ✓ Karl E. Case and Ray C. Fair (2007): *Principles of Economics*, 8<sup>th</sup> Edition, Pearson Education Inc.
- ✓ Richard T. Froyen (2005): *Macroeconomics*, 2<sup>nd</sup> Edition, Pearson Education Asia, New Delhi.

## **Minor (Paper-I)**

### **Semester III/IV**

#### **Core II**

#### **Indian Economy I**

#### **Course Description**

Using appropriate analytical frameworks, this course reviews major trends in economic indicators and policy debates in India in the post-independence period, with particular emphasis on paradigm shifts and turning points. Given the rapid changes taking place in India, the reading list should be updated annually.

#### **Course Outcomes**

1. To have an understanding of the evolution of the Indian economy from pre-colonial to modern times, and its current state as a developing economy.
2. To be able to explain the relationship between population growth, human development, and economic development in India.
3. To be able to assess the national income trends in India, including sectoral composition, regional disparities, and challenges like poverty, inequality, and unemployment.
4. To gain the ability to critically analyze the role of economic planning in India's development, including the evolution from Five-Year Plans to NITI Aayog.

#### **Unit I: Basic Characteristics of Indian Economy as a Developing Economy**

Indian Economy in the Pre-British Period; The Structure and Organization of Villages and Towns; Industries and Handicrafts in Pre-British India; Colonialism; Economic Consequences of British Rule; Decline of Handicrafts and Progressive Ruralization; The Land System and Commercialization of Agriculture; Industrial Transition; Colonial Exploitation and Impacts – Underdevelopment; Colonization and Modernization; State Policies and Economic Underdevelopment; The Current State of Indian Economy

**LO:** *This module shall enable the students to gain an in-depth understanding of the pre-British Indian economy, including its structure, industries, colonial impacts, and modernization, and evaluate state policies and current economic conditions.*

## **Unit II: Population and Human Development**

Population Growth and Economic Development – size, growth and Future of Population; Causes of rapid Population Growth; Population and Economic Development; Population Policy; Demographic Issues– Sex and Age Composition of Population; Demographic Dividend; Urbanization and Migration; Human Resource Development – Indicators and importance of Human Resource Development; Education policy; Health and nutrition.

**LO:** *Upon completion of this module, students will analyze the population trends and policies in India, understand their impact on economic development, and evaluate the importance of human development (education, health) for India's future.*

## **Unit III: National Income in India: The Growth Story and Current Challenges**

Trends in national and per capita income; Changes in sectoral composition of national income; Regional disparities in Growth and Income; Savings and Investment and Economic Growth – The Linkage; Poverty – Estimation and Trends, Poverty Alleviation Programs– MGNREGA, NRLM, SJSRY; Inequality –Measures and trends in India; Unemployment– Nature, Estimates, Trends, Causes and Employment Policy.

**LO:** *Upon completion of this module, students will have an understanding of national income trends, sectoral contributions, regional inequalities, and challenges that India faces like poverty, inequality, and unemployment.*

## **Unit IV: Economic Planning in India**

Rationale, Features, Objectives, Strategies, Achievements and Assessment of Planning in India; Eleventh Five Year Plan– Objectives, Targets and Achievements; Twelfth Five Year Plan – Vision and Strategy; From Planning to NITI– Transforming India's Development Agenda.

**LO:** *Upon completion of this module, students will be able to appreciate the rationale and features of economic planning in India, its objectives and strategies, evaluate its achievements, and describe the transition to NITI Aayog.*

### **Text Book:**

- ✓ Misra, S. K. and Puri V. K. *Indian Economy — Its Development Experience.* Himalaya Publishing House, Mumbai

### **Reference Books:**

- ✓ Dutt R. and Sundharam K. P. M: *Indian Economy.* S. Chand & Company Ltd., New Delhi.
- ✓ Datt and Sundharam, Gaurav Datt and Ashwani Mahajan, S Chand: *Indian Economy, Publications, 7<sup>th</sup> Revised Edition*
- ✓ *Indian Economy Since Independence*, ed by Uma Kapila, Academic Foundation, Revised Nineteenth Edition 2008-09
- ✓ *Government of India (Current Year): Economic Survey*, Ministry of Finance, New Delhi
- ✓ Basu, K. (2008): *Oxford Companion to Economics in India*, Oxford University Press

## **Minor (Paper-III)**

### **SEMESTER V/VI**

#### **Core III**

#### **Basic Economics II**

##### **Course Description**

This course is designed to expose the students to the basic principles of how the economy works at the microeconomic level with some basic concepts like production, firms and input markets. This course also aims to introduce the students to the basic macroeconomic concepts of money, inflation, and the theories of determination of income and employment in the aggregate economy.

##### **Course Outcomes**

- ✓ *To have a clear idea about the principles that govern the economy's running at the micro and macro levels.*
- ✓ *To understand about the working of the input market.*
- ✓ *To gain clarity about dynamic concepts of Inflation, Employment, money, and income.*
- ✓ *To understand of the theories of determination of income and employment in the aggregate economy.*

##### **Unit I: The Firm and Market Structures**

Cost concepts; Production and Costs; The various measures of cost – Fixed and Variable cost, Average and Marginal cost; Cost curves and their shapes; Costs in the short run and the long run; Economies and diseconomies of scale. Firms in Competitive Markets – What is a competitive market; Profit maximization and the competitive firm's supply curve; The marginal cost curve and the firm's supply decision; Firm's short-run decision to shut down; Firm's long-run decision to exit or enter a market; The supply curve in a competitive market – short run and long run

**LO:** *Upon completion of this module, the students will have a clear understanding of the traditional theory of cost and different cost concepts, and be able to distinguish between short-run and long-run costs, and relate them to a firm's decision-making under competitive markets.*

##### **Unit II: The Input Markets**

The Demand for Labour – The production function and the marginal product of labour; Value of the marginal product of labour and demand for labour; Shifts in labour demand curve; The supply of labour – the trade-off between work and leisure; Shifts in the labour supply curve; Equilibrium in the Labour Market; Other factors of production: Land and Capital; Linkages among factors of production

**LO:** *Upon completion of this module, the students will get an insight into the analysis of demand and supply of inputs and the linkages among the factors of production.*

##### **Unit III: Money and Changes in its Value**

Evolution and Functions of Money, Quantity Theory of Money – Cash Transactions, Cash Balances and Keynesian Approaches, Value of Money and Index Number of Prices  
Inflation – Meaning, Causes, and Anti-Inflationary Measures; Classical, Keynesian, Monetarist and Modern Theories of Inflation, Inflationary Gap, Deflation- Meaning, Causes, and Anti-Deflationary Measures, Depression and Stagflation; Inflation vs. Deflation

**LO:** *Upon completion of this module, the students shall understand the evolution of money and the classical theories of money supply and be able to explain the causes of inflation and deflation in an economy and the impact and solution thereto.*

#### **Unit IV: Determination of National Income**

The Classical Approach - Say's Law, Theory of Determination of Income and Employment with and without saving and Investment; Basics of Aggregate Demand and Aggregate Supply and Consumption-Saving – Investment Functions, The Keynesian Approach – Basics of Aggregate Demand and Aggregate Supply and Consumption, Saving, Investment Functions; The Principle of Effective Demand; Income Determination in a Simple 2-Sector Model; Changes in Aggregate Demand and Income- The Simple Investment Multiplier

**LO: Upon completion of this module, the students shall get to know the classical and Keynesian theories of income and employment determination.**

#### **Text Book:**

- ✓ Gregory N Mankiw: *Principles of Economics*, 6<sup>th</sup> Edition, Cengage Learning India Private Limited, New Delhi
- ✓ Gregory N. Mankiw (2010): *Macroeconomics*, 7th edition, Cengage Learning India Private Limited, New Delhi
- ✓ Government of India (2012): *National Accounts Statistics Sources and Methods*, CSO, MOSPI

#### **Reference Book:**

- ✓ Karl E. Case and Ray C. Fair (2007): *Principles of Economics*, 8<sup>th</sup> Edition, Pearson Education Inc.
- ✓ Richard T. Froyen (2005): *Macroeconomics*, 2<sup>nd</sup> Edition, Pearson Education Asia, New Delhi.

### **Minor-IV Semester-VII (With/Without Research) Indian Economy-II**

#### **Course Description**

This course examines sector-specific policies and their impact in shaping trends in key economic indicators in India. It highlights major policy debates and evaluates the Indian empirical evidence. Given the rapid changes taking place in the country, the reading list should be updated annually.

#### **Course Outcomes**

- To analyze the current state of Indian agriculture, including production trends, factors influencing production, and policy initiatives like land reforms and the green revolution.
- To evaluate the development of Indian industries, including historical industrial policies, challenges faced by small-scale industries, and the role of labor.
- To assess the contribution of the tertiary sector to the Indian economy, and understand the concept of Human Resource Development (HRD) and its role in India's development.
- To explain India's foreign trade scenario, including trade composition, export promotion strategies, and the role of foreign capital.
- To analyze the environmental policies implemented in India and the global response to climate change, considering India's specific situation.

#### **Unit I: Agricultural Development in India**

Indian Agriculture: nature, importance, trends in agricultural production and productivity, factors determining production, land reforms, new agricultural strategies and green revolution, rural credit;

Agricultural marketing and warehousing.

**LO: Students will be able to analyze the structure, challenges, and advancements in Indian agriculture, including policies, credit, and marketing.**

## **Unit II: Industrial Development in India**

Trends in industrial output and productivity; Industrial Policies of 1948, 1956, 1977, and 1991; Industrial Licensing Policies – MRTP Act, FERA, and FEMA; Growth and problems of SSIs, Industrial sickness; Industrial finance; Industrial labor.

**LO: Students will know about industrial output and productivity trends, industrial policies, the impact of licensing policies, small-scale industries' growth, industrial finance, and labor issues in India.**

## **Unit III: Tertiary Sector, HRD, and the External Sector**

Tertiary Sector: growth and contribution of the service sector to GDP of India, share of services in employment; Human development – concept, evolution, measurement; HRD: indication, importance, education in India, Indian educational policy; Health and Nutrition. Foreign Trade: role, composition, and direction of India's foreign trade, trends of export and import in India, export promotion versus import substitution; Balance of Payments of India; India's Trade Policies; Foreign Capital – FDI, Aid and MNCs.

**LO: Students will have an understanding of the growth of India's service sector, human development strategies (education & health), and international trade dynamics (exports, imports, foreign investment)**

## **Unit IV: Indian Economy and Environment**

Environmental Policies in India: The Environment (Protection) Act 1986, The Environment (Protection) Rules 1986, The National Forest Policy 1988, Policy statement for Abatement of Pollution 1992, National Conservation Strategy and Policy Statement on Environment and Development 1992, The National Environment Appellate Authority Act 1997, National Environmental Policy 2006; Global deal with Climate Change: Introduction, Intergovernmental Panel for Climate Change (IPCC), Impact of Climate Change on India, Global Response on Climate Change, Possible Role of India.

**LO: Students will be able to analyze key environmental policies in India, the global deal on climate change, IPCC's role, climate change impacts, and global responses to India's role.**

### **Text Book:**

- ✓ Mishra, S. K. and Puri V. K. *Indian Economy — Its Development Experience*. Himalaya Publishing House, Mumbai

### **Reference Books:**

- ✓ Dutt R. and Sundharam K. P. M.: *Indian Economy*. S. Chand & Company Ltd., New Delhi.
- ✓ Datt and Sundharam, Gaurav Datt and Ashwani Mahajann: *Indian Economy*, S Chand Publications, 7<sup>th</sup> Revised Edition
- ✓ *Indian Economy Since Independence*, ed by Uma Kapila, Academic Foundation, Revised Nineteenth Edition 2008-09
- ✓ *Government of India (Current Year): Economic Survey*, Ministry of Finance, New Delhi



**3 Yr. Degree Course  
(One Major & Two Minor)  
based on NEP-2020  
EDUCATION**



(Effective from Session 2025-26)

**(Batch: 2025-2028)**



**SAMBALPUR UNIVERSITY**

**JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019**

## COURSE AT A GLANCE (NEP-UG)

SUBJECT: EDUCATION

ACADEMIC SESSION: **2025-28**

### CORE-I COURSE

| Course Number | Semester | Course Title                              | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------|-------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I        | Philosophical Foundation of Education     | P                                                | 4           | 100                        |
| Paper-II      |          | Psychological Foundation of Education     | P                                                | 4           | 100                        |
| Paper-III     | II       | Sociology of Education                    | P                                                | 4           | 100                        |
| Paper-IV      |          | Pedagogical Perspectives in Education     | P                                                | 4           | 100                        |
| Paper-V       | III      | Assessment & Evaluation in Education      | P                                                | 4           | 100                        |
| Paper-VI      |          | Historical Bases of Indian Education      | P                                                | 4           | 100                        |
| Paper-VII     |          | Educational Thinkers of Modern India      | P                                                | 4           | 100                        |
| Paper-VIII    | IV       | Early Childhood Care & Education          | P                                                | 4           | 100                        |
| Paper-IX      |          | Trends ,Policies & Practices in Education | P                                                | 4           | 100                        |
| Paper-X       |          | ITC in Education                          | P                                                | 4           | 100                        |
| Paper-XI      | V        | Pedagogy of Odia                          | P                                                | 4           | 100                        |
| Paper-XII     |          | Pedagogy of English                       | P                                                | 4           | 100                        |
| Paper-XIII    |          | Pedagogy of Social Science                | P                                                | 4           | 100                        |
| Paper-XIV     | VI       | Knowledge and Curriculum                  | P                                                | 4           | 100                        |
| Paper-XV      |          | COMMUNITY ENGAGEMENT SERVICES             | P                                                | 4           | 100                        |
| Paper-XVI     | VII      | EDUCATIONAL MANAGEMENT AND LEADERSHIP     | P                                                | 4           | 100                        |
| Paper-XVII    |          | FUNDAMENTAL OF EDRL RESEARCH              | P                                                | 4           | 100                        |
| Paper-XVIII   |          | STATISTICS IN EDUCATION                   | P                                                | 4           | 100                        |
| Paper-XIX     |          | GUIDEANCE AND COUNCILING IN EDUCATION     | P                                                | 4           | 100                        |

|             |      |                                         |   |   |     |
|-------------|------|-----------------------------------------|---|---|-----|
| Paper-XX    | VIII | ART AND CRAFT EDUCATION                 | P | 4 | 100 |
| Paper-XXI   |      | INCLUSIVE EDUCATION                     | P | 4 | 100 |
| Paper-XXII  |      | TEACHER EDUCATION                       | P | 4 | 100 |
| Paper-XXIII |      | COMPUTER EDUCATION IN TEACHING LEARNING | P | 4 | 100 |

## CORE-II/CORE-III COURSE

| Course Number | Semester<br>Core-II/<br>Core-III | Course Title                          | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------------------------------|---------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I/II                             | PHILOSOPHICAL FOUNDATION OF EDUCATION | P                                                | 4           | 100                        |
| Paper-II      | III/IV                           | PSYCHOLOGICAL FOUNDATION OF EDUCATION | P                                                | 4           | 100                        |
| Paper-III     | V/VI                             | SOCIOLOGY OF EDUCATION                | P                                                | 4           | 100                        |
| Paper-IV      | VII                              | PEDASOSIAL PERSPECTIVE IN EDUCATION   | P                                                | 4           | 100                        |
| Paper-V       | VIII                             | ASSESMENT AND EVOLUTION IN EDUCATION  | P                                                | 4           | 100                        |

## **CORE COURSE II/III**

### **Minor (Paper-I)**

#### **Semester-I/II**

### **Philosophical Foundations of Education**

**Course Outcomes (COs):** On completion of the course, the students will be able to:

- To understand the philosophical foundation of education as a discipline under the faculty of the Liberal Arts and Social Science.
- To understand various schools of thought, to develop ability to distinguish one from the other and critically analyze each school of thought.
- To understand the basic Indian schools of thought.
- To develop the ability to relate the philosophical foundation with educational practices.

#### **Course Contents:**

**UNIT-I: Education in Philosophical Perspective** Learning Outcomes Understand concept of education along with individual and social aims. ☐ Explain relationship between Philosophy and education. ☐ Relate the functions of philosophy in our life.

- Concept of Education, Narrower and broader concept of education.
- Concept of Lifelong Education. Individual and Social Aims of Education.
- Meaning and nature of philosophy of education. Branches of Philosophy- Metaphysics, Epistemology and Axiology, and its educational implications.
- Functions of Philosophy in relation to education.

**UNIT-II: Western Schools of Philosophy and their Educational Implications**

**Learning Outcomes** Describe the nature of schools of philosophy and its branches. ☐ Understand Western Schools of Philosophy and their Implications to the current system of education. • Idealism with reference to: Aims of Education, Curriculum, Methods of Teaching, Role of Teacher, Discipline. • Naturalism with reference to: Aims of Education, Curriculum, Methods of Teaching, Role of Teacher, Discipline • Pragmatism with reference to: Aims of Education, Curriculum, Methods of Teaching, Role of Teacher, Discipline • Existentialism with reference to: Aims of Education, Curriculum, Methods of Teaching, Role of Teacher, Discipline.

**UNIT-III: Indian Schools of Philosophy and their Educational Implications.**

**Learning Outcomes** Understand Indian Schools of Philosophy and their Implications to the current system of education. ☐ Compare and contrast Indian and Western philosophies of education. • Common Characteristics of Indian Philosophy with reference to Metaphysics, Epistemology, Axiology, Orthodox and Heterodox • Sankhya, Vedanta, Buddhism, Jainism with reference to: Philosophical doctrines, Aims of education, Curriculum, Methods of Teaching, Role of Teacher

**UNIT-IV: Contributions of Great Educational Thinkers**

**Learning Outcomes** Critically examine contributions of great thinkers to the field of education and its reflections in curriculum at school and higher education. • **Contributions of Western thinkers:** Plato and Aristotle with reference

to their philosophical orientation, aims of education, method of teaching, role of teacher. • Rousseau and John Dewey with reference to their philosophical orientation, aims of education, method of teaching, role of teacher. • Paulo Freire and Ivan Pillich with reference to their philosophical orientation, with reference to their philosophical orientation, aims of education, method of teaching, role of teacher and student.

Mode of Course Transaction: Seminar, Team Teaching, Dialogue, Peer-Teaching, Peer Group Discussion, Collaborative and Cooperative Learning, Field Trip, Concept Mapping, Lecture Method, Self-Learning. Practicum: 30 Marks (Any one of the following 4) Field visit to a seat of learning/educational institute in the locality and prepare report and submission. 5) Presentation (through PPT) of a paper in Department level seminar on any topic from the above course and submit full paper along with handout of PPT. 6) Appraisal of aims of education and curriculum proposed by one of the educational thinkers in the present sociocultural context of India and submit the report. (N.B.: The report will be evaluated by both internal and external examiners) Text Books: [?] Safaya, R.N. & Shaida, B.D. (2010). Modern Theory and Principles of Education. New Delhi: Dhanpatrai Publishing Company Pvt. Ltd. Nayak, B.K. (2018). [?] Ravi, Samuel. S. (2015). A Comprehensive Study of Education. Delhi: PHI Learning Pvt. Ltd. [?] Taneja, V.R. (2000). Educational thought and practice. New Delhi: Sterling Publishers Pvt. Limited. [?] Aggrawal, J.C. (2013). Theory and principle of education. New Delhi: Vikash Publishing House Pvt. Ltd. Suggested Books: [?] Anand, C.L. et.al. (1983). Teacher and education in emerging in Indian society, New Delhi: NCERT. Brubacher, John.S.(1969). Modern philosophies of education. New York: McGraw Hill Co. [?] Clarke, P. (2001). Teaching and learning: The Culture of pedagogy. New Delhi: Sage Publication. [?] Dash, B.N. (2011) Foundation of education, New Delhi; Kalyani Publishers. [?] Dewey, J. (1916/1977). Democracy and education. New York: MacMillan. [?] Dewey, J. (1956). The Child and the curriculum, school and society. Chicago, Illinois: University of Chicago Press. [?] Dewey, John (1997). Experience and education. New York: Touchstone. [?] Ganesh, K. &Thakkar, U.(Ed.) (2005). Culture and making of identity in India. New Delhi: Sage Publications. [?] Govt. of India (1986/'92). National policy on education. New Delhi: MHRD. [?] Krishnamurthy, J. (1953). Education and significance of life. New Delhi: B.I. Publications [?] Kumar Krishna (1996). Learning from conflict. New Delhi: Orient Longman. [?] Ministry of Education (1966). Education and national development. New Delhi: Ministry of Education, Government of India. [?] Ministry of Education, Govt. of India (2020). National education policy 2020. [?] Mishra, A. D. (nd). Mahatma Gandhi on Education. Vikas Publishing [?] Ornstein, Allan C. & Levine, Daniel, U. (1989). Foundations of education (4th Ed.). Boston: Houghton MifflinCo.

[?] Pathak, R. P. (2012). Philosophical and sociological principles of education. Delhi: Pearson. Pathak, A. (2002). Social implications of schooling. New Delhi: Rainbow Publishers. [?] Peters, R.S. (1967). The Concept of education. London: Routledge Kegan& Paul. Radhakrishnan, S. Indian philosophy Vol. I and Vol. II [?] Ross, J. S. (1981). Ground work of educational theory. Delhi: Oxford University Press Rusk, Robert R., Philosophical bases of education, London: Oxford University Press. [?] Salamatullah, (1979). Education in social context. New Delhi: NCERT. [?] Srinivas, M.N., (1986). Social changes in modern India. Bombay: Allied Publishers. [?] Wingo, G. M. (1975). Philosophies of education. New Delhi: Sterling Publisher Pvt. Limited.

## **Minor (Paper-II)**

### **Semester-III / IV**

#### **Psychological Foundations of Education (4 Credits)**

Course Outcomes (COs): On completion of the course, the students will be able to: • Understand the concept of educational psychology

• Know different methods of educational psychology to understand learners • Explain the different stages of growth and development Course Contents:

**UNIT-I: Educational Psychology in Developmental Perspective** Learning Outcome ☐ Explain concept of educational psychology and its relationship with psychology. ☐ Describe various methods to understand learners. ☐ Understand concepts of growth and development of child and adolescence, and underlined general principles of growth and development. ☐ Describe the typical characteristics of growth and development during childhood and adolescence. ☐ Explain theory of cognitive development and its educational implications. • Concept, nature, scope and relevance of educational psychology. • Methods to understand learners: Observation, Experimentation and Case Study. • Concept and difference between growth and development. Principles of growth and development. • Characteristics of development during childhood and adolescence in different areas: Physical, Cognitive, Social and Emotional.

**UNIT-II: Intelligence, Creativity and Individual difference** Learning Outcome ☐ State different forms and characteristics of individual differences and the ways of meeting the classroom issues arising out of the differences. ☐ Understand concept and nature of intelligence. ☐ Develop insight into the theories and measurement of intelligence and creativity. • Individual difference: concept, nature, factors and role of education • Intelligence: concept and nature of intelligence, concept of IQ, theories of intelligence- Two factor theories, Guildford's structure of intelligence (SI) model, Gardner's multiple theory of intelligence. • Measurement of intelligence: individual and group test, verbal, non-verbal test • Creativity: meaning, nature and stages of creative thinking, strategies for fostering creativity

**UNIT-III: Learning and Motivation** Learning Outcome ☐ Develop critical ideas on various theories of learning and processes of learning with their educational implications. ☐ Explain concept of motivation and theories of personality. • Learning: Concept, nature and factors of learning. • Learning and Maturation. Factors affecting learning. • Theories of learning and its educational implications: Classical conditioning, operant conditioning, insightful learning and constructivist approach to learning.

• Motivation: concepts, types, and techniques of motivation.

#### **UNIT-IV: Personality and Mental health**

Learning Outcome ☐ Critically examine relevance of learning about

mental health, and adjustment mechanisms. • List of characteristics of individual differences • Find out the concept of intelligence • Examine the relevance of learning about mental health and adjustment mechanism • Personality: Concept and nature of personality. Relevance of studying personality for learning. • Theories of personality: Type theory and Trait theory with implications. Assessment of personality: Subjective, objective and projective techniques. • Mental health: Concept, mental health of teacher, factors affecting mental health and role of teacher. • Adjustment mechanism: Concept and Types. Sample Question 5. What is behavior? [ 1 mark] 6. Mention any two educational implications of case study. [2 Marks] [Within 50 Words] 7. Describe the steps of creativity. [3 Marks] [Within 300 words] 8. Explain the factors affecting mental health of the learner? [8 marks] [Within 500 to 800 words] Practicum: 30 Marks (Any one of the following) 4) Administration and interpretation of any psychological test relating to intelligence, creativity, and personality and preparation of a report and submission. 5) Case Study of a problem child / a slow learner/ a disadvantaged child and preparation and submission of report. 6) Analysis of the common behavioral problems observed in the classroom. Suggesting the ways to address them, Preparation and submission of report. (N.B.: The report will be evaluated by both the Internal and External examiners.) Mode of Course Transaction: Seminar, TeamTeaching, Dialogue, Peer-Teaching, PeerGroupDiscussion, Collaborative and Cooperative Learning, Field Trip, Concept Mapping, Lecture Method, Self-Learning. Text books: ☐ Aggarwal, J.C. (2014). Essentials of Educational Psychology. New Delhi: Vikas Publishing House Pvt Ltd. ☐ Chauhan, S.S. (1978). Advanced educational psychology. New Delhi: Vikas Publishing House Pvt. Ltd. ☐ Mangal, S.K. (2002). Advanced educational psychology. New Delhi: Prentice Hall of India. ☐ Woolfolk, A. (2015). Educational psychology (9th Ed.). New Delhi: Pearson Publication Suggested books: ☐ Arnett, J. (2007). Adolescence and emerging adulthood: A cultural approach. (3rd Edn.). Upper Saddle River, N.J.: Pearson. ☐ Berk, Laura E. (2011). Child development (9th Edn.). New Delhi: Prentice Hall of India. ☐ Chaube S.P. & Chaube A. (nd). Foundations of Education, 2nd Edition Vikas Publishing

☐ Flavell, J.H. (1963). The developmental psychology of Jean Piaget. New York: Van No strand ☐ Hurlock, E. B. (1980). Developmental psychology: All span approach. New York: McGraw Hill Book. ☐ Hurlock, E.B. (1980). Child development (6th Edn.). Tokyo: McGraw-Hill, Kogakusha Ltd. ☐ Hurlock, E.B. (2007). Child growth and development. New York: McGraw Hill. ☐ Kail, Robert V (2011). Children and their development (6th Edition). Englewood Cliffs, N.J: Prentice Hall. ☐ Stephens, J. M.; Evans, E. D. (1973). Development and classroom learning: An introduction to educational psychology. New York: Holt, Rinehart and Winston

## **Minor (Paper-III)**

### **Semester- V/VI**

## **Sociology of Education**

**Course Outcomes (COs):** On completion of the course, the students will be able to:

- Know the concept of educational sociology with its nature, scope and importance.
- Understand the social process
- Analysis the functions of different agencies of education for socialization of children.
- Describe the role of different agencies of education
- Find out the linkage between education and modernization
- Understand the concept of equality and equality

Course Contents:

### **UNIT I: Concept and approaches to sociology of education**

Learning Outcomes ☐ Understand concept of educational sociology along with its nature, scope and importance. ☐ Explain relationship between Education and Sociology.

- Concept, nature, scope and importance of Sociology of education.
  - Relationship between education and sociology.
  - Understanding the evolution of sociology of education as a discipline.
  - Sociological theories; functionalism, conflict theory, interactionism and post modernism.
  - Thought of Antonio Gramsci and Pierre Bourdieu
- UNIT -2: Education and social system Learning Outcomes ☐ Relate the functions of different agencies of education for socialization of children. ☐ Describe the different agencies of education and their functions

- Agencies of education (Family, School, Society, Mass media and State) – it's Importance and functions
  - Understanding education as a factor of social stratification and social mobility.
  - Socialization: concept and theories of socialization (theory of G.H.Mead, Cooley's theory of the looking- glass self, Durkheim's theory of collective representation);
- UNIT-3: Education, Social change and Modernization Learning Outcomes ☐ Describe the role of education in modernization and globalization

- Concept, Factors and theories of Social Change, Education as an instrument of social change and social control.
  - Modernization; Concept and attributes, Education for accelerating the process of modernization.
  - Concept of globalization and its impact on education.
- Unit-4: Social group and their educational implications Learning Outcomes Describe the function of education to ensure equality and equity ☐ Explain the process of equalization of educational opportunity and the steps taken towards its attainment

- Concept of equality, equity and inclusion: its educational implication
- Educational Opportunity and Participation in Education of Scheduled Castes, Scheduled Tribes, Women, Minority and CWSN.
- Group dynamic- cohesion and conflict; conflict resolution

- Classroom climate; Understanding interpersonal relationship of classrooms technique (socio-metric and guess who technique) and its educational effects.
- Social responsibility of Higher education. Practicum: 30 Marks (Any one of the following)

5. Field visit to Study a social unit (School/Village/Slum) in the locality and prepare a report
6. Organizing some community activities, social intervention, and awareness camp in the locality for participation of disadvantaged groups in education.
7. Presentation (through PPT) of a paper in Department level seminar on any topic from the above course and submit full paper along with handout of PPT.

8. Make a compendium of news articles published in social media and print media about the education of disadvantage groups. N.B.: The report will be evaluated by both internal and external examiners) Mode of Course Transaction: Seminar, Team Teaching, Dialogue, Peer-Teaching, Peer Group Discussion, Collaborative and Cooperative Learning, Field Trip, Concept Mapping, Lecture Method, Self-Learning. Text Books

- Pathak, R. P. (2012). Philosophical and sociological principles of education. Delhi: Pearson.
- Shukla, S. and Kumar, K. (Eds.) (1985). Sociological Perspectives in Education: A Reader. Delhi: Chanakya Publications, 1985.
- Bhattacharya, S. (2006). Sociological Foundation of Education. New Delhi: Atlantic
- Anand, C.L. et.al. (Ed.) (1983). Teacher and Education in Emerging in Indian Society. New Delhi: NCERT.
- Deshpande, S. (2004). Contemporary India: A Sociological View. New Delhi: Penguin
- Gore, M. S., Desai, I.P. and Chitnis, S. (Eds.). (1967). The Sociology of Education in India. New Delhi: National Council of Educational Research and Training.
- Illich, I. (1996). Deschooling Society. Marion Boyers, London.
- Kumar, K. and Oosterheld, J. (Eds.) (1995). Education and Social Change in South Asia. New Delhi: Orient Longman.
- Mathur, S. S. (2000). A sociological Approach to Indian Education. Agra: Vinod Pustak Mandir

**Suggested books:**

- Ravi, Samuel.S.(2015). A Comprehensive Study of Education. Delhi: PHI Learning Pvt. Ltd.
- Aggrawal, J.C.(2013). Theory and principle of education. New Delhi: Vikash Publishing House Pvt Ltd.
- Tilak,jandhyal B.G(2003) education,society and development. New delhi: APH publishing corporation for NUEPA.
- Safaya, R.N. & Shaيدا, B.D. (2010), Modern theory and principles of education. New Delhi: Dhanpati Publising Company Pvt. Ltd.
- Ganesh, Kamala & Thakkar, Usha (Ed.) (2005). Culture and making of identity in India. New Delhi: Sage Publications.
- Pathak, Avijit (2002). Social implications of schooling. New Delhi: Rainbow Publishers.
- Clarke, P. (2001). Teaching and learning: The Culture of pedagogy. New Delhi: Sage Publication.
- Taneja, V.R. (2000). Educational thought and practice, New Delhi: Sterling Publishers Pvt. Limited.
- Saraswati, T.S. (Ed.) (1999). Culture, socialization and human development. Theory, research and applications in India. New Delhi: Sage Publication.
- Dewey, John (1997). Experience and education. New York: Touchstone.
- Ornstein, Allan C. & Levine, Daniel U. (1989). Foundations of education (4th Edn.). Boston: Houghton Mifflin Co.
- Anand, C.L. et.al. (1983). Teacher and education in emerging in Indian society, New Delhi: NCERT.
- Salamatullah, (1979). Education in social context. New Delhi: NCERT.
- Dewey, John (1916/1977). Democracy and education. New York: MacMillan.
- Govt. of India (1986/'92). National policy on education. New Delhi: MHRD.
- Ministry of Education (1966). Education and national development. New Delhi: Ministry of Education, Government of India.
- Delor, J. (1996). Learning: The Treasure Within - Report to UNESCO of the International Commission. Paris: UNESCO.

Coser, L.A. (1996). Masters of Sociological Thoughts Ideas in Historical and Social Context. Jaipur: Rawat Pub.

**Minor (Paper-IV)**  
**(With/Without Research)**

**Semester- VII**

**Pedagogical Perspectives in Education**

**Course Outcomes (COs):** On completion of the course, the students will be able to: • Understand the concept of pedagogy. • Explain different teaching Strategies. • Find out the relationship between teaching and learning.

• Enlist different approaches and methods of teaching. • Know the core teaching skills. • Prepare lesson plans following different designs. Course Contents:

**UNIT-I** Concept of Teaching and Learning Outcomes ☐ Explain the concept of pedagogy ☐ Explain different teaching task with example ☐ Prepare a lesson plan following different designs • Meaning and definition of teaching and learning, Relationship between teaching and learning • Variables involved in teaching task: independent, dependent and intervening • Phases of teaching: Pre-active, inter- active and post- active • Levels of teaching: memory, understanding and reflective • Lesson plan design- The Herbartian steps, 5 E and ICON design model

**UNIT II** - Theories of Teaching Learning Outcomes ☐ Differentiate pedagogy from other allied concepts ☐ Establish relationship between teaching and learning • Meaning and nature of teaching theory • Types of teaching theories: • Formal theories of teaching- communication theory of teaching • Descriptive theories of teaching– Gagne’s hierarchical theory of instruction and • Bruner’s cognitive theory of instruction • Normative theories of teaching - Mitra’s psychological theory of teaching and • Clarke’s general theory of teaching

**UNIT-III** Principles and maxims of teaching • General principles of teaching • Psychological principles of teaching • Maxims of teaching • Core teaching skills: Introducing the lesson, explaining, illustrating with examples, • stimulus variation, and reinforcement, questioning, probing questions, closure.

**UNIT IV** Approaches and methods of Teaching Learning Outcomes ☐ List out different approaches and methods of teaching • Concept of approach, method, strategy and techniques • Methods of teaching: inductive-deductive, analytic- synthetic, problem solving and • project • Shift in focus from teaching to learning- constructivist approach to learning Practicum: 30 Marks Preparation of rating scale/ checklist /observation schedule to evaluate classroom Teaching and reporting. NB: It will be evaluated by both the internal and external examiners. Mode of Course Transaction:

Seminar, Team Teaching, Dialogue, Peer-Teaching, Peer Group Discussion, Collaborative and Cooperative Learning, Field Trip, Concept Mapping, Lecture Method, Self-Learning.

**Text Books** ☐ Kochar, S.K. (2011). *Methods and Techniques of teaching*. Sterling Publisher Pvt. Ltd., New Delhi ☐ Chauhan, S.S. (1995). *Innovations of teaching learning process*. Vikash Publishing House, New Delhi ☐ Sharma, R.A. (1986). *Technology of Teaching*. International Publishing House, Meerut. **Suggested Books** ☐ Aggarwal, J.C. (1995). *Essentials of Educational Technology*. Vikash PublishingHouse, New Delhi ☐ Walia, J.S. (2013). *Educational Technology*. Jalandhar, Punjab: Ahim Publications. ☐ Mangal, S.K. and Mangal, U.(2010) *Essentials of Educational Technology*, NewDelhi, PHI Learning Pvt. Limited

☐ *Nageswar Rao, S., Sreedhar, P. & Rao, B. (2007). Methods and techniques of teaching, Sonali Publications, New Delhi* ☐ *Oliver, R.A. (1963) Effective teaching, JM Dent & Sons* Pathak, R.P. & Chaudhary, J. (2012) *Educational Technology, Pearson, New Delhi* ☐ *Ryburn, W.M.(1955) Principles of Teaching, Geoffrey Cembidge, OUP* ☐ *Sampath, K, Pannir Salvam, A., & Santhanam, S.(1981) Introduction to Educational Technology, Sterling Publisher, New Delhi* Minor (Paper- V)

**Semester- VIII Assessment and Evaluation in Education Course Outcome (COs):** On completion of this course, the students will be able to: • Understand the meaning of assessment and evaluation • Know different types of evaluation • Explain the scales of measurement • State the taxonomy of instructional learning objectives • Describe the characteristics of Good test • Analyze the principles of construction of tests • **CO7: Prepare a list of non- standardized** **Course Content:**

**UNIT 1: Assessment and Evaluation in Education Learning Outcomes** ☐ Understand the concept of measurement, evaluation and assessment ☐ Gain knowledge about the nature, purpose and types of educational assessment and evaluation. ☐ Understand different scales of measurement –nominal, ordinal, interval and ratio • Understanding the meaning and purpose of test, measurement, assessment and evaluation • Scales of measurement- nominal, ordinal, interval and ratio • Types of test- teacher made and standardized • Approaches to evaluation- placement, formative, diagnostic and summative • Types of evaluation- norm referenced and criterion referenced • Concept and nature of continuous and compressive evaluation **UNIT 2: Instructional Learning Objectives Learning Outcomes** ☐ Explain the importance of instructional objectives for learning and its processes for enhancing the quality of learning and teaching • Taxonomy of instructional Learning Objectives with special reference to cognitive domain • Criteria of selecting appropriate Learning Objectives, and stating of general and specific instructional Learning Objectives • Relationship of evaluation procedure with Learning Objectives • Difference between objective based objective type test and objective based essay type test **UNIT 3: Tools and Techniques of Assessment and construction of Test Learning Outcomes** ☐ Develop and use different types of tools and techniques for continuous and comprehensive assessment of learning in the school situation ☐ Describe the characteristic of a good test. ☐ Illustrate the principles of test construction in education. • Steps of test construction: planning, preparing, trying out and evaluation • Principles of construction of objective type test items- matching, multiple choice, completion and true – false • Principles of construction of essay type test • Non- standardized tools: Observation schedule, interview schedule, rating scale, check list, portfolio and rubrics. **UNIT 4: Characteristics of a good Test Learning Outcomes** ☐ Analyze and interpret results of the assessment using standard scores. • Validity-concept, types and methods of validation • Reliability- concept and methods of estimating reliability • Objectivity- concept and methods of estimating objectivity • Usability- concept and factors ensuring usability **Practical Construction of Unit test on a school subject based on blueprint and reporting.** NB: It will be evaluated by both Internal and External examiners.

#### **Text Books**

☐ *Cecil, R. Reynold; Ronalds, B. Living Sone; Victor willium, Arbind, K. Jha; Pearson Education, Second Edition 2017* ☐ *Mohan Radha, Measurement, Evaluation and Assessment in Education, PHI Learning Pvt. Ltd. Suggested Books:* ☐ *Aiken, L.R, Tests and Examinations - Measuring Abilities and Performance, Willey, New York, 1998.* ☐ *Airasian, P. Classroom Assessment, Mcraw Hill, New York, 1995.* ☐ *Anatasi, A & Urbina, S., Psychological Testing, Prentice Hall, Englewood Cliffs, 1997.* ☐ *Banks, S. R Classroom Assessment: Issues and Practices, Pearson Allyn & Bacon, Boston, 2005.* ☐ *Cohen, R. J., Swerdlik, M.E. & Philips, S. M., Psychological testing and Assessment, An Introduction to the Tests and measurement, Mayfield Publishing Co. California, 1996.* ☐ *Cronbech L. J., Essentials of Psychological Testing, Harper Collins, New York, 1990.* ☐ *Ebel, R. L. & Frisbie, D. A. Essentials of Educational measurement, Practice Hall of India, Pvt. Ltd., New Delhi, 1991.* ☐ *Grounlund, N. E. Assessment of student Achievement. Allyn & Bacon, Boston, 2003.* ☐ *Gregory, R.J. Psychological testing: History, Principles and Applications, Allyn & Bacon, Boston 1992.* ☐ *10. Harper, A. E., Jr. & Harper, E. S., Preparing Objective Examinations: A Handbook for Teachers,*

*Students and Examiners, Prentice Hall of India Pvt. Ltd., New Delhi. 1992. □ 11. Hopkins, K. D. Educational and Psychological Measurement and Evaluation, Allyn & Bacon, Boston, 1998. □ 12. Kaplan, R M. & Saccuz*

**Minor (Paper-V)**  
**(With/Without Research)**  
**Semester- VIII**  
**Assessment and Evolution of Education**

**Course Outcome (COs):**

On completion of this course, the students will be able to:

- Understand the meaning of assessment and evaluation
- Know different types of evaluation
- Explain the scales of measurement
- State the taxonomy of instructional learning objectives
- Describe the characteristics of Good test
- Analyze the principles of construction of tests
- **CO7:** Prepare a list of non- standardized

**Course Content:**

**UNIT 1: Assessment and Evaluation in Education**

**Learning Outcomes**

- *Understand the concept of measurement, evaluation and assessment*
- *Gain knowledge about the nature, purpose and types of educational assessment and evaluation.*
- *Understand different scales of measurement –nominal, ordinal, interval and ratio*
- Understanding the meaning and purpose of test, measurement, assessment and evaluation
- Scales of measurement- nominal, ordinal, interval and ratio
- Types of test- teacher made and standardized
- Approaches to evaluation- placement, formative, diagnostic and summative
- Types of evaluation- norm referenced and criterion referenced
- Concept and nature of continuous and compressive evaluation

**UNIT2: Instructional Learning Objectives**

**Learning Outcomes**

- *Explain the importance of instructional objectives for learning and its processes for enhancing the quality of learning and teaching*

- Taxonomy of instructional Learning Objectives with special reference to cognitive domain
- Criteria of selecting appropriate Learning Objectives, and stating of general and specific instructional Learning Objectives
- Relationship of evaluation procedure with Learning Objectives
- Difference between objective based objective type test and objective based essay type test

### **UNIT 3: Tools and Techniques of Assessment and construction of Test**

#### **Learning Outcomes**

- *Develop and use different types of tools and techniques for continuous and comprehensive assessment of learning in the school situation*
- *Describe the characteristic of a good test.*
- *Illustrate the principles of test construction in education.*
- Steps of test construction: planning, preparing, trying out and evaluation
- Principles of construction of objective type test items- matching, multiple choice, completion and true – false • Principles of construction of essay type test
- Non- standardized tools: Observation schedule, interview schedule, rating scale, check list, portfolio and rubrics.

### **UNIT 4: Characteristics of a good**

#### **Test Learning Outcomes**

- *Analyze and interpret results of the assessment using standard scores.*
- Validity-concept, types and methods of validation
- Reliability- concept and methods of estimating reliability
- Objectivity- concept and methods of estimating objectivity
- Usability- concept and factors ensuring usability

#### **Practical**

Construction of Unit test on a school subject based on blueprint and reporting.

*NB: It will be evaluated by both Internal and External examiners.*

#### **Text Books**

- *Cecil, R. Reynold; Ronalds, B. Living Sone; Victor willium, Arbind, K. Jha; Pearson Education, Second Edition 2017*
- *Mohan Radha, Measurement, Evaluation and Assessment in Education, PHI Learning Pvt. Ltd.*

#### **Suggested Books:**

- *Aliken, L.R, Tests and Examinations - Measuring Abilities and Performance, Willey, New York, 1998.*
- *Airasian, P. Classroom Assessment, Mcraw Hill, New York, 1995.*
- *Anatasi, A & Urbina, S., Psychological Testing, Prentice Hall, Englewood Cliffs, 1997.*
- *Banks, S. R Classroom Assessment: Issues and Practices, Pearson Allyn & Bacon, Boston, 2005.*

- Cohen, R. J., Swerdlik, M.E. & Philips, S. M., *Psychological testing and Assessment, An Introduction to the Tests and measurement*, Mayfield Publishing Co. California, 1996.
- Cronbach L. J., *Essentials of Psychological Testing*, Harper Collins, New York, 1990.
- Ebel, R. L. & Frisbie, D. A. *Essentials of Educational measurement*, Practice Hall of India, Pvt. Ltd., New Delhi, 1991.
- Grounlund, N. E. *Assessment of student Achievement*. Allyn & Bacon, Boston, 2003.
- Gregory, R.J. *Psychological testing: History, Principles and Applications*, Allyn & Bacon, Boston 1992.
- 10. Harper, A. E., Jr. & Harper, E. S., *Preparing Objective Examinations: A Handbook for Teachers, Students and Examiners*, Prentice Hall of India Pvt. Ltd., New Delhi. 1992.
- 11. Hopkins, K. D. *Educational and Psychological Measurement and Evaluation*, Allyn & Bacon, Boston, 1998.
- 12. Kaplan, R M. & Saccuzzo. D. P., *Psychological Testing Principles Applications & Issues*, Wordsworth, California, 2000.

**3 Yr. Degree Course  
(Minor)  
based on NEP-2020  
HISTORY**



**(Effective from Session 2025-26)  
(Batch: 2025-2028)**



**SAMBALPUR UNIVERSITY**  
**JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019**

## COURSE AT A GLANCE (NEP-UG)

SUBJECT: HISTORY

ACADEMIC SESSION: **2025-28**

### CORE-I COURSE

| Course Number | Semester | Course Title                                                        | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------|---------------------------------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I        | HISTORY OF INDIA ( FROM VEDIC AGE)                                  |                                                  | 4           | 100                        |
| Paper-II      |          | SOCIAL FORMATION AND CULTURAL PATTERN OF A.W.                       |                                                  | 4           | 100                        |
| Paper-III     | II       | HISTORY OF INDIA - II (600 B.C.E- 750 C.E.)                         |                                                  | 4           | 100                        |
| Paper-IV      |          | SOCIAL FORMATION AND CULTURAL F. OF THE M. WORLD                    |                                                  | 4           | 100                        |
| Paper-V       | III      | HISTORY OF INDIA -II (750-1206)                                     |                                                  | 4           | 100                        |
| Paper-VI      |          | RISE OF MODERN WEST - I                                             |                                                  | 4           | 100                        |
| Paper-VII     |          | HISTORY OF INDIA (1206-1526)                                        |                                                  | 4           | 100                        |
| Paper-VIII    | IV       | RISE OF MODERN WEST II                                              |                                                  | 4           | 100                        |
| Paper-IX      |          | HISTORY OF INDIA (1526-1750)                                        |                                                  | 4           | 100                        |
| Paper-X       |          | HISTORICAL THEORIES AND METHODS                                     |                                                  | 4           | 100                        |
| Paper-XI      | V        | HISTORY OF MODERN EUROPE (1780-1880)                                |                                                  | 4           | 100                        |
| Paper-XII     |          | HISTORY OF INDIA (C.1750-1857)                                      |                                                  | 4           | 100                        |
| Paper-XIII    |          | HISTORY OF INDIA ( 1857-1950)                                       |                                                  | 4           | 100                        |
| Paper-XIV     | VI       | HISTORY AND CULTURE OF ODISHA -I                                    |                                                  | 4           | 100                        |
| Paper-XV      |          | HISTORY OF ORISSA : MAKING OF A REGION                              |                                                  | 4           | 100                        |
| Paper-XVI     | VII      | HISTORY OF MODERN EUROPE(C.1880-1939)                               |                                                  | 4           | 100                        |
| Paper-XVII    |          | HISTORY OF MODERN CHINA (18 <sup>th</sup> - 20 <sup>th</sup> cent.) |                                                  | 4           | 100                        |
| Paper-XVIII   |          | EVOLUTION OF MODERN POLITICAL THOUGHTS IN INDIA                     |                                                  | 4           | 100                        |

|             |      |                                            |  |   |     |
|-------------|------|--------------------------------------------|--|---|-----|
| Paper-XIX   |      | BASIC PRINCIPLES AND METHODS OF ARCHEOLOGY |  | 4 | 100 |
| Paper-XX    | VIII | ART AND ARCH. IN INDIA ( UPTO- MEDIVAL)    |  | 4 | 100 |
| Paper-XXI   |      | A SHORT HISTORY OF CONTEMPERY CULTURE      |  | 4 | 100 |
| Paper-XXII  |      | TRIBES OF ODISHA THROUGH AGES              |  | 4 | 100 |
| Paper-XXIII |      | READING HISTORICAL EASSY AND WRITINGS      |  | 4 | 100 |

### CORE-II/CORE-III COURSE

| Course Number | Semester<br><br>Core-II/<br>Core-III | Course Title                           | Type of Paper<br><br>P-Practical<br><br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|--------------------------------------|----------------------------------------|----------------------------------------------------------|-------------|----------------------------|
| Paper-I       | I/II                                 | HISTORY OF INDIA-600BC- 750 BC         |                                                          | 4           | 100                        |
| Paper-II      | III/IV                               | HISTORY OF INDIA (C.1750-1857)         |                                                          | 4           | 100                        |
| Paper-III     | V/VI                                 | HISTORY OF INDIA (C.1857-1950)         |                                                          | 4           | 100                        |
| Paper-IV      | VII                                  | HISTORY OF ORISSA-I MAKING OF REGION   |                                                          | 4           | 100                        |
| Paper-V       | VIII                                 | HISTORY OF MODERN EUROPE( C.1880-1939) |                                                          | 4           | 100                        |

## **CORE COURSE II/ III**

### **Minor (Paper-I) SEMESTER- I/II**

#### **History of India-II: From State formation to early medieval (c.600BCE- c.750CE)**

##### **Course Objectives**

- Understand the process of state formation and 2<sup>nd</sup> urbanism in the period of Buddha
- Analyse the relation of socio-economic changes in early historical period and rise of heterodoxy religions such as Buddhism, Jainism, Ajivakas, Lokayat
- To make students appreciate the emergence of Asokan empire and Critically understand socio-economic and political changes ushered by them
- Understand the emergence of state system in the Deccan and Odisha in the post Mauryan period
- Understand the expanding cultural arc of India by analysing the influence of India in Southeast Asia
- Make students appreciate the changes and excellences in various spheres in the Gupta period
- Understand the changes and continuities between ancient India and the beginning of early medieval, especially the beginning of Samanta system

##### **Course Outcomes**

- Students will be able to understand the linkages between social, political, economic and cultural processes of early Historical Development
  - They will be able to appreciate the context and the structure of the Mauryan empire and the policy of Asoka in a multicultural past of India
  - Able to identify various Indo Greek and Kushana Coins
  - Students will be able to understand the nature of Puranic religion and how Puranic-agamic religion created a sacred geography of India **Unit-I: Economy and Society (circa 600 BCE to circa CE 300):**
1. Urban growth: Material conditions such as agricultural expansion, Janapada nivesa, Sixteen Mahajanapada, Urban centres: Trade & Commerce, Organisation of Production (Srenis), Trade Routes
  2. Social stratification: Class, Varna, Jati, Gender
  3. Buddhism and Jainism: Material milieu of Heterodoxies , Social Significance, Buddhist Sects,, Major Principles of Jainism,

##### **Unit-II: Changing Political Formations (circa 300 BCE to circa CE 300):**

1. The Mauryan Empire: Asoka's Policy of Dhamma, Reading Asokan inscriptions, Administration, economy, Decline
2. Post-Mauryan Polities: Kushanas, and Satavahanas and Sangam in deep South

3. Indic Cultural Arc: India's contact with China, Central Asia and Southeast Asia; Silk route and expansion of Buddhism

### **Unit-III: The Guptas:**

1. Political Developments: Expansion, Fragmentation and Huna Invasion from Samudra Gupta to Skanda Gupta
2. Literary and Scientific Developments during the Guptas; education in Nalanda
3. Development of Puranic Religions: Temples, Tirthas, Hindu pantheon

### **Unit-IV: Towards Early Medieval India [circa CE fourth century to CE 750]:**

1. Agrarian Expansion, Land Grants, Graded Land Rights and
2. Peasantry.
3. Varna, Proliferation of Jatis: changing norms of marriage and property.
4. Post- Gupta Polities - Pallavas, Chalukyas, and Vardhanas

### **Suggested Text Books:**

- ✓ Upinder Singh,. *A History of Ancient and Early Medieval India: From the Stone Age, Delhi, Pearson, 2008. to the 12th Century. Delhi: Pearson Longman. (More relevant parts are Chapters 6, 7 and 8) (Also available in Hindi)*
- ✓ D. D. Kosambi, *An Introduction to the Study of Indian History*, 1975.
- ✓ Romila Thapar,. (2012). *Asoka and the Decline of the Mauryas. Delhi: Oxford University Press. PP. 119-227*
- ✓ Romila Thapar,. *The Mauryas Revisited, Calcutta, 1986.*
- ✓ Allchin, F. R. (et al.)(1995). *The Archaeology of Early Historic South Asia: The Emergence of Cities and States. Cambridge: Cambridge University Press. Chapter 6 (pp.73-98) & Chapter 10 (pp. 185- 221).*
- ✓ A. L. Basham, *Wonder That Was India*, Rupa.
- ✓ Aswini. Agarwal: *The Guptas*, Delhi
- ✓ H.P.Ray, *The Winds of Change*, Delhi, OUP. 1994
- ✓ R.S. Sharma, *Indian Feudalism*, Delhi, Macmillan, various edition
- ✓ , B. D. Chattopadhyaya (1994). *The Making of Early Medieval India*, Delhi: Oxford University Press. (Introduction, pp. 1-37.)
- ✓ *Age of Imperial Unity*, Bharatiya Vidya Bhawan Series, Vol 2.
- ✓ Suvira Jaiswal,. (1998). *Caste: Origin, Function and Dimensions of Change*, Delhi: Manohar. (pp.1-131.)
- ✓ R. S Sharma,. (1990). *Sudras in Ancient India: A Social History of the Lower Order Down to circa. A. D. 600.* Delhi: Motilal Banarsidas. (pp. 90-254)
- ✓ A.S Altekar, *Eeducation in Ancient India*, Delhi

### **Internet resources**

- ✓ Society and economy under the Mauryas by Ranabir Chakravarti <https://www.youtube.com/watch?v=0PZxqlmoXkA&app=desktop> □ Kushana Coins: Arti Gupta. <https://www.youtube.com/watch?v=iR4Y4tlUPbw> □ Science and Technology in the Gupta period. <https://www.youtube.com/watch?v=NFOQt9TjNLM>
- ✓ Nalanda University in BBC <https://www.youtube.com/watch?v=O67m2k70JLA>
- ✓ The Silk Road: Khan Academy <https://www.khanacademy.org/humanities/world-history/ancientmedieval/silk-road/v/early-silk-road>
- ✓ Sangam Age (CEC)  
<https://www.youtube.com/watch?v=HkPxVkJ7TtU&list=PLNsppmbLKJ8KB9BAenzBGCEpD2KEaMqiY&index=119>

### Activities

- ✓ Group Discussion on the similarities and difference between Vedic Religion and Puranic Religion
- ✓ Visit [www.sacredtexts.com](http://www.sacredtexts.com) and read Agganna Sutta. Prepare a report on the origin and nature of state as given in Aganna Sutta
- ✓ Identify different Buddhist sites along the Silk Route up to China from Internet

## **Minor (Paper-II)**

### **SEMESTER-III/IV**

## **HISTORY OF INDIA (c. 1750 - 1857)**

### **Course Objectives:**

- Students of history will learn how to raise regional powers in India after the downfall of the Mughal Empire and in the course of time how to rise of the Company's absolute power in India.
- They can understand about the colonial nature of state during 200 years rule of the British power in this land.
- They can gather knowledge about how the Indian society, politics, religion and economy had changed during the Company's rule in India.
- They will understand how the company's economic exploitation made Indian revolutionary against the British rule.
- That ultimately paved the background of the Great Revolt of 1857.

### **Course Outcomes**

- Appreciate the relation between capitalism and colonialism in the context of a colonial country like India
- Understand the domestic political economic and foreign policy that operated from the standpoint of the British Imperialism
- Analyse the discourses of Development by the Raj and the incidental benefits of such development on national consciousness
- Critically examines the coercive and hegemonic basis of the Raj
- Students will be able to develop team to discuss on the nature of 1857 Revolt

### **Unit-I: Expansion and Consolidation of Colonial Power:**

1. Foreign Trade and Early forms of Economic Exploitations in Bengal
2. Dynamics of Expansion, with special reference to Bengal, Mysore and Odisha
3. Expanding frontiers: Foreign Policy of British India

### **Unit-II: Colonial State and Ideology:**

1. Arms of the Colonial state: army, Police, Law
2. Imperial Ideology: Orientalism and Utilitarianism
3. Education: Indigenous and Modern.

### **Unit-III: Economy and Society:**

1. Land revenue systems- Permanent, Ryotwari and Mahalwari.
2. Commercialization of Agriculture- Consequences
3. Drain of Wealth- Causes and Consequences

#### 4. Growth of Modern Industry

#### **Unit-IV: Popular Resistance:**

1. Santhal Uprising (1856-57)
2. Indigo Rebellion (1860)
3. Movement of 1857- Causes and Consequences

#### **Unit I & II:**

This unit will discuss the structure and apparatus of governability by the Imperial British Power. The unit also looks at the way the EEC rule brought about fundamental transformation in peasants relation with the land and how it brought about the notion of individualism and eminent domain in then sphere of property and natural resources. It deals with consolidation of Colonial state through law, judiciary, army, police. The unit also deals with the emergence of cartographic British India with emphasis on extending India's natural frontier which led to war with Afghanistan and frontier extension in the north-eastern India.

#### **Unit III:**

This unit engages with the issue of disruption and change that British policies brought about in India's economy. Students will be acquainted with debates regarding the linkage between British policy, and famine, deindustrialisation debate and changes in Indian society brought about by the colonial rule.

#### **Unit IV:**

the fundamental changes brought about by colonial policies dispossessed many Indians. Many sections of India rose in protest against the British rule. These revolts vary from restoration to millenarianism. The unit discusses forms and nature of these protests.

#### **Suggested Text Books:**

- ✓ Dharma Kumar and Tapan Raychaudhuri, (ed.), *The Cambridge Economic History of India, Vol. II.*
- ✓ Bipan Chandra, K.N. Panikkar, Mridula Mukherjee, Sucheta Mahajan and Aditya Mukherjee, *India's Struggle for Independence*, Delhi,
- ✓ Sumit Sarkar, *Modern India (1885-1947)*, Delhi, Macmillan, various edition
- ✓ ,Isita Banerjee Dubey, *Modern India*, Delhi, Cambridge University Press, 2019
- ✓ . Bandyopadhyay, (2017). *From Plassey to Partition and After: A History of Modern India*, New Delhi: Orient Blackswan, 2nd edition (Chapter 7, "Many Voices of a Nation").
- ✓ Metcalfe, Barbara D and Thomas R. (2002). *A Concise History of India*. Cambridge: Cambridge University Press,

#### **Reference Reading:**

- ✓ P.J. Marshall *The New Cambridge History of India- Bengal The British Bridgehead*, Cambridge, Cambridge University Press, 2008.
- ✓ R. Vlyanovsky, *Agrarian India between the World Wars*.
- ✓ G.Kaushal, *Economic History of India, 1757-1956*

✓ **Minor (Paper-III)**

**SEMESTER-V/VI**

**History of India (c. 1857 - 1950)**

**Course Objectives:**

- Students can acquire vast knowledge on local rebellion and movements like the Indigo rebellion, the Deccan Riots, the growth of the new middle class; the age of associations, the Aligarh movement, the Arya and the Prarthana Samaj aftermath of 1857.
- They will learn the real historiography of Indian Nationalism; Birth of Indian National Congress, The Moderates and the Extremists, Partition of Bengal, the Swadeshi movement in Bengal in 1905.
- They can acquire knowledge how to rise of Gandhi's power in Indian politics and his activities towards the freedom like, Rowlatt Satyagraha, Khilafat and Non-cooperation movement, The Swarajya party, Poona Pact, Civil Disobedience Movement, Quit India Movement.
- They also learn how to raise communal politics and opposition politics on the eve of the Freedom movement in India and aftermath of partition in India
- The paper deals with the making of independence and Constitution making in search of an equalitarian democratic society

**Course Outcome**

- After successful completion of the course, the students will be able to: Identify how different regional, religious, linguistic and gender identities developed in the late 19th and early 20th centuries.
- Outline the social and economic facets of colonial India and their influence on the national movement.
- Explain the various trends of anti-colonial struggles in colonial India.
- Analyse the complex developments leading to communal violence and Partition.
- Discuss the negotiations for independence, the key debates on the Constitution and need for socio-economic restructuring soon after independence

**Unit-I: Cultural Changes, Socio and Religious Reform Movements:**

1. The advent of Printing and its Implications
2. Reform and Revival: Brahmo Samaj, Arya Samaj, Aligarh Movement.
3. Emancipation of Women, Sanskritization and Anti-Caste Movements

**Unit-II: Nationalism: Trends up to 1919:**

1. Political Ideology and Organizations, Formation of INC
2. Moderates and Extremists.
3. Swedish Movement
4. Revolutionaries

### **Unit-III: Gandhian Nationalism after 1919: Ideas and Movements:**

1. Mahatma Gandhi: His Perspectives and Methods
2. Non- Cooperation, Civil Disobedience, Quit India,
3. Subhas Chandra Bose and INA
4. Nationalism and Social Groups: Peasants, Tribes, Dalits and Women

### **Unit-IV: Communalism and Partition:**

1. Ideologies and Practices, Muslim League
2. Hindu Maha Sabha
3. Partition and Independence
4. Making of the Constitution

Unit I: This unit looks at the different forms of responses to colonial encounter by various sections of India, including the rise of nationalism in literature

Unit II: This unit engages with the early forms of National movements in India

Unit III: This unit the fundamental transformation in National Movement with the coming of Gandhi. This unit deals with how Gandhi's politics represented a new model for mobilizing different social groups in the national movement.

Unit IV: It deals with events leading to partition of the British India and constitution making

### **Suggested Text Books:**

- ✓ Sumit Sarkar, *Modern India, 1885-1947*, Delhi, Macmillan, various edition
- ✓ Bipan Chandra, K.N. Panikkar, Mridula Mukherjee, Sucheta Mahajan and Aditya Mukherjee, *India's, Struggle for Independence*, Penguin.
- ✓ Jones, Kenneth *Socio-Religious Reform Movements in British India*. New Delhi: Cambridge University Press, 1994.
- ✓ O'Hanlon, Rosalind. (2002). *Caste, Conflict and Ideology: Mahatma Jyotirao Phule and Low Caste Protest in 19th Century Western India*. Ranikhet: Permanent Black, pp. 3-11.
- ✓ Chandra, Bipan. (1966). *The Rise and Growth of Economic Nationalism in India: Economic Policies of Indian National Leadership, 1880–1905*. New Delhi: People's Publishing House (Introduction).
- ✓ Bipan Chandra, et. al. *India's Struggle for Independence*, Delhi, Penguin, Various editions.

### **Reference Reading:**

- ✓ McLane, J.R. (1977). *Indian Nationalism and the Early Congress*. Princeton: Princeton University Press, pp.3-21; 89-178
- ✓ Hardiman, David. (2005). *Gandhi in his time and ours*. Delhi, Orient Blackswan, pp.1-81; 109-184.
- ✓ Bandyopadhyay, Sekhar. (Ed.) (2009). *Nationalist Movement in India: A Reader*. New Delhi: Oxford University Press, pp. 55-155.
- ✓ A. R. Desai, *Social Background of Indian Nationalism*, Popular, Bombay.

- ✓ *Brown, Judith. (1972). Gandhi's Rise to Power. Indian Politics 1915-1922. New York: Cambridge University Press (Chapters 3,4,5,6,7,9).*

#### Internet Videos

1. Foundation of the Congress

[https://www.youtube.com/watch?v=gT9\\_zoIVWXo&t=41s](https://www.youtube.com/watch?v=gT9_zoIVWXo&t=41s)

2. Mahatma Gandhi and Mass Nationalism

<https://www.youtube.com/watch?v=VjzboxNy8nw&t=774s>

3. ***Militant-Nationalism***

<https://www.youtube.com/watch?v=cPf77YPQtE&list=PLNsppmbLKJ8KB9BAenzBGCEpD2KEaMgiY&index=3>

#### **Activities to do**

1. The class should be encouraged watch the film Traumas and horrors of partition. 2. Students should be encouraged to read Hind Swaraj of Gandhi and a write an essay on it.
3. Find out the unsung heroes in your district and prepare a report

## **Minor (Paper-IV)**

### **SEMESTER-VII (With/Without Research)**

#### **History of Orissa-I: The Making of a Region**

##### **(Afghan Rule to Post Independence Period)**

#### **Course Objectives:**

- This will also help students to understand and assess the nature, causes and impact of the several resistance movements in the 19<sup>th</sup> century Odisha with a special reference to the Paik rebellion of 1817.
- The paper will critically evaluate the process through which Odia nationalism emerged in late 19<sup>th</sup> century leading to the formation of a separate state on linguistic basis.
- It also focuses on the forms and agencies of colonial capitalism in changing the pre-colonial social order in Odisha as well as political arithmetic during colonial period.

#### **Unit I: Afghan to Maratha Occupation of Odisha (1568-1803)**

1. Afghan, Mughal and Maratha Occupation of Odisha: Events, Administration and Impact
2. Emergence of Garjat States: Case of Sambalpur and Mayurbhanj
3. Evolution of Odia literature (Panchasakhas and Riti Yuga)

#### **Unit II:**

1. British Occupation and Early Colonial Administration: Land Revenue, Salt Policy, Currency Policy, Jail and Police Administration.
2. Nature, form, Limitations and causes of Resistance Movements: Ghumsar Rebellion, Paik rebellion, Keonjhar Uprisings. Revolt of 1857 and Surendra Sai 3. Famine of 1866 – Causes, Consequences and significance.

#### **Unit III:**

1. Growth of Press, Education, Language Movement and Odia Nationalism
2. Nationalist Politics in Odisha (Non-cooperation, Civil Disobedience and Quit India movements in Odisha) Developments leading to Formation of a separate Province of Orissa
3. Prajamandal Movement and Merger of Princely States

#### **Unit IV: Odisha after Independence**

1. Political Developments from 1952 to 1977
2. Economic and Industrial Development in Post Independent Odisha

3. Social Development in Post Independent Odisha: Education, women empowerment: policies and Programme.

**Unit I:** This unit acquaints u the shift in political power with the coming of the Afghans, Moghuls and Marathas. This also deals with the developments in Odia literature from 15<sup>th</sup> to 18<sup>th</sup> century

**Unit II:**

The unit seeks to explain the structural changes brought about in Odisha after the British occupations of Odisha in 1803. It deals with various forms of resistance in different forms to these structural changes

**Unit III:**

This unit engages students with the quest for a united Odisha and rise of Odia consciousness. It also sees how both the aspirations- that of united Orissa province and struggle against colonial rule under Gandhian leadership merged. It also deals with the Garjat states and their unification after Independence leading to a united Odisha state.

**Unit IV:**

The unit seeks to explain the challenges of a backward region like Odisha and governance measures taken in the first quarter of Post-Independence period

**Suggested Reading List:**

- ✓ P.K. Mishra & J.K. Samal, *A Comprehensive History and Culture of Orissa- Vol. I & II*
- ✓ K.M. Patra, *Freedom Struggle in Odisha.*
- ✓ J.K.Samal, *Orissa under the British Crown.*
- ✓ 3.K.M.Patra, *Orissa State Legislature & Freedom Struggle.*
- ✓ A.C. Pradhan, *A Study of the History of Odisha, Panchasheel.*
- ✓ B.K. Mallik, *Paradigm of Dissent and Protest :- Social Movements in Eastern India*
- ✓ Chaudhury, Pradipta (1991) "Peasants and British Rule in Orissa", *Social Scientist, Vol. 19, No. 8/9 (Aug. - Sep., 1991), pp.28-56.*
- ✓ Mohanty, Nivedita (1982.) *Oriya nationalism: quest for a united Orissa, 1866-1936, New Delhi: Manohar,*
- ✓ Mohanty, Sachidananda () *Social Reform Movements in Orissa, Study of Sailabala Das, Delhi:*
- ✓ Mohapatra, Bishnu N (2001) "Social Connectedness and Fragility of Social Capital: View from an Orissa Village", *Economic and Political Weekly, Vol. 36, No. 8 (Feb. 24 - Mar. 2, 2001), pp.665-672*
- ✓ Mubayi, Yaaminey. 2004. *Altar of Power. The Temple and the State in the Land of Jagannatha, Delhi: Manohar.*
- ✓ Nanda, CP (2008) *Vocalising Silence: Political protest in Orissa-1930-42, Delhi: Sage.*

- ✓ Pati Biswamoy (1992) "Of Movements, Compromises and Retreats: Orissa, 1936- 1939", *Social Scientist*, Vol. 20, No. 5/6 (May - Jun., 1992), pp.64-88
- ✓ Pati Biswamoy (1999) "Oriya Intellectuals Then and Now" *Economic and Political Weekly*, Vol. 34, No. 19 (May 8-14, 1999), p.1093
- ✓ Pati, Biswamoy (1998) *Siting the Body: Perspectives on Health and Medicine in Colonial Orissa* Author(s): *Social Scientist*, Vol. 26, No. 11/12 (Nov. - Dec., 1998), pp.3-26.
- ✓ Pati, Biswamoy (1999) "The Dialectics of Retreat: Orissa, 1943-1950," *Social Scientist*, Vol. 27, No. 7/8 (Jul. - Aug., 1999), pp.75-112.
- ✓ Pati, Biswamoy () "High'-'Low' Dialectic: Peasant in Oriya Literature" *Economic and Political Weekly*, Vol. 24, No. 14 (Apr. 8, 1989), pp.747-75
- ✓ Pati, Biswamoy (1992) "Dialectics of Transition: Orissa, 1943-50", *Economic and Political Weekly*, Vol. 27, No. 7 (Feb. 15, 1992), pp.353-364
- ✓ Pati, Biswamoy (Jul. 1983), "Peasants, Tribals and the National Movement in Orissa (1921-1936)" *Social Scientist*, Vol. 11, No. 7, pp.25-49.
- ✓ Pati, Biswamoy "Autonomous Enclaving", *Economic and Political Weekly*, Vol.25, No. 42/43 (Oct. 20-27, 1990), p. 2388.
- ✓ Pati, Biswamoy "Koraput: Perceptions in a Changing Society" *Economic and Political Weekly*, Vol. 25, No. 18/19 (May 5-12, 1990), pp.986-988
- ✓ Patra, K. M: *Freedom Movement in Orissa*,
- ✓ Pattnaik, J () *Feudatory States in Orissa*,
- ✓ Pattnaik, NR (ed.) *Comprehensive History of Orissa*
- ✓ Pradhan, Prasant Kumar, (1998 ) *Gandhians' rise to power : national movement, power politics & independence, 1920-47 AD*, New Delhi : Commonwealth Publishers,
- ✓ Samal, J () *Orissa under the British Crown*, Calcutta Sinha, Surjit (1977) *Kshatrisation* . In MN Das (ed.), *Sidelights on the History and Culture of Orissa*,

#### **Internet Resources**

1. Merger of princely states of Odisha: <https://www.youtube.com/watch?v=OCpBRgGnksQn>
2. Merger of Princely States (Publication Division): <https://www.youtube.com/watch?v=Zp2om49-RS4>

#### **Activities to read**

1. Find out the sequence of merger of various princely states with Odisha Province in 1947 and 1948.
2. Discuss in the classroom the life and times of a prominent freedom fighter of your locality. Prepare jointly a report
3. Group Discussion

## **Minor (Paper-V)**

### **SEMESTER-VIII (With/Without Research)**

#### **History of Modern Europe II (c. 1880 - 1939)**

##### **Course Objectives:**

- Students will learn about the post-war developments of Social, Political and Economic scenarios of the World and decolonization and the emergence of the Third world.
- They will learn about changing world political scenarios and emerging trends in culture, media and Revolution among European countries.
- It deals with the nature and impact of Imperialism between the two wars □ It deals with rise of Totalitarian regimes
- The paper deals with new movements in art and literature such as existentialism

##### **Course Outcome:**

- Upon completion of this course the student shall be able to: Trace varieties of nationalists and the processes by which new nation-states were carved out.
- Discuss the peculiarities of the disintegration of large empires and remaking of Europe's map.
- Deliberate on the meaning of imperialism and the manifestations of imperialist rivalry and expansion in the 19th and early 20th century.
- Analyses the conflict between radical and conservative forces, and the gradual consolidation of ultra-nationalist and authoritarian regimes in Europe. □ Contextualise major currents in the intellectual sphere and arts

##### **Unit-I: Liberal Democracy, Working Class Movements and Socialism in the 19<sup>th</sup> and 20<sup>th</sup> Centuries:**

1. The Struggle for Parliamentary Democracy and Civil Liberties in Britain.
2. Forms of Protest during early Capitalism: Food Riots in France and England: Luddites and Chartism.
3. Early Socialist Thought; Marxian Socialism

##### **Unit-II: The Crisis of Feudalism in Russia and Experiments in Socialism:**

1. Emancipation of Serfs
2. Revolutions of 1905; the Bolshevik Revolution of 1917.
3. Programme of Socialist Construction.

##### **Unit-III: Imperialism, War and Crisis: c. 1880-1939**

1. Growth of Militarism; Power Blocks and Alliances: Expansion of European Empires–First World War (1914 – 1918)

2. Fascism and Nazism.
3. The Spanish Civil War.
4. Origins of the Second World War.

#### **Unit-IV: Intellectual Developments since circa 1850: Major Intellectual Trends:**

1. Mass Education and Extension of Literacy.
2. Institutionalization of Disciplines: History, Sociology and Anthropology.
3. Darwin and Freud.

#### **Unit I:**

At the end of this rubric the student will be familiar with the economic, social and political issues that democratic industrialised England faced in 19<sup>th</sup> century. Further, in contrast to Capitalism, thinkers began to search for alternative socio-economic system, which resulted in the rise of Socialism, nihilism, anti-property thinking.

#### **Unit II:**

At the end of this rubric the student will be familiar with the economic, social and political issues that troubled the Tsarist regime in Russia in the nineteenth century. She/he will develop an understanding of popular movements and the political ascendancy of the socialists eventually leading to the revolutions in the early 20<sup>th</sup> century. It also deals with socialist programmes under Lenin and Stalin in the form of Five Year Plan and Nationalisation of Resources.

#### **Unit III:**

At the end of these units, students will be able to understand the shortcomings of the Post war international political architecture inked at Paris Peace Conference. They will also understand the limits to which a capitalist economy can be given a free rein. Students will explore the nature of totalitarian regime. The student will be expected to demonstrate a familiarity with the historiographical debates and discussion associated with the rise and development of the fascist/Nazi state in Italy and Germany eventually leading to the outbreak of the Second World War.

#### **Unit IV:**

At the end of this unit, Students will be acquainted with the broad social and cultural changes of 20<sup>th</sup> centuries, such as expansion of literacy, mass culture. Students will also understand the intellectual climate of 20<sup>th</sup> century, especially the evolutionary biology of Charles Darwin and the role of unconscious in shaping human Behavior (Freud) decisively changed our understanding of man and his behavior. However, the crisis of capitalism, two world wars seriously dented faith in capitalism, hence, there were new isms such as Absurdism emerged in the post war period.

#### **Suggested Text Books:**

- ✓ *C.M. Cipolla, Fontana Economic History of Europe, Volume II the Present (1981). I: The Industrial Revolution.*
- ✓ *William Keylor, the Twentieth Century World, an International History, London, OUP, 1996.*

- ✓ Carr.E.H., *International Relations between the Two World Wars, 1919-1939*, New York, 1966.
- ✓ Frank McDonough *The Origins of the First and the Second World War*. Cambridge: Cambridge University Press, 1997.
- ✓ James A. Womersley, *European Culture since 1848*. New York: Palgrave, 2001.
- ✓ Bayly, C.A. *The Birth of the Modern World, 1780-1914*. Oxford: Blackwell Publishing, 2004, pp. 199-244. □ Iben Stein, *Today's ism*
- ✓ Wood, Alan. (2003). *The Origins of the Russian Revolution 1861-1917*. London and New York: Routledge.

#### **Internet resources**

- ✓ **Parliament of UK to see 1832 Reform Act** □ **Germany and Italian Unification:**  
[https://www.youtube.com/watch?v=KSjDe9\\_jZk8](https://www.youtube.com/watch?v=KSjDe9_jZk8)
- ✓ **Hannah Arendt's "The Origins of Totalitarianism"**  
<https://www.youtube.com/watch?v=WAxI6BhiSzc>
- ✓ **The Great Depression -** [https://www.youtube.com/watch?v=x4F5gIWS\\_Is](https://www.youtube.com/watch?v=x4F5gIWS_Is)

#### **Activities to do**

1. Watch the movie Holocaust and discussion on the nature of anti-Semitism of Nazism
2. Discuss about various theories regarding the Capitalist Crisis in 1930s.
3. Find out why Occupy Wall Street Movement occurred in 2011. Why did it peter out soon? Have a peer group discussion.

**3 Yr. Degree Course  
(Minor)  
based on NEP-2020  
MATHEMATICS**



(Effective from Session 2025-26)

**(Batch: 2025-2028)**



**SAMBALPUR UNIVERSITY**

**JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019**

## COURSE AT A GLANCE (NEP-U.G.)

SUBJECT: MATHEMATICS

ACADEMIC SESSION: **2025-28**

### CORE-I COURSE

| Course Number | Semester | Course Title                              | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------|-------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I        | Calculus and Analytic Geometry            | NP                                               | 4           | 100                        |
| Paper-II      |          | Introduction to Algebra & Number Theory   | NP                                               | 4           | 100                        |
| Paper-III     | II       | Real Analysis-I                           | NP                                               | 4           | 100                        |
| Paper-IV      |          | Algebra-I                                 | NP                                               | 4           | 100                        |
| Paper-V       | III      | Probability                               | NP                                               | 4           | 100                        |
| Paper-VI      |          | Differential Equations-I                  | P                                                | 4           | 100                        |
| Paper-VII     |          | Linear Algebra                            | NP                                               | 4           | 100                        |
| Paper-VIII    | IV       | Real Analysis-II                          | NP                                               | 4           | 100                        |
| Paper-IX      |          | Complex Analysis-I                        | NP                                               | 4           | 100                        |
| Paper-X       |          | Algebra-II                                | NP                                               | 4           | 100                        |
| Paper-XI      | V        | Differential Equations-II                 | P                                                | 4           | 100                        |
| Paper-XII     |          | Real Analysis-III                         | NP                                               | 4           | 100                        |
| Paper-XIII    |          | Numerical Analysis & Scientific Computing | P                                                | 4           | 100                        |
| Paper-XIV     | VI       | Multivariable Calculus                    | NP                                               | 4           | 100                        |
| Paper-XV      |          | Differential Geometry                     | NP                                               | 4           | 100                        |
| Paper-XVI     | VII      | Measure Theory & Integration              | NP                                               | 4           | 100                        |
| Paper-XVII    |          | Algebra-III                               | NP                                               | 4           | 100                        |
| Paper-XVIII   |          | Topology                                  | NP                                               | 4           | 100                        |

|             |      |                            |    |   |     |
|-------------|------|----------------------------|----|---|-----|
|             |      |                            |    |   |     |
| Paper-XIX   |      | Mathematical Methods       | NP | 4 | 100 |
| Paper-XX    | VIII | Functional Analysis        | NP | 4 | 100 |
| Paper-XXI   |      | Analytic Number Theory     | NP | 4 | 100 |
| Paper-XXII  |      | Complex Analysis-II        | NP | 4 | 100 |
| Paper-XXIII |      | Differential Equations-III | NP | 4 | 100 |

### CORE-II/CORE-III COURSE

| Course Number | Semester<br>Core-II/<br>Core-III | Course Title                            | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------------------------------|-----------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I/II                             | Calculus & Analytic Geometry            | NP                                               | 4           | 100                        |
| Paper-II      | III/IV                           | Introduction to Algebra & Number Theory | NP                                               | 4           | 100                        |
| Paper-III     | V/VI                             | Real Analysis-I                         | NP                                               | 4           | 100                        |
| Paper-IV      | VII                              | Linear Algebra                          | NP                                               | 4           | 100                        |
| Paper-V       | VIII                             | Multivariable Calculus                  | NP                                               | 4           | 100                        |

**CORE COURSE II/ III**  
**Minor (Paper-I) Semester I/II**  
**CALCULUS & ANALYTIC GEOMETRY**

**Objective:** The main emphasis of this course is to equip the student with necessary analytic and technical skills to handle problems of mathematical nature as well as practical problems. More precisely, main target of this course is to explore the different tools for higher order derivatives to plot the various curves and to solve the problems associated with differentiation and integration of vector functions.

**Learning Outcomes:** After completing the course the student will be able to

- CO1:** trace a curve and find asymptotes.
- CO2:** calculate integrals of typical type using reduction formulae, etc.
- CO3:** calculate arc length, surface of revolution and know about conics
- CO4:** calculate triple products, gradient divergence, curl, etc.

**UNIT-I**

Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications to problems of the type  $e^{ax+b}\sin x$ ,  $e^{ax+b}\cos x$ ,  $(ax+b)^n\sin x$ ,  $(ax+b)^n\cos x$ , concavity and inflection points, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospital rule, application in business, economics and life sciences.

**UNIT-II**

Riemann integration as a limit of sum, integration by parts, reduction formulae, derivations and illustrations of reduction formulae of the type  $\int \sin^n x dx$ ,  $\int \cos^n x dx$ ,  $\int \tan^n x dx$ ,  $\int \sec^n x dx$ ,  $\int (\log x)^n dx$ ,  $\int \sin^n x \cos^n x dx$ , definite integral, integration by substitution.

**UNIT-III**

Volumes by slicing, disks and washer's methods, volumes by cylindrical shells, parametric equations, parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution, techniques of sketching conics, reflection properties of conics, rotation of axes and second degree equations, classification into conics using the discriminant, polar equations of conics.

## UNIT-IV

Triple product, introduction to vector functions, operations with vector-valued functions, limits and continuity of vector functions, differentiation, partial differentiation, div, curl and integration of vector functions, tangent and normal components of acceleration.

### **BOOKS RECOMMENDED:**

1. H. Anton, I. Bivens and S. Davis: Calculus, 10<sup>th</sup> Ed., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
2. Shanti Narayan, P. K. Mittal: Differential Calculus, S. Chand, 2014.
3. R. J. T Bell: An elementary Treatise on coordinate geometry, MacMillan and Company Limited, 2005.

### **BOOKS FOR REFERENCE:**

1. James Stewart: Single Variable Calculus, Early Transcendental, 8<sup>th</sup> edition, Cengage Learning, 2016.
2. G.B. Thomas and R. L. Finney: Calculus, 9<sup>th</sup> Ed., Pearson Education, Delhi, 2005.
3. M. J. Strauss, G. L. Bradley and K. J. Smith: Calculus, 3<sup>rd</sup> edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
4. Suggested digital platform: NPTEL/SWAYAM/MOOCs.
5. e-Learning Source <http://ndl.iitkgp.ac.in> ; <http://ocw.mit.edu> ; <http://mathforum.org>

## **Minor (Paper-II) Semester III/IV**

### **INTRODUCTION TO ALGEBRA & NUMBER THEORY**

**Objectives:** To present a systematic introduction to number theory and a basic course on algebra.

**Learning Outcomes:** After completing the course the student will be able to

**CO1:** understand the equivalence relations and concept of group with different examples.

**CO2:** understand the properties of cyclic groups, rings, and integral domain.

**CO3:** know divisibility and division algorithm and find  $gcd$  using Euclidean Algorithm.

**CO4:** solve linear Diophantine equations, find least common multiples, solve linear congruence applying the Chinese remainder theorem.

## **UNIT- I**

Integers and equivalence relations, properties of integers, modular arithmetic, mathematical inductions, equivalence relations, Introduction to groups, symmetries of a square, the dihedral groups, definitions and examples of groups, elementary properties of groups, subgroups, examples of subgroups.

## UNIT-II

Cyclic groups, properties of cyclic groups, classification of subgroups of cyclic groups, definitions and examples of normal subgroups, Introduction to rings, definition and examples of rings, properties of rings, subrings, definition and examples of integral domain and fields.

## UNIT-III

Divisibility, division algorithms, prime and composite numbers, Fibonacci and Lucas numbers, Fermat numbers, greatest common divisor, Euclidean algorithm.

## UNIT-IV

Fundamental theorem of arithmetic, least common multiple, linear Diophantine equations, congruence, linear congruence, Chinese remainder theorem, Wilson's theorem, Fermat little theorem, Euler's theorem.

### **BOOKS RECOMMENDED:**

1. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House, New Delhi, 1999.(IX Edition 2010).
2. Thomas Koshy, Elementary Number Theory with Applications (2<sup>nd</sup> Edition), Academic Press, 2007.

### **BOOKS FOR REFERENCE:**

1. I. N. Herstein: Topics in Algebra, Wiley Eastern Limited, India, 1975.
2. David M. Burton: Elementary Number Theory (6th Edition), Tata McGraw-Hill Edition, Indian Reprint, 2007.
3. Suggested digital platform: NPTEL/SWAYAM/MOOCs.
4. e-Learning Source <http://ndl.iitkgp.ac.in> ; <http://ocw.mit.edu> ; <http://mathforum.org>.

## **Minor (Paper-III) Semester-V/VI**

### **REAL ANALYSIS-I**

**Objective:** The objective of the course is to introduce the basics of real number system and the properties of sequence and series of real numbers. The ideas of completeness, least upper bound property, denseness, limit, continuity and uniform continuity will also be introduced. This is one of the core courses essential to start doing mathematics.

**Learning Outcomes:** On successful completion of this course, students will be able to **CO1:** learn basics of real number system and test countability of a set.

**CO2:** know on sequence of real numbers and their basic properties.

**CO3:** test convergence of an infinite series.

**CO4:** find limit and continuity of functions and test uniform continuity of functions.

#### **UNIT-I**

Finite and infinite sets, countable and uncountable sets, examples, algebraic and order Properties of  $\mathbb{R}$ , unaccountability of  $\mathbb{R}$ , completeness property of  $\mathbb{R}$ , applications of the supremum property, Intervals, nested interval property, denseness of rationals in  $\mathbb{R}$ .

#### **UNIT-II**

Sequence and their limits, limit theorems, monotone sequences, monotone Convergence theorem, subsequences, divergence criteria, monotone subsequence theorem, Bolzano Weierstrass theorem for sequences, Cauchy sequence, Cauchy's convergence criterion.

#### **UNIT-III**

Infinite series, convergence and divergence of infinite series, Cauchy criterion, Tests for convergence: comparison test, limit comparison test, ratio test, Cauchy's nth root test, Raabe's test, integral test, alternating series, Leibniz test, absolute and conditional convergence.

#### **UNIT-V**

Limits of functions, limit theorems, some extensions of limit concept, continuous functions and their combinations, continuous functions on intervals, boundedness theorem, maximum minimum theorem, intermediate value theorem, uniform continuity, examples, uniform continuity theorem.

#### **BOOKS RECOMMENDED:**

1. R. G. Bartle and D. R. Sherbert, *Introduction to Real Analysis*, 3<sup>rd</sup> Edn., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
2. G. Das and S. Pattanayak, *Fundamentals of Mathematical Analysis*, TMH Publishing Co., 30<sup>th</sup> reprints, 2021.

#### **BOOKS FOR REFERENCE:**

3. S. C. Mallik and S. Arora, *Mathematical Analysis*, New Age International Publications.
4. A. Kumar, S. Kumaresan, *A basic course in Real Analysis*, CRC Press, 2014.
5. Brian S. Thomson, Andrew. M. Bruckner, and Judith B. Bruckner, *Elementary Real Analysis*, Prentice Hall, 2001.

6. Gerald G. Bilodeau , Paul R. Thie, G. E. Keough, *An Introduction to Analysis*, Jones & Bartlett, Second Edition, 2010.
7. e-Learning Source <http://ndl.iitkgp.ac.in> ; <http://ocw.mit.edu> ; <http://mathforum.org> 8. Suggested digital platform: NPTEL/SWAYAM/MOOCs.

## Minor (Paper-IV) Semester VII

### LINEAR ALGEBRA

**Objective:** The objective of this course is to acquaint students with matrix operations, solution of system of equations, vector spaces and linear transformations. In addition, the student will learn about eigenvalues, diagonalization, canonical forms, etc., which has many applications in almost all areas of science and engineering.

**Learning Outcomes:** After completing the course the student will be able to

**CO1:** determine basis and the dimension of a finite-dimensional vector space, know the relation between rank and nullity of a linear transformation.

**CO2:** the relation between matrix and linear transformation.

**CO3:** to find solution of system of linear equations, compute eigenvalues, eigenvectors of a matrix and linear transformation.

**CO4:** about orthogonality of vectors and application of it to different form of matrix, introduced to different operators.

#### UNIT-I

Vector spaces, subspaces, span of a set, more about subspaces, linear dependence, independence, product and quotient space, dimension and basis, linear transformations, range and kernel of a linear map, rank and nullity of linear map.

#### UNIT-II

Inverse of linear transformation, consequences of rank – nullity theorem, the space  $L(U, V)$ , composition of linear maps, matrix associated with linear map, linear map associated with matrix, rank and nullity of a matrix, determinant minors and rank of a matrix, transpose of a matrix and special type of matrices, elementary row operations

#### UNIT-III

System of linear equations, matrix inversion, application of determinant to linear equations, eigenvalues and eigenvectors, similarity of matrices, invariant subspaces, minimal polynomial (eigenvalues and the minimal

polynomial), upper triangular matrices, diagonalizable operators (diagonal matrices, conditions for diagonalizability).

#### UNIT-IV

Inner product space: inner products and norms, orthonormal bases, orthogonal complements, self-adjoint and normal operators, spectral theorems, isometries, unitary operators, characteristic polynomial, Cayley – Hamilton theorem, Jordan form, trace, quadratic form, application to reduction of quadrics.

#### **BOOKS RECOMMENDED:**

1. V. Krishnamurthy, V.P. Mainra, J. L. Arora, *An introduction to linear algebra*, Affiliated East – West press Pvt. Ltd., New Delhi, 1976.
2. Sheldon Axler, *Linear algebra done right* (Fourth edition), Springer, 2024.

#### **BOOKS FOR REFERENCES:**

3. Seymour Lipschutz and Marc Lars Lipson, *Linear Algebra* (Schaum's outlines, Fourth Edition), McGraw Hill, New York, 2009.
4. A. Ramachandra Rao and P. Bhimsankaram, *Linear Algebra* (Second Edition), Hindustan Book Agency, 2000.
5. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, *Linear Algebra* (Fourth Edition), Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.
6. Gilbert Strang, *Linear Algebra and its Applications*, Thomson, 2007.
7. S. Kumaresan, *Linear Algebra- A Geometric Approach*, Prentice Hall of India, 1999.
8. Suggested digital platform: NPTEL/SWAYAM/MOOCs.
9. e-Learning Source <http://ndl.iitkgp.ac.in> ; <http://ocw.mit.edu> ; <http://mathforum.org> ; <https://linear.axler.net>; and <https://library.oapen.org/handle/20.500.12657/85067>

## **Minor (Paper-V) Semester VIII**

### **MULTIVARIABLE CALCULUS**

**Objectives:** The primary objective of this course is to introduce students, the extension of the studies of single variable differential and integral calculus to functions of two or more independent variables with the geometry and visualization of curves and surfaces. To aware the students about the techniques multiple integrations and higher order derivatives.

**Learning Outcomes:** After completing the course the student will be able to

**CO1:** learn the concept of limit, continuity and differentiations of functions of more than one.

**CO2:** understand the maximization and minimization of multivariable functions with the given constraints on variables.

**CO3:** learn about inter-relationship amongst the line integral, double, and triple integral formulations.

**CO4:** familiarize with the Green's, Stokes' and Gauss divergence theorems and their applications.

#### **UNIT-I**

Functions of several variables, limit and continuity of functions of two variables: partial differentiation, total differentiability, sufficient condition for differentiability, chain rule for one and two independent parameters, directional derivatives, the gradient, maximal and normal property of the gradient, tangent planes.

#### **UNIT-II**

Extrema of functions of two variables, method of Lagrange multipliers, constrained optimization problems, double integration over rectangular region, double integration over non rectangular region, double integrals in polar co-ordinates.

#### **UNIT-III**

Triple integrals, triple integral over a parallelepiped and solid regions, volume by triple integrals, cylindrical and spherical co-ordinates, change of variables in double integrals and triple integrals.

#### **UNIT-IV**

Definition of vector field, divergence and curl, line integrals, applications of line integrals: mass and work, fundamental theorem for line integrals, conservative vector fields, independence of path, Green's theorem, surface integrals, integrals over parametrically defined surfaces. Stokes' theorem, the divergence theorem.

#### **BOOKS RECOMMENDED:**

1. M. J. Strauss, G. L. Bradley and K. J. Smith: Calculus, 3<sup>rd</sup> Edition, Dorling Kindersley (India) Pvt. Ltd. Pearson Education, Delhi, 2007.
2. E. Marsden, A. J. Tromba and A. Weinstein: Basic Multivariable Calculus, Springer Student International Edition, Indian reprint, 2005.

#### **BOOK FOR REFERENCES:**

1. S. C. Mallik and S. Arora: Mathematical Analysis, New Age International Publications, New Delhi, 2005.
2. Tom Apostol: Mathematical Analysis, Narosa Publishing House, 2002.
3. G. B. Thomas and R. L. Finney: Calculus, 9<sup>th</sup> Ed., Pearson Education, Delhi, 2005.
4. Suggested digital platform: NPTEL/SWAYAM/MOOCs.
5. e-Learning Source <http://ndl.iitkgp.ac.in> ; <http://ocw.mit.edu> ; <http://mathforum.org>

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**(Batch: 2025-2028)**



**SAMBALPUR UNIVERSITY**

**JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019**

**CORE COURSE II/ III**  
**Minor (Paper-I)**  
**Semester-I/II**

**MECHANICS:**

*(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30hrs)*

- CO-1** To Learn the basic concepts of Rigid body dynamics, Radius of Gyration, Moment of Inertia, Non- Inertial Systems
- CO-2** To Understand the concept of Elasticity, Fluid motion and Types of Vibration
- CO-3** To understand the concept of Newtonian theory through Gravitation, Central force motion, Kepler's laws, GPS
- CO-4** To learn the concept of Special theory of Relativity, Michelson- Morley experiment, Lorentz transformation, Relativistic Doppler effect.
- CO-5** Apply the basic concepts of Mechanics in experiments.

**UNIT-I**

**Rotational Dynamics:** Centre of Mass, Motion of CoM, Centre of Mass and Laboratory frames, Angular momentum of a particle and system of particles, Principle of conservation of angular momentum, Rotation about a fixed axis, Moment of Inertia, Perpendicular and Parallel Axis Theorems, Routh's Rule, Calculation of moment of inertia for cylindrical and spherical bodies, Kinetic energy of rotation, Euler's Equations of Rigid Body motion, Motion involving both translation and rotation. Moment of Inertia of a Flywheel.

**Non-Inertial Systems:** Non-inertial frames and fictitious forces, uniformly rotating frame, Laws of Physics in rotating coordinate systems, Centrifugal force, Coriolis force.

**UNIT-II**

**Oscillations:**

Damped oscillation. Equation of motion and solution (cases of oscillatory, critically damped and overdamped) Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor, Bar Pendulum, Katers Pendulum

**Elasticity:** Relation between Elastic constants, Twisting torque on a Cylinder or Wire, Bending of beams, External bending moment, Flexural rigidity, Single and double cantilever

**Fluid Motion:** Kinematics of Moving Fluids: Poiseuilles Equation for Flow of a Liquid through a

Capillary Tube, Surface tension, Gravity waves and ripple

**Viscosity:** Poiseuilles Equation for Flow of a Liquid with corrections.

### UNIT-III

**Gravitation and Central Force Motion:** Law of gravitation, Gravitational potential energy, Inertial and gravitational mass, Potential and field due to spherical shell and solid sphere, Motion of a particle under a central force field, Two-body problem and its reduction to one-body problem and its solution, Differential Equation of motion with central force and its solution, The first Integrals (two), Concept of power Law Potentials, Kepler's Laws of Planetary motion, Satellites. Geosynchronous orbits, Weightlessness, Basic idea of global positioning system (GPS).

### UNIT-IV

**Special Theory of Relativity:** Michelson-Morley Experiment and its out-come, Postulates of Special Theory of Relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, Frequency and wave number, Relativistic addition of velocities, Variation of mass with velocity, Massless Particles, Mass- energy Equivalence, Relativistic Doppler effect, Relativistic Kinematics, Transformation of Energy and Momentum.

#### Text Books:

1. Mechanics, D. S. Mathur ( S. Chand Publishing)
2. Introduction to Special Relativity, R. Resnick (John Wiley)

#### Reference Books:

1. Introduction to Mechanics Daniel Klapnner and Robert Kolenkow, McGrawHill.
2. Mechanics by K.R Simon
3. Mechanics, Berkeley Physics, vol. 1, C.Kittel, W. Knight, et al (Tata McGraw-Hill)
4. Physics, Resnick, Halliday and Walker (8/e.2008,Wiley) 5. Theoretical Mechanics-M.R. Spiegel (Tata McGrawHill).
6. Feynman Lectures, Vol. I, R.P.Feynman, R.B.Leighton, M.Sands (Pearson)
7. Mechanics-M.Das, P.K.Jena and R.N. Mishra (SrikrishnaPublications)
8. Classical Mechanics , Gupta Kumar & Sharama,(Pragati Prakashan)
9. Classical Mechanics, J.C.Upadhyaya, (Himalaya Publishing Home)

### **LAB: Credit-1**

**(Minimum 4 experiments are to be done):**

1. To study surface tension by capillary rise method.
2. To determine the height of a building using a Sextant.
3. To study the Motion of Spring and calculate (a) Spring constant, (b)  $g$  and (c) Modulus of rigidity.
4. To determine the Moment of Inertia of a Flywheel.
5. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
6. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
7. To determine the value of  $g$  using Bar Pendulum.
8. To determine the value of  $g$  using Kater's Pendulum.

### **Reference Books:**

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practical's, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. A Text book of Practical Physics, I. Prakash and Ramakrishna, 11th Edn, 2011, Kitab Mahal

## **Minor (Paper-II)**

### **SEMESTER- III/IV**

#### **ELECTRICITY AND MAGNETISM:**

(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30hrs)

- CO-1 To understand the basic concepts of Electricity and Magnetism
- CO-2 To Understand the various phenomena in Electricity and Magnetism
- CO-3 To Understand Circuit analysis and network theorems
- CO-4 To Explain the Dynamics of Charged Particles
- CO-5 To Apply the acquired knowledge in Experiment.

#### **UNIT-1**

##### **Electric Field and Electric Potential**

**Electric field:** Electric field lines, Electric flux, Gauss Law with applications to charge distributions with spherical, cylindrical and planar symmetry, Conservative nature of Electrostatic Field. Electrostatic Potential, Potential and Electric Field of a dipole, Force and Torque on a dipole, Potential calculation in different simple cases, Laplace and Poisson equations, The Uniqueness Theorem, Method of Images and its application to (1) Plane Infinite Sheet and (2) Sphere. Electrostatic energy of system of charges, Electrostatic energy of a charged sphere, Conductors in an electrostatic Field, Surface charge and force on a conductor.

#### **UNIT-II**

**Magnetic Field:** Magnetic Force, Lorentz Force, Biot Savarts Law, Current Loop as a Magnetic Dipole and its Dipole Moment (analogy with Electric Dipole), Amperes Circuital Law and its application to (1) Solenoid (2) Toroid (3) Helmholtz coil, Properties of curl and divergence, Vector Potential, Ballistic Galvanometer: Torque on a current Loop, Current and Charge Sensitivity, Electromagnetic damping, Logarithmic damping, CDR.

### UNIT-III

**Dielectric Properties of Matter:** Electric Field in matter, Polarization, Polarization Charges, Electrical Susceptibility and Dielectric Constant, Capacitor (parallel plate, spherical, cylindrical) filled with dielectric, Displacement vector  $D$ , Relations between  $E$ ,  $P$  and  $D$ , Gauss Law in dielectrics. Magnetic Properties of Matter: Magnetization vector ( $M$ ), Magnetic Intensity ( $H$ ), Magnetic Susceptibility and permeability, Relation between  $B$ ,  $H$ ,  $M$ , Ferromagnetism,  $B$ - $H$  curve and hysteresis. Electromagnetic Induction: Faradays Law, Lenz's Law, Self -Inductance and Mutual Inductance, Reciprocity Theorem, Energy stored in a Magnetic Field, Introduction to Maxwell's Equations.

### UNIT-IV

Electrical Circuits: AC Circuits: Kirchhoffs laws for AC circuits, Complex Reactance and Impedance, Series LCR Circuit: (1) Resonance (2) Power Dissipation (3) Quality Factor, (4) Band Width, Parallel LCR Circuit.

**Network theorems:** Kirchoff's law for electrical circuits, Ideal Constant-voltage and Constantcurrent Sources.

Network Theorems: Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem, Applications to DC circuits. Transient Currents Growth and decay of current in RC and LR circuits.

### Text Books:

1. Introduction to Electrodynamics – D.J. Griffiths (Pearson, 4th edition, 2015)
2. Foundations of Electromagnetic Theory-Ritz and Milford (Pearson)

### Reference Books:

1. Classical Electrodynamics, J. D. Jackson (Wiley).
2. Electricity and Magnetism D. C. Tayal (Himalaya Publishing house)
3. Electricity, Magnetism and Electromagnetic Theory- S. Mahajan and Choudhury (Tata McGraw Hill)
4. Feynman Lectures Vol. 2, R. P. Feynman, R. B. Leighton, M. Sands
5. (Pearson)
6. Electricity and Magnetism, J. H. Fewkes and J. Yarwood. Vol. I (Oxford Univ. Press)
7. Classical Electromagnetism, H.C.Verma, Bharati Bhawan

**LAB: Credit-1 (Minimum 4 experiments are to be done):**

Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.

1. To study the characteristics of a series RC Circuit.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Fosters Bridge.
4. To compare capacitances using DeSauty's bridge.
5. Measurement of field strength B and its variation in a solenoid (determine dB/dx)
6. To verify the Thevenin and Norton theorems.
7. To determine self-inductance of a coil by Andersons bridge.
8. To study response curve of a Series LCR circuit and determine its (a) Reso- nant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
9. To study the response curve of a parallel LCR circuit and determine its (a)
10. Anti-resonance frequency and (b) Quality factor Q.

**Reference Books:**

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I. Prakash and Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. A Laboratory Manual of Physics for undergraduate classes, D.P. Khandelwal, 1985, Vani Pub

## **Minor (Paper-III)**

### **SEMESTER- V/VI**

#### **WAVES AND OPTICS:**

**Credit-3**

**CO-1:** Basic understanding of propagation of light, its application and wave nature.

**CO-2:** To Understand the concepts of wave motion.

**CO-3:** To Understand the concepts of interference and its application.

**CO-4:** To Understand the concepts of diffraction and its application.

**CO-5:** To Apply the acquired knowledge of optics in Experiment

#### **UNIT – I**

**Geometrical optics:** Fermat's principle, reflection and refraction at plane interface, Matrix formulation of geometrical Optics, Cardinal points and Cardinal planes of an optical system, Idea of dispersion, Application to thick Lens and thin Lens, Ramsden and Huygens eyepiece. Wave Optics: Electromagnetic nature of light. Definition and properties of wave front Huygens Principle. Temporal and Spatial Coherence.

#### **UNIT - II**

**Wave Motion:** Plane and Spherical Waves, Longitudinal and Transverse Waves, Plane Progressive (Traveling) Waves, Wave Equation, Particle and Wave Velocities, Differential Equation, Pressure of a Longitudinal Wave, Energy Transport, Intensity of Wave. Superposition of two perpendicular Harmonic Oscillations: Graphical and Analytical Methods, Lissajous Figures (1:1 and 1:2) and their uses, Superposition of Harmonic waves.

#### **UNIT- III**

**Interference:** Division of amplitude and wave front, Young's double slit experiment, Lloyds Mirror and Fresnel's Bi-prism, Phase change on reflection: Stokes treatment, Interference in Thin Films: parallel and wedge-shaped films, Fringes of equal inclination (Haidinger Fringes), Fringes of equal thickness (Fizeau Fringes), Newton's Rings: Measurement of wavelength and

refractive index. Interferometer : Michelson's Interferometer-( 1) Idea of form of fringes ( No theory required), ( 2) Determination of Wavelength, ( 3) Wavelength Difference, ( 4) Refractive Index, and ( 5) Visibility of fringes, Fabry-Perot interferometer.

## **UNIT – IV**

**Fraunhofer diffraction:** Single slit, Circular aperture, Resolving Power of a telescope, Double slit, Multiple slits, Diffraction grating, Resolving power of grating. Fresnel Diffraction: Fresnel's Assumptions, Fresnel's Half-Period Zones for Plane Wave, Explanation of Rectilinear Propagation of Light, Theory of a Zone Plate: Multiple Foci of a Zone Plate, Fresnel's Integral, Fresnel diffraction pattern of a straight edge, as lit and a wire.

### **Text Books:**

1. A text book of Optics N.Subhramanyam and BrijLal (S.Chand Publishing)
2. Optics - Ajoy Ghatak (McGraw Hill)

### **Reference Books:**

1. Optics- E. Hecht (Pearson)
2. Fundamentals of Optics-F. A. Jenkins and H. E. White(McGraw-Hill)
3. Geometrical and Physical Optics R.S. Longhurst (Orient Blackswan)
4. The Physics of Vibrations and Waves- H. J .Pain( John Wiley)
5. Optics P. K. Chakraborty.
6. Principles of Optics-Max Born and Emil Wolf (Pergamon Press)
7. The Physics of Waves and Oscillations-N. K. Bajaj (Mc Graw Hill)

## **LAB: Credit-1**

### **(Minimum 5 experiments are to be done)**

1. To determine the frequency of an electric tuning fork by Melde's experiment and verify 2-T law.
2. To plot the I-D curve and to determine the refractive index of a prism
3. To determine refractive index of the Material of a prism using sodium source.

4. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
5. To determine wavelength of sodium light using Newton's Rings.
6. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
7. To determine dispersive power and resolving power of a plane diffraction grating.

#### **Reference Books:**

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I. Prakash and Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. A Laboratory Manual of Physics for undergraduate classes, D. P. Khandelwal, 1985, Vani

### **Minor (Paper-IV)**

#### **SEMESTER- VII (With/Without Research)**

#### **ANALOG SYSTEMS: Credits-3**

*(4 Credit, Theory: 45hrs, 1 Credit, Practical: 30hrs)*

CO-1: Basic understanding of semiconductor diodes, devices and their applications.

CO-2 : To Understand the basic concepts in transistors and amplifiers.

CO-3: To Understand the concept of coupled amplifier and its application in feedback circuit.

CO-4: To Understand the concepts of operational amplifier and its application. CO-5: To Apply the acquired knowledge of electronic circuits in Experiments.

#### **UNIT-1**

**Semiconductor Diodes:** P and N type semiconductors, energy level diagram, conductivity and Mobility,

Concept of Drift velocity, PN junction fabrication (simple idea), Barrier formation in PN Junction Diode, Static and Dynamic Resistance, Current flow mechanism in Forward and Reverse Biased Diode, Drift velocity, derivation for Barrier Potential, Barrier Width and current Step Junction.

**Two terminal device and their applications:** (1) Rectifier Diode: Half-wave Rectifiers, center-tapped and bridge type Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, L and C Filters (2) Zener Diode and Voltage Regulation, Principle and structure of LEDs,

(3) Photo diode (3) Solar Cell.

## UNIT II

**Bipolar Junction Transistors:** n-p-n and p-n-p transistors, Characteristics of CB, CE and CC Configurations, Current gains  $\alpha$  and  $\beta$ , Relation between  $\alpha$  and  $\beta$ , Load line analysis of Transistors,

DC Load line and Q-point, Physical mechanism of current flow, Active, Cut-off and Saturation Regions.

**Transistors Biasing:** Transistor Biasing and Stabilization circuits, Fixed Bias and Voltage Divider Bias.

**Amplifiers:** Transistors as 2-port network h-parameter Equivalent Circuit, Analysis of a single stage CE amplifier using Hybrid Model, Input and Output impedance, Current, Voltage and Power Gains.

## UNIT-III

**Classification of class A, B and C amplifiers, Push-pull amplifier (class B)**

**Coupled Amplifier:** RC-coupled amplifier and its frequency response.

**Feedback in Amplifiers:** Effect of Positive and Negative Feedback on Input Impedance, Output Impedance, Gain Stability, Distortion and Noise. Sinusoidal Oscillations: Barkhausens criterion for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency, Hartley and Colpitts oscillators.

## UNIT-IV

**Operational Amplifiers (Black Box approach):** Characteristics of an Ideal and Practical OP-AMP (IC741). Open-loop and Closed Loop Gain. Frequency Response. CMRR, Slew Rate and concept of virtual ground.

**Applications of Op-Amps:** (1) Inverting and non-inverting amplifiers (2) Adder (3) Subtractor (4) Differentiator, (5) Integrator (6) Log amplifier, (7) Zero crossing detector (8) Wein bridge oscillator.

**Text Books:**

1. Foundations of Electronics-Raskhit and Chattopadhyay (New age International Publication)
2. Concept of Electronics- D. C.Tayal ( Himalay Publication) **Reference Books:**

1. Electronic devices and circuits R. L. Boylstad(PearsonIndia)
2. Electronic Principles- A.P.Malvino (Tata McGrawHill)
3. Principles of Electronics- V. K. Mehta and Rohit Mehta (S. Chand Publication)
4. OP-Amps and Linear Integrated Circuit-R. A. Gayakwad (PrenticeHall)
5. Physics of Semiconductor devices, Donald A Neamen(PrenticeHall)
6. Analog System and Application: Gupta Kumar, Pragati Prakashan

**LAB: Credit-1****(Minimum 5 experiments are to be done)**

1. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
2. Study of V-I and power curves of solar cells, and find maximum power point and efficiency.
3. To study the characteristics of a Bipolar Junction Transistor in CE configuration.
4. To study the various biasing configurations of BJT for normal class A operation.
5. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
6. To design a Wien bridge oscillator for given frequency using a non-amp.
7. To design a phase shift oscillator of given specifications using BJT.
8. To study the Colpitt's oscillator.

**Reference Books:**

1. Modern Digital Electronics, R.P. Jain, 4th Edition, 2010, Tata McGraw Hill.
2. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc Graw Hill.

3. Microprocessor Architecture Programming and applications with 8085, R.S. Goankar, 2002, Prentice Hall.
4. Microprocessor 8085: Architecture, Programming and interfacing, A. Wadhwa, 2010, PHI Learning.

### **Minor (Paper-I)**

### **SEMESTER- VIII (With/Without Research)**

**DIGITAL SYSTEM:**

**Credit-3**

CO-1: To Understand IC's and scales of Integration, Digital Circuits and their realization, Applications

CO-2: Build strong knowledge about Boolean Algebra, Truth tables, Equivalent Circuits, Theory and application of CRO.

CO-3: Gain a clear understanding of Data processing circuits, Arithmetic Circuits, different types of Timers: IC 555

CO-4: To Explain the knowledge of computer organization, Shift registers and counters.

CO-5: To Apply the acquired knowledge to realize various types of circuits in experiment

#### **UNIT-I**

**Integrated Circuits (Qualitative treatment only):** Active and Passive Components, Discrete components, Wafer Chip, Advantages and Drawbacks of ICs, Scale of Integration: SSI, MSI, LSI and VLSI (basic idea and definitions only), Classification of ICs, Examples of Linear and Digital ICs.

**Digital Circuits:** Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversation, BCD, Octal and Hexadecimal numbers, AND, OR and NOT. Gates (realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gates and application as Parity Checkers.

#### **UNIT-II**

**Boolean algebra:** De Morgan's Theorems: Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Fundamental Products, Idea of Minterms and Maxterms, Conversion of truth table into Karnaugh Map and SOP and POS simplification. Universal logic implementation (NAND & NOR).

### **UNIT-III**

**Data Processing Circuits:** Basic Idea of Multiplexers, De-multiplexers, Decoders, Encoders.

**Arithmetic Circuits:** Binary Addition. Binary Subtraction using 2s complement. Half and Full Adders. Half and Full Subtractors, 4 bit binary Adder/Subtractor.

**Timers: IC 555:** block diagram and application is Astable multivibrator and Monostable multi vibrator.

### **UNIT-IV**

**Introduction to Computer Organization:** Input/output Devices, Data storage (idea of RAM and ROM), Computer memory, Memory organization and addressing, Memory Interfacing, Memory Map.

**Shift registers:** Serial-in-serial-out, Serial-in-Parallel-out, Parallel-in-Serial- out and Parallel- in- Parallel-out. Shift Registers (only up to 4 bits)

**Counters (4 bits):** Ring Counter, Asynchronous counters, Decade Counter. Synchronous Counter.

#### **Text Books:**

1. Digital Circuits and Logic design: Samuel C. Lee(PrinticeHall)
2. Digital Principles and Applications -A.P. Malvino, D.P. Leach and Saha(Tata Mc Graw)

#### **Reference Books :**

1. The Art of Electronics by Paul Horowitz and Wilfield Hill, Cambridge University
2. Electronics by Allan R. Hambley Prentice Hall
3. Principles of Electronics V.K.Mehta and Rohit Mehta (S.Chand Publishing)
4. Digital Logic and Computer design M. Morris Mano (Pearson)
5. Concepts of Electronics D. C. Tayal ( Himalaya Publishing house)
6. Digital System and Application, Gupta Kumar, Pragati Prakashan

### **LAB: Credit-1**

**(Minimum 6 experiments are to be done)**

1. To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO and to test a Diode and Transistor using a Millimeter.

2. To design a switch (NOT gate) using a transistor.
3. To verify and design AND, OR, NOT and XOR gates using NAND gates.
4. Half Adder, Full Adder and 4-bit binary Adder.
5. Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder I.C.
6. To build Flip-Flop (RS, Clocked-RS, D-type and JK) circuits using NAND gates.
7. To design an astable multivibrator of given specifications using 555 Timer.
8. To design a monostable multivibrator of given specifications using 555 Timer.

**Reference Books:**

1. Basic Electronics: A Text Books lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
2. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
3. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.  
Electronic Devices and circuit Theory, R.L. Boylestad and L.D. Nashelsky, 2009, Pearson

**3 Yr. Degree Course  
(Minor)  
based on NEP-2020  
POLITICAL SCIENCE**



**(Effective from Session 2025-26)  
(Batch: 2025-2028)**



**SAMBALPUR UNIVERSITY**  
**JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019**

## COURSE AT A GLANCE (NEP-UG)

SUBJECT: POLITICAL SCIENCE

ACADEMIC SESSION: **2025-28**

### CORE-I COURSE

| Course Number | Semester | Course Title                          | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------|---------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I        | FUNDAMENTAL OF POLITICAL SCIENCE      |                                                  | 4           | 100                        |
| Paper-II      |          | INTRODUCTION TO CONSTITUTION OF INDIA |                                                  | 4           | 100                        |
| Paper-III     | II       | INTRODUCTION TO POLITICAL THEORY      |                                                  | 4           | 100                        |
| Paper-IV      |          | COMPARATIVE GOVERNMENTS               |                                                  | 4           | 100                        |
| Paper-V       | III      | COLONIALISM AND NATIONALISM           |                                                  | 4           | 100                        |
| Paper-VI      |          | INTERNATIONAL RELATIONS               |                                                  | 4           | 100                        |
| Paper-VII     |          | WESTERN POLITICAL THOUGHTS-I          |                                                  | 4           | 100                        |
| Paper-VIII    | IV       | INDIAN POLITICS                       |                                                  | 4           | 100                        |
| Paper-IX      |          | WESTERN POLITICAL THOUGHTS-II         |                                                  | 4           | 100                        |
| Paper-X       |          | PUBLIC ADMINISTRATION                 |                                                  | 4           | 100                        |
| Paper-XI      | V        | GLOBAL POLITICS                       |                                                  | 4           | 100                        |
| Paper-XII     |          | COMPARATIVE POLITICS                  |                                                  | 4           | 100                        |
| Paper-XIII    |          | INDIAN POLITICAL IDEAS -I             |                                                  | 4           | 100                        |
| Paper-XIV     | VI       | INDIAN'S FOREIGN POLICY               |                                                  | 4           | 100                        |
| Paper-XV      |          | GOVERNMENT AND POLICY IN ODISHA       |                                                  | 4           | 100                        |
| Paper-XVI     | VII      |                                       |                                                  | 4           | 100                        |
| Paper-XVII    |          |                                       |                                                  | 4           | 100                        |
| Paper-XVIII   |          |                                       |                                                  | 4           | 100                        |
| Paper-XIX     |          |                                       |                                                  | 4           | 100                        |

|             |      |  |  |   |     |
|-------------|------|--|--|---|-----|
| Paper-XX    | VIII |  |  | 4 | 100 |
| Paper-XXI   |      |  |  | 4 | 100 |
| Paper-XXII  |      |  |  | 4 | 100 |
| Paper-XXIII |      |  |  | 4 | 100 |

## CORE-II/CORE-III COURSE

| Course Number | Semester<br>Core-II/<br>Core-III | Course Title                          | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------------------------------|---------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I/II                             | FUNDAMENTAL OF POLITICAL SCIENCE      | NP                                               | 4           | 100                        |
| Paper-II      | III/IV                           | INTRODUCTION TO CONSTITUTION OF INDIA | NP                                               | 4           | 100                        |
| Paper-III     | V/VI                             | INTRODUCTION TO POLITICAL THEORY      | NP                                               | 4           | 100                        |
| Paper-IV      | VII                              |                                       |                                                  | 4           | 100                        |
| Paper-V       | VIII                             |                                       |                                                  | 4           | 100                        |

**CORE COURSE II/ III**  
**Minor (Paper-I) Semester I/II**  
**Fundamentals Of Political Science**

**Course Objectives**

This course will familiarize students with the basic normative concepts in political theory and encourage them to understand how these concepts manifest in social practices. The course will also help students learn how we make use of these concepts in organizing our social living. The main objective is to project the plural, interdisciplinary orientation of political theory and to emphasise its deep engagement with the political process.

**Expected Learning Outcomes**

The course would provide students with a rudimentary understanding of political concepts, theories, and their application in contemporary society and their interplay with societal and economic factors. The unit-wise outcomes are given below.

**Unit-I:** Upon completion of this Unit, students will have acquired a comprehensive understanding of the multifaceted nature of politics, its theoretical underpinnings across disciplines, and its intricate interplay with societal and economic spheres.

**Unit-II:** After completing this Unit, student's understanding on the state as a political entity will be deepened and students would be able to critically examine its relationship with sovereignty, governing structures, and the multifaceted challenges posed by globalization.

**Unit-III:** Upon completion of Unit III, students will be able to critically analyse and synthesize the intricate concepts of power, authority, and legitimacy, as well as the interrelated notions of rights, freedoms, equality, and justice, thereby enabling them to comprehend the theoretical underpinnings that shape socio political constructs and inform discourse on contemporary issues.

**Unit-IV:** Upon completion of this Unit, students would have developed a nuanced and multidimensional understanding of democracy along with its models, and the critical roles played by pluralism and diversity in shaping democratic ideals, practices, and discourse. This will deepen democratic values among students.

## **Course Content:**

### **Unit-I: Introduction**

- a) What is Political?
- b) Political Philosophy, Political Theory, Political Science
- c) Politics and Society, Politics and Economy

### **Unit-II: State**

- a) State: Meaning, Origin and Development
- b) State and Sovereignty
- c) State and Government
- d) State and Globalization

### **Unit-III: Concepts**

- a) Power, Authority, and Legitimacy
- b) Rights and Freedom
- c) Equality and Justice

### **Unit-IV: Democracy**

- a) Meaning of Democracy
- b) Models of Democracy: Representative, Participatory, Deliberative
- c) Pluralism, Diversity, and Democracy

## **Essential Readings:**

1. Bhargava, R. (2008). 'What is Political Theory', in Bhargava, R. and Acharya, A. (eds), *Political Theory: An Introduction*. Pearson Longman. pp. 2-16
2. Heywood, A. (2022). *Political Theory: An Introduction*. Bloomsbury Publishing.
3. McKinnon, C. (2019). *Introduction: Issues in Political Theory*. Oxford University Press.
4. Menon, K. (2008). 'Justice', in Bhargava, R. and Acharya, A. (eds), *Political Theory: An Introduction*. Pearson Longman. pp. 74-86.
5. Srinivasan, J. (2008). 'Democracy', in Bhargava, R. and Acharya, A. (eds), *Political Theory: An Introduction*. Pearson Longman. pp. 106-128.
6. Talukdar, P.S. (2008) 'Rights', in Bhargava, R. and Acharya, A. (eds), *Political Theory: An Introduction*. Pearson Longman. pp. 88-104.

7. Vinod, M. J. and Deshpande Meena. (2013). *Contemporary Political Theory*. PHI Learning Pvt Ltd, Delhi

### **Additional Readings:**

- ✓ Bhargava, R. (2008). 'Why do we need Political Theory', in Bhargava, R. and Acharya, A. (eds), *Political Theory: An Introduction*. Pearson Longman, pp. 17-36 ✓ Dahl, R. A. (2000). *On Democracy*. Yale University Press.
- ✓ Gauba, O. P. (2023). *An Introduction to Political Theory*. National Publication.
- ✓ Mookherjee, M. (2008) 'Multiculturalism', in McKinnon, C. (ed), *Issues in Political Theory*. Oxford University Press. pp. 218-240.
- ✓ Seglow, J. (2003) 'Multiculturalism', in Bellamy, Richard and Mason, Andrew (eds), *Political Concepts*. Manchester University Press. pp. 156-168.
- ✓ Wolf, J. (2021) 'Social Justice', in McKinnon, C. (ed). *Issues in Political Theory*. Oxford University Press. pp. 172-193.

### **Internet Resources:**

The internet resources include online articles and e-contents published on websites, blogs, eNewspaper, online magazines, scholarly journals, digital repositories, and Audio- Visual content.

1. CEC. (2015). *What is Political Theory?*. YouTube.  
<https://www.youtube.com/watch?v=fdTNlx52Weg>
2. Jha, Mithilesh Kumar. (2018). *Introduction to Political Theory*. NPTEL.  
<https://archive.nptel.ac.in/courses/109/103/109103141/>
3. Basu, Sibaji Pratim. (2020). *MOOC on Introduction to Political Theory*. SWAYAM.  
[https://onlinecourses.SWAYAM2.ac.in/cec20\\_hs28/preview](https://onlinecourses.SWAYAM2.ac.in/cec20_hs28/preview)

### **Activities to do:**

1. Students can participate in a debate on a philosophical or theoretical concept related to politics, such as the nature of power, the principles of equality and justice, which will encourage critical thinking, argumentation skills, and the ability to analyze complex concepts from multiple perspectives.
2. Organize a simulation exercise where students assume different roles in a hypothetical political system or scenario and could simulate the functioning of a democratic government, with students taking on

roles like legislators, activists, lobbyists, or members of the media. This activity will allow students to experience and understand the dynamics of political processes and decision-making.

3. Students can conduct literature review, prepare a draft and analyse primary sources on any topic mentioned in this course.

## **Minor (Paper-II) Semester III/IV**

### **Introduction To The Constitution Of India**

#### **Course Objectives:**

This course introduces students to the Constitution of India – the supreme law of the land. The primary objective of this course is to provide students with a comprehensive understanding of the constitutional framework and political institutions in India. Through a critical examination of the constitutional design, the learners will explore the foundational principles of the Indian Constitution. By tracing the historical contestations surrounding the incorporation of these values into the Constitution and their practical manifestations, learners will develop an appreciation for the intricate interplay between institutional practices and political contexts. Furthermore, the course aims to cultivate an understanding of the institutional dynamics within the Indian governance matrix, characterized by both conflict and cooperation, asymmetrical federal arrangements, and mechanisms for safeguarding vulnerable populations against discrimination. Additionally, students will gain insight into the powers and functions of key governmental figures such as the President, Prime Minister, and Chief Minister and other constitutional and non-constitutional bodies, while also delving into the intricacies of Union-State relations.

#### **Expected Learning Outcomes:**

This course endeavours to equip students with the necessary knowledge and analytical tools to engage critically with the constitutional structures and processes that underpin Indian democracy. The unit-wise outcomes are given below.

**Unit-I:** The learners would gain basic understanding of Indian Constitution and its underlying values. This would enable them to analyse the operation of the Constitution of India from a policy perspective, and in the context of social and cultural diversity. This would strengthen the foundation of constitutional ethics among the learners.

**Unit-II:** The learners would develop awareness regarding the basic structures and processes of government at both union and state levels with a specific focus on power and responsibilities of highest constitutional dignitaries. This will help them to acquire administrative skills and political insights for engaging in various institutions.

**Unit-III:** The learners would be familiar with the judicial structures and procedures in India. Further, the awareness about Writs, Judicial Review, PIL, Basic Structure Doctrine would enable them to develop an understanding about their rights and entitlements as citizens and methods to secure these within the legal framework, in case of violation.

**Unit-IV:** The learners would understand the division of power between Union and States with focus on different constitutional bodies. This would enable them to understand and analyse the manner in which the Indian federal system functions.

### **Course Content:**

#### **Unit-I: Basic Structure of the Indian Constitution**

- a) Making of the Indian Constitution: Formation and Working of Constituent Assembly
- b) Preamble: Nature of State and Constitutional Values
- c) Fundamental Rights, Directive Principles of State Policy, Fundamental Duties

#### **Unit-II: Legislature and Executive in Union and State**

- a) Structure of the Parliament and Legislative procedures; State Legislatures
- b) President; Governor
- c) Prime Minister and Council of Ministers; Chief Minister

#### **Unit-III: Judiciary**

- a) Supreme Court of India: Structure and Functions

- b) High Courts: Structure and Functions
- c) Judicial Review and Basic Structure Doctrine, Public Interest Litigation (PIL)

#### **Unit-IV: Union-State Relationship**

- a) Division of Power: Administrative, Legislative and Financial
- b) Election Commission, Finance Commission, CAG
- c) NITI Ayog, Inter-State Council, GST Council

#### **Essential Readings:**

- ✓ *Austin, Granville (1999). The Constitution of India: Cornerstone of a Nation. Oxford University Press.*
- ✓ *Bakshi, P.M. (2023). The Constitution of India. Universal Law Publishing.*
- ✓ *Basu, D. D. (2022). Introduction to the Constitution of India. Educational Printed;26<sup>th</sup> Edition, Lexis Nexis.*
- ✓ *Chakrabarty, Bidyut (2017). Indian Constitution: Text, Context and Interpretation. Sage Publication India Private Limited.*
- ✓ *Kashyap, Subhash (2021). Our Constitution. National Book Trust.*
- ✓ *Khosla, Madhav, Mehta, Pratap Bhanu and Choudhry, Sujit (Eds). (2016). The Oxford Handbook of the Indian Constitution. Oxford University Press.*
- ✓ *Pai, Sudha (2020). Constitutional and Democratic Institutions in India: A Critical Analysis. Orient Blackswan.*

#### **Additional Readings:**

1. *Bhargava, Rajeev (2009). Politics and Ethics of the Indian Constitution. Oxford University Press.*
2. *Chandra, Bipan, Mukherjee, Aditya and Mukherjee, Mridula. (2008). India Since Independence. Penguin Books.*
3. *Ghosh, Peu (2021). Indian Government and Politics, PHI Learning.*
4. *Gupta, D.C. (2023). Indian government and Politics. Vikas Publishing House Pvt. Ltd.*
5. *Jain, M.P. (2018), Indian Constitutional Law, LexisNexis.*

6. Jayal, Niraja Gopal and Mehta, Pratap Bhanu (2011). *The Oxford Companion to Politics in India*. Oxford University Press.
7. Kumar, Avinash and Pai, Sudha (2017). *The Indian Parliament: A Critical Appraisal*. Orient Blackswan Pvt Limited.
8. Pylee, M.V. (2023). *India's Constitution*. S. Chand Publishing.
9. Shivhare, Nitin (2023). *Indian Polity and Governance*. S. Chand Publishing.
10. Shukla, V.N. (2019). *Constitution of India*. Eastern Book Company.
11. Subramanian, S.G. (2022). *Indian Constitution and Polity*. Pearson Education.

### Internet Resources:

The internet resources include online articles and e-contents published on websites, blogs, eNewspaper, online magazines, or scholarly journals, digital repositories, Audio- Visual contents.

1. Digital Sansad. *Historical Debates: Constituent Assembly Draft Making Debates*.  
<https://sansad.in/ls/debates/historical?1>
2. Ghosh, Sujit. (2018). *Indian Judiciary: Organizational structure and Jurisdiction*. National Judicial Academy. [https://nja.gov.in/Concluded\\_Programmes/2017-18/SE-13\\_PPTs/6.Judiciary%20organization%20HC%20and%20SC.pdf](https://nja.gov.in/Concluded_Programmes/2017-18/SE-13_PPTs/6.Judiciary%20organization%20HC%20and%20SC.pdf)
3. Goel, Anupama. *Advanced Constitutional Law*. SWAYAM.  
[https://onlinecourses.SWAYAM2.ac.in/cec20\\_hs22/preview](https://onlinecourses.SWAYAM2.ac.in/cec20_hs22/preview)
4. NIOS. *Political Science: Aspects of the Constitution of India*. National Institute of Open Schooling.  
[https://nios.ac.in/online-course-material/sr-secondarycourses/political-science-\(317\).aspx](https://nios.ac.in/online-course-material/sr-secondarycourses/political-science-(317).aspx)
5. NITI Aayog. <https://www.niti.gov.in/>. National Institution for Transforming India **Activities to do:**
  1. Watch **Constitution Assembly Speeches** from News on Official YouTube [<https://www.youtube.com/watch?v=0W9L6rFljF0>] and organize a discussion on various themes with two groups of learners debating on issues discussed by the Constituent Assembly.
  2. Watch **Constitution of India – A Journey** from Prasar Bharati Archives on YouTube [[https://www.youtube.com/playlist?list=PLqtVCj5iilH4hOskMihD3woXA5\\_C\\_58B0y](https://www.youtube.com/playlist?list=PLqtVCj5iilH4hOskMihD3woXA5_C_58B0y)] and stage a short play depicting the essence of this journey.
  3. Read the biographies of freedom fighters and founding fathers of Indian Constitution.

4. Study important judgements passed by Supreme Court of India on Basic Structure Doctrine and assess its impact on the functioning of the Constitution.
5. Study a Report prepared by NITI Ayog and evaluate its significance.
6. Organize community outreach programme to aware people about their rights and duties as citizens.

## **Minor (Paper-III) Semester V/VI**

### **Introduction To Political Theory**

#### **Course Objectives:**

The course seeks to foster a comprehensive and nuanced understanding of political theory, its significance within the discipline of Political Science, and its profound influence on conceptualizing and interpreting various facets of social life. Through a critical examination of influential traditions and perspectives, students will gain insights into how theoretical frameworks shape debates and discourses on socio political issues. Furthermore, the course aims to equip learners with the ability to critically analyse and deconstruct contemporary theories and perspectives that delve into the intricate interplay between politics and social constructs. It begins with an overview of why we study political theory and what are the approaches and forms of political theory. It then proceeds to elaborate in a detailed manner on the key concepts in political theory such as 'Liberty', 'Equality', 'Rights', 'Justice', 'Democracy'. It will also focus on recent trends of Political Theory. Each concept is explained through the thoughts and writings of noted theorists who have deliberated at length on that particular issue with emphasis given on readings of original writings.

#### **Expected Learning Outcomes:**

This course aims to cultivate a sophisticated understanding of the theoretical foundations that inform and shape the ever-evolving political landscape. The unit-wise outcomes are given below.

**Unit-I:** This unit familiarises the students with the basic concepts of political theory, how political theory has evolved as well as the nature of political theory. It also introduces the students to the normative and empirical

dimensions of political theory. The necessity of values and the importance of empirical investigation in the theory building exercise is the primary objective of this unit. This unit also makes an attempt to explain how modernity influenced the theory building exercise and how it reshaped some of the important debates on politics and society.

**Unit-II:** This unit makes an attempt to study important traditions in political theory. These traditions influence our political decisions. Even since the evolution of industrial revolution, nation state, political questions and debates have revolved round the concepts of liberalism and Marxism. Students will be exposed to various debates in each of these traditions and their importance in the present-day context.

**Unit-III:** Political theory, fifty years back, was only concerned about liberalism and Marxism. Of late, with the advancement of society and our understanding of society, new ideas have emerged. They have expanded the horizon of political theory. New theories have evolved and they have thrown new challenges to the society. Modernity encouraged societies to engage in theory building exercise. The emergence of post modernity challenged the grand narratives and encouraged all of us to have micro perspective and challenge everything as modern. Similarly, new theories emerged challenging the existing power structure of the state and society. The understanding of a monocultural society has also changed with people shifting their choice of living from one country to another country. This unit promises to throw many interesting ideas to the students of political science.

**Unit-IV:** This unit makes an attempt to understand some of the important political ideas within the nation state framework. Once nation state is strongly established, it is important to understand the political concepts in detail. Even though concepts like citizenship and civil society are old yet these concepts need some sort of redefinition in the modern context. Similarly, the emergence of welfare state in a political system also has reinforced its presence in the modern context. A student of Political Science needs to take concepts like welfare state and swaraj seriously as it throws many new challenges to the already existing political ideas.

### **Course Content:**

#### **Unit-I: Introduction**

- a) What is Political Theory? Why do we need Political Theory?
- b) Approaches to Political Theory: Normative and Empirical
- c) Modernity and Political Theory

#### **Unit-II: Traditions**

- a) Liberalism
- b) Neo-Liberalism
- c) Marxism
- d) Neo-Marxism

### **Unit-III: Recent Trends**

- a) Feminism
- b) Post-Modernism
- c) Green Political Theory
- d) Multiculturalism

### **Unit-IV: Concepts**

- a) Citizenship
- b) Civil Society
- c) Welfare State
- d) Idea of Swaraj

### **Essential Readings:**

- ✓ *Adams, I. (2001). Political Ideology Today. United Kingdom: Manchester University Press.*
- ✓ *Bhargava, Rajeev, and Acharya, Ashok (2008). Political Theory: An Introduction, New Delhi: Pearson Longman.*
- ✓ *Farrelly, Colin, (2003). Contemporary Political Theory, A Reader, Sage Publications*
- ✓ *Goodin, Robert E. and Philip Pettit edited (1997). Contemporary Political Philosophy, Oxford, Blackwell Publishers.*
- ✓ *Kymilika, Will. (2014). Contemporary Political Philosophy. New Delhi, Oxford*
- ✓ *Miller, David and Larry Siedentop (edited). (1983). The Nature of Political Theory, Oxford, Clarendon Press.*
- ✓ *Ramaswamy, Sushila. (2014). Political Theory: Ideas and*

Concepts. PHI Learning Pvt Ltd.

- ✓ Rawls, John, (1971). *A Theory of Justice*. Oxford, Oxford University Press.
- ✓ Sandel, Michael, (2002). *Liberalism and The Limits of Justice*. Cambridge University Press.
- ✓ Vinod, M.J. and Deshpande, Meena. (2013). *Contemporary Political Theory*. PHI Learning Private Limited, Delhi.

#### **Additional Readings:**

- ✓ Arblaster, A. (3<sup>rd</sup> Edition). (2002). *Democracy*. Open University Press.
- ✓ Bakshi, Om (1988). *The Crisis of Political Theory*, Oxford University Press.
- ✓ Bellamy, Richards (1993). *Theories and Concepts of Politics*, Manchester University Press, New York.
- ✓ Heywood, Andrew (2022). *Political Theory: An Introduction*. Bloomsbury Publication.
- ✓ Kukathas, Ch. and Gaus, G.F. (2004) (eds.). *Handbook of Political Theory*. Sage.
- ✓ Mckinnon, C. (ed.) (2008). *Issues in Political Theory*. Oxford University Press.
- ✓ Parekh, B. (2005). *Rethinking Multiculturalism: Cultural Diversity and Political Theory*. Macmillan Press.
- ✓ Ramaswamy, Sushila. (2014). *Political Theory: Ideas and Concepts*. PHI Learning Pvt Ltd.
- ✓ Sen Amartya (2000). *Development as Freedom*. Oxford University Press.
- ✓ Vincent, A. (2004). *The Nature of Political Theory*. Oxford University Press.

#### **Internet Resources:**

The internet resources include online articles and e-contents published on websites, blogs, eNewspaper, online magazines, or scholarly journals, digital repositories, Audio- Visual contents.

1. eGyankosh. *What is Political Theory*. IGNOU.  
<https://egyankosh.ac.in/bitstream/123456789/57829/1/Unit1.pdf>
2. O'Connor, J. (2010). Marxism and the Three Movements of Neoliberalism. *Critical Sociology*. 36(5) 691-715.  
<https://journals.sagepub.com/doi/pdf/10.1177/0896920510371389>
3. University of Mumbai. *Political Theory*. University of Mumbai.  
[https://archive.mu.ac.in/myweb\\_test/M.A.\(Part%20-%20I\)%20Political%20Science%20Paper%20-%20I%20-%20Political%20Theory%20\(Eng\)%20-%20Rev.pdf](https://archive.mu.ac.in/myweb_test/M.A.(Part%20-%20I)%20Political%20Science%20Paper%20-%20I%20-%20Political%20Theory%20(Eng)%20-%20Rev.pdf)
4. Veeravalli, A. (2011). Swaraj and Sovereignty. *Economic and Political Weekly*. 46(5). 65-69. <https://www.jstor.org/stable/27918091>

### **Activities to do:**

1. [Identify some of the political activities with an explanation. Please exclude voting-related activities.](#)
2. [Identify the liberal/Marxist elements of the Indian state](#)
3. [Try to analyse some major policies of your locality putting it in a liberal and Marxist or any other theoretical framework.](#)
4. [Identify some of the major religious communities in your locality and try to build a theory based on their living experience.](#)

**3 Yr. Degree Course  
(Minor)  
based on NEP-2020  
ZOOLOGY**



(Effective from Session 2025-26)  
(Batch: 2025-2028)



**SAMBALPUR UNIVERSITY**  
JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019

## COURSE AT A GLANCE (NEP-UG)

SUBJECT: ZOOLOGY

ACADEMIC SESSION: **2025-28**

### CORE-I COURSE

| Course Number | Semester | Course Title                                           | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------|--------------------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I        | INVERTIBRATES: PROTISTA TO ECHINODERMATA               | P                                                | 4           | 100                        |
| Paper-II      |          | DIVERSITY OF CHORDATES: PROTOCHORDATES TO MAMMALIA     | P                                                | 4           | 100                        |
| Paper-III     | II       | MICROLOGY                                              | P                                                | 4           | 100                        |
| Paper-IV      |          | CELL BIOLOGY                                           | P                                                | 4           | 100                        |
| Paper-V       | III      | PRINCIPLES OF ECOLOGY                                  | P                                                | 4           | 100                        |
| Paper-VI      |          | PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS       | P                                                | 4           | 100                        |
| Paper-VII     |          | FUNDAMENTALS OF BIOCHEMISTRY                           | P                                                | 4           | 100                        |
| Paper-VIII    | IV       | ENDOCRINOLOGY & REPRODUCTIVE BIOLOGY                   | P                                                | 4           | 100                        |
| Paper-IX      |          | COMPARATIVE ANATOMY OF VERTIBRATES                     | P                                                | 4           | 100                        |
| Paper-X       |          | PHYSIOLOGY: LIFE SUSTAINING SYSTEMS                    | P                                                | 4           | 100                        |
| Paper-XI      | V        | BIOCHEMISTRY OF METABOLIC PROCESS<br>PROGRAMME OUTCOME | P                                                | 4           | 100                        |
| Paper-XII     |          | PRINCIPLES OF GENETICS                                 | P                                                | 4           | 100                        |
| Paper-XIII    |          | MOLECULAR BIOLOGY                                      | P                                                | 4           | 100                        |
| Paper-XIV     | VI       | DEVELOPMENT BIOLOGY                                    | P                                                | 4           | 100                        |
| Paper-XV      |          | TAXONOMY AND EVOLUTIONARY BIOLOGY                      | P                                                | 4           | 100                        |
| Paper-XVI     | VII      |                                                        |                                                  | 4           | 100                        |
| Paper-XVII    |          |                                                        |                                                  | 4           | 100                        |
| Paper-XVIII   |          |                                                        |                                                  | 4           | 100                        |
| Paper-XIX     |          |                                                        |                                                  | 4           | 100                        |
| Paper-XX      | VIII     |                                                        |                                                  | 4           | 100                        |
| Paper-XXI     |          |                                                        |                                                  | 4           | 100                        |
| Paper-XXII    |          |                                                        |                                                  | 4           | 100                        |
| Paper-XXIII   |          |                                                        |                                                  | 4           | 100                        |

### CORE-II/CORE-III COURSE

| Course Number | Semester<br>Core-II/<br>Core-III | Course Title                                       | Type of Paper<br>P-Practical<br>NP-Non-practical | Credit Hour | Maximum Weightage of Marks |
|---------------|----------------------------------|----------------------------------------------------|--------------------------------------------------|-------------|----------------------------|
| Paper-I       | I/II                             | INVERTIBRATES: PROTISTA TO ECHINODERMATA           | NP                                               | 4           | 100                        |
| Paper-II      | III/IV                           | DIVERSITY OF CHORDATES: PROTOCHORDATES TO MAMMALIA |                                                  | 4           | 100                        |
| Paper-III     | V/VI                             | MICROBIOLOGY                                       |                                                  | 4           | 100                        |
| Paper-IV      | VII                              |                                                    |                                                  | 4           | 100                        |
| Paper-V       | VIII                             |                                                    |                                                  | 4           | 100                        |

**CORE COURSE II/ III**  
**Minor (Paper-I) SEMESTER- I/II**

**Invertebrates: Protista to Echinodermata**

**(4Credit, Theory-45h and Practical – 30h)**

**Programme Outcome:**

- Understand the general characteristics of non-chordate groups of organisms.
- Acquire knowledge regarding classification of the taxa with examples.
- Develop an understanding of important phenomena associated with each taxon.
- Acquire skills in identifying representative species of groups studied.
- Illustrate phylogenetic distribution of lower groups of Non-chordates.
- Understand elaboration of coelomic evolution and metamerism on Coelomates with their classification up to their class and excretion system in Annelidans.
- Recognize insect vision, respiration and metamorphosis in Arthropoda with reference to Termites and in evolutionary significance of Onychophora with general characteristics.
- Obtain an over view of the general features, respiration, Gastropodan evolution, mechanism of torsion, and significance of larval life stages.
- Acquire knowledge on general characters and classification of Echinoderms and their affinities with Chordates.

**Course Outcome:**

- Utilize information to understand the differences of the groups studied.
- Develop skills in examining diversity of the taxa.
- Develops skills in elaborating the general features and evolutionary significance of the coelomate from Annelida to Echinoderms.
- Impactful visual understanding and enables the students to correlate the evolutionary significance of each organism on the phylogenetic tree.
- Study on various general features and characteristics of body symmetry and arrangement with various vision types, excretory systems and developmental stage give a strong fundamental understanding on the subject on Coelomates.

**Learning Outcome**

- Systematically understand the diverse group of organisms from Protista to Cnidaria and Ctenophora
- Systematically understand the diverse group of organisms that make up Phyla Platyhelminthes and Nematelminthes.
- Understand the diverse organisms that make up Phyla from Annelida, Arthropoda and Onychophora.
- Understand the diverse organisms that make up Phyla from Mollusca and Echinodermata and significant processes associated.

## **Unit 1: Protista to Cnidaria and Minor Phylum Ctenophora**

General characteristics and Classification up to classes. Locomotion, Nutrition and Reproduction in Protista, Life cycle and pathogenicity of *Plasmodium vivax*, Canal system and spicules in sponges, Metagenesis in Obelia, Polymorphism in Cnidaria, Corals and coral reefs, Evolutionary significance of Ctenophora.

## **Unit 2: Platyhelminthes and Nematelminthes**

General characteristics and Classification up to classes. Life cycle and pathogenicity of *Fasciola hepatica* and *Taenia solium*, Life cycle, and pathogenicity of *Ascaris lumbricoides* and *Wuchereria bancrofti*. Parasitic adaptations in helminthes

## **Unit 3: Annelida, Arthropoda and Onychophora**

General characteristics and Classification up to classes. Evolution of coelom and metamerism. Excretion in Annelida, Vision and Respiration in Arthropoda. Metamorphosis in Insects. Social life in bees and termites. Onychophora: General characteristics and Evolutionary significance.

## **Unit 4: Mollusca and Echinodermata**

General characteristics and Classification up to classes. Respiration in Mollusca. Torsion and detorsion in Gastropoda. Evolutionary significance of trochophore larva. Water-vascular system in Echinoderms, Larval forms in Echinodermata

### **TEXT BOOKS**

- ✓ *Kotpal RL; Modern Textbook of Zoology – Invertebrates; Rastogi Publications - Meerut; 2016 edition.*
- ✓ *Richard Brusca, W. Moore, Stephen M. Shuster. Invertebrates; OUP USA; 3 edition (19 January 2016).*

### **SUGGESTED READINGS**

- ✓ *Richard Fox, Robert D. Barnes, Edward E. Ruppert, Invertebrate Zoology: A Functional Evolutionary Approach, Brooks/Cole; 7th edition edition 2003*
- ✓ *Barrington, E.J.W. Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson.*
- ✓ *Hyman, L.H. Invertebrate Series (Recent edition).*
- ✓ *Parker JJ and WA Haswel Textbook of Zoology. Vol I and II.*
- ✓ *Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson.*
- ✓ *Barnes, R.S.K., Calow, P., Olive, P. J. W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science.*

## **Invertebrates: Protista to Echinodermata**

### **Practical**

1. Study of whole mount of *Euglena*, *Amoeba* and *Paramecium*, Binary fission and Conjugation in *Paramecium*.
2. Study of *Sycon* (T.S. and L.S.), *Hyalonema*, *Euplectella*, *Spongilla*, Spicules and Spongin fibers.
3. Study of Cnidarians *Obelia*, *Physalia*, *Millepora*, *Aurelia*, *Tubipora*, *Corallium*, *Alcyonium*, *Gorgonia*, *Metridium*, *Pennatula*, *Fungia*, *Meandrina*, *Madrepora*, *Ctenophore*.
4. Study of Life cycle stages of *Fasciola hepatica*, *Taenia solium* and *Ascaris lumbricoides*
  - i. (Slides/micro-photographs).
5. Study of Annelids - *Aphrodite*, *Nereis*, *Heteronereis*, *Sabella*, *Serpula*, *Chaetopterus*, *Pheretima*, *Hirudinaria*.
6. Study of Arthropods – Crab, *Limulus*, *Palamnaeus*, *Palaemon*, *Daphnia*, *Balanus*, *Sacculina*, *Eupagurus*, *Scolopendra*, *Julus*, *Bombyx mori*, *Periplaneta americana*, termites, honey bees and *Peripatus*
7. Study of Molluscs and Echinodermata- *Chiton*, *Dentalium*, *Pila*, *Doris*, *Helix*, *Unio*, *Ostrea*, *Pinctada*, *Sepia*, *Octopus*, *Nautilus*.
  - i. Echinodermata - *Pentaceros/Asterias*, *Ophiura*, *Clypeaster*, *Echinus*, *Cucumaria* and *Antedon*
8. Study of digestive system, nephridia of earthworm (Virtual), T.S. through pharynx, gizzard, and typhlosolar region of earthworm, Mounting of mouth parts and dissection of digestive system and nervous system (Virtual) of *Periplaneta americana*.
9. To submit a Project Report on any related topic.

### **Suggested Reading**

- ✓ Verma PS and Srivastava PC. (2011) *Advanced Practical Zoology*. S Chand Publication.
- ✓ S.S Lal. (2019) *Practical Zoology (Invertebrate)* Rastogi Publications.

## **Minor (Paper-II) SEMESTER- III/IV**

### **Diversity of Chordates: Protochordates to Mammalia**

(4Credit, Theory-45h and Practical – 30h)

#### **Programme Outcome:**

- The students learn about the salient features, diversity and distribution of all Chordates.
- To know the evolution of aquatic, amphibious and terrestrial vertebrates.
- To understand the importance of distribution of vertebrates in different realms.

#### **Course Outcome:**

- Understanding the origin, larval forms, distribution and adaptation of different vertebrates.
- Accumulating the knowledge and understanding on the classification, affinities and comparative anatomy of different vertebrates and their evolutionary significance.
- Learning the mechanism of flight and aquatic adaptations in birds and mammals.
- Obtaining knowledge pertaining to the distribution of animals particularly vertebrate in different realms.

#### **Learning Outcome:**

- Gain understanding of Protochordates and origin of Chordates.
- Knowledge regarding characteristics and classification of Agnatha, Pisces, Amphibia, and evolution of tetrapoda.
- Understanding characteristics and classification of Reptiles and Aves and their connecting links.
- Comprehend characteristics and organization of mammals, in addition to their distribution in zoogeographical realms.

#### **Unit 1: Protochordates and Origin of Chordates**

General characteristics and outline classification Chordata (Protochordata: Hemichordata, Urochordata and Cephalochordata). Study of larval forms in protochordates; Retrogressive metamorphosis in Urochordat; Dipleurula concept and the Echinoderm theory of origin of chordates.

#### **Unit 2: Agnatha, Pisces & Amphibia**

General characteristics and classification up to order. Migration, Parental care in fishes, Accessory respiratory organs in Pisces, Evolutionary significance of Dipnoi.  
Amphibia: Origin of Tetrapoda (Evolution of terrestrial ectotherms); Parental care.

#### **Unit 3: Reptilia & Aves**

General characteristics and classification up to order. Affinities of Sphenodon; Poison apparatus and Biting mechanism in snakes. Archaeopteryx- a connecting link; Flight adaptations and Migration in birds.

#### Unit 4: Mammals & Zoogeography

General characters and classification up to order; Affinities of Prototheria; Adaptive radiation with reference to locomotory appendages. Zoogeographical realms, Theories pertaining to distribution of animals, Plate tectonic and Continental drift theory, distribution of vertebrates in different realms.

#### PRACTICAL

1. Protochordata: *Balanoglossus*, *Herdmania*, *Branchiostoma*, Urochordata, Sections of *Balanoglossus* through proboscis and branchio-genital regions, Sections of *Amphioxus* through pharyngeal, intestinal and caudal regions. Permanent slides of *Herdmania* spicules, *Doliolum*, *Salpa*
2. Agnatha: *Petromyzon* and *Myxine*.
3. Fishes: *Scoliodon*, *Sphyrna*, *Pristis*, *Torpedo*, *Chimaera*, *Mystus*, *Heteropneustes*, *Labeo*, *Exocoetus*, *Echeneis*, *Anguilla*, *Hippocampus*, *Tetrodon/ Diodon*, *Anabas*, Flat fish.
4. Amphibia: *Ichthyophis/Ureotyphlus*, *Necturus*, *Bufo*, *Hyla*, *Alytes*, Salamander.
5. Reptilia: *Chelone*, *Trionyx*, *Hemidactylus*, *Varanus*, *Uromastix*, *Chamaeleon*, *Ophiosaurus*, *Draco*, *Bungarus*, *Vipera*, *Naja*, *Hydrophis*, *Zamenis*, *Crocodylus*. Key for Identification of poisonous and non-poisonous snakes
6. Aves: Study of six common birds from different orders. Types of beaks and claws. Study of feathers.
7. Mammalia: *Sorex*, Bat (Insectivorous and Frugivorous), *Funambulus*, *Loris*, *Herpestes*, *Erinaceus*.
8. Power point presentation on study of any two examples representing two different classes.. Submission of report on local species.

#### Text Books:

- ✓ *Kotpal RL; Modern Textbook of Zoology –Vertebrates; Rastogi Publications - Meerut; 2016 edition*
- ✓ *Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford University Press.*
- ✓ *Tiwari SK (2006) Fundamentals of World Zoogeography, Sarup & Sons.*

#### Suggested Readings:

- ✓ *Pough H. Vertebrate life, VIII Edition, 2007 Pearson International.*
- ✓ *Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jonesand Bartlett Publishers Inc.*
- ✓ *Hickman CP, Roberts LS, Keen S, Larson A, I'AnsonH, Isenhour DJ Integrated Principle of Zoology, 14th edition, 2008, McGrawHill publication.*

## **Minor (Paper-I) SEMESTER- I/II**

### **Microbiology**

**(4Credit, Theory-45h and Practical – 30h)**

#### **Programme Outcome:**

- Knowledge of microbial diversity and classification.
- To understand microbial culture, growth and reproduction.
- To understand the importance of viral pathogenicity, nature of viral transmission.
- To comprehend the importance of Anti-viral drugs and vaccines.

#### **Course Outcome:**

- Obtaining knowledge pertaining to future scopes and modern trends of microbiology.
- Understanding the experimental approaches to explore the origin of microbes.
- Understanding the morphology, classification and significance of host-vector relationship.
- Learning the mechanism of action of microbial toxins and pathogenicity.
- Obtaining knowledge on pathogenic manifestation of Oncoviruses & HIV.

#### **Learning Outcome:**

- Finding the historical background and modern experimental approaches to understand the origin and development of microbiology.
- Analysing the general features, classification and pathogenicity of Archea and Eubacteria.
- Deducing knowledge on role of microbes in agriculture and healthcare sector.
- Interpreting the mechanism of antibacterial and anti-viral their mode of action, and importance of vaccines.

#### **Unit-1**

**History and development of microbiology:** Biogenesis and abiogenesis, Contribution of Francesco Redi, Lazzaro Spallanzani, John Needham, Louis Pasteur, John Tyndall, Joseph Lister, Robert Koch (germ theory), Edward Jenner and Alexander Fleming's experiments on discovery of Penicillin, Modern trends and future scope of Microbiology.

#### **Unit-2**

**Microbial systems of classification:** General features of Bergey's manual for classification of microbes, Whittaker's five kingdom concept, Carl Woese's 3 domain classification, Lynn Margulis theory of endosymbiotic theory. General features of Archaea: Structure, Nutrition and Reproduction.

General features, pathogenicity of Mycoplasma, Rickettsia and Spirochaetes.

### Unit-3

**Isolation, culture and maintenance of microorganisms:** Microbial growth, continuous culture (chemostat), Factors influencing growth of microbes, Role of microbes in agriculture and healthcare industry. Reproduction of Eubacteria, Genetic recombination in bacteria (Transformation, Conjugation and Transduction).

### Unit-4

**Virion and viroids:** General characteristics and classification of viruses, morphology, nature of viral transmission. Bacteriophage replication, Oncoviruses & HIV: structure, transmission, pathogenicity and replication. Microbial toxins: types, mode of actions and pathogenicity (Exo and Endo-toxin). Antibiotics and their mode of action, Anti-virals and vaccine.

### PRACTICAL

1. Study on aseptic techniques in microbiology: various methods of sterilization process.
2. Preparation and formulation of microbial media and methods of inoculation.
3. Methods of isolation of bacteria: spread plate, streak plate, pour plate, serial dilution.
4. Sampling and quantification of microorganisms in air, water and soil.
5. Morphological identification of microorganisms from various habitats through simple staining, differential staining, acid fast staining, spore staining.
6. Methods of microscopic measurements, micrometer (ocular and stage), haemocytometer.
7. Preparation of bacterial growth curve.

**3 Yr. Degree Course  
(Minor)  
based on NEP-2020  
ODIA**



**(Effective from Session 2025-26)  
(Batch: 2025-2028)**



**SAMBALPUR UNIVERSITY**  
JYOTI-VIHAR, BURLA, SAMBALPUR, ODISHA-768019

## Core I

## ପ୍ରଥମ ପର୍ଯ୍ୟାୟ (Semester-I)

### ଭାଷାବିଜ୍ଞାନ

#### Course Outcome (ପାଠ୍ୟପୁସ୍ତକ ଫଳଶ୍ରୁତି):

ଭାଷା ଭାବବିବିନୟନ ମାଧ୍ୟମ । ଭାଷା ବ୍ୟବହାର କରି ସର୍ବନିଶ୍ଚୟ ସ୍ପଷ୍ଟ ସାହିତ୍ୟଗୁଣ୍ଠି କରିଥାଏ । ତେଣୁ ସାହିତ୍ୟ ବିଶ୍ଳେଷଣ ପାଠ୍ୟପୁସ୍ତକରେ ଆଦ୍ୟରେ ଭାଷା ସମ୍ପର୍କରେ ସାଧାରଣ ଉପଲବ୍ଧି ଆଣିବା ଚିନ୍ତିତ ଏହି ପଢ଼ୁଥି ଉପଯୋଗୀ ହେବ ।

#### Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି):

- ୧ମ ଏକକ : ଭାଷା ବାଣ, ବାହାର ପରିବର୍ତ୍ତନ, ଭାଷାର ସ୍ୱରୂପ ଓ ବିଭିନ୍ନ ପ୍ରକାରରେ ସମ୍ପର୍କରେ ଏହି ଏକକ ଉପଲବ୍ଧି ଆଣିବ ।
- ୨ୟ ଏକକ : ଭାଷା ଉପରୁ ଉତ୍ପତ୍ତି ହେଲା, ଏବଂ ସମ୍ପର୍କରେ ପ୍ରତ୍ୟେକ ବିଭିନ୍ନ ବିଭାଗର ପରିଚୟ ଲାଭକରି ଛାତ୍ରଛାତ୍ରୀ ଭାଷା ଗୁଣ୍ଠିର ବିଭବିତ୍ତତା ଜାଣିପାରିବେ ।
- ୩ୟ ଏକକ : ବିଶ୍ୱରେ ବହୁଭାଷା ପ୍ରଚଳିତ । ଭାଷାବଦ୍ଧ ଗୁଣ୍ଠିରୁ ବେହି ସମୁଦାୟ ଭାଷାକୁ ନେଇ ପୃଷ୍ଠବାର ଭାଷା ପରିବାର ଉଠିବ । ବେହି ଭାଷା ପରିବାର ସମ୍ପର୍କରେ ଛାତ୍ରଛାତ୍ରୀ ଜାଣିବା ନିମନ୍ତ ଆବଶ୍ୟକ । ଏହି ଏକକଟି ବେହି ଉଦେଶ୍ୟ ପୂରଣ କରିବ ।
- ୪ର୍ଥ ଏକକ : ଗୋଟିଏ ନିର୍ଦ୍ଦିଷ୍ଟ ପ୍ରଦେଶରେ ଯେଉଁ ଗୁଣ୍ଠି ଭାଷା ପ୍ରଚଳିତ, ତାହା ସାଧାରଣତଃ ମାନବ ଭାଷା ଭୂପେ ପରିଚିତ ହୁଏ । ମାତ୍ର ବିଭିନ୍ନ ଅଞ୍ଚଳରେ ମାନବଭାଷା ବ୍ୟବହାର ଅନ୍ୟ କେତେକ ଅଞ୍ଚଳର ଭାଷାର ପ୍ରଚଳନ ପରିଲକ୍ଷିତ ହୋଇଥାଏ । ଏହି ଏକକରେ ମାନବଭାଷା ଓ ଉପଭାଷା ସମ୍ପର୍କରେ ଶିକ୍ଷା ଆନନ୍ଦର କରିପାରିବେ ।

### ପାଠ୍ୟ ବିଷୟ

- ୧ମ ଏକକ : ଭାଷାର ସଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକାରରେ
- ୨ୟ ଏକକ : ଭାଷା ଉତ୍ପତ୍ତି ସମ୍ପର୍କରେ ବିଭିନ୍ନ ବିଭାଗ
- ୩ୟ ଏକକ : ପୃଷ୍ଠବାର ଭାଷା ପରିବାର
- ୪ର୍ଥ ଏକକ : ମାନବଭାଷା ଓ ଉପଭାଷା

#### ସନ୍ଦର୍ଭ ଗ୍ରନ୍ଥସୂଚୀ (Book of Reference):

୧. ଭାଷାବିଜ୍ଞାନର ଉପରେଖ – ବାସୁଦେବ ସାହୁ, ପ୍ରେସ୍‌ବ୍ ପବ୍ଲିଶର୍ସ, କଟକ ।
୨. ଭାଷାଶାସ୍ତ୍ର ପରିଚୟ – ଗୋଲୋବ ବିହାରୀ ଧର, ଓ. ରାଜ୍ୟ ପା. ପୁ. ପ୍ର. ଓ ପ୍ର. ସଂସ୍ଥା, ଭୁବନେଶ୍ୱର ।
୩. ଓଡ଼ିଆ ଭାଷାର ଗୁଣ୍ଠି ଓ ବିଭାଗ – ଉପେନ୍ଦ୍ର ପ୍ରସାଦ ଦତ୍ତ, ଏ. ଲେ ମିଶ୍ର ପବ୍ଲିଶର୍ସ, କଟକ ।
୪. ଓଡ଼ିଆ ଭାଷାର ଉତ୍ପତ୍ତି ଓ ବିଭାଗ – ବାସୁଦେବ ସାହୁ, ପ୍ରେସ୍‌ବ୍ ପବ୍ଲିଶର୍ସ, କଟକ ।
୫. ଭାଷା ଭାବନା - ପ୍ରଫ. ବିହାରୀଧର ମହାନ୍ତି, ବିଦ୍ୟା ପ୍ରକାଶନ, ଭୁବନେଶ୍ୱର ।
୬. ଓଡ଼ିଆ ଭାଷା ଓ ଭାଷାବିଜ୍ଞାନ – ଦେବୀ ପ୍ରସାଦ ପଟ୍ଟନାୟକ, ଗ୍ରନ୍ଥମୟୀ, କଟକ ।
୭. ଓଡ଼ିଆ ଭାଷାର ଉପଭାଷା-ସଂସ୍କୃତୀୟତା ଗାନ୍ଧୀପୁର, ଓଡ଼ିଆ ସାହିତ୍ୟ ଏକାଡେମୀ, ଭୁବନେଶ୍ୱର ।
୮. ମଣିଷର ଭାଷା- ଗୋଲୋବ ବିହାରୀ ଧର, ପ୍ରେସ୍‌ବ୍ ପବ୍ଲିଶର୍ସ, କଟକ ।

୯. ଭାଷା ଚର୍ଚ୍ଚା ପଢ଼ାପଢ଼ା-ଗଗନେନ୍ଦ୍ରନାଥ ଦାଶ, ପ୍ରେସ୍‌ବ୍ ପବ୍ଲିଶର୍ସ, କଟକ ।

**Sample Questions (ନମୁନା ପ୍ରଶ୍ନ):**

୧. ଭାଷାର ଏକ ସାର୍ଥକ ସଂଜ୍ଞା ପ୍ରଦାନକର । (୧ ମାର୍କ ପ୍ରଶ୍ନ)

୨. ଭାଷା କିପରି ସମ୍ପର୍କିତ ଧ୍ୱନି ଅନୁରଣ୍ୟ ଶିକ୍ଷାକର ଚିତ୍ରଣା ଲେଖ । (୨ମାର୍କ ପ୍ରଶ୍ନ)

୩. ମାନବଭାଷା ଓ ଉପଭାଷା ମଧ୍ୟରେ ତାରତମ୍ୟ ଦର୍ଶାଅ । (୫ମାର୍କ ପ୍ରଶ୍ନ)

୪. ପୃଥିବୀର ଭାଷା ପରିବାର ସମ୍ପର୍କରେ ଆଲୋଚନା କର । (୮ମାର୍କ ପ୍ରଶ୍ନ)

## Core II

## ପ୍ରଥମ ପର୍ଯ୍ୟାୟ (Semester-I)

### ସାହିତ୍ୟର ସ୍ୱରୂପ

**Course Outcome (ପାଠ୍ୟପତ୍ର ଫଳସ୍ଥୁତି):**

ସାହିତ୍ୟ ବିଶିଷ୍ଟରୂପର ସମାହାର । ଭାବ୍ୟ କବିତା, ଗଳ୍ପ ଉପନ୍ୟାସ, ନାଟକ , ଏକାଙ୍କିକା ଏବଂ ଉପ୍ୟାସ ସାହିତ୍ୟର ବିଭିନ୍ନ ରୂପ ସାହିତ୍ୟକୁ କବିତା ପରିପୁଷ୍ଟ । ଛାତ୍ରଛାତ୍ରୀମାନେ ସାହିତ୍ୟର ସେହି ରୂପର ବିଶିଷ୍ଟ ଓ ଜାଣିବା ଦ୍ୱାରା ଉପରେ ଅବଗତ ହେବା ଆବଶ୍ୟକ । ଏହି ପତ୍ରଟି ଶିକ୍ଷାଧୀନମାନଙ୍କୁ ସେ ସମ୍ପର୍କରେ ଧାରଣା ପ୍ରଦାନ କରିବ ।

**Unit Wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳସ୍ଥୁତି) :**

୧ମ ଏକକ : ଭାବ୍ୟ, ମହାଭାବ୍ୟ ଓ କବିତାର ସଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ବିଶିଷ୍ଟତା ସମ୍ପର୍କରେ ଛାତ୍ରଛାତ୍ରୀ ଏଥିରେ ଜ୍ଞାନ ଲାଭ କରିବେ ।

୨ୟ ଏକକ : ଉପାସାହିତ୍ୟର କବିତା ମଧ୍ୟ ବର୍ଣ୍ଣନା, ବିଶେଷତା ଗଳ୍ପ ଓ ଉପନ୍ୟାସର ଚାରିଟି ପିଲା ଭଦ୍ର ଜାହାଜ ବିଶେଷତା ଓ ପ୍ରକାରଭେଦ ଏହି ଏକକରୁ ଜାଣି ହେବ ।

୩ୟ ଏକକ : ନାଟକ ଓ ଏକାଙ୍କିକା ସାହିତ୍ୟର ପ୍ରଭୁତ୍ୱପୂର୍ଣ୍ଣ ଅଟେ । ଏହା ଏକାଧାରରେ ପାଠକ ଓ ଦର୍ଶକଙ୍କୁ ଆକୃଷ୍ଟ କରିଥାଏ । ବେଶ୍ ଏକକର ସଂଜ୍ଞା, ସ୍ୱରୂପ, ରୂପଭେଦ ଉପରେ ଏହି ଏକକ ଅବଗତ କରାଇବ ।

୪ର୍ଥ ଏକକ : ଉପ୍ୟାସକାର ବିଭିନ୍ନତା ମଧ୍ୟରୁ ପ୍ରବନ୍ଧ, ଗମ୍ୟ ଗବନୀ, ପ୍ରମୁଖ କାହାଣୀ ତଥା କାହାଣୀ ଓ ଆତ୍ମକାହାଣୀ ଆଧୁନିକ ସାହିତ୍ୟକୁ କବିତା ପ୍ରମୁଖ । ଏହି ଉପନ୍ୟାସକର ଗାନ୍ଧି ଓ ରୁଣାମୁକ ବିଶିଷ୍ଟତା ଜାଣିବା ପାଇଁ ଏହି ଏକକ ଉଦ୍ଦିଷ୍ଟ ।

### ପାଠ୍ୟ ବିଷୟ

|                             |                                                                                                                          |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------|
| ୧ମ ଏକକ : ଭାବ୍ୟକବିତା -       | କ) ଭାବ୍ୟ, ମହାଭାବ୍ୟର ସଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକାର ଭେଦ<br>ଖ) ସାହିତ୍ୟକବିତା, ଗାଥାକବିତା, ସମ୍ବେଦ, ସମ୍ବୋଧନଗାଥାକବିତାର ସଂଜ୍ଞା ଓ ସ୍ୱରୂପ |
| ୨ୟ ଏକକ : ଗଳ୍ପ ଓ ଉପନ୍ୟାସ -   | (କ) ଗଳ୍ପର ସଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକାରଭେଦ<br>(ଖ) ଉପନ୍ୟାସର ସଂଜ୍ଞା, ସ୍ୱରୂପ, ଓ ପ୍ରକାରଭେଦ                                         |
| ୩ୟ ଏକକ : ନାଟକ ଓ ଏକାଙ୍କିକା - | (କ) ନାଟକର ସଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକାରଭେଦ<br>(ଖ) ଏକାଙ୍କିକାର ସଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ପ୍ରକାରଭେଦ                                        |
| ୪ର୍ଥ ଏକକ : ଉପ୍ୟାସ -         | (ପ୍ରବନ୍ଧ, ଗମ୍ୟଗବନୀ, ପ୍ରମୁଖ କାହାଣୀ, କାହାଣୀ-ଆତ୍ମକାହାଣୀର ସଂଜ୍ଞା ଓ ସ୍ୱରୂପ)                                                   |

**ସନ୍ଦର୍ଭଗ୍ରନ୍ଥସୂଚୀ (Book of Reference):**

୧. ସାହିତ୍ୟର ସମ୍ବିଧାନ - ପୂର୍ଣ୍ଣଚନ୍ଦ୍ର ମହାନ୍ତି, ଶ୍ରୀ ଶ୍ରୀ ୩-୨, ସେକ୍ଟର-୭, ମାର୍ଚ୍ଚ ନଗର, କଟକ-୭୦୧୭ ।
୨. ସାହିତ୍ୟର ସ୍ୱରୂପ- ବିଭୂତି ପଟ୍ଟନାୟକ, ନାୟକା, ବିନୋଦବିହାରୀ, କଟକ - ୨୦୧୦ ।
୩. ସାହିତ୍ୟର ରୂପରେଖ - ନାଟାଦ୍ୱି କୁଞ୍ଜରାୟ ଛତିଶବନ, କାବ୍ୟସ୍ୱ ସେହେରା, ବିଦ୍ୟାପୁରୀ, ବାଲୁବଜାର, କଟକ-୨୦୧୭ ।
୪. ସାହିତ୍ୟର ଗଢ଼ପତ୍ର - ସୁରେନ୍ଦ୍ର କୁମାର ମହାପାତ୍ର, ପ୍ରେସ୍‌ପବ୍ଲିଶର୍ସ, କଟକ ୨୦୧୮ ।
୫. ସାହିତ୍ୟ ଚର୍ଚ୍ଚା : ପ୍ରାଚ୍ୟ ଓ ପାଶ୍ଚାତ୍ୟ - ଚ୍ୟୋପାମୟୀ ପ୍ରଧାନ, ପ୍ରେସ୍‌ପବ୍ଲିଶର୍ସ, କଟକ-୨୦୧୯ ।
୬. ସାହିତ୍ୟର ଗଠନ ଗାଢ଼ି - ଦୈତ୍ୟ ଚରଣ ସାମଲ, ପ୍ରେସ୍‌ପବ୍ଲିଶର୍ସ, କଟକ ।
୭. ସାହିତ୍ୟ ଚର୍ଚ୍ଚା - ଧନେଶ୍ୱର ମହାପାତ୍ର, ପ୍ରଜ୍ଞମୟିର, କଟକ, ।
୮. ସାହିତ୍ୟର ଆମାତ୍ୟ କଥନ- ଶେତ୍ରବାଣୀ ନାୟକ, ସାଥୀ ମହଲ, କଟକ ।
୯. ସମ୍ବାଦ-ଆମ ଓଡ଼ିଶା : ସାହିତ୍ୟଲେଖ- ସଂ. ବାଉରସ୍ ବାସ, ସୁଦର୍ଶନ ଆଗାର୍ଯ୍ୟ, ଦେବେନ୍ଦ୍ର କୁମାର ଦାଶ, ଗୌରାଙ୍ଗ ଚରଣ ଦାଶ, ଆମ ଓଡ଼ିଶା, ୪ ଆର୍ ୧/୨, ଇନ୍‌ସିଟ୍-୩, ଭୁବନେଶ୍ୱର ।

**ନମୁନା ପ୍ରଶ୍ନ(Sample Questions):**

୧. ସନ୍ଦେହରେ କେତେଗୋଟି ପାଦ ଉଦ୍ଧୃତାଏ ? (୧ମାର୍କ ପ୍ରଶ୍ନ)
୨. ଉକ୍ତ ଓ ଉପନାସ ମଧ୍ୟରେ ଦୁଇଗୋଟି ପାର୍ଥକ୍ୟ ଲେଖ । (୨ମାର୍କ ପ୍ରଶ୍ନ)
୩. ଏକାକିତା ଗୀତକର ଜାମନରୂପ ନୁହେଁ, କାହିଁକି? ଦର୍ଶାଅ । (୫ମାର୍କ ପ୍ରଶ୍ନ)
୪. ଭ୍ରମଣ ଜାତୀୟତା ସଂଜ୍ଞା, ସ୍ୱରୂପ ଓ ଶୈଶିଷ୍ୟ ପ୍ରଦର୍ଶନ କର । (୮ମାର୍କ ପ୍ରଶ୍ନ)

**Core III** **ଦ୍ୱିତୀୟ ପର୍ଯ୍ୟାୟ (Semester - II)**  
**ପ୍ରାଚୀନ ଓଡ଼ିଆ ସାହିତ୍ୟର ଇତିହାସ**

**Course Outcome (ପାଠ୍ୟପୁସ୍ତକ ଫଳଶ୍ରୁତି):**

ଓଡ଼ିଆ ସାହିତ୍ୟର ପ୍ରାଚୀନ ଐତିହ୍ୟ ଶୈଳୀଭାବେ । ବିଶେଷତଃ ଶୈଳ ସିଦ୍ଧାନ୍ତାର୍ଥମାନଙ୍କ ଚର୍ଯାଗାରିକାଠାରୁ ପଞ୍ଚମଖ୍ୟ ପର୍ଯ୍ୟନ୍ତ ଓଡ଼ିଆ ସାହିତ୍ୟରେ ଓଡ଼ିଆର ଧର୍ମଧାରା, ସାମାଜିକ ଓ ସାଂସ୍କୃତିକ ପ୍ରାଣପ୍ରବାହ ତଥା ଓଡ଼ିଆ ଗୀତିର ଅସ୍ଥିତା ପ୍ରସ୍ତୁତି । ଏହି ପ୍ରସ୍ତୁତିର ଅଧ୍ୟୟନ ମଧ୍ୟମରେ ଶିକ୍ଷାର୍ଥୀମାନେ ପ୍ରାକ୍-ପାରତା, ପାରତା ଓ ପଞ୍ଚମଖ୍ୟ ସାହିତ୍ୟର ଐତିହାସିକ ବିକାଶ ଓ ବିଶେଷତ୍ୱକୁ ଉପଲବ୍ଧି କରିପାରିବେ ।

**Unit wise Learning Outcome (ପ୍ରତି ଏକକର ଅଧ୍ୟୟନ ଫଳଶ୍ରୁତି) :**

- ୧ମ ଏକକ : ପ୍ରାକ୍-ପାରତା ଯୁଗର ସାହିତ୍ୟ ମୁଖ୍ୟତଃ ଧର୍ମନୈନ୍ଦ୍ରିକ, ଚତୁର୍ଥରୁ ଶୈବଧର୍ମ ଓ ନାଥଧର୍ମ ସମ୍ପର୍କରେ ଉଚିତ ସାହିତ୍ୟ ଉପରେ ଏହି ଏକକ ଧାରଣା ପ୍ରଦାନକରିବ । ପ୍ରସଙ୍ଗକ୍ରମେ ଶାତ୍ରୁଘ୍ନାଦି ଚର୍ଚ୍ଚନାଦ୍ୱାରା ସାମାଜିକ ଓ ସାହିତ୍ୟିକ ପରିଚୟ ସମ୍ପର୍କରେ ମଧ୍ୟ ଅବଗତ ହୋଇପାରିବେ ।
- ୨ୟ ଏକକ : ମହାବଳି ଆରମ୍ଭ ଦାସଙ୍କ ସାହିତ୍ୟ ଓଡ଼ିଆର ସାମାଜିକ ଓ ସାଂସ୍କୃତିକ ଜୀବନର ଶୈଶିଷ୍ୟ ବହନ କରେ । ଶାସ୍ତିକ ଏକକରେ ତାହା ଉପଲବ୍ଧ ହେବ ।

ଶାଞ୍ଜ ଏକତ୍ର : ପଞ୍ଚମଶ୍ରେଣୀ ପାଠ୍ୟପୁସ୍ତକରୁ ଉଦାହରଣ ଗାଥା ଓ ଉପଲକ୍ଷ୍ୟ ଗାଥାକୁ ଚୂନିବା ଅନୁରୋଧ । ଏହି ଦୁଇ ପାଠ୍ୟପୁସ୍ତକ  
ସମ୍ପର୍କରେ ଏହି ଏକତ୍ରର ଅଧ୍ୟୟନ ଉପାଦେୟ ରେବ ।

୪ର୍ଥ ଏକତ୍ର : ଅତ୍ୟୁତ୍ତମ, ଯଶୋବନ୍ତ ଓ ଶିଶୁ ଅନନ୍ତଙ୍କ ପାଠ୍ୟପୁସ୍ତକ ସୃଷ୍ଟିର ମହତ୍ତ୍ୱ ଏହି ଏକତ୍ରରୁ ମିଳିପାରିବ ।

## ପାଠ୍ୟ ବିଷୟ

୧ମ ଏକତ୍ର : ପ୍ରାଚୀନ-ପାଶ୍ଚାତ୍ୟ ପାଠ୍ୟ : ଚନ୍ଦ୍ରାବତୀର ଓ ନାଥ ପାଠ୍ୟ

(ପାମାଣିକ, ପାଠ୍ୟପୁସ୍ତକ, ଧାର୍ମିକ ମୂଲ୍ୟାୟନ)

୨ୟ ଏକତ୍ର : ପାଶ୍ଚାତ୍ୟ ପାଠ୍ୟ

(ପାମାଣିକ, ଐତିହାସିକ, ସାଂସ୍କୃତିକ ଓ ପାଠ୍ୟପୁସ୍ତକ ମୂଲ୍ୟ)

ଶାଞ୍ଜ ଏକତ୍ର : ପଞ୍ଚମଶ୍ରେଣୀ ପାଠ୍ୟ : ଉଦାହରଣ ଗାଥା ଓ ଉପଲକ୍ଷ୍ୟ ଗାଥା (ବିଶେଷ ଅଧ୍ୟୟନ)

୪ର୍ଥ ଏକତ୍ର : ପଞ୍ଚମଶ୍ରେଣୀ ପାଠ୍ୟ : ଅନନ୍ତ ଗାଥା, ଯଶୋବନ୍ତ ଗାଥା ଓ ଅତ୍ୟୁତ୍ତମ ଗାଥା (ବିଶେଷ ଅଧ୍ୟୟନ)

ସନ୍ଦର୍ଭର ପୁସ୍ତକ ପୁରୀ (Book of Reference):

୧. ଚନ୍ଦ୍ରାବତୀର- ଉଦାହରଣ ଗାଥାପାଠ, ପ୍ରେସ୍‌ ପବ୍ଲିଶର୍ସ, କଟକ ।

୨. ଉଦ୍‌ଭିକ୍ଷର ନାଥ ପାଠ୍ୟପୁସ୍ତକ ଓ ନାଥ ପାଠ୍ୟ - ବାଂଶୀଧର ମହାନ୍ତି, ପ୍ରେସ୍‌ ପବ୍ଲିଶର୍ସ, କଟକ ।

୩. ଉଦ୍‌ଭିକ୍ଷ ପାଠ୍ୟର ଉଦ୍‌ଭିକ୍ଷ- ସୂର୍ଯ୍ୟ ନାରାୟଣ ଦାଶ (୧ମ, ୨ୟ ଭାଗ) ଗ୍ରନ୍ଥ ମନ୍ଦିର, କଟକ ।

୪. ଉଦ୍‌ଭିକ୍ଷ ପାଠ୍ୟର ଆଦିପର୍ବ - ପ୍ରଭେନ୍ଦ୍ର ମହାନ୍ତି, କଟକ ଷ୍ଟୁଡେଣ୍ଟ୍‌ ଷ୍ଟୋର, କଟକ ।

୫. ଉଦ୍‌ଭିକ୍ଷ ପାଠ୍ୟର ସଂକ୍ଷିପ୍ତ ପରିଚୟ - କୁସାବନ ଚନ୍ଦ୍ର ଆଚାର୍ଯ୍ୟ, ଗ୍ରନ୍ଥ ମନ୍ଦିର, କଟକ ।

୬. ଉଦ୍‌ଭିକ୍ଷ ପାଠ୍ୟର ମଧ୍ୟପର୍ବ ଓ ଉତ୍ତର ମଧ୍ୟପର୍ବ- ପ୍ରଭେନ୍ଦ୍ର ମହାନ୍ତି, କଟକ ଷ୍ଟୁଡେଣ୍ଟ୍‌ ଷ୍ଟୋର, କଟକ ।

୭. ପଞ୍ଚମଶ୍ରେଣୀ ଉଦ୍‌ଭିକ୍ଷ ପାଠ୍ୟ- ଦେବେନ୍ଦ୍ର ମହାନ୍ତି, ପ୍ରେସ୍‌ ପବ୍ଲିଶର୍ସ, କଟକ ।

୮. ଉଦ୍‌ଭିକ୍ଷ ପାଠ୍ୟର ଉଦ୍‌ଭିକ୍ଷ ଓ ଉତ୍ତର ଉଦ୍‌ଭିକ୍ଷ- କୃଷ୍ଣାୟା ଭାଗ-ଦେବେନ୍ଦ୍ର ମହାନ୍ତି, ପ୍ରେସ୍‌ ପବ୍ଲିଶର୍ସ, କଟକ ।

୯. ଆଶ୍ୱର୍ଯ୍ୟ ଚନ୍ଦ୍ରାବତୀ - ବରୁଣାକର କର, ଉଦ୍‌ଭିକ୍ଷ ପାଠ୍ୟ ଏକାଡେମୀ, ଭୁବନେଶ୍ୱର ।

୧୦. ପାଶ୍ଚାତ୍ୟ ମହାବିଦ୍ୟାଳୟର ଚୂନିପର୍ବ- ଉପଲକ୍ଷ୍ୟ ଗାଥା, ଚିତ୍ରର ପ୍ରକାଶନ, କଟକ ।

ନମୁନା ପ୍ରଶ୍ନ (Sample Questions):

୧. ଚନ୍ଦ୍ରାବତୀରରେ କେଉଁ ଉଦ୍‌ଭିକ୍ଷ କବିଙ୍କର ସର୍ବାଧିକ ଗାଥା ରହିଛି ? (୧ମାର୍କ ପ୍ରଶ୍ନ)

୨. ଭୁବନେଶ୍ୱରର ଦୁଇଗୋଟି ଗାଥାକାର ନାମ ଲେଖ । (୨ମାର୍କ ପ୍ରଶ୍ନ)

୩. ନାଥପାଠ୍ୟକୁ ଗୋରୋଜନାଥଙ୍କ ଅବଦାନ ଉଲ୍ଲେଖ କର । (୫ମାର୍କ ପ୍ରଶ୍ନ)

୪. ଉଦାହରଣ ଗାଥା 'ଦାଣ୍ଡି ଉପାୟଣ'ର ପାମାଣିକ ମୂଲ୍ୟ ନିର୍ଣ୍ଣୟ କର । (୮ ମାର୍କ ପ୍ରଶ୍ନ)