

**CHSE, ODISHA**  
**VOCATIONAL COURSES, 2016-2018**  
**PART – I**  
**AGRICULTURE AND ENGINEERING**  
**Scheme of Studies**

**A. Common Compulsory Subjects**

1. English  
MIL (Alternative English / Bengali / Hindi / Odia / Sanskrit / Telugu / Urdu)
2. Environment Education, Basic Computer Education, Yoga

**B. Basic Foundation Course (BFC)**

Biology, Chemistry, Mathematics, Physics

**C. Trade Subjects**

**For Part I**

1. Agriculture Area
  - (i) Crop production
  - (ii) Dairying
  - (iii) Horticulture
  - (iv) Inland Fisheries
  - (v) Poultry Farming
  - (vi) Repair and Maintenance Power Driven Farm Machinery (PDFM)
  - (vii) Sericulture
  - (viii) Para Medical Health Care (PHC) and  
Medical Laboratory Techniques (MLT)
  - (ix) Microbiology and Serology
2. Engineering Area
  - (ix) Audio Video Technique (AVT)
  - (x) Building Maintenance (BM)
  - (xi) Computer Technique
  - (xii) Repair & Maintenance of Electrical Domestic Appliances (EDA)

**D. Pattern of Course, Marks Distribution**

|    | <b>Compulsory</b>  | <b>1<sup>st</sup> Year</b> |              |            | <b>2<sup>nd</sup> Year</b>       |            |
|----|--|----------------------------|--------------|------------|----------------------------------|------------|
| 1. | English  | 50 Marks                   |              |            | 50 Marks                         |            |
| 2. | MIL  | 50 Marks                   |              |            | 50 Marks                         |            |
| 3. | BFC – 300 Marks<br>(any three subjects from the list)<br>(If the subject has no practical Element, the total marks is 100) | BFC-I                      | Theory       | 70         |                                  | 70         |
|    |  |                            | Practical    | 30         |                                  | 30         |
|    |  | BFC-II                     | Theory       | 70         |                                  | 70         |
|    |  |                            | Practical    | 30         |                                  | 30         |
|    |  | BFC-III                    | Theory       | 70         |                                  | 70         |
|    |  |                            | Practical    | 30         |                                  | 30         |
| 4. | Trade Subject – 200 Marks<br>(Any <b>One</b> subjects from the list)   | Trade <b>Paper I</b>       | Theory       | 40         | Trade <b>Paper III</b><br>Theory | 40         |
|    |  |                            | Practical    | 60         | Practical                        | 60         |
|    |  | Trade <b>Paper II</b>      | Theory       | 40         | Trade <b>Paper IV</b><br>Theory  | 40         |
|    |  |                            | Practical    | 60         | Practical                        | 60         |
|    |  |                            | <b>Total</b> | <b>600</b> |                                  | <b>600</b> |
|    |  |                            |              |            |                                  |            |

**E. (i) Duration of the Examination & Periods required :**

|           | <b>Marks</b> | <b>Duration</b> |
|-----------|--------------|-----------------|
| Theory    | 100 marks    | 3.00 Hrs        |
|           | 70 Marks     | 3.00 Hrs        |
|           | 60 Marks     | 3.00 Hrs        |
|           | 50 Marks     | 2.30 Hrs        |
|           | 40 Marks     | 2.00 Hrs        |
| Practical | 60 Marks     | 3.00 Hrs        |
|           | 30 Marks     | 3.00 Hrs        |

**(ii) Periods required** for 100 marks 180 Periods **minimum** in a Session

**ATTENTION PLEASE :**

Suggestions in the context of above stated course –structure are invited from all concerned. Views, if any may be communicated to the Secretary, CHSE (O), Chandrasekharpur, Bhubaneswar-13 within 15<sup>th</sup> December 2016 by Post only.

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| 2. |                         | (i)     | Environment Education   | 34          |
|    |                         | (ii)    | Basic Computer Education  | 40          |
|    |                         | (iii)   | Yoga  | 42          |
| 3. | Basic Foundation Course | (i)     | Biology   | 45          |
|    |                         | (ii)    | Chemistry   | 61          |
|    |                         | (iii)   | Mathematics   | 74          |
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| 4. | Trade Subjects          | (i)     | Crop Production   | 97          |
|    |                         | (ii)    | Dairying  | 105         |
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**COMPULSORY ENGLISH**  
**(For +2 Vocational Course in Arts, Science & Commerce)**  
**(2016 ADMISSION BATCH)**

**Full Mark : 50**

**First Year**

**Unit-I : Prose** **(10 Marks)**

- |      |                            |                        |
|------|----------------------------|------------------------|
| i.   | Standing Up for Yourself   | Yevgeny Yevtushenko    |
| ii.  | The Legend behind a Legend | Hariharan Balakrishnan |
| iii. | The Golden Touch           | Nathaniel Hawthorne    |

**Unit-II : Poetry** **(10 Marks)**

- |      |                                      |                    |
|------|--------------------------------------|--------------------|
| i.   | Stopping by Woods on a Snowy Evening | Robert Frost       |
| ii.  | The Inchcape Rock                    | Robert Southey     |
| iii. | Fishing                              | Gopa Ranjan Mishra |

**Unit-III : (A) Writing Skills** **(10 Marks)**

- i. Writing a Paragraph
- ii. Developing Ideas into Paragraphs

**(B) Writing Personal Letters and Notes** **(10 Marks)**

- i. Writing Applications, Official Letters and Business letters
- ii. Writing Telegrams, E-mails, Personal Advertisements, and Short Notices
- iii. Using Graphics

**(C) GRAMMAR** **(10 Marks)**

- i. Countable and Uncountable Nouns
- ii. Tense Patterns
- iii. Modal Verbs
- iv. Prepositions
- v. The Imperatives

**Book Prescribed : Invitation to English - 1, 2, 3 & 4, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar.**

**ENGLISH**  
**SECOND YEAR**

**Full Marks : 50**

**Unit-I : Prose**

**(10 Marks)**

- (xiii) My Greatest Olympic Prize by Jesse Owens
- (xiv) On Examinations by Winston S. Churchill
- (xv) The Portrait of a Lady by Khushwant Singh

**Unit -II : Poetry**

**(10 Marks)**

- i. Daffodils by William Wordsworth
- ii. The Ballad of Father Gilligan by William Butler Yeats
- iii. A Psalm of Life by Henry W. Longfellow

**Unit -III :**

**A. Writing Skills**

- i. Information Transfer **(05 Marks)**
- ii. Dictionary Skill **(05 Marks)**

**B. Essay **(10 Marks)****

**C. Grammar **(10 Marks)****

**Book Prescribed : Invitation to English - 1, 2, 3 & 4 , Published by Odisha State  
Bureau of Text Book Preparation and Production, Bhubaneswar.**

## ALTERNATIVE ENGLISH

### Introduction :

The course is meant for the students

- (a) Who opt to study English in lieu of a Modern Indian Language and
- (b) Who seek to develop a high level of competence in English

It is assumed that the students who offer to study this course have high motivation and competence in English. Hence, it aims at building up on their previous learning and their acquisition of skills in compulsory English course which they are exposed to simultaneously.

### Objectives :

By the end of the course a student should be able to

- (a) transact real-life business in English, and
- (b) appreciate, evaluate and enjoy different types of writing in English.

By the end of the Higher Secondary Course in Alternative English, the learners are expected to acquire the language skills specified below :

### Reading (Non-fictional prose) :

- (a) To make predictions and guesses while reading a prose text
- (b) To understand relations between the parts of a reading text and recognize the indicators in discourse.
- (c) To understand the writer's intention/attitude, to discriminate between facts and opinions, to recognize the writer's bias, if any, and to assess the communicative value of a given text.
- To identify the structure of a text, such as descriptive sequence, chronological sequence, cause-and-effect chain, argumentative and logical organization, etc.
- To compare and contrast two texts on similar themes

- To use reference skills to select a suitable text for reading.
- To use the title, blurb, contents and index of a book in order to form an overall idea of what the book is about and of whether it will be relevant reading with reference to a particular topic.

**Reading (Poetry) :**

- (a) To recognize the structure of a poem and to appreciate the themes and ideas presented therein.
- (b) To recognize, identify and interpret poetic structure in a given poem. To recognize and appreciate the effects of different poetic devices like simile / metaphor / symbol / personification / irony / alliteration / assonance, etc.

**Writing :**

The students will be able

- (a) To design and write a brochure or pamphlet.
- (b) To write the dialogues of a face-to-face/telephonic conversation.

**Creative Writing :**

The students are expected to develop in them the ability

- (a) To add a suitable beginning/ending/title to a given poem/story
- (b) To reconstruct a story from a given set of questions/fillers/outlines.

**Grammar and Usage :**

Points relating to Grammar and usage will be mainly discourse-based. These points are discussed in 'Approaches to English Book I and in Reference Books for Grammar mentioned under 'Instructional Materials'. They are related to the following broad topics :

- (i) Tense and Aspect
- (ii) Modals
- (iii) The Passive
- (iv) Prepositions
- (v) Phrasal Verbs
- (vi) Clause-types
- (vii) Word Order and Emphasis

**Instructional Materials :**

- (a) Approaches to English, Book-I
- (b) Approaches to English, Book-II

Published by the Odisha State Bureau of Textbook Preparation and Production,  
Pustak Bhavan, Bhubaneswar.

**FIRST YEAR**  
**APPROACHES TO ENGLISH, BOOK-I**  
**Prose**

**Marks : 50**

Units to be studied :

- The Adventure of Learning
- Men and Women
- Modern Living

**APPROACHES TO ENGLISH, BOOK -II**  
**Poetry**

Units to be studied :

- (i) Ecology (A.K. Ramanujan)
- (ii) Dog's Death (John Updike)
- (iii) Ballad of the Landlord (Langston Hughes)

**GRAMMAR & USAGE**

- (i) Tense and Aspect
- (ii) Modals
- (iii) The passive
- (iv) Prepositions and Phrasal Verbs

**APPROACHES TO ENGLISH, BOOK-I  
SECOND YEAR**

**A. APPROACHES TO ENGLISH, BOOK-I (Prose)**

Units to be studied

The Wonder World of Science

Our Environment

The Changing World

**B. APPROACHES TO ENGLISH, BOOK-II (Poetry)**

Units to be studied :

- Indian Children Speak (Juanita Bell)
- Of a Questionable Conviction (Jayanta Mahapatra)
- Mirror (Sylvia Plath)

**GRAMMAR & USAGE**

- (i) Revision of 'Tense and Aspect'
- (ii) Revision of Prepositions and Phrasal Verbs
- (iii) Clause-types

**Word Order and Emphasis**

**Scheme of Evaluation & Distribution of Marks**

There will be a college examination in Alternative English at the end of the First Year. This will be Alternative English Paper -I carrying 50 marks. The final examination to be conducted by CHSE at the end of the second year of the course will consist of one written paper of Alternative English carrying 50 marks. The paper shall test the student's proficiency in English with respect to correctness, appropriacy, tone and style.

## First Year

Alternative English (1st Year) - (To be evaluated at the college level)

Reading Comprehension :

- (a) A prescribed prose piece or extract  
(5 questions, each question carrying 2 marks - including inferential questions-are to be answered) 2x5=10
- (b) A prescribed poem/extract (5 questions, each question carrying 2 marks, including inferential questions and those on poetic devices, figures of speech, mood, tone and style etc.) 2x5=10

## Writing skills

- (a) Reconstruct a story from a given set of questions/fillers/outlines or completion of a story. 10 marks.
- (b) Essay writing (including brainstorming, organizing, outlining, writing first draft and revising) 10 marks.

Grammar and usage (in context) Correcting 10 grammatical errors from a given passage. 1x10=10

## Second Year

Alternative English (2nd year) To be evaluated at CHSE level

Reading Comprehension.

- (a) A prescribed prose piece or extract  
(5 questions, each question carrying 2 marks, including inferential questions are to be answered). 2x5=10

- (b) A prescribed poem / extract (5 questions, each question carrying 2 marks, including inferential questions and those on poetic devices, figures of speech, mode, tone and style etc.) 2x5=10

Writing skills.

- (a) Designing and writing a brochure / pamphlet. 10 marks.

- (b) Writing dialogues of a face-to-face / telephonic conversation. 10 marks.

Grammar and usage (in context) Correcting 10 grammatical errors from a given passage. 1x10=10 marks.

**M.I.L. (BENGALI)  
First Year**

**50 MARKS**

**UNIT – I**

**PROSE**

**(20 Marks)**

Uchha Madhyamik Bangia Sankalan. (Gadya) for Class XI & XII. Published by Paschim Banga Uchha Madhyamik Siksha Sansad, Viswa Varati.

The following pieces are to be studied in the first year:

1. Bangladeshe Nilkar - Pyarichand Mitra.
2. Sitar Banabas - Iswarchandra Vidyasagar
3. Sudra gaganan - Swami Vivekananda

**UNIT – II**

**POETRY**

**(20 Marks)**

Madhukari - Kalidas Ray

(Published by Orient Book Company, Kolkata -12)

The following pieces are to be studied in the first year:-

1. Srigoura Chandra - Gobinda das kabiraj.
2. Bhabollas – Vidyapati
3. Premer Tulana - Durija Chandidas

**UNIT - III**

**Grammar & Essay**

**(10 Marks)**

- A. Proverbs
- B. Letter

**M.I.L. (BENGALI)  
SECOND YEAR**

F.M. - 50

**UNIT - I**

**Prose**

**(20 Marks)**

Uchha Madhyamik Bangia Sankal"an (Gadya) for Class XI & XII.

Published by Paschim Banga Uchha Madhyamik Siksha Sansad, Viswa Varati.

The following pieces are to be studied in the Second year

1. Bangia Bhasa - Haraprasad Sastri
2. Tota Kahini - Rabindranath Tagore
3. Naisha Avijaa - Sarat Ch. Chattopadhyay

**UNIT – II**

**Poetry**

**(20 Marks)**

Madhukari - Kalidas Ray

(Published by Orient Book Company, Kolkata -12)

*Pieces to be Studied:*

1. Baisakh - Oebendra Nath Sen
2. Lohar Byatha - Jatindra Nath Sengupta
3. Swarga Haite Viday - Rabindra nath Tagore

**UNIT - III**

**Essay**

**(10 Marks)**

**M.I.L. (Hindi)**  
**FIRST YEAR**

**Full Mark : 50**

**Distribution of Marks**

Unit – I : Prose : 20 Marks

Unit – II : Poetry: 20 Marks

Unit – III : Karyalayeee Hindi Aur Rachanatmak lekhan – 10 Marks

**Unit – I (Prose) :**

1. Eleven Objective type questions (Multiple choice and single word / sentence answer) : 1 x 11 = 11
2. Two Short answer questions for the answer in two/three sentences : 2 x 2 = 4
3. One long answer type question within 150 words : 5 x 1 = 5

**Unit – II (Poetry) :**

1. Eleven Objective type questions (Multiple choice and single word / sentence answer) : 1 x 11 = 11
2. Two Short answer questions for the answer in two/three sentences : 2 x 2 = 4
3. One long answer type question within 150 words : 5 x 1 = 5

**Unit – III (Grammar) :**

1. Five 1 mark questions from the Grammar portions : 1 x 5 = 5
2. One comprehension (prose-unseen passage carries five single mark questions) OR One Essay : 1 x 5 = 5

**M.I.L. (Hindi)**  
**SECOND YEAR**

**Full Mark : 50**

**Distribution of Marks**

|            |   |                                 |          |
|------------|---|---------------------------------|----------|
| Unit – I   | : | Prose :                         | 20 Marks |
| Unit – II  | : | Poetry:                         | 20 Marks |
| Unit – III | : | Karyalayeee Hindi Aur Grammar – | 10 Marks |

**Unit – I (Prose) :**

1. Eleven Objective type questions (Multiple choice and single word / sentence answer) : 1 x 11 = 11
2. Two Short answer questions for the answer in two/three sentences : 2 x 2 = 4
3. One long answer type question within 150 words : 5 x 1 = 5

**Unit – II (Poetry) :**

1. Eleven Objective type questions (Both Multiple choice and single word / sentence answer) : 1 x 11 = 11
2. Two Short answer questions for the answer in two/three sentences : 2 x 2 = 4
3. One long answer type question within 150 words : 5 x 1 = 5

**Unit – III (Grammar) :**

1. Five 1 mark questions from Grammar : 1 x 5 = 5
2. One unseen comprehension carries five single mark questions OR One Letter Writing : 1 x 5 = 5

**M.I.L. (Hindi)**  
**FIRST YEAR**

**Full Mark : 50**

**Unit- I : गद्य भाग**

**(20 marks)**

१. प्रेमचंद - जीयन मे साहित्य का स्थान
२. दिनकर – ईर्ष्या, तू न गई मेरे मन से
३. रामविलास शर्मा - अतिथि

**Unit- II : काव्य भाग**

**(20 marks)**

१. कबीरदास - दोहे
२. सूरदास - बाल लीला
३. बिहारी - दोहे
४. सुमित्रानंदन पंत - भारतमाता
५. अक्षेय - हीरोशिमा

**Unit – III : कार्यालयी हिन्दी और रचनात्मक लेखन**

**(10 marks)**

१. व्याकरण – (क) क्रिया (ख) काल
२. अपठित गद्यांश OR निबंध लेखन

**पुस्तक : अमृत भारती, भाग – I**

Published by Odisha State Bureau of Textbook Preparation and Production (Within  
150 words)

**M.I.L (HINDI) - II**

**Second Year**

**Full Marks - 50**

**Unit- I : गद्य भाग**

**(20 marks)**

१. बालकृष्ण भट्ट - आत्मानिर्भरता
२. रामचन्द्र सुवल - उत्साह
३. शरह जोशी - टुम जाओगे, अतिथि

**Unit- II : काव्य भाग**

**(20 marks)**

१. रहीम - दोहे
२. मैथिलीशरण गुप्त - नर हो, न निःश करो मन को
३. निराला - वीणा वादिनी वट हे, बादल एग
४. बच्चन - अग्निपथ
५. मुक्ति बोध - पूँजीवादी समाज के प्रति

**Unit - III : कार्यालयी हिन्दी, व्याकरण और पत्र लेखन**

**(10 marks)**

1. व्याकरण (क) लिंग (ख) वचन
2. अपठित गद्यांश OR पत्र लेखन

पुस्तक : अमृत भारती, भाग - २

Published by Odisha State Bureau of Textbook Preparation and Production (within 150 words)

**MIL (O)**  
**ଆଧୁନିକ ଭାରତୀୟ ଭାଷା ଓଡ଼ିଆ**  
**ପ୍ରଥମ ବର୍ଷ (୧ମ ଭାଗ)**

**ପୂର୍ଣ୍ଣ ସଂଖ୍ୟା – ୫୦**

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ଓଡ଼ିଶା ରାଜ୍ୟ ପାଠ୍ୟ ପୁସ୍ତକ ପ୍ରଣୟନ ଓ ପ୍ରକାଶନ ସଂସ୍ଥା, ଭୁବନେଶ୍ୱର

**MIL (O)**

**ଆଧୁନିକ ଭାରତୀୟ ଭାଷା ଓଡ଼ିଆ**

**ଦ୍ଵିତୀୟ ବର୍ଷ (୨ୟ ଭାଗ)**

**ପୂର୍ଣ୍ଣ ସଂଖ୍ୟା – ୫୦**

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**ତୃତୀୟ ଏକକ ପ୍ରବନ୍ଧ ଓ ବ୍ୟାକରଣ**

**୧୦ ନମ୍ବର**

ପାଠ୍ୟଗ୍ରନ୍ଥ – ସାହିତ୍ୟ ଜ୍ୟୋତି, ପ୍ରଥମ ଭାଗ

ଓଡ଼ିଶା ରାଜ୍ୟ ପାଠ୍ୟ ପୁସ୍ତକ ପ୍ରଣୟନ ଓ ପ୍ରକାଶନ ସଂସ୍ଥା, ଭୁବନେଶ୍ଵର

**M.I.L (SANSKRIT)  
FIRST YEAR**

**Full Marks 50  
Time : 2 Hrs.**

**Distribution of Marks**

|            |   |         |   |          |
|------------|---|---------|---|----------|
| Unit – I   | : | Prose   | : | 20 Marks |
| Unit-II    | : | Poetry  | : | 20 Marks |
| Unit – III | : | Grammar | : | 10 Marks |

**Unit - I**

|    |   |   |             |
|----|---|---|-------------|
| 1. | Multiple choice questions from Prose          | : | 1 x 10 = 10 |
| 2. | Short Questions from Prose                    | : | 2 x 3 = 6   |
| 3. | Translation from Prose Text to Odia / English | : | 2 x 2 = 4   |

**Unit - II**

|    |  |   |             |
|----|--|---|-------------|
| 1. | Multiple choice questions from Poetry  | : | 1 x 10 = 10 |
| 2. | Short Questions from Poetry            | : | 2 x 3 = 6   |
| 3. | Translation of Verse to Odia / English | : | 2 x 2 = 4   |

**Unit - III**

|    |                  |   |           |
|----|------------------|---|-----------|
| 1. | Stripratyaya     | : | 1 x 2 = 2 |
| 2. | Sandhivichheda   | : | 1 x 2 = 2 |
| 3. | Prakrutipratyaya | : | 1 x 2 = 2 |
| 4. | Samasa           | : | 1 x 2 = 2 |
| 5. | Ekapadikarana    | : | 1 x 2 = 2 |

**OR**

Application / Letter Writing

10 Marks

**OR**

Comprehension one Passage from Text (1 – 8)

(2 x 5 = 10)

**M.I.L (SANSKRIT)**  
**SECOND YEAR**

**Full Marks 50**

|            |   |         |   |          |
|------------|---|---------|---|----------|
| Unit – I   | : | Prose   | : | 20 Marks |
| Unit-II    | : | Poetry  | : | 20 Marks |
| Unit – III | : | Grammar | : | 10 Marks |

**Unit - I**

|    |   |   |             |
|----|---|---|-------------|
| 1. | Multiple choice questions from Prose          | : | 1 x 10 = 10 |
| 2. | Short Questions from Prose                    | : | 2 x 3 = 6   |
| 3. | Translation from Prose Text to Odia / English | : | 2 x 2 = 4   |

**Unit - II**

|    |  |   |             |
|----|--|---|-------------|
| 1. | Multiple choice questions from Poetry  | : | 1 x 10 = 10 |
| 2. | Short Questions from Poetry            | : | 2 x 3 = 6   |
| 3. | Translation of Verse to Odia / English | : | 2 x 2 = 4   |

**Unit - III**

|    |                   |   |           |
|----|-------------------|---|-----------|
| 1. | Sabdarupa         | : | 1 x 2 = 2 |
| 2. | Dhaturupa         | : | 1 x 2 = 2 |
| 3. | Stripratyaya      | : | 1 x 2 = 2 |
| 4. | Samasa            | : | 1 x 2 = 2 |
| 5. | Karaka - Vibhakti | : | 1 x 2 = 2 |

**OR**

Comprehension of one Passage from Text (9 – 16) 10 Marks

**OR**

Explanation of a Verse from Poetry Text 10 Marks

**M.I.L. (SANSKRIT)  
FIRST YEAR  
UNIT – I**

**Prose**

**(20 Marks)**

**Sanskrutaprabha (Gadyabhagah)**

संस्कृतप्रभा-गद्यभागः

The following prose pieces from the above mentioned book are to be studied

- 1) मनुमत्स्याख्यानम् (Manumatsyakhyanam)
- 2) चतुरशृगालः (Chaturasrugalah)
- 3) जाबालः सत्यकामः (Jabalah Satyakamah)

**UNIT – II**

**Poetry**

**(20 Marks)**

**Samskrtaprabha (Podyabhagah) संस्कृतप्रभा (पद्यभागः)**

The following poetry pieces from the above book are to be studied

- 1) सुभाषितावली (Subhasitavali)
- 2) वसन्तः (Vasantah)

**UNIT – III**

**GRAMMAR**

**(10 Marks)**

**(a) Grammar from the Prose and Poetry**

- 1) सन्धि - सन्धिविच्छेद Sandhi and Sandhi Viccheda
- 2) प्रकृतिप्रत्यय (Prakrti Pratyaya)

**(b) Topics from the Grammar text**

- 3) स्त्रीप्रत्यय Stripratyaya
- 4) समास Samasa
- 5) एकपदीकरण Formation of single word from Stripratyaya and Samasa

**(c) Translation and Comprehension**

- 1) Comprehension - Sanskrit Passage from the comprehension passages of संस्कृतप्रभा, Part - I

**(d) Writing Skill**

The art of writing - letters, Applications, Textual Explanation, Textual long questions.

**Books Recommended**

- 1) Sanskritaprabha, Part - I - संस्कृतप्रभा - प्रथमोभागः  
Published by Odisha State Bureau of Textbook Preparation and Production.
- 2) Vyakarana - darpan – व्याकरण दर्पणः  
Published by Odisha State Bureau of Textbook Preparation and Production.

**M.I.L (SANSKRIT)  
SECOND YEAR**

**Full Marks 50**

**UNIT – I**

**Prose**

**(20 Marks)**

**Prose - Sanskrutaprabha (Gadyabhagah)**

संस्कृतप्रभा - गद्यभागः

The following prose pieces from the above mentioned book are to be studied

- 1) कपोतलुब्धककथा (Kapotalubdhakakatha)
- 2) गुणगुणहीनविवेकः (Gunigunahinavivekah)
- 3) रामतपोवनाभिगमनम् (Ramatapovanabhigamanam)

**UNIT – II**

**Poetry**

**(20 Marks)**

**Poetry - Samskrutaprabha (Podyabhagah)**

संस्कृतप्रभा (पद्यभागः)

The following poetry pieces from the above book are to be studied

- 1) दशावतारस्तुतिः (Dasavatarastutih)
- 2) गीतासवरभम् (Gitasourabham)

**UNIT – III**

**(10 Marks)**

**GRAMMAR**

(a) 1. कारकविभक्ति (Karak Vibhakti)

(b) **Topics from the Grammar text**

- 1) शब्दरूप Sabdarupa (नर, फल, लता, मुनि, मति, वारि, नदी, पितृ, मातृ, गच्छत्, मनस्, आत्मन्, तद्, किम्, इदम्, अस्मद्, युष्मद्, द्वि, त्रि, चतुर)
- 2) धातुरूप Dhaturupa (भू, गम्, पठ्, कृ, अस्, लभ्, पूज्)

- 3) समास Samasa
- 4) स्त्रीप्रत्यय Stripratyaya

(c) **Translation and Comprehension**

1. Comprehension - Sanskrit Passage from the comprehension passages of संस्कृतप्रभा, Part-II

(d) **Writing Skill**

The art of writing - Textual Explanation, Textual long questions and Precis writing.

**Books Recommended**

- 1) Sanskritaprabha, Part - II - संस्कृतप्रभा - द्वितीयोभागः  
Published by Odisha State Bureau of Textbook Preparation and Production.
- 2) Vyakarana - darpan – व्याकरण दर्पणः

Published by Odisha State Bureau of Textbook Preparation and Production.

**M.I.L (TELUGU)**  
**FIRST YEAR**

**Full Marks 50**

**Distribution of Marks**

|              |   |         |   |               |
|--------------|---|---------|---|---------------|
| Unit – I     | : | Prose   | : | 20            |
| Unit – II    | : | Poetry  | : | 20            |
| Unit – III A | : | Grammar | : | 10            |
|              |   | B :     |   | General Essay |

**Unit – I**

1. Eight nos of Short Objective Type Questions one mark each : 08
2. One Short Question of 100 words : 05
3. One Long Question of 200 words : 07

**Unit – II**

1. Eight nos of Short Objective Type Questions one mark each : 08
2. One Short Question of 100 words : 05
3. One Long Question of 200 words : 07

**Unit – III**

1. A. Grammar – Vibhakti, Pratyayalu, Paribhasika, Padamulu : 05  
Five Short Questions (One mark each)
2. B. General Essay : 05

**M.I.L (TELUGU)**  
**SECOND YEAR**

**Full Marks 50**

**Unit – I : Prose : 20**

**Unit – II : Poetry : 20**

**Unit – III A : Grammar : 10**

**B : Re-translation**

**Unit – I**

1. Eight nos of Short Objective Type Questions one mark each : 08
2. One Short Question of 100 words : 05
3. One Long Question of 200 words : 07

**Unit – II**

1. Eight nos of Short Objective Type Questions one mark each : 08
2. One Short Question of 100 words : 05
3. One Long Question of 200 words : 07

**Unit – III**

1. A. Grammar – Alankaras, Chandassu : 05
2. B. Re-translation : 05

**M.I.L. (TELUGU)**

**FIRST YEAR**

**F. M. : 50**

**UNIT – I**

**Prose**

**(20 Marks)**

1. MitraLabhamu - Paravastu Chhinnayasuri
2. Vemana - Dr. G.V.Krishna Rao
3. Teiugu Patrikala Purva Rangam - Namala Visveswara Rao

**UNIT – II**

**Poetry**

**(20 Marks)**

1. Ekalavyudu - Nannaya Bhattu
2. Balivamana Samvadamu - Bammara Potana
3. Subhashitamulu - Enugu Lakshmana Kavi
4. Tokachukka - Gurajada Apparao

**UNIT – III**

**(10 Marks)**

A. **GRAMMAR** – I. Vibhakti – Pratyayalu

II. Paribhasika Padamulu

**B. WRITING / GENERAL ESSAY**

**BOOKS PRESCRIBED :**

1. Poetry & Prose : SAHITEE VIPANCHI - By Dr. Singupuram Narayana Rao
2. Grammar - VYAKARANA PARIJATAMU - - By Dr. Singupuram Narayana Rao

**M.I.L (TELUGU)**

**SECOND YEAR**

**Full Marks 50**

**UNIT – I**

**Prose**

**(20 Marks)**

1. MitraBhedamu - Paravastu Chinnayasuri
2. Rayaprolu streevada drukpadham - Prof K.Yadagiri
3. Goutama Budhudu - Dr.- V. Rajagopala Chakravarty

**UNIT – II**

**Poetry**

**(20 Marks)**

1. Sanjaya Rayabharamu - Tikkana Somayaji
2. Hanumatsandesamu - Atukuri Molla
3. Piradausi.Lekha - Gurram Jashuwa
4. Manchi Mutyala Saralu - Sri Sri

**UNIT – III**

**(10 Marks)**

A. GRAMMAR – Alankaramulu, Chandassu

B. RE-TRANSLATION

**BOOKS PRESCRIBED**

Poetry & Prose : Sahitee Mandaram By Dr. Singupuram Narayana Rao

Grammar : Vyakarana Parijatamu By Dr. Singupuram Narayana Rao

**MIL (URDU)**  
**Mark Distribution**  
**+2 First Year & Second Year**

F.M. 50

- Unit – I : Prose – 20 Marks**
- Unit – II : Poetry – 20 Marks**
- Unit – III : Grammar – 10 Marks**

**Unit – I**

1. Eight Objective Types multiple choice question from prose portions with alternative. : 1 x 8 = 08
2. One Short Question in one hundred words with alternative. : 1 x 5 = 05
3. One long answer type Question within 200 words with an alternative from the prose portions. : 1 x 7 = 07

**Unit – II**

1. Eight Objective Types multiple choice question from prose portions with alternative. : 1 x 8 = 08
2. One Short Question in one hundred words with alternative. : 1 x 5 = 05
3. Two 'Ashaar's' explanation from Ghazliyat : 2 x 3 ½ = 07

**Unit – III**

1. Tazkir O Tanees : 10 Marks
2. Ghalat Jumle Aur Islah

**FIRST YEAR**

**Books Prescribed ; - “JADIDADAB PARE” Part – I**

**Edited by : - Dr. Azizur Rahman**

**Mir Ashraf Ali**

Recommended Book “JADIDADAB PARE” Part I published by Odisha State Bureau of Text Book preparation and Production, Pustak Bhawan, Bhubaneswar for the students of +2 level in Arts / SC / Commerce Stream from 2016-18.

**UNIT-I**

1. **Prose Chapters to be studied :-** (15 Classes)

- (i) Sair Pahle Darwesh Ki – Mir Amman
- (ii) Bahadur Shah – Do – Ghaz Zamine – Dr. Mahfugul Hasan.

**UNIT - II**

2. **Poetry** (15 Classes)

Chapters to be Studied :-

- (i) Tasweere – e – Dard – Iqbal
- (ii) Jogan Aur Chandni Raat – Mir Husan.

(b) **Ghazliyat Portims to be studied**

- (i) Ghalib
- (ii) Dard

**Unit - III**

3. Urdu Zaban – O – Qwaid – Part – I by Shafi Ahmad Siddiqui. (15 Classes)

Chapter to be Studied :-

- (i) Tazkir O Tanees
- (ii) Ghalat Jumle Aur Unki Islah.

**SECOND YEAR**

**Book Prescribed : Jadid Adab Pare – Part-II**

**Edited by : Dr. Azizur Rahman**

**Mir Ashraf Ali**

Recommended Book “JADID ADAB PARE – PARE Part II” published by Odisha State Bureau of Text Book preparation and production, Pustak Bhawan, Bhubaneswar.

**Unit – I**

1. Prose chapters to be studied.
  - (i) Hindu Musalman Eik Qaum – Sir Sayed Ahmad
  - (ii) Ustad Ki Talas : - Farhatullah Baig

**Unit – II**

2. Poetry chapters to be studied.
  - (i) Wadie Ganga mein Eik Raat : - Akhtar Shirani
  - (ii) Tajmahal Ki Pahli Jhalak Per : Dr. Karamat Ali Karamat.
3. Ghazliyat Poets to be studied.
  - (i) Dagh
  - (ii) Shad

**Unit – III**

4. Essay / Letter / Application Writing

## ENVIRONMENT EDUCATION

F.M. 70

### Theory

Unit - I Man and Environment

Unit - II Environmental Pollution

Unit -III Environmental Management

Unit -IV Road Safety.

### UNIT - I

#### (A) Man and Environment: Environment: Components: -

Atmosphere, Lithosphere, Hydrosphere and Biosphere- Human being as a rational social partner in environmental action - Impact of human activities on environment - Environmental Problems of urban and rural areas- Stress on civic amenities: supply of water, electricity, transport and health services.

#### (B) Natural Resources

Land, water, forest as primary natural resources- Fresh water and Marine resources-Natural resources of Orissa - Concept of Biodiversity and its conservation - Renewable and non-renewable resources - Conventional and non - conventional energy.

### UNIT - II

#### Environmental Pollution:

Types of pollution; and pollutants-Causes, effects and control of air pollution, water pollution, soil pollution and noise pollution, Green house effect, Global Warming, Eutrophication, Ozone layer depletion.

### UNIT - III

**(A) Environmental Management:**

Scope, of Environmental Management -Management of solid, liquid and gaseous wastes - Resource Management- disaster Management (flood, cyclone and earthquake) - Concept of sustainable development-Management of agricultural produce.

**(B) Environmental Laws:**

Constitutional Provisions .-Major provisions of Environmental Laws and Pollution Control Laws with particular reference to the Water Act, 1974, the Air Act, 1981, the E(P) Act 1986, CPCB and SPCB- (Central and State' Pollution Control Boards).

### UNIT - IV

#### ROAD SAFETY

- a) Concept & Need
- b) Traffic signs
- c) What to do and what not to do while on the road – safety guidelines, offence and penalties.
- d) Traffic Management: RTO, MVI, Police / Traffic Police
- e) Traffic Awareness.

#### PROJECTS

**F.M. : 30**

1. To study the changes that have taken place in the given land area of a city,village/locality/ market during the last five years in respect of at least five parameters like number of houses^ residents and families; food habits, number of household goods in a family, consumption of water, electricity and fuel including that of personal vehicles by a family, sources of noise (public

address systems being used, television, radio and vehicles on the road), common facilities like number of schools, hospitals, shops, theatres, public conveyance, public utilities, public transport, number of factories, industries and/or the facilities for production and processing of goods, loss of water bodies, types and quantity of wastes, their disposal and treatment facilities with a view to discuss the patterns of changes and impact on the environment and quality of life. One specific project on these aspects may be selected to study the changes that have taken place in a given area during the last five years in respect of the number of houses, residents and families and to prepare a report on the effects on civic amenities like availability of water, electricity and fuel; the drainage system, disposal of wastes including night soil,

2. To study the environmental profile of a town/ locality/village in respect of population density, green cover, educational level of residents, social problems and sources of pollution and their effect on air, water and soil.
3. To collect data on monthly consumption of electricity and fuel from at least five families, any two commercial establishments and four public utilities in a given locality. To plan strategies for educating consumers to economise on the consumption of electricity and fuel by reducing their over-use, misuse and improper use.
4. To study, for a period of one month, the status of sanitary conditions and methods of waste disposal of a given locality vis-a-vis the role of Panchayat, Municipality no 40 Science Stream Corporation and to prepare an action plan for making the conditions more environment friendly.
5. To investigate the impact of an industry or a large manufacturing unit o'n the

local environment. The parameters could be land use, the ratio of the covered area and the open space, the raw materials used for production, inputs like electricity and water, the types of waste generated and the modes of waste disposal, use of environment friendly and efficient technology, types of pollutants emitted or discharged, the average health status of the employees and residents in the area.

6. To study the impact of changes in agricultural practices or animal husbandry including poultry, piggery, fishery and apiculture over a period of time on the local environment of a given locality or village. The components for analysis may include: types of crops, land area under cultivation, mechanisation, use of electricity, mode of irrigation and agrochemicals, agro-waste and their disposal, types of animal breed and their feed, types of shelter and healthcare, methods of preservation and processing of products and animal wastes and their disposal. To suggest an action plan for modifying the prevailing practices so as to make them environment friendly and sustainable.
7. To collect samples of water from different sources and study their physical characteristics like turbidity, colour, odour, the measure of pH, the nature of suspended and dissolved impurities and pollutants, the presence of toxic materials like mercury, lead, arsenic, fluorine and the presence of living organisms. For testing the presence of toxic materials and living organisms, the help of a local laboratory or institution may be taken, if available. To identify the most polluted sample of water and locate the sources of its pollution. To devise an action plan for mobilising public opinion for checking the pollution.
8. To study the practices followed in the region for storage, preservation, transportation and processing of perishable or non- perishable farm products

and to assess the extent of their wastage due to faulty practices.

9. To prepare a status report on the prevalence of child labour in a given area through sample surveys on children engaged as domestic help and as workers in farms, commercial establishments and manufacturing units: The survey may be in respect of age group, education, wages, working hours, working conditions, safety in works place, health, handling hazardous materials and the like. Units dealing with hazardous materials and processes may be identified and an action plan for mobilising public opinion against, the practice of child labour may be prepared.
10. To conduct a survey of plants in a locality and to collect information about their cultural, economic and medicinal values from the local people and the available literature. To prepare an action plan for their propagation.
11. **Road Safety Project.**
  - (i) To conduct a survey on Traffic Offences and student initiatives to check it.
  - (ii) To prepare a status report on the prevalence of Traffic - problems in a given area.
  - (iii) To suggest an action plan for prevention of road accidents,
  - (iv) To suggest the use of efficient technology for better traffic management.

**NOTE :** Environmental Education will be assessed at the college level for 100 marks (70 marks for theory and 30 marks for project work) before Test Examination of the college for Annual Higher Secondary Examination and the grades (A +, A, B, C, D, in order of merit) are to be awarded by the college and the same shall be recorded in

the body of the pass certificate given by the council subsequently. The grade secured in the Environmental Education (EE) will not affect the result of the candidate.

| Mark          | Grade |
|---------------|-------|
| 70% and above | Gr A+ |
| 60% to 69%    | Gr A  |
| 50% to 59%    | Gr B  |
| 35% to 49%    | Gr C  |
| Below 35%     | Gr D  |

**BOOK PRESCRIBED:**

**Bureau's Higher Secondary (+2) Environmental Education, Published by Odisha State Bureau of Textbook Preparation & Production, Bhubaneswar.**

## BASIC COMPUTER EDUCATION

+2 1st Year

### UNIT - I

**Computer Fundamentals** : Necessity and uses of computer, what is computer?, Computer as a system, problem and problem solving technique, Important terminology, Input-Output devices, types of computer, (Digital, Analog, Hybrid, Super computer, Main Frame, Mini, <sup>JC</sup>, Note Book, and Laptop). Generation of Computer, Computer Memory, (Main, Secondary, Virtual. Buffer, Cache,) Computer Languages and its types. **8 Hours**

### UNIT - II

Operating System: types, software, Dos and Windows : Fundamentals and Commands, Security and Anti-virus

Introduction to MS OFFICE :

**MS-WORD:** Creating a File, setting and typing text, page formatting, editing; printing, saving the files, creating Folders, Insertion tables and objects, Bulletin, Page Numbering., spell check, indenting;, paragraph setting and mail merge, CD writing.

**MS-EXCEL:** Spread sheet and its uses, an introduction, formatting work sheet, setting columns/ Rows, range, Format, protect, sorting, types of graphs, functions and formula, printing text, copying and saving the document.

**MS-POWER POINT:** Features, Uses, Menus, Toolbars, creating a presentation through auto context wizard, templates, manual slides show, saving, deleting, opening a presentation, Editing.

**MS-ACCESS:** Data base, database Management system, RDBMS, advantages and limitations of MS- Access, parts, tables, integrity constraints, relationship and designing tables. **5 Hours**

### UNIT - III

**INTERNET AND COMPUTER SECURITY:** Introduction to Internet, net browsing, Emails, Networking and its types, topology, computer crime, components required for internet, saving and printing the web files.

**APPLICATIONS:** in Education, Medical Science, Business, Entertainment, Social "service's and Research etc.

#### +2 2nd Year

#### PRACTICALS

**NOTE :** DOS, Windows, MS-Office, web page, browsing, sending and creating email.

- (i) For +2 1st year 50 marks theory examination and For +2 2nd year 50 marks practical examination.
- (ii) The grade secured taking together both the theory and Practical marks will be reflected in the Mark sheet' and the pass certificate of the Council as follows :

| <b>Mark</b>   | <b>Grade</b> |
|---------------|--------------|
| 70% and above | Gr A+        |
| 60% to 69%    | Gr A         |
| 50% to 59%    | Gr B         |
| 35% to 49%    | Gr C         |
| Below 35%     | Gr D         |

# YOGA

**+2 FIRST YEAR**

**Paper – I (Theory)**

**Full Marks – 50**

## UNIT- I

### CONCEPT

**10 marks**

Meaning, Definition and Scope of yoga, Importance and aim of yoga for the students,  
Misconception of Yoga. Yoga and Spirituality

## UNIT- II

### BASIC PRINCIPLES

**10 marks**

Place, Time, Age, Diet, Dress, Do's and Don'ts  
Power of Silence

## UNIT-III

### BRANCHES

**10 marks**

Karma Yoga, Bhakti Yoga, Raja Yoga, Jnana Yoga  
Yoga in Srimad Bhagavat Gita

## UNIT- IV

### CONCEPT OF ASTHANGA YOGA

**10 marks**

Yama, niyama, asana, pranayama, pratyahara, dharana, dhyana and samadhi

## UNIT - V

### (a) YOGA AND PERSONALITY DEVELOPMENT

**10 marks**

Meaning, Dimension of Personality: Views of Swami Vivekananda and Sri  
Aurobindo.

### (b) YOGA AND PHYSICAL EDUCATION :

Sound Health, Sound Mind

**YOGA**  
**+2 SECOND YEAR**  
**Paper - II, Practical**

Full Marks - 50

**UNIT - I**

**ASANA**

**PRILIMINARY PRACTICES** : Greeva Sanchalana, skandha chakra (shoulder rotation), purna, titali asana (full butterfly), marjari asana (cat stretch pose), Surya Namaskara

**STANDING POSTURE** : Tadasana, tiryak tadasana, katichakrasana pada-hastasana, ardha chakrasana, ardhakati chakrasana, ekapada pranamasana, garudasana, natarajasana.

**SITTING POSTURE** : padmasana janusirasana, paschimottanasana, supta vajrasana, shashankasana, ustrasana, ardhmatsyendrasana.

**PRONE LYING POSTURE** : shalabhasana, bhujangasana, dhanurasana.

**SUPINE POSTURE** : uttanapadasana, supta pawanamuktasana, naukasana, halasana, sarvangasana, matsyasana, chakrasana.

**UNIT-II**

**RELAXATION** : savasana, yoganidra Unit-III

**PRANAYAMA** : Priliminary practices: abdominal, thoracic, clavicular and fullyogic breathing kapalabhati, nadisodhana, bhramari seetali/seetkari Unit - IV and Unit - V

**MEDITATION** : Antarmouna - sensorial awareness : (sound, touch, vison, smell, taste), breath awareness, awareness of the spontaneous thought process. Unit-V

**KRIYA** : Trataka (internal and external)

**NOTE :**

**For +2 1st year 50 marks theory examination and For +2 2nd year 50 marks practical examination but in 1st year and 2nd year students will learn practical**

The grade secured taking together both the theory and Practical marks will be reflected in the Marks sheet and the pass certificate of the Council.

| <b>Mark</b>   | <b>Grade</b> |
|---------------|--------------|
| 70% and above | Gr A+        |
| 60% to 69%    | Gr A         |
| 50% to 59%    | Gr B         |
| 35% to 49%    | Gr C         |
| Below 35%     | Gr D         |

**Book Prescribed : An Introduction to Yoga,**

**Published by Odisha State Bureau of Textbook Preparation**

# **BASIC FOUNDATION COURSE (BFC)**

## **BIOLOGY**

### **1st year Science (Theory)**

Unit I : Diversity in living world

Unit II: Structural organization in animals and plants

Unit III: Cell structure and function

Unit IV: Plant physiology

Unit V: Human physiology

## **Biology**

### **2nd year Science(Theory)**

Unit I: Reproduction

Unit II: Genetics and Evolution

Unit III: Biology and Human Welfare

Unit IV: Biotechnology and its applications

Unit V: Ecology and Environment

Question Pattern (Section A-Botany; Section B-Zoology)

Time : 1.5 hrs Full Marks : 35

Group: A

1. Multiple choice/ one word answer : 1 mark x 5 = 5 marks

2. Correct sentence/ Fill up blanks : 1 mark x 5 = 5 marks

Group: B

3. Answer within 3 sentences : 2.5 marks x 3 = 7.5 marks

4. Differentiate between : 3.5 marks x 1= 3.5 marks

Group: C

Answer two questions : 7 marks x 2 = 14 marks

## 1st year Science(Theory) Theory

### I. Diversity in Living World

(Periods 10)

- a. What is living?, Biodiversity; Need for classification; Three domains of life; Taxonomy and Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature; Tools for study of Taxonomy- Museum, Zoos, herbaria, Botanical gardens.
- b. Five Kingdom classification; Salient features and classification of Monera, Protista and Fungi into major groups; Lichens; Viruses and Viroids.
- c. Salient features and classification of plants into major groups-Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms (three to five salient and distinguishing features and at least two examples of each category); Angiosperms- classification up to class, characteristic features and examples.
- d. Salient features and classification of animals- non-chordates up to phyla level and chordates up to classes level (three to five salient features and at least two examples).

### II. Structural Organization in Animals and Plants

(Periods 12)

- a. Morphology and modification in plants; Tissues; Anatomy and functions of different parts of flowering plants- Root, stem, Leaf; inflorescence- cymose and racemose; flower, fruit and seed (To be dealt along with the relevant practical of the Practical Syllabus).
- b. Animal tissues (epithelial, connective, muscular, nervous); Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (Brief account only).

### III. Cell Structure and Function

- a. Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; Cell envelope, cell membrane, cell wall; Cell organelles structure and function; Endo membranes system- endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, micro bodies; Cytoskeleton, cilia, flagella, centrioles (ultra structure and function); nucleus' nuclear

- membranes, chromatin, nucleolus.
- b. Chemical constituents of living cells: Biomolecules - structure and function of proteins, carbohydrates, lipid, nucleic acids; Enzymes-types, properties, enzyme action.  
Cell division: Cell cycle, mitosis, meiosis and their significance.

#### IV. Plant Physiology

(Period 16)

- a. **Transport in Plants:** Movement of water, gases and nutrients; Cell to cell transport- Diffusion, facilitated diffusion, active transport; Plant-water relations- Imbibition, water potential, osmosis, plasmolysis; Long distance transport of water- Absorption, apoplast, symplast, transpiration pull, root pressure and guttation ; Transpiration Opening and closing of Stomata; Uptake and translocation of mineral nutrients, Transport of food, phloem transport, Mass flow hypothesis; Diffusion of gases (brief mention).
- b. **Mineral Nutrition:** Exchange of gases; Cellular respiration- glycolysis, fermentation(anaerobic), TCA cycle and electron transport system (aerobic); Energy relation - Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.
- c. **Plant growth and Development:** Seed germination; Phases of plant growth and plant growth rate; Conditions of growth; Differentiation, defferentiation and redifferentiation; Sequence of developmental process in plant cell; Growth regulators-auxin, gibberellin, cytokine, ethylene, Basilica acid (ABA); Seed dormancy; Vernalisation; Photoperiodism.

#### V. Human Physiology (Periods 30)

- a. **Digestion and Absorption:** Alimentary canal and digestive glands; Role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; Calorific value of proteins, carbohydrates and fats (brief account); Ejection; Nutritional and digestive disorders- PEM, indigestion, constipation, vomiting, jaundice, diarrhoea.
- b. **Breathing and Respiration:** Respiratory organs in animals (tracheal, broncheal, cutaneous, pulmonary); Respiratory system in humans; Mechanism of respiration (breathing) and its regulation in humans- Exchange of gases, transport of gases. Respiratory volumes; Disorders related to respiration- Asthma, Emphysema, Occupational respiratory disorders.
- c. **Body fluids Circulation:** Composition of blood, blood groups, coagulation of blood;

Composition of lymph and its function; Human circulatory system- Structure and working of human heart, blood vessels; Cardiac cycle, cardiac output, ECG; Double circulation; Regulation of cardiac activity. Disorders of circulatory system- Hypertension, Coronary artery disease, Angina pectoris, Heart failure.

- d. Excretory products and their elimination:** Modes of excretion- Ammonotelism, ureotelism, uricotelism; Human excretory system- structure and function; Mechanism of Urine formation, Osmoregulation: Regulation of kidney function- Reninangiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus; Role of other organs in excretion; Disorders- Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.
- e. Locomotion and Movement:** Types of movement- ciliary, flagellar, muscular; Skeletal muscle- contractile proteins and muscle contraction; Skeletal system and its functions (To be dealt with the relevant practical of Practical Syllabus); Joints; Disorders of muscular and skeletal system- Myasthenia gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.
- f. Neural control and Coordination:** Neuron and nerves; Nervous system in humans- central nervous system (brain, spinal cord), peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse; Reflex action; Sensory perception; Sense organs; Elementary structure and function of eye and ear.
- g. Chemical coordination and Regulation:** Endocrine glands and hormones; Human endocrine system- Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulator, Hypo- and hyperactivity and related disorders (Common disorders e.g. Dwarfism, acromegaly, cretinism, goiter, exophthalmic goiter, diabetes, Addison's disease).

(NB: Ib, c; IIa; III and IV units are to be taught by Botany Faculty. Ia, d; IIb; V units are to be taught by Zoology Faculty.)

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**QUESTION PATTERN AND DISTRIBUTION OF MARKS**

**BIOLOGY- I Theory  
+ 2 1st Year Science (For College Level  
Exam.) Section A - Botany**

Time : 1.5 hrs

Full Marks : 35

Group A: (Objective Type - Compulsory)

Q1.- Multiple choice/ one word answer : 1 mark each x 5 = 5 marks

Q2.- Correct the sentences/ Fill up the blanks : 1 marks each x 5 = 5 marks

Group B: (Short Answer Type)

Q3.- Answer within three sentences : 2.5 marks each x 3 = 7.5 marks

(3 bits to be answered out of 6 bits)

Q4.- Differentiate between (3 important differences)

(1 bit to be answered out of 3 bits) : 3.5 marks = 3.5 marks

**Group C: (Long Answer Type)**

Answer two questions out of four : 7.0 marks each x 2 = 14 marks

**Section B - Zoology**

**Time : 1.5 hours**

**Full Marks : 35**

**Group A: (Objective Type - compulsory)**

Q1.- Multiple choice/ one word answer : 1 mark each x 5 = 5 marks

Q2.- Correct the sentences/ Fill up the blanks : 1 marks each x 5 = 5 marks

**Group B: (Short Answer Type)**

Q3.- Answer within three sentences : 2.5 marks each x 3 = 7.5 marks

(3 bits to be answered out of 6 bits)

Q4.- Differentiate between (3 important differences)

(1 bit to be answered out of 3 bits) : 3.5 marks = 3.5 marks

**Group C: (Long Answer Type)**

Answer two questions out of four : 7 marks each x 2 = 14 marks

N.B: Long answer type questions are to be set only from the portions underlined in the syllabus.

**BIOLOGY- I Botany Practical**  
**+2 First year Science**  
**Detailed syllabus**

**Study of:**

1. Different parts of the Dissecting and Compound microscopes.
2. A typical Angiospermic plant.

**Major experiment**

3. Study and describe at least one common flowering plant from each of the following families (Malvaceae, Solanaceae, Fabaceae and Liliaceae) including dissection and display of floral whorls, and and other and ovary to show number of chambers.
4. Preparation and study of T.S. of dicot and monocot roots, and stem and leaf (Primary).
5. Study of mitosis in onion root tips.

**Minor experiment:**

6. Study of cells (Onion scale leaf, *Rhoeo* leaves)
7. Test for presence of starch, proteins and fats.
8. Study of starch grains and raphides.
9. Qualitative test for catalase activity by leaf disc method.
10. Modification of root, stem and leaf.
11. Study of flower and its parts.
12. Types of inflorescence.

**Spotting:**

- a. Study of the specimens and identification with reasons - bacteria, Oscillatoria, Spirogyra, Rhizopus, Mushroom, Yeast, Livewort, Moss, Fern, Cycas, one monocotyledonous plant, one dicotyledonous plant and one lichen.
- b. Study of tissues and diversity in shapes and sizes in plants (simple tissue, complex tissue) through temporary/permanent slides.

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**BIOLOGY- I (Botany) Practical  
+ 2 First Year Science (For College Level Exam)**

Time : 2 hours

Full Marks : 15

|   |            |
|---|------------|
| 1. Major experiment (One)                               | : 7 marks  |
| 2. Minor experiment (One)                               | : 3 marks  |
| 3. Spotting (Three - two from bit a and one from bit b) | : 3 marks  |
| 4. Record   | : 12 marks |
| Total   | : 15 marks |

**Instruction:**

1. All the above experiments should be conducted by individual students.
2. Questions for major and minor experiments are to be set by drawing lots.
3. For each major and minor experiment, candidates have to write the requirements as per the questions, which may be verified and signed by the external examiner only.
4. One observation for major experiment maybe verified and signed by the external examiner only.

**BIOLOGY - I (Zoology) Practical  
+2 First year Science  
Detailed Syllabus**

**A. EXPERIMENTS/ OBSERVATIONS:**

1. To test the presence of carbohydrate, protein and fat in suitable animal materials (qualitative only).
2. To test the presence of urea in urine/ given sample solution.
3. To test the presence of albumin in urine/ given sample solution.
4. To test the presence of bile salts in urine/ given sample solution.

**B. SPOTTINGS/ IDENTIFICATION:**

- a. Study of specimens and identification with reasons- Amoeba, Hydra, Sycon, Liver fluke, Earthworm, Leech, Cockroach, Prawn, silkworm, Honeybee, Snail and Starfish.
- b. Study of squamous epithelium, muscle fibres and mammalian blood film; stages of mitosis and meiosis (temporary/ permanent slides).
- c. Study and comment on the morphological adaptations of two animals (Tree frog, Bat) found in terrestrial conditions and two animals (Flying fish, Turtle) found in aquatic conditions.

**Book Recommended :**

Bureau's Higher Secondary (+2) Zoology, Practical, Published by Odisha State  
Bureau of Text Book Preparation and Production, Bhubaneswar.

**QUESTION PATTERN AND DISTRIBUTION OF MARKS**  
**BIOLOGY - I (Zoology) Practical**  
**+2 First year Science (For College Level Exam)**

**Time : 2 hours**

**Full marks : 15**

- |   |                 |            |
|---|-----------------|------------|
| 1. Experiment (One experiment to be set from A)     |                 |            |
|   |                 | : 07 marks |
| Theory and Procedure                                | - 03 marks      |            |
| Experiment, Observation and Results                 | - 04 marks      |            |
| 2. Spotting (Four spots to be set from B)           |                 |            |
|   | - 1.5 marks x 4 | : 06 marks |
| (Two from bit a, one from bit b and one from bit c) |                 |            |
| 3. Practical Record                                 |                 |            |
|   |                 | : 02 marks |

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**BIOLOGY**  
**2nd Year Science**  
**Theory**

**I. Reproduction**

**a. Reproduction in organism:** Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction - Asexual and sexual; Asexual reproduction; Modes- Binary fission, sporulation, budding, gemmule formation, fragmentation; vegetative propagation in plants.

**Sexual reproduction in flowering plants:** Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events Development of endosperm and embryo, Development of seed and formation of fruit; Special modes- apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.

**b. Human Reproduction:** Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis- spermatogenesis 7 oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).

**Reproductive health:** Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control- Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies - IVF, ZIFT, GIFT (Elementary idea for general awareness).

**II. Genetics and Evolution (Periods 20)**

**a. Heredity and Variation:** Mendelian Inheritance; Deviations from Mendelism- Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Linkage and crossing over.

- b. Sex determination- In humans, birds, honey bee; Sex linked inheritance- Haemophilia, Colour blindness; Mendelian disorders in humans- Thalassaemia; Chromosomal disorders in humans- Down's syndrome, Turner's and Klinefelter's syndromes.
- c. **Molecular Basis of Inheritance:** Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, Genetic code, Translation; Gene expression and regulation- Lac Operon; Genome and human genome project; DNA finger printing.
- d. **Evolution:** Origin of life; Biological evolution and evidences for biological evolution (Paleontological, comparative anatomy, embryology and molecular evidence); Darwinism, Modern Synthetic theory of Evolution; Mechanism of evolution- Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution (in brief).

### III. Biology and Human Welfare (Periods 08)

- a. **health and Disease:** Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology- vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse.
- b. **Improvement in food production:**
- i) Plant breeding, tissue culture, single cell protein, Biofortification;
  - ii) Apiculture and Animal husbandary.
- c. **Microbes in human welfare:** In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

### IV. Biotechnology and its Applications (Periods 08)

- a. **Principles and process of Biotechnology:** Genetic engineering (Recombinant DNA technology).
- b. **Application of Biotechnology in health and agriculture:** Human insulin and vaccine production, gene therapy; Genetically modified organisms- Bt crops; Transgenic Animals; Biosafety issues- Biopiracy and patents.

### V. Ecology and environment (Periods 12)

- a. **Organisms and environment:** Habitat and niche; Population and ecological

adaptations; population interactions-mutualism, competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution.

**b. Ecosystems:** Patterns, components; productivity and decomposition; Energy flow;

Pyramids of number, biomass, energy; Nutrient cycling (carbon and phosphorous);

Ecological succession; Ecological Services- Carbon fixation; pollination, oxygen release.

**c. Biodiversity and its conservation:** Concept of Biodiversity; Patterns of Biodiversity;

Importance of Biodiversity; Loss of Biodiversity, conservation; Hotspots, endangered

organisms, extinction, Red Data Book: Biosphere reserves, National parks and

Sanctuaries.

**Environmental issues:** Air pollution and its control; Water pollution and its control;

agrochemicals and their effects; Solid waste management; Radioactive waste

management; Greenhouse effect and global warming; Ozone depletion; Deforestation;

Any three case studies as success stories addressing environmental issues.

(NB: Ia, II a, c; III b (i), c and v units are to be taught by Botany Faculty. I b; II b; III a, b(ii); IV units are to be taught by Zoology Faculty.)

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**QUESTION PATTERN AND DISTRIBUTION OF MARKS****BIOLOGY - II Theory  
+ 2 Second Year Science  
Section A - Botany****Time : 1.5 hours Full****Marks : 35 Group A: (Objective Type- Compulsory)**

Q1.- Multiple choice/ one word answer : 1 mark each x 5 = 5 marks

Q2.- Correct the sentences/ Fill up the blanks : 1 marks each x 5 = 5 marks

**Group B: (Short Answer Type)**

Q3.- Answer within three sentences : 2.5 marks each x 3 = 7.5 marks

Q4.- Difference between (3 important differences)

(1 bit to be answered out of 3 bits) : 3.5 marks = 3.5 marks

**Group C: (Long Answer Type)**

Answer two questions out of four : 7 marks x 2 = 14 marks

**Section B - Zoology****Time : 1.5 hours****Full Marks : 35****Group A: (Objective Type- Compulsory)**

Q1.- Multiple choice/ one word answer : 1 mark each x 5 = 5 marks

Q2.- Correct the sentences/ Fill up the blanks : 1 marks each x 5 = 5 marks

**Group B: (Short Answer Type)**

Q3.- Answer within three sentences : 2.5 marks each x 3 = 7.5 marks

(3 bits to be answered out of 6 bits)

Q4.- Difference between (3 important differences)

(1 bit to be answered out of 3 bits) : 3.5 marks = 3.5 marks

**Group C: (Long Answer Type)**

Answer two questions out of four : 7 marks x 2 = 14 marks

N.B: Long answer type questions are to be set only from the portions understand in the syllabus.

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**BIOLOGY - II (Botany) Practical**  
**+2 Second Year Science**  
**Detailed Syllabus**

**Major Experiment:**

1. Study of the effect of temperature and chemicals (ethanol, acetone, formaldehyde) on leaching of pigments in beet root.
2. Study of plants pigments by paper chromatography.
3. Study of transpiration by Ganong's or Farmer's potometer.
4. Study of relation between transpiration and absorption by T/A apparatus.
5. Effect of different wave length of light on photosynthesis by Wilmott's bubbler.
6. Study of effect of dissolved carbondioxide on photosynthesis by Wilmott's bubbler.
7. Comparative study of rate of transpiration from upper and lower surface of dicot leaf.
8. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity of soil. Correlate with the kinds of plants found in them.
9. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms.
10. Study the presence of suspended particulate matter in air at the two widely different sites.
11. Study of plant population density by quadrat method.
12. Study of plant population frequency by quadrat method.

**Minor Experiments:**

13. Study of pollen germination on a slide.
14. Study of distribution of stomata on upper and lower surface of a dicot and a monocot leaf.
15. Study of osmosis by potato osmometer.
16. Analysis of samples for verification of Mendelian ratio using Pea seeds or colour beads.
17. Study of plasmolysis.

**Spotting:**

18. Conditions necessary for seed germination.
19. Types of germination.
20. Phototropism/ Geotropism.
21. Morphological adaptation of hydrophyte and Xerophyte.

**QUESTION PATTERN AND DISTRIBUTION OF MARKS**

**BIOLOGY - II (Botany) Practical**

**+ 2 Second Year Science**

|                           |            |
|---------------------------|------------|
| 1. Major experiment (One) | : 7 marks  |
| 2. Minor experiment (One) | : 3 marks  |
| 3. Spotting (Three)       | : 3 marks  |
| 4. Record                 | : 2 marks  |
| Total                     | : 15 Marks |

**Instruction:**

5. All the above experiments should be conducted by individual student.
6. Questions for major and minor experiments are to be set by drawing lots.
7. For each major and minor experiments, candidates have to write the requirements as per their questions which may be verified and signed by the external examiner only.
8. One observation for major experiment may be verified and signed by the external examiner only.

**BIOLOGY - II (Zoology) Practical  
+2 Second year Science  
Detailed Syllabus**

**A. EXPERIMENTS/ OBSERVATIONS:**

1. To test the action of salivary amylase on starch; study the effects of pH and temperature on it.
2. To test the presence of urea sugar in urine/ given sample solution.
3. To determine the pH of three water samples collected from water bodies (using pH paper).
4. To study the prepared pedigree charts of genetic traits in man such as rolling of tongue, blood groups, widow's peak and colour blindness.

**B. SPOTTINGS/ IDENTIFICATION:**

- a. Study of specimens and identification with reasons- Shark, Rohu, Frog, Garden lizard, Cobra, Krait, Pigeon and Rat.
- b. TS/ VS through spinal cord, ovary, testis, artery, vein, kidney, stomach and blastula of frog.
- c. Axial and appendicular skeleton of rabbit (excluding skull).
- d. Identification of common disease causing organisms- Entamoeba, Plasmodium, Taenia, Ascaris and Ringworm (permanent slides/ specimens). Comment on the symptoms of the diseases they cause.

**Book Recommended :**

Bureau's Higher Secondary (+2) Zoology, Practical, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar.

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**QUESTIONS PATTERN AND DISTRIBUTION OF MARKS  
BIOLOGY - II (Zoology) Practical  
+ 2 Second Year Science**

**Time : 2 hours**

**Full Marks : 15**

- |    |  |                                |
|----|--|--------------------------------|
| 1. | Experiment (One experiment to be set from A) | : 07 marks                     |
|    | Theory and procedure                         | - 03 marks                     |
|    | Experiment, Observation and Results          | - 04 marks                     |
| 2. | Spotting (Four spots to be set from B)       | -1.5 marks each x 4 : 06 marks |
| 3. | Practical Record                             | :02 marks                      |

# BFC CHEMISTRY

For 1st Year Science

## Course Structure

| Unit | Title  | Marks |
|------|--|-------|
| I    | Basic Concepts of Chemistry                            | 11    |
| II   | Structure of Atom                                      |       |
| III  | Classification of Elements & Periodicity in Properties | 4     |
| IV   | Chemical Bonding and Molecular Structure               |       |
| V    | States of Matter : Gases and Liquids                   |       |
| VI   | Thermodynamics   | 21    |
| VII  | Equilibrium  |       |
| VIII | Redox Reactions  |       |
| IX   | Hydrogen   | 16    |
| X    | s-Block Elements                                       |       |
| XII  | Organic Chemistry : Basic Principles & Techniques      |       |
| XIII | Hydrocarbons   | 18    |
| XIV  | Environmental Chemistry                                |       |
|      | Total  | 70    |

### Unit I: Some Basic Concepts of Chemistry

General Introduction: Importance and scope of chemistry

Nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules

Atomic and molecular masses and equivalent mass of elements, acid, base, and salt, oxidants, reductants, and mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

### Unit II: Structure of Atom

Discovery of Electron, Proton and Neutron, atomic number, isotopes and isobars. Thomson's model and its limitations. Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half filled

### **Unit III: Classification of Elements and Periodicity in Properties**

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements - atomic radii ionic radii, inert gas radii, Ionization enthalpy, electron gain enthalpy, electronegativity, valency and oxidation state. Nomenclature of elements with atomic number greater than 100.

### **Unit IV : Chemical Bonding and Molecular Structure**

Valence electrons, ionic bond, covalent bond; bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s,p and d orbitals and shapes of some molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), hydrogen bond.

### **Unit V : States of Matter : Gases and Liquids**

Three states of matter, intermolecular interactions, types of bonding, melting and boiling points, role of gas laws in elucidating the concept of the molecule, Boyle's law, Charles law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro's number, ideal gas equation. Deviation from ideal behaviour liquefaction of gases, critical temperature, kinetic energy and molecular speeds (elementary idea) Liquid State vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

### **Unit VI : Chemical Thermodynamics**

Concepts of System and surroundings and types of system, surroundings, work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics - internal energy and enthalpy, heat capacity and specific heat, measurement

of U and H, Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution, Second law of Thermodynamics (brief introduction). Introduction of entropy as a state function, Gibb's energy change for spontaneous and non-spontaneous processes, criteria for equilibrium.

Third law of thermodynamics (brief introduction).

### **Unit VII : Equilibrium**

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant ( $K_c$ ,  $K_p$  and  $K_x$  and their relationship) factors affecting equilibrium - Le Chatelier's principle, ionic equilibrium-ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of poly basic acid strength, concept of PH, Henderson Equation, hydrolysis of salts (elementary

idea), buffer solution, solubility, product, common ion effect (with illustrative examples) numerical problems.

### **Unit VIII : Redox Reaction**

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number, applications of redox reactions.

### **Unit IX : Hydrogen**

Position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen, hydrides-ionic covalent and interstitial; physical and chemical properties of water, heavy water, hydrogen peroxide-preparation, reactions and structure and use; hydrogen as a fuel.

### **Unit X : s-Block Elements (Alkali and Alkaline Earth Metals)**

#### **Group 1 and Group 2 Elements**

General introduction, electronic configuration, occurrence, anomalous, properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen and halogens, uses.

#### **Preparation and Properties of Some Important Compounds :**

Sodium Carbonate, Sodium Chloride, Sodium Hydroxide and Sodium Hydrogencarbonate, Biological importance of Sodium and Potassium. Calcium Oxide and Calcium Carbonate and their industrial uses, biological importance of Magnesium and Calcium.

### **Unit XI : Some p- Block Elements**

#### **General Introduction to p- Block Elements**

**Group 13 Elements :** General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group, Boron - physical and chemical properties, some important compounds, Borax, Boric acid, Boron Hydrides, Aluminium : Reactions with acids and alkalis, uses.

**Group 14 Elements :** General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first elements. Carbon-catenation, allotropic forms, physical and chemical properties; uses of some important compounds: oxides. Important compounds of Silicon and a few use: Silicon Tetrachloride, Silicones, Silicates and Zeolites, their uses.

### **Unit XII : Organic Chemistry - Some Basic Principles and Technique**

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyperconjugation. Homolytic and heterolytic fission of a covalent bond free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions.

### **Unit XIII : Hydrocarbons**

Classification of Hydrocarbons

Aliphatic Hydrocarbons :

Alkanes - Nomenclature, isomerism, conformation (ethane only), physical properties methods of preparation chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

Alkenes - Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markownikoff's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes - Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions : acidic character of alkynes, addition reaction of - hydrogen, halogens, hydrogen halides and water.

Aromatic Hydrocarbons : Introduction, IUPAC nomenclature, benzene : resonance, aromaticity, chemical properties: mechanism of electrophilic substitution, nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation, directive influence of functional group in monosubstituted benzene. Carcinogenicity and toxicity.

### **Unit XIV : Environmental Chemistry**

Environmental pollution - air, water and soil pollution, chemical reactions in atmosphere, smog, major atmospheric pollutants, acid rain, ozone and its reactions, effects of depletion of ozone layer, greenhouse effect and global warming-pollution due to industrial wastes, green chemistry as an alternative tool for reducing pollution, strategies for control of environmental pollution.

**CHEMISTRY (PRACTICAL)****+2, 1st Year Science****(Detailed syllabus)****Experiments :****1. Basic Laboratory Techniques : (Non-evaluative)**

- a) Bunsen burner (different parts and their functions)
- b) Chemical balance - weighing with chemical balance by equal oscillation method.
- c) Cutting and bending of glass tube, drawing jet and boring a cork.

**2. Crystallisation :**Preparation of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  crystal from  $\text{CuCO}_3$ .**3. Qualitative Analysis :**

- a) Identification of acid radicals :

Radicals :  $\text{CO}_3^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{NO}_2^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$  &  $\text{PO}_4^{3-}$ 

- b) Identification of Basic Radicals :

Radicals :  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Hg}_2^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Hg}^{2+}$ ,  $\text{Bi}^{3+}$ ,  $\text{As}^{3+}$ ,  $\text{Sb}^{3+}$ ,  $\text{Sn}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{NH}_4^+$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$  and  $\text{Na}^+$  (Dry Tests only).**4. Volumetric Analysis :**

Single titration of acids and bases (three experiments to be done; one on direct determination of normality of one of the solutions from that of the other and the other two, involving numerical calculations)

**5. Gravimetric Analysis :**

- a) Equivalent mass of Mg by hydrogen displacement method.
- b) Solubility of  $\text{K}_2\text{SO}_4$  at room temperature.

**Books Recommended :**

+2 Practical Chemistry, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar

## QUESTION PATTERN AND DISTRIBUTION OF MARKS

**CHEMISTRY  
(PRACTICAL)**

+2, 1st year Science

**Full Mark : 30****Time : 3 Hrs**

|           |   |   |   |                 |
|-----------|---|---|---|-----------------|
| <b>1.</b> | <b>Salt analysis (Acid radical)</b>                               | - | - | <b>10 marks</b> |
|           | <b>Dry Test</b>   | - |   | <b>04 mark</b>  |
|           | <b>Wet Test</b>   | - |   | <b>06 mark</b>  |
| <b>2.</b> | Crystallisation / Single titration / Equivalent mass / Solubility | - | - | 10 marks        |
| <b>3.</b> | Viva-Voce   | - | - | 06 marks        |
| <b>4.</b> | Record  | - | - | 04 marks        |

**CHEMISTRY  
2ND YEAR SCIENCE****Course Structure**

| <b>Unit</b>  | <b>Title</b>                            | <b>Marks</b> |
|--------------|---|--------------|
| I            | Solid State                             |              |
| II           | Solutions                               |              |
| III          | Electrochemistry                        | 23           |
| IV           | Chemical Kinetics                       |              |
| V            | Surface Chemistry                       |              |
| VI           | Isolation of Elements                   |              |
| VII          | p-Block Elements                        |              |
| VIII         | d- and f- Block Elements                | 19           |
| IX           | Coordination Compounds                  |              |
| X            | Haloalkanes and Haloarenes              |              |
| XI           | Alcohols, Phenols and Ethers            |              |
| XII          | Aldehydes, Ketones and Carboxylic Acids |              |
| XIII         | Organic Compounds containing Nitrogen   | 28           |
| XIV          | Biomolecules                            |              |
| XV           | Polymers                                |              |
| XVI          | Chemistry in Everyday Life              |              |
| <b>Total</b> |   | <b>70</b>    |

## **CHEMISTRY**

### **THEORY - II**

#### **Unit I: Solid State**

Classification of solids based on different binding forces: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea). Unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, packing efficiency, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties.

Band theory of metals, conductors, semiconductors and insulators and n & p type semiconductors.

#### **Unit II: Solutions**

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties - relative lowering of vapour pressure, Raoult's law, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, van't Hoff factor.

#### **Unit III: Electrochemistry**

Redox reactions, electrolytes and non-electrolyte conductor, conductance in electrolytic solutions, specific and molar conductivity, variation of conductivity with concentration, Kohlrausch's law, electrolysis and laws of electrolysis (elementary idea), dry cell electrolytic cells and Galvanic cells, lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and emf of a cell, fuel cells, corrosion.

#### **Unit IV: Chemical Kinetics**

Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst, order and molecularity of a reaction, rate law

and specific rate constant, integrated rate equations and half life (only for zero and first order reactions), concept of collision theory (elementary idea, no mathematical treatment). Activation energy, Arrhenius equation.

### **Unit V: Surface Chemistry**

Adsorption - physisorption and chemisorption, factors affecting adsorption of gases on solids, catalysts, homogenous and heterogenous activity and selectivity; enzyme catalysts colloidal state distinction between true solutions, colloids and suspension; lyophilic, lyophobic multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation, emulsion - types of emulsions.

### **Unit VI: General Principles and Processes of Isolation of Elements**

Principles and methods of extraction - concentration, oxidation, reduction - electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and iron.

### **Unit VII: p - Block Elements**

**Group 15 Elements:** General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; nitrogen preparation properties & uses; compounds of nitrogen, preparation and properties of ammonia and nitric acid, oxides of nitrogen (Structure only); Phosphorus - allotropic forms, compounds of phosphorus: preparation and properties of phosphine, halides  $\text{PCl}_3$ ,  $\text{PCl}_5$  and oxoacids (elementary idea only).

**Group 16 Elements:** General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties, dioxygen: Preparation, Properties and uses, classification of oxides, Ozone, Sulphur 0 allotropic forms; compounds of sulphur: Preparation properties and uses of sulphur - dioxide,

sulphuric acid: industrial process of manufacture, properties and uses; oxoacids of sulphur (Structures only).

**Group 17 Elements:** General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens, Preparation properties and uses of chlorine and hydrochloric acid, interhalogen compounds, oxoacids of halogens (structure only).

**Group 18 Elements:** General introduction, electronic configuration, occurrence, trends in physical and chemical properties, uses.

### **Unit VIII: d and f Block Elements**

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals - metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation, preparation and properties of  $K_2Cr_2O_7$  and  $KMnO_4$ .

**Lanthanoids** - Electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequences.

**Actinoids** - Electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequences.

**Actinoids** - Electronic configuration, oxidation states and comparison with lanthanoids.

### **Unit IX: Coordination Compounds**

Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory, VBT and CFT; structure and stereoisomerism, importance of coordination compounds (in qualitative analysis,

extraction of metals and biological system).

### **Unit X: Haloalkanes and Haloarenes**

**Haloalkanes:** Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, optical rotation.

**Haloarenes:** Nature of C - X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only.

Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT, BHC.

### **Unit XI: Alcohols, Phenols and Ethers**

**Alcohols:** Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses with special reference to methanol and ethanol.

**Phenols:** Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

Ethers :Nomenclature, methods of preparation physical and chemical properties uses.

### **Unit XII : Aldehydes, Ketones and Carboxylic Acids**

Aldehydes and Ketones : Nomenclature nature of carbonyl group methods of preparation, physical and chemical properties, mechanism of nucleophilic addition reactivity of alpha hydrogen in aldehydes uses.

Carboxylic Acids : Nomenclature, acidic nature, methods of preparation, physical and chemical properties uses.

### **Unit XIII : Organic compounds containing Nitrogen**

Amines : Nomenclature classification, structure, methods of preparation, physical and chemical properties, uses identification of primary, secondary and tertiary amines.

Cyanide and Isocyanides-will be mentioned at relevant places in context

Diazonium salt - Preparation, chemical reactions and importance in synthetic organic chemistry.

#### **Unit XIV : Biomolecules**

**Carbohydrates** - Classification(aldoses and ketoses) Monosaccharides(glucose and fructose), D-L configuration oligosaccharides(sucrose, lactose, maltose) polysaccharides(starch, cellulose, glycogen) importance.

**Proteins**-Elementary idea of L- amino acids, peptide bond, polypeptide, proteins, structure of proteins-primary secondary, tertiary structure and quaternary structure(qualitative idea only), denaturation of proteins, enzymes, hormones-Elementary idea excluding structure

Vitamins-Classification and functions

Nucleic Acids : DNA and RNA

#### **Unit XV: Polymers**

Classification-Natural and synthetic methods of polymerization(addition and condensation)co polymerization, some important polymers, natural and synthetic like polythene, nylon, polyester, bakelite, rubber, Biodegradable and non-biodegradable polymers.

#### **Unit XVI : Chemistry in Everyday life**

**Chemical in Medicines**- Analgesics, tranquilizers antiseptics, disinfectants, antimicrobials, antifertility, drugs, antibiotics, antacids, antihistamines.

**Chemical in food**-Preservations, artificial sweetening agents, elementary idea of antioxidants

**Cleansing agents**-Soap and detergents, cleansing action.

**CHEMISTRY (PRACTICAL)**  
**+2, 2nd Year Science**  
*(Detailed syllabus)*

**1. Crystallisation**

- a) Preparation of Mohr's Salt ( $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ ] crystal  
 b) Preparation of potash alum [ $\text{K}_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$ ] crystal

**2. Quantitative Analysis :**

- a) **Double titration** : Two experiments to be done - i) one acid two alkalis double titration and ii) two acids one alkali double titration.  
 b) **Bench Acid Titration** : Strong acid of approximately 2.0 N be supplied.  
 c) **Redox Titration** : Titration between potassium permanganate and oxalic acid.

**3. Qualitative Inorganic Analysis :**

**Wet tests for basic radicals** : Wet tests for the following basic radicals be done.

Group-I basic radicals :  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Hg}_2^{2+}$

Group-II basic radicals :  $\text{Hg}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Bi}^{3+}$ ,  $\text{As}^{3+}$ ,  $\text{Sb}^{3+}$ ,  
 $\text{Sn}^{2+}$  &  $\text{Sn}^{4+}$  Group-III A basic radicals :  $\text{Fe}^{3+}$ ,  $\text{Al}^{3+}$  &  
 $\text{Cr}^{3+}$

Group-III B basic radicals :  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  
 $\text{Zn}^{2+}$  &  $\text{Mn}^{2+}$ . Group-IV basic radicals :  
 $\text{Ba}^{2+}$ ,  $\text{Ca}^{2+}$  &  $\text{Sr}^{2+}$

Group-V basic radicals :  $\text{NH}_4^+$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$ ,  $\text{Na}^+$ . Identification of unknown basic radicals. [For Identification of unknown basic radicals both dry and wet tests are to be performed]

**4. Qualitative Organic Analysis :**

Tests for unsaturation, distinction between aromatic and aliphatic compounds by copper foil test, tests for carboxylic, phenolic, aldehydic, ketonic and alcoholic groups.

**Book Recommended**

+2 Practical Chemistry : Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar.

**QUESTION PATTERN AND MARKS DISTRIBUTION  
CHEMISTRY (PRACTICAL)**

+2, 2nd year Science

**Full Mark : 30**

**Time : 3 Hrs**

|  |   |         |                 |
|--|---|---------|-----------------|
| <b>1. Salt analysis (Identification of basic radical only)</b> |   |         | <b>10 marks</b> |
| Dry Test   | - | 04 mark |                 |
| Wet Test   | - | 06 mark |                 |
| <b>2. Crystallisation / Double Titration /</b>                 |   |         |                 |
| Bench Acid Titration OR  |   | 06      | 10 marks        |
| Redox Titration  |   |         |                 |
| Organic compound   |   | 04      |                 |
| 3. Viva-Voce   | - | -       | 06 marks        |
| 4. Record  | - | -       | 04 marks        |

**Boks Prescribed :Bureau's Higher Secondary (+2) CHEMISTRY, VOL-I &II**

**Published by - Odisha State Bureau of Textbook Preparation & Production, Pustak Bhavan Bhubaneswar.**

**BFC**  
**MATHEMATICS**  
**(+2 First Year)**

**COURSE STRUCTURE**

| <b>Unit</b>  | <b>Topic</b>               | <b>Marks</b> | <b>No. of Periods</b> |
|--------------|----------------------------|--------------|-----------------------|
| I            | Sets and Functions         | 29           | 60                    |
| II           | Algebra                    | 37           | 70                    |
| III          | Co-ordinate Geometry       | 13           | 40                    |
| IV           | Calculus                   | 06           | 30                    |
| V            | Mathematical Reasoning     | 03           | 10                    |
| VI           | Statistics and Probability | 12           | 30                    |
| <b>Total</b> |                            | <b>100</b>   | <b>240</b>            |

**UNIT - I : Sets and Functions**

**1. Sets**

Sets and their representations. Empty set, Finite and Infinite sets, Equal sets, Subsets, Subsets of a set of real numbers especially intervals (with notations), Power set, Universal set, Venn diagrams, Union and Intersection of sets, Difference of sets, Complement of a set, Properties of Complement of Sets, Practical Problems based on sets.

**2. Relations & Functions**

Ordered pairs, Cartesian product of sets. Number of elements in the Cartesian product of two finite sets. Cartesian product of the sets of real (upto  $\mathbb{R} \times \mathbb{R}$ ). Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special kind of relation from one set to another. Pictorial representation of a function, domain co-domain and range of a function. Real valued functions, domain and range of these functions: Constant, identity, polynomial, rational, modulus, signum, exponential, logarithmic and greatest integer function, with their graphs. Sum, difference, product and quotients of functions.

**3. Trigonometric Functions**

Positive and negative angles. Measuring angles in radians and in degrees and conversion of one into other. Definition of trigonometric functions with the help of unit circle. Truth of  $\sin^2 x + \cos^2 x = 1$ , for all  $x$ . Signs of trigonometric functions. Domain and range of

trigonometric functions and their graphs. Expressing  $\sin(x \pm y)$  and  $\cos(x \pm y)$  in terms of  $\sin x$ ,  $\sin y$ ,  $\cos x$  &  $\cos y$  and their simple application. Deducing identities like the following :

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \cot(x \pm y) = \frac{\cot x \cot y \mp 1}{\cot y \pm \cot x}$$

$$\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}, \cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2},$$

$$\sin x - \sin y = 2 \cos \frac{x+y}{2} \sin \frac{x-y}{2}, \cos x - \cos y = -2 \sin \frac{x+y}{2} \sin \frac{x-y}{2},$$

Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$  and  $\tan 3x$ . Trigonometric equations  
Principal solution, General solution of trigonometric equations of the type  $\sin x = \sin y$ ,  $\cos x = \cos y$  and  $\tan x = \tan y$ . Proof and Simple applications of sine and cosine formula.

## UNIT-II : Algebra

### 1. Principle of Mathematical Induction

Process of the proof by induction, motivation the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.

### 2. Complex Numbers and Quadratic Equations

Need for complex numbers, especially  $\sqrt{-1}$ , to be motivated by inability to solve some of the quadratic equations; Algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex system. Square root of a complex number, cube roots of unity and its properties..

### 3. Linear Inequalities

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Graphical solution of system of linear inequalities in two variables.

#### 4. Permutations and Combinations

Fundamental principle of counting, factorial  $n$ . ( $n!$ ), Permutations and combinations, derivation of formulae and their connections, simple applications.

#### 5. Binomial Theorem

History, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, General and middle term in binomial expansion, simple applications.

#### 6. Sequence and Series

Sequence and Series, Arithmetic Progression (A.P.). Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P, sum of  $n$  terms of a G.P., Arithmetic and Geometric series, infinite G.P. and its sum, geometric mean (G.M.), Harmonic (mean) relation between A.M., GM. and H.M., Formula for the following special sum :

Arithmetico-Geometric Series, Exponential Series, Logarithmic Series, Binomial Series.

### UNIT - III : Co-ordinate Geometry

#### 1. Straight Lines

Brief recall of two dimensional geometry from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line : parallel to axis, point-slope form, slope-intercept form, two-point form, intercept form and normal form. General equation of a line. Equation of family of lines passing through the point of intersection of two lines. Distance of a point from a line, Shifting of Origin.

#### 2. Conic Sections

Sections of a cone : circles, ellipse, parabola, hyperbola; a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section; Standard equations and simple properties of Circle, parabola, ellipse and hyperbola.

#### 3. Introduction to Three-dimensional Geometry

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

## UNIT-IV: Calculus

### 1. Limits and Derivatives

Derivative introduced as rate of change both as that of distance function and geometrically. Intuitive idea of limit. Limits of polynomials and rational functions, trigonometric, exponential and logarithmic functions. Definition of derivative, relate it to slope of tangent of a curve, derivative of sum, difference, product and quotient of functions. The derivative of polynomial and trigonometric functions.

## UNIT-V : Mathematical Reasoning

### 1. Mathematical Reasoning

Mathematically acceptable statements. Connecting words/phrases-consolidating the understanding of “if and only if (necessary and sufficient) condition,” “implies”, “and/or”, “implied by”, “and”, “or”, “there exists” and their use through variety of examples related to real life and Mathematics. Validating the statements involving the connecting words, difference between contradiction, converse and contrapositive,

## UNIT-VI : Statistics and Probability

### 1. Statistics

Measures of dispersion; Range, mean deviation, variance and standard deviation of ungrouped/ grouped data. Analysis of frequency distributions with equal means but different variances.

### 2. Probability

Random experiments; outcomes, sample spaces (set representation). Events; occurrence of events, ‘not’, ‘and’ and ‘or’ events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event. Probability of ‘not’, ‘and’ ‘or’ events.

### Books Recommended:

Bureau’s Higher Secondary (+2) Elements of Mathematics, Part-I, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar.

**BFC**  
**MATHEMATICS**  
**(+2 Second Year)**

**COURSE STRUCTURE**

| Unit         | Topic  | Marks      | No. of Periods |
|--------------|--|------------|----------------|
| I            | Relations and Functions & Linear Programming | 20         | 45             |
| II           | Algebra and Probability                      | 20         | 45             |
| III          | Differential Calculus                        | 20         | 45             |
| IV           | Integral Calculus                            | 20         | 45             |
| V            | Vector 3-D Geometry                          | 20         | 45             |
| <b>Total</b> |  | <b>100</b> | <b>220</b>     |

**General Instructions :**

- All questions are compulsory in Group A, which are very short answer type questions. All questions in the group are to be answered in one word, one sentences or as per exact requirement of the question. (1x10=10 Marks)
- Group-B contain 5(five) questions and each question have 5 bits, out of which only 3 bits are to be answered (Each bit carries 4 Marks) (4 x15=60 Marks)
- Group-C contains 5(five) questions and each question contains 2/3 bits, out of which only 1(one) bit is to be answered. Each bit carries 6(six) Mark (6x5 =30 Marks)

**UNIT - I : Relations and Functions**

**1. Relations and Functions**

Types of relations ; reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, composite functions, inverse of function. Binary operations.

**2. Inverse Trigonometric Functions**

Definition, range, domain, principle value branch. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

**3. Linear Programming**

Introduction, related terminology such as constraints, objective function,

optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded and unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

## **UNIT - II : Algebra**

### **1. Matrices**

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operation on matrices; Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

### **2. Determinants**

Determinant of a square matrix (up to  $3 \times 3$  matrices), properties of determinants, minors, co-factors and applications of determinants in finding the area of a triangle, Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

### **3. Probability**

Conditional probability, multiplication theorem on probability. Independent events, total probability, Baye's theorem, Random variable and its probability distribution, mean and variance of random variable. Independent (Bernoulli) trials and Binomial distribution.

## **UNIT-III : Differential Calculus**

### **1. Continuity and Differentiability**

Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit functions. Concept of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretation.

## 2. Applications of Derivatives

Applications of derivatives : rate of change of bodies, increasing and decreasing functions, tangents and normals, use of derivatives in approximation, maxima and minima (first derivative test motivate geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

## UNIT-IV Integral Calculus

### 1. Integrals

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

$$\frac{dx}{x+a}, \frac{dx}{x-a}, \frac{dx}{a-x}, \frac{dx}{ax+bx+c}$$

$$\frac{dx}{ax+bx+c}, \frac{px+q}{ax+bx+c} dx,$$

$$\frac{px+q}{ax+bx+c} dx, \sqrt{a^2-x^2} dx,$$

$$\frac{px+q}{\sqrt{x^2-a^2}} dx,$$

$$\sqrt{ax^2+bx+c} dx, (px+q)\sqrt{ax^2+bx+c} dx$$

$$\sqrt{\quad} \quad \sqrt{\quad}$$

Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

**2. Applications of the Integrals**

Applications in finding the area under simple curves, especially lines, circles/parabolas/ ellipses (in standard form only). Area between any of the two above said curves (the region should be clearly identifiable).

**3. Differential Equations.**

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type :

$$\frac{dy}{dx} + py = q, \text{ where } p \text{ and } q \text{ are functions of } x \text{ or constants.}$$

$$\frac{dx}{dy} + px = q, \text{ where } p \text{ and } q \text{ are functions of } y \text{ or constants.}$$

# BFC PHYSICS

(Theory)  
+2 1<sup>st</sup> Year Science  
(Detailed Syllabus)

No. of Periods – 160

## **Unit-I      Physical world and Measurement      (10 Periods)**

Physics and its scope, Physics, Technology and Society. Measurement, need for measurement, units of measurement, fundamental and derived units, SI Units, accuracy and precision of measuring instruments, errors in measurement, absolute, relative error, percentage of error, Combination of errors, significant figures.

Dimensions of Physical quantities. Dimensional analysis and its applications.

## **Unit – II      Kinematics.      (24 Periods)**

### 1.              Motion in a straight line :

Rest and motion, Frame of reference, motion in a Straight line, position – time graph, speed and velocity. Concepts of differentiation and integration for describing motion (elementary idea), uniform and non-uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity – time and position – time graph, Relation for uniformly accelerated motion (graphical treatment)

### 2.              Motion in a plane :

Scalars and vectors, general vectors and their notations, position and displacement vectors, equality of vectors, unit vectors, multiplication of vectors by a real number, addition and subtraction of vectors, relative velocity, resolution of a vector in a plane, rectangular components, Dot and Cross products of two vectors.

Motion in a plane, cases of uniform velocity and uniform acceleration – projectile motion (equation of trajectory, range, time of flight, maximum height); uniform circular motion.

## **Unit-III : Laws of Motion : 14 Periods**

Concept of force, Newton's first law, inertia, momentum and Newton's 2<sup>nd</sup> law, impulse,

impulse-momentum theorem, Newton's 3<sup>rd</sup> law, Law of Conservation of linear momentum and its application. Equilibrium of Concurrent forces, static and Kinetic friction, laws of friction, rolling friction, lubrication.

Dynamics of uniform circular motion, Centripetal force, motion of a vehicle on a level circular road and vehicle on a banked road.

**Unit-IV Work, Energy and Power (12 Periods)**

Work done by a Constant force and variable force, kinetic energy, work- energy theorem, power. Notion of potential energy, potential energy of a spring, conservative and non-conservative forces, conservation of mechanical energy (Kinetic and Potential energies), motion in a vertical circle, elastic and in-elastic collisions in one and two dimensions.

**Unit-V Motion of System of Particles and Rigid bodies : (18 Periods)**

System of Particles and Rotational Motion :

Centre of mass of a two-particle system, momentum conservation and centre of mass motion, centre of mass of rigid bodies, Centre of Mass of a uniform rod.

Moment of a force, torque, angular momentum, conservation of angular momentum with its applications.

Equilibrium of rigid bodies, equations of rotational motion, comparison of linear and rotational motions.

Moment of inertia, radius of gyration, moment of inertia of simple geometrical objects (no derivation). Parallel and perpendicular axes theorem and their applications.

**Unit-VI Gravitation (12 Periods)**

Newton's law of gravitation, Kepler's laws of planetary motion (only statements), Gravitational field and Potential, gravitational potential energy, acceleration due to gravity and its variation with altitude and depth, Escape velocity, orbital velocity of a satellite, Geostationary satellites,

**Unit-VII Properties of Bulk Matter (24 Periods)**

1. Mechanical properties of Solids:

Elastic Behaviours, Stress, Strain, Hookes' Law, Stress-Strain diagram, Young's modulus, Bulk modulus, Shear modulus of rigidity, Poisson's ratio, elastic energy.

## 2. Mechanical properties of fluids:

Pressure due to a fluid column, Pascal's law and its applications (hydraulic lift and hydraulic brakes) effect of gravity on fluid pressure.

Surface energy and surface tension, angle of contact, excess pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise.

Viscosity, Stoke's law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's theorem and its application.

## 3. Thermal properties of matter:

Concepts of heat and temperature, Thermal expansion of solids, liquids and gases, anomalous expansion of water, specific heat capacity :  $C_p$ ,  $C_v$ . Calorimetry, change of state, latent heat capacity .

Heat transfer: Conduction, Convection and radiation, thermal conductivity, qualitative ideas of black body radiation, Wien's displacement law, Stefan's law, Greenhouse effect.

**Unit-VIII Thermodynamics (12 Periods)**

Thermal equilibrium, definition of temperature (Zeroth law of thermodynamics) heat, work and internal energy. First law of thermodynamics, isothermal and adiabatic processes, second law of thermodynamics, reversible and irreversible processes, Carnot's engine and refrigerator, Efficiency of Carnot's engine (no derivation).

**Unit-IX Kinetic theory of gases: (08 Periods)**

Equation of state of a perfect gas, work done in compressing a gas.

Kinetic theory of gases- Postulates, concept of pressure, kinetic interpretation of temperature, mean and RMS speed of gas molecules, degrees of freedom, law of equipartition of energy (statement only) and its applications to specific heat of gases, concept of mean free path and Avogadro's number.

**Unit-X Oscillation and waves (26 Periods)**

1. Periodic motion: Period, Frequency, displacement as a function of time, periodic function. Simple harmonic motion and its equation, phase, oscillation of a spring, Restoring

force and force constant, kinetic and potential energy in SHM, simple pendulum, derivation of expression for its time period.

Free, damped and forced oscillation (qualitative idea only), resonance.

## 2. Waves:

Wave motion, transverse and longitudinal waves, speed of wave motion, displacement relation for a progressive wave, speed of longitudinal wave in an elastic medium and speed of transverse wave in a stretched string (qualitative idea only), principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler's effect.

### Books Recommended :

1. Bureau's Higher Secondary (+2) Physics Vol.-I published by Odissa State Bureau of Text Book Preparation and Production; Bhubaneswar.

### UNIT WISE MARK DISTRIBUTION (Physics Theory)

Time- 3 hours

Max. Marks.-70

| Units     | Subjects                                     | Marks |
|-----------|--|-------|
| Unit-I    | Physical World and Measurement               | 23    |
| Unit-II   | Kinematics                                   |       |
| Unit-III  | Laws of Motion                               |       |
| Unit-IV   | Work, Energy and Power                       | 17    |
| Unit-V    | Motion of System of Particles and Rigid Body |       |
| Unit-VI   | Gravitation                                  |       |
| Unit-VII  | Properties of Bulk Matter                    | 20    |
| Unit-VIII | Thermodynamics                               |       |
| Unit-IX   | Kinetic theory of gases                      |       |
| Unit-X    | Oscillations and Waves                       | 10    |
|           | Total  | 70    |

**QUESTION WISE BREAK UP**

| Type of Question | Mark per Question | Total No. of Question | Total Marks |
|------------------|-------------------|-----------------------|-------------|
| VSA              | 1                 | 14                    | 14          |
| SA-I             | 2                 | 7                     | 14          |
| SA-II            | 3                 | 7                     | 21          |
| LA               | 7                 | 3                     | 21          |
| TOTAL            |                   |                       | 70          |

[VSA-Very Short Answer, SA-Short Answer, LA-Long Answer.]

1. Internal Choice : There is no overall choice in the paper. However, there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and all the three questions of 7 marks weightage.
2. The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.

**PRACTICALS**

**Total Periods 60**

**Section A****Experiments**

1. To measure diameter of a small spherical/cylindrical body using Vernier calipers and to measure internal diameter and depth of a given beaker/calorimeter using Vernier calipers and hence find its volume.
2. To measure diameter of a given wire and thickness of a given sheet using screw gauge.
3. To measure volume of an irregular lamina using screw gauge.
4. To determine radius of curvature of a given spherical surface by a spherometer.

5. To determine the mass of two different objects using a beam balance.
6. To find the weight of a given body using parallelogram law of vectors,
7. Using a simple pendulum, plot  $L-T^2$  graph and hence find the effective length of a second's pendulum.
8. To study variation of time period of a simple pendulum of a given length by taking bobs of same size but different masses and interpret the result.
9. To study the relationship between force of limiting friction and normal reaction and to find the coefficient of friction between a block and a horizontal surface.
10. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination by plotting graph between force and  $\sin \theta$

## **Section B**

### **Experiments**

1. To determine young's modulus of elasticity of the material of a given wire.
2. To find the force constant of helical spring by plotting a graph between load and extension.
3. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between  $P$  and  $V$ , and between  $P$  and  $1/V$ .
4. To determine the surface tension of water by capillary rise method.
5. To determine the coefficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.
6. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.

7. To determine specific heat capacity of a given solid by method of mixtures.
8. To study the relation between frequency and length of a given wire under constant tension using sonometer.
9. To study the relation between the length of a given wire and tension for constant frequency using sonometer.
10. To find the speed of sound in air at room temperature using a resonance tube by two resonance positions.

**XXXXXXXXXX**

The record to be submitted by the students, at the time of their annual examination, has to include record of at least 15 Experiments (with a minimum of 6 each from Section – A and Section- B) performed by them. Two experiments are to be performed one from each section in the examination.

Time Allowed: -3 hours

Max. Mark: 30

Two experiments one from each section

10+10

Practical record

4

Viva on experiments

6

**PHYSICS**  
(Theory)  
**+2, 2<sup>nd</sup> Year Science**  
(Detailed Syllabus)

No. of Periods yearly – 160

**Unit-I        Electrostatics**

**(22 Periods)**

**1. Electric charges and fields:**

Electric charge and its quantization, conservation of charge, Coulomb's law, force between two point charges, force between multiple charges, superposition principle, Continuous charge distribution.

Electric field due to a point charge, electric field lines, electric field due to a dipole at any point, torque on a dipole in uniform electric field.

Electric flux, Gauss's theorem (statement only) and its applications to find field due to uniformly charged infinite plane sheet, infinitely long straight wire and uniformly charged thin spherical shell (field inside and outside).

**2. Electrostatic potential and capacitance:**

Electric potential, potential difference, electric potential due to a point charge, potential due to a dipole, potential due to a system of charges. Equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

Conductors, insulators, free charges and bound charges inside a conductor, Dielectrics and electric polarization, capacitors and capacitance, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, combination of capacitors in series and in parallel energy stored in a capacitor.



**Unit-IV Electromagnetic induction and Alternating current: (20 Periods)**

1. Electromagnetic induction :

Faraday' laws of electromagnetic induction, induced EMF and current, Lenz's law, Eddy currents, self and mutual induction.

2. Alternating Current:

Alternating currents, peak and RMS value of alternating current / voltage, reactance and impedance, LC oscillation (qualitative idea only), LCR series circuit, resonance, power in AC circuits, wattles current, A.C. generator and transformer.

**Unit-V Electromagnetic waves: (04 Periods)**

Basic idea of displacement current, qualitative idea about characteristics of electromagnetic waves, their transverse nature.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, Ultra violet, X-ray and gamma rays), including elementary ideas about their uses.

**Unit-VI Optics (25 Periods)**

1. Ray optics and optical instruments:

Reflection of light, spherical mirrors, mirror formula, lateral and longitudinal magnification, refraction of light, refractive index, its relation with velocity of light (formula only) total internal reflection and its applications, optical fibre, Refraction at spherical surfaces, thin lens formula, lens makers formula, magnification, power of lenses, combination of two thin lenses in contact, combination of a lens and a mirror, refraction and dispersion of light through prism; Scattering of light: blue colour of sky and reddish appearance of sun at sunset and sunrise. Optical instruments: microscopes and telescopes (reflecting and refracting) and their magnifying powers.

2. **Waves Optics :**

Wave front, Huygen's principle, reflection and refraction of plane wave at a plane surface using wavefronts, proof of laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width, coherent sources, sustained interference of light, diffraction due to a single slit, width of a central

maximum, resolving power of microscope and astronomical telescope (qualitative idea), polarization, plane polarized light, Brewster's law, uses of plane polarized light and polaroids.

**Unit-VII Dual nature of Radiation and matter: (08 Periods)**

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations, Einstein's photoelectric equation, particle nature of light.

Matter waves- wave nature of particles, de-Broglie relation, Davisson- Germer experiment, (only conclusions should be explained).

**Unit-VIII Atoms and Nuclei (14 Periods)**

1. Atoms:

Alpha- particle scattering experiment, Rutherford's model of atom, its limitations, Bohr model, energy levels, hydrogen spectrum.

2. Nuclei:

Atomic nucleus, its composition, size, nuclear mass, nature of nuclear force, mass defect, binding energy per nucleon and its variation with mass number, nuclear fission, fusion, Radioactivity, alpha, beta and gamma particles/ rays and their properties, radioactive decay law, half life and decay constant.

**Unit-IX Semiconductor electronics: (15 Periods)**

Energy bands in conductors, semiconductors and insulators (qualitative idea only), p-type, n-type semiconductors, semiconductor diode, V-I characteristics in forward and reverse bias, diode as a half and full wave rectifier (centre tap), efficiency (no derivation).

Special purpose p-n junction diodes: LED, photodiode, solar cell and Zener diode and their characteristics, Zener diode as a voltage regulator.

Junction transistor, transistor action, Characteristics of transistor, transistor as an amplifier (CE configuration), basic idea of analog and digital signals, Logic gates (OR, AND, NOT, NAND, and NOR)

**Unit-X      Communication System:      (10 Periods)**

Elements of a communication system (block diagram only), bandwidth of signals (speech, TV and digital data), bandwidth of transmission medium, propagation of electromagnetic waves in the atmosphere, sky and space wave propagation, satellite communication, Need for modulation, qualitative idea about amplitude modulation and frequency modulation, advantages of frequency modulation over amplitude modulation, basic idea about internet, mobile telephony and global positioning system (GPS).

**Books Recommended:**

1.      Physics; Class-XII, Part-I and Part-II published by NCERT.
2.      Bureau's Higher Secondary (+2) Physics Vol.-II, published by Odisha State Bureau of Text Book Preparation and Production; Bhubaneswar

**UNIT WISE MARK DISTRIBUTION (Physics Theory)**

Time- 3 hours

Max. Marks.-70

| Units     | Subjects   | Marks |
|-----------|--|-------|
| Unit-I    | Electrostatics                                     | 15    |
| Unit-II   | Current Electricity                                |       |
| Unit-III  | Magnetic Effects of Current and Magnetism          | 16    |
| Unit-IV   | Electromagnetic Induction and Alternating Currents |       |
| Unit-V    | Electromagnetic Waves                              | 17    |
| Unit-VI   | Optics   |       |
| Unit-VII  | Dual Nature of Radiation and Matter                | 10    |
| Unit-VIII | Atoms and Nuclei                                   |       |
| Unit-IX   | Semiconductor Electronics                          | 12    |
| Unit-X    | Communication Systems                              |       |
|           | Total  | 70    |

**QUESTION WISE BREAK UP**

| Type of Question | Mark per Question | Total No. of Question | Total Marks |
|------------------|-------------------|-----------------------|-------------|
| VSA              | 1                 | 14                    | 14          |
| SA-I             | 2                 | 7                     | 14          |
| SA-II            | 3                 | 7                     | 21          |
| LA               | 7                 | 3                     | 21          |
| TOTAL            |                   |                       | 26      70  |

[VSA-Very Short Answer, Sa-Short Answer, A-Long Answer.]

1. Internal Choice : There is no overall choice in the paper. However, there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and all the three questions of 7 marks weightage.
2. The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.

**PRACTICALS****Total Periods 60****Section A****Experiments**

1. To determine resistance per cm of a given wire by plotting a graph for potential difference versus current.
2. To find resistance of a given wire using metre bridge and hence determine the resistivity of its material.
3. To verify the laws of combination (series) of resistances using a metre bridge.
4. To verify the laws of combination (parallel) of resistances using a metre bridge.
5. To compare the EMF of two given primary cells using potentiometer.
6. To determine the internal resistance of given primary cell using potentiometer.
7. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
8. To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of desired range and to verify the same.
9. To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of desired range and to verify the same.
10. To find the frequency of the ac mains with a sonometer.

**Section B****Experiments**

1. To find the value of  $V$  for different values of  $u$  in case of a concave mirror and to find the focal length.
2. To find the focal length of a convex mirror, using a convex lens.
3. To find the focal length of a convex lens by plotting graphs between  $u$  and  $v$  or between  $1/u$  and  $1/v$ .

4. To find the focal length of a concave lens, using a convex lens.
5. To determine angle of minimum deviation for a given prism by plotting a graph between the angle of incidence and the angle of deviation.
6. To determine refractive index of a glass slab using a travelling microscope.
7. To find refractive index of a liquid by using convex lens and plane mirror.
8. To draw the I-V characteristic curve of a P-n junction in forward bias and reverse bias.
9. To draw the characteristic curve of a zener diode and to determine its reverse breakdown voltage.
10. To study the characteristics of a common-emitter npn or pnp transistor and to find out the values of current and voltage gains.

**XXXXXXXX**

The record, to be submitted by the students, at the time of their annual examination, has to include record of at least 15 Experiments (with a minimum of 6 each from Section- A and Section- B) performed by them. Two experiments are to be performed one from each section in the examination.

|                                       |            |
|---------------------------------------|------------|
|                                       | Max. Mark: |
| Time Allowed: -3 hours                | 30         |
| Two experiments one from each section | 10+10      |
| Practical record                      | 4          |
| Viva on experiments                   | 6          |

**TRADE SUBJECTS**  
**CROP PRODUCTION**  
**FIRST YEAR**

PAPER-1 (THEORY)

(Weekly Two Periods, Total- 68 Periods per year)

Full Marks-40

**Unit - I**

**ELEMENTARY AGRONOMY**

- **Weather and Climate:** Elements of weather and climate, factors of climate, crop weather relationship.
- Cropping system, classification of crops, mono-cropping, multiple cropping, crop rotation, mixed cropping, inter cropping and relay cropping. Cropping intensity, cropping scheme, calendar of operation.

**Unit - II**

**Tillage:** Types of tillage, objectives of tillage, tillage implements, ploughs, cultivators, harrows, seed drill, seed-cum-fertilizer drill, inter culture, harvesting and threshing implements.

**Seeds:** Characteristics of good seed, types of seed, seed viability, moisture germination and purity testing.

**Unit - III**

**Water Management:** Importance of irrigation and drainage, factors affecting-irrigation requirements, methods of irrigation, irrigation appliances, water logging, its causes and effects, types and methods of drainage.

**Unit - IV**

**Weed Control:** Definition and classification of weeds, principles and methods of weed control, cultural, mechanical and chemical methods of weed control. Classification of herbicides.

**Rural Development:** Recent Rural Development programmes (NFSM, MG NREGA, ATMA, GGY, PMGSY, etc.) related to crop production.

**CROP PRODUCTION  
FIRST YEAR  
PAPER-1 (PRACTICAL)  
(Weekly Two Classes, Total-68 classes per year)**

Full Marks-60

**Unit - I**

1. Identification and use of meteorological equipments, preparation of temperature, rainfall and humidity maps of Odisha.
2. Preparation of cropping scheme, cropping pattern, crop-rotation and calendar of operation of different crops.

**Unit - II**

1. Identification and study of primary, secondary and inter-tillage implements in the field.
2. Identification of crop plants and their seeds and seed treatment. Germination and purity test of seeds.

**Unit - III**

1. Lay-out of different methods of irrigation and their field demonstrations, operation and maintenance of water pumps.

**Unit - IV**

1. Identification of weeds associated with upland, medium land and low land crops. Preparation of herbicide spray solution and methods of their application. Mechanical and chemical method of weed control.
2. Study of different Rural Development programmes and record keeping.

**CROP PRODUCTION  
FIRST YEAR  
PAPER - II (THEORY)  
(Weekly Two periods, Total-68 periods per year)**

Full Marks-40

**Unit - I**

**Soil and its properties:** Soil a medium of plant growth, soil formation, soil profile, morphological features, volume composition of soil- four major components, Mineral matter , soil separates, their properties, soil-organic matter and its properties, soil micro-organisms and its role in soli. Soil physical properties, soil texture, soil structure, soil PH and availability of nutrients to plants.

**Unit - II**

**Concept of soil fertility and productivity:** Essential elements: Macro & micro nutrients, their role in plants and deficiency symptoms: sources of their availability and utilization for crop production. Soil testing as a tool to assess soil fertility.

**Unit - III**

**Manures, Fertilizers:- Bulky organic manures:** FYM, Compost, Green manures, Bio-fertilizers, Concentrated organic manures:- Oil cakes, their nutrient content and uses.

**Chemical fertilizers:** Straight and complex fertilizer, mixed fertilizer, their nutrient content. Principles of Fertilizer Application, quantity, time and method of fertilizer application. Calculation of Fertilizer requirement for different crops.

**Unit - IV**

Soil amendments and their application. Reclamation and management of acid, saline and alkaline soils.

**Soil conservations:** Soil erosion, types of erosion, their effect. Soil conservation practices and watershed management.

**CROP PRODUCTION  
FIRST YEAR  
PAPER-II (PRACTICAL)  
(Weekly Two Classes, Total-68 Classes per year)**

**Full Marks-60**

**Unit - I**

Study of soil profile in the field, study of soil physical properties, determination of texture, structure, bulk density and pore space. Use of soil testing kits for testing of soil PH and conductivity.

**Unit - II**

Interpretation of soil test report and recommendation, study of deficiency symptoms of nutrients in the fields. Computations of doses of fertilizer for different crops from soil test value.

**Unit - III**

Identification of fertilizers, bio-fertilizers and their application. Methods of fertilizer application, preparation of FYM and compost, seed inoculation with Rhizobium culture.

**Unit - IV**

Identification and computation of dose of soil amendment. Determination of lime requirement of soil. Visit to Soil conservation farms to study conservation measures. Visit to water shed areas to study the water shed programme.

**CROP PRODUCTION  
SECOND YEAR  
PAPER-III (THEORY)  
(Weekly Two Periods, Total-68 Periods per year)**

**Full Marks-40**

**Unit - I**

Distribution, Climate/Season, Soil, variety, Seed treatment, Seedbed Preparation, Time and method of sowing, Nursery management, Seedrate, Spacing, Manure and fertilizer application, Interculture and weed control, Irrigation, Plant protection, Harvesting and threshing, Storage and economic of production of the following crops:

**Cereals and Millets:** Rice, Wheat, Maize, Ragi

**Pulses:** Greengram, Blackgram, Arhar, Horsegram

**Oil seeds:** Groundnut, Rapeseed and Mustard, Sesamum, Sunflower.

**Unit - II**

**Fibre Crops:** Jute, Cotton

**Sugar Crops:** Sugar cane

**Unit - III**

**Fodder Crops:** Maize, Jowar, Paragrass, Guineagrass, Napier

**Plantation Crop:** Coconut, Cashew, Rubber

**Unit - IV**

**Fruit Crops:** Mango, Banana, Citrus, Guava, Pineapple, Papaya

**Vegetable Crops:** Brinjal, Tamato, Potato, Aokra, Cucurbits, Onion, Beans, Cole Crops, Root vegetables, Spices(Chilli/Termeric/Ginger)

**CROP PRODUCTION  
SECOND YEAR  
PAPER-III (PRACTICAL)  
(Weekly Two Classes, Total-68 Classes per year)**

**Full Marks-60**

**Units**

1. Identification of crop plants at a different stages of growth. Identification of varieties and seeds. Preparation of nursery and seedbed, seed treatment and sowing of seed by different methods. Transplanting of Paddy and Ragi.
2. Seed treatment with fungicides, rhizobium culture and bio-fertilizers.
3. Inter cultural operations, weeding and use of herbicides and preparation of herbicide spray solution.
4. Preparation of cotton seed for sowing. Treatment of sugarcane sets before sowing/planting. Retting operation of jute. Identification of different fruit crops vegetable crops, plantation crops, varieties, seeds and garden implements.
5. Calculation of seed rate of different crops. Manuring and other cultural operation, raising vegetable crops in the student demonstration plot. Visit to horticultural firms to study the cultivation of fruits and vegetables. Visit to different agricultural firms and soil testing laboratories.

**CROP PRODUCTION  
SECOND YEAR  
PAPER- IV (THEORY)  
(Weekly Two Periods, Total-68 Periods per year)**

**Full Marks-40**

**Unit - I**

**Plant Protection:** Importance of Plant Protection in Agriculture. Integrated insect pest and disease control, Physical/Mechanical, Cultural, Biological, Chemical and Legal control measures.

**Unit - II**

Common Plant Protection Chemicals and their classification. Insecticides and fungicides and their formulation, methods of use and safe handling. Plant protection equipments, their use and maintenance.

**Unit - III**

Important insect pests and diseases of different crops (Rice, Wheat, Maize, Blackgram, Greengram, Arhar, Groundnut, Mustard, Sugarcane, Jute, Cotton, Vegetables & Fruit crops grown in Odisha), store grain pests, their damage and control measures.

**Unit - IV**

Mushroom cultivation for domestic and commercial purposes.

Animal husbandry in relation to crop production- Indigenous and exotic breeds of cattle, Management of Dairy Animals.

Pisci culture in relation to crop production.

**CROP PRODUCTION**  
**SECON YEAR**  
**PAPER-IV (PRACTICAL)**  
**(Weekly Two Classes, Total-68 Classes per year)**

**Full Marks : 60**

**Unit - I**

Identification and collection of insect pests of field crops, cereals, pulses, oil seeds, sugarcane, vegetables, jute, cotton and store grain pests. Identification of damaged plant parts by insects, preservation of insects in collection box.

**Unit - II**

Study of different insecticides, preparation of spray solutions. Identification of diseased plant parts, their collection, preservation and study of control measures.

**Unit - III**

Identification of different types of plant protection equipments, their parts, function and use in the field. Preservation of weeds in herbarium and their identification.

**Unit - IV**

Preparation of mushroom beds and maintenance. Identification of different breeds of cattles. Identification of common feed and fodder. Visit to Dairy farm to study the management of dairy animals. Identification of common fishes, visit to spawn collection centers. Visit to Fish Farm. Application of artificial food rearing ponds.

## DAIRYING (DAI)

### FIRST YEAR PAPER – I (Theory)

Theory : 40

|                   |   |   |
|-------------------|---|---|
| <b>Unit - I</b>   | Introduction to Dairing                               | Dairying – introduction. History & Present status of dairy farm produces in India & Odisha.<br><br>Scope of development in cattle wealth, Human diet & of Dairy enterprises, farmers and supporting professionals.  |
| <b>Unit - II</b>  | Dairy farming Basics                                  | Setting up a Dairy farm – aspects to consider, farmer's eligibility & critical needs. Opportunities, shortcomings & challenges. Making up entrepreneurial deficiencies.<br><br>Supporting & dependant activities to Dairy farming.  |
| <b>Unit - III</b> | Morphology & Bred charatstics of cattle & buffalo     | Broad idea on Cattle & buffalo morphology, productive traits, behavior & Habitat – under domestication.<br><br>Importance of herd composition; Goodness cattle & buffalo ratios.<br><br>Planning of herd size & quality.<br><br>Recognised Cattle & Buffalo breeds of India, Odisha & Exotic donor breeds used. Outlines on salient characteristics & productivity, milk yield & quality.   |
| <b>Unit - IV</b>  | Stocking of animals, herd improvement and maintenance | Stocking strategies. Breeding policies – National & Odisha. Factors whilst selecting foundation stock for<br><br>Principles of genetical improvement of breeds. Systems of breeding.<br><br>Maintenance of blood level.<br><br>Selection & culling based on records & judging.<br><br>Procurement of Dairy animals, Soundness certification, legal requisites and insurance cover.<br><br>Mode of Transport, Care during transportation & post procurement. |

**DAIRYING (DAI)**  
**FIRST YEAR**  
**PAPER – I (Practical)**

Theory : 60

**Units**

- (i) Utility of milk in human diet.
- (ii) External & Internal Anatomical outlines of cow.
- (iii) Identification with salient traits of important breeds of Indian Dairy, draft & dual cattle, Exotic donor breeds, Buffalo breeds.
- (iv) Common terms used in Dairy Farming & cattle markets.
- (v) Diagrammatic representation to maintain blood level in Cross bred & Full blood animals.
- (vi) Study of dairy wedges.
- (vii) Preparation & use of score card for judging of milch cow.
- (viii) Restraint, leading & handling of Cattle & buffaloes
- (ix) Determination of age basing dentition.
- (x) Ear Tagging & branding of animals.
- (xi) Study of a soundness certificate and Monetary transaction document at purchase of a milch cow.
- (xii) Study & filling up of cattle insurance proposal form.
- (xiii) Enlisting of Mandatory requirements for animal transport.

**DAIRYING (DAI)**  
**FIRST YEAR PAPER – II (Theory)**

Theory : 40

|                   |  |  |
|-------------------|--|--|
| <b>Unit - I</b>   | Housing of Dairy Animals - Ideal environment of well being of live stock | Site for dairy farm – considering available resources, legal, economic & other factors.<br><br>Systems of cattle rearing – Suitability Dairy housing for different systems.  |
| <b>Unit - II</b>  | Hygiene, Sanitation & Waste Management in dairy farms                    | Hygiene, sanitation, safety in dairy farms.<br><br>Construction of structures, use of space & money saving techniques<br><br>Fittings & fixtures for accommodation, Tools & equipments – their maintenance & storage.<br><br>Waste & carcass management. Study of Production, bottling, storage & distribution of Biogas.  |
| <b>Unit - III</b> | Forage Production - I  | Importance of Forage; Status of pastures, grass lands & forage cultivation in Odisha & India. Challenges to fodder production in Odisha.<br><br>Soil : types, topography, chemical & physical properties.<br><br>Soil fertility & productivity. Relation of meteorology, water availability & soil properties to forage production.<br><br>Fodder crops : selection. Tillage of soil and cultivation practices for cereals, legumes & grasses. Application of manure, fertilizers, pesticides – merits & demerits.<br><br>Crop rotation, inter cropping & cropping schemes.<br><br>Relevance of Irrigation & drainage systems for forage production. |
| <b>Unit - IV</b>  | Forage Production - II   | Organic forage production.<br><br>Stages of harvest of different fodder crops. Loss minimization tips.<br><br>Fodder seed production & storage. Preservation of green fodder.<br><br>Use of grass, fodder & lopped leaves as green forage.<br><br>Merits of chaffing & diet dosing of green fodder.  |

**DAIRYING (DAI)**  
**FIRST YEAR**  
**PAPER - II (Practical)**

**Units**

- (i) Floor space requirements for different age & stage of dairy animals.
- (ii) Preparation of Design for a Dairy farm.
- (iii) List of tools & equipments used in a milch cow byre.
- (iv) Dairy farm – waste disposal designs.
- (v) Study of a Biogas plant, Composition & utility of Biogas.
- (vi) Study of Forage growing areas in India & Odisha.
- (vii) Identification of major forages & their productivity.
- (viii) Identification of Fodder & their seeds / stumps.
- (ix) Preparation of a Design of a fodder plot.
- (x) Study of a chaff cutter.

**Dairying (DAI)**  
**Second Year**  
**Paper – III (Theory)**

Theory : 40

- |                   |  |   |
|-------------------|--|---|
| <b>Unit - I</b>   | Feeds & feeding of Dairy animals           | <ul style="list-style-type: none"><li>• Importance of good nutrition to dairy animals. Digestive system of adult ruminants &amp; calves. Physiology of Digestion, absorption &amp; utilization.</li><li>• Classification of feeds. Concentrates, Roughages, Feed supplements &amp; additives and water – their role &amp; nutritional values. Importance of good quality of feed &amp; water.</li><li>• Ration requirement for maintenance &amp; production stages. DCP &amp; TDN – Formulation principle for mixed concentrates.</li></ul> |
| <b>Unit - II</b>  | Feeding practices & value addition of feed | <ul style="list-style-type: none"><li>• Feeding of dairy animals at different age and stages.</li><li>• Value added provender – Bypass protein &amp; Fat, Chelated minerals, Pre &amp; pro-biotic, NPN. Manipulative measures to reduce feed cost &amp; increase FCR &amp; gain advantages.</li><li>• Anti-nutritive factors and adulterants in common feedstuff – combating maneuvers.</li><li>• Feed stuff procurement – BIS Standards. Quality control of feed &amp; packing. storage of feed.</li></ul>                                 |
| <b>Unit – III</b> | Care & Management of Dairy cattle          | <ul style="list-style-type: none"><li>• Care of Dairy animals. Factors contributing to wellbeing of animals. Providing Basic needs like Balanced diet, Clean water, comfortable ambience &amp; Fresh air &amp; exercise etc. – common to all categories.</li><li>• Special attention to different categories of animals. Routine &amp; casual attention in dairy farm.</li></ul>  |

**Unit - IV** Diseases of cattle & buffalo and their prevention & control

- Necessity of proper Health care of dairy animals.
- Ideal institution for Health Care of dairy animals : 'Go-Rakshyai' at Asureswar of Cuttack district and other similar institutions : a Study.
- Out lines on infectious and metabolic diseases of cattle & Buffalo.
- Recognition of Redline symptoms of important diseases. Steps for prompt treatment & Vet First Aid.
- Concept on Prevention & control of Diseases in farm animals. Immunity system & vaccines & its effect.
- Prevention of calf mortality, Abortions & mastitis. Control & eradication of Parasitic diseases.
- Recognition of common health problems not necessitating a veterinary Doctors attention; treatment & care at farm level.

**Dairying (DAI)**  
**Second Year**  
**Paper – III Practical**

Theory : 60

**Units**

- (i) Identification of feed stuff with TDN & DCP values for cattle.
- (ii) Identification of feed additives & promoters.
- (iii) Computation of ration with locally available feed stuff.
- (iv) Recognition of inedibility in feedstuff by organoleptic test.
- (v) BIS standard for cattle feeds of diff categories.
- (vi) Study of water provisions & sanitization in farm. (VISIT)
- (vii) Study of cattle feed manufacturing (VISIT)
- (viii) Formulation of concentrate mix using Pearson's square.
- (ix) Preparation of hand mixed feed concentrate at farm.
- (x) Preparation of Artificial colostrums & calf starter.
- (xi) Feeding calves using sterilized feeding bottles. (VISIT)

**Dairying (DAI)**  
**Second Year**  
**Paper – IV (Theory)**

Theory : 40

- |                   |                                 |   |
|-------------------|---------------------------------|---|
| <b>Unit - I</b>   | Repro deduction in Dairy Cattle | <ul style="list-style-type: none"><li>• Concepts of animal reproduction. Merits of AI mediated planned breeding of female animals in the farm. Vet-Embryo- transfer.</li><li>• Synchronized mass AI concept &amp; facilities available.</li><li>• Broad idea on Anatomy &amp; physiology of reproductive system in cattle &amp; buffaloes.</li><li>• Oestrus symptoms &amp; detection. Choice of semen &amp; Timing of AI.</li><li>• Pregnancy diagnosis &amp; special care of Pregnant animals and under development regimes.</li><li>• AI techniques, Idea on Frozen semen straw production, handling, transport &amp; storage.</li><li>• Infertility and other breeding failures in the farm. Causes &amp; remedial steps. Parturition – Symptoms and Mechanism. Dystokea &amp; ROP etc. problems and points to intervene.</li></ul> |
| <b>Unit - II</b>  | Milk Production                 | <ul style="list-style-type: none"><li>• Methods of milking and precaution.</li><li>• Factors affecting quality and quantity of milk production</li><li>• Clean milk production.</li><li>• Quality Improvement &amp; Values addition of milk.</li></ul>  |
| <b>Unit - III</b> | Dairy entrepreneurship          | <ul style="list-style-type: none"><li>• Importance of economic viability in a dairy enterprise. General principles of accounts keeping. Maintaining of traditional and e-accounts &amp; records and balance sheets. Various Govt. schemes for</li></ul>   |

dairy development.

**Unit - IV** Organised Milk Marketing and extension

- PDE : Promotion of dairy enterprises
- DEEDS : Dairy Enterprisers Development Scheme
- CAE Dairy : Commercial Agri. Enterprises Dairy etc.
- Structure & functions of organized Dairy Cooperative setups in Odisha – organisational function of OMFED.
- How milk producers and other stake holders mutually benefit from this sector. Registration of business firms; producer groups & companies.
- Pollution control, SPCA, Consumer protection, cattle trespass, Prevailing Milk & Milk product Laws. Cattle and Micro-insurance schemes. Labor laws & zoonosis. Provident Fund and other welfare benefit options available to employees.
- Extension methods & Techniques. Need to training to employees & other stakeholders. Crises management & conflict resolution in workers.

**Second Year**  
**Paper – IV Practical**

**Marks : 60**

**Units**

- (i) Maintenance of pedigree sheet for a milch cow of a dairy farm.
- (ii) Steps to combat stress to farm animals in hot humid weather.
- (iii) Observation & trial of hand milking & udder care. (VISIT). Observation of activities in Dairy Co. Op. Society. (Visit)
- (iv) Observing vital steps to clean milk production (VISIT)
- (v) Study of Process of Weaning, Drying off.
- (vi) Familiarizing with Maintenance of different records.
- (vii) Sample Routine of Daily & Casual works.
- (viii) Observing Vaccination of animals & study of Vaccine calendar.
- (ix) Administration of medications – drenching, spray etc.
- (x) Performing Castration (closed), dehorning, hoof trimming.
- (xi) Enlisting First – aid steps of animals in emergencies.
- (xii) Observing parenteral administration of drugs to animals.
- (xiii) Practice of drain of abscess, wound dressing & bandaging.
- (xiv) Knowing medicaments – label, Expiry data & storage etc.

# **HORTICULTURE**

## **(BASIC HORTICULTURE AND FRUIT CULTIVATION)**

### **FIRST YEAR**

#### **Paper – I Theory**

**Full Marks : 40**

#### **UNIT - I**

##### **Basic Horticulture**

Introduction, Definition of Horticulture, Divisions of Horticulture (Pomology, Olericulture, Floriculture, Spices, Plantation crops, aromatic and medicinal plants, fruit, nurseries, fruit and vegetable processing and marketing in brief)

#### **UNIT - II**

##### **Soil**

Types of soil, soil fertility, soil organic matter content, nature of soil suitable for production of horticultural crops.

#### **UNIT - III**

##### **Climate**

Climate factors influencing production of horticultural crops

#### **UNIT - IV**

##### **Fruit Cultivation**

Importance, present status and future prospects of fruit cultivation in India with special emphasis on Odisha. Cultivation aspects of major fruit crops with special reference to climate, soil, varieties, propagation, manuring, irrigation, inter culture, insect pests, diseases, disorders, intercropping, harvesting, yield, post harvest care, storage of mango, banana, citrus (sweet orange, mandarine, lime and lemon) guava, litchi, papaya, pine apple, pome granate.

**HORTICULTURE**  
**(BASIC HORTICULTURE AND FRUIT CULTIVATION)**  
**FIRST YEAR**  
**Paper - I Practical**

**Full Marks : 60**

**Units**

1. Identification of fruit trees and their varieties.
2. Selection of sites, planning, soil and soil management.
3. Method of planting of fruit plants (papaya, mango, banana)
4. Study of different inter cultural operations in fruit plants.
5. Study of method of manuring and fertilizer application in fruit plants with calculation of fertilizer requirement.
6. Methods of spraying for controlling plant diseases in some fruit plants.  
(Mango, Banana)
7. Method of application of growth regulators in different plants. (Mango, Citrus)
8. Training and Pruning in fruit plants.

**HORTICULTURE**

**(POST HARVEST MANAGEMENT AND PRESERVATION OF FRUITS,  
VEGETABLES AND ORNAMENTAL CROPS)**

**FIRST YEAR**

**Paper - II Theory**

**Full Marks : 40**

**UNIT - I**

**Preservation and Post Harvest Losses**

1. Importance of preservation and extent of post harvest losses.
2. Maturity standards of fruits and vegetables, handling, grading, packaging and transportation.

**UNIT - II**

**Storage and growth regulations**

1. Techniques of storage
2. Use of growth regulators and emulsion for extending the storage life.

**UNIT - III**

**Principles of Preservation**

1. Importance of preservation industry in India as well as in Odisha.
2. Principles and methods of preservation by low temperature, chemical additives, salt, sugar, heat, drying etc.
3. Preparation and preservation of fruit juice, squashes, jam, jelly, marmalade, pickles and sauces.

**UNIT - IV**

**Drying & Dehydration of fruits, vegetables & flowers**

1. Drying and dehydration of important fruits, vegetables and flowers

**HORTICULTURE**  
**(POST HARVEST MANAGEMENT AND PRESERVATION OF FRUITS,  
VEGETABLES AND ORNAMENTAL CROPS)**

**FIRST YEAR**

**Paper - II Practical**

**Full Marks : 60**

**Units**

1. Importance of preservation and extent of post harvest losses.
2. Maturity standards of fruits and vegetables, handling, grading, packaging and transportation.
3. Techniques of storage.
4. Use of growth regulators and emulsions for extending the storage life.
5. Importance of preservation industry in India as well as in Odisha.
6. Principles and methods of preservation by low temperature, chemical additives, salts, sugar, heat, drying etc.
7. Preparation and preservation of fruit juice, squashes, jam, jelly, marmalade, pickles and sauces.
8. Drying and dehydration of important fruits, vegetables and flowers.

**HORTICULTURE**  
**(Vegetable Production and Floriculture)**  
**Second Year**  
**Paper - III Theory**

**Full Marks : 40**

**UNIT - I**

**Importance of vegetables in human nutrition**

Introduction, role of vegetables in human nutrition. Importance of vegetable cultivation present status and future prospects of vegetable cultivation in India as well as in Odisha. Classification of vegetable garden off season vegetable cultivation.

**UNIT - II**

**Vegetable Cultivations**

Details of vegetables cultivation with special reference of food value, varieties, climate, soil, nursery raising, sowing / planting, manuring, inter culture, irrigation, drainage, insect pests, beans, pea, cabbage, cauliflower, knoll khol, pumpkin, cucumber, bitter gourd, ridge gourd, pointed gourd, spine gourd.

**UNIT - III**

**Floriculture**

Introduction, importance of floriculture, present status and future prospects of floriculture in India as well as in Odisha. Definition of garden, garden features and adornments, lawn, rock garden. Flowering trees, shrubs, creepers, annuals, culture of pot plants.

**UNIT - IV**

**Cultivation practices of floriculture crops**

Cultivation practices of commercial floriculture crops such as rose, chrysanthemum, dahlia, marigold, tuberose, gladiolus with special reference to varieties, climate, soil, sowing, planting, manuring, inter culture, irrigation, drainage, insect pests, diseases, harvesting, yield, p-ackaging and storage.

**HORTICULTURE**  
**VEGETABLE PRODUCTION AND FLORICULTURE**  
**SECOND YEAR**

**Paper - III Practical**

**Full Marks : 60**

1. Identification of vegetable seeds and seed testing.
2. Preparation and management of nursery beds (soil solarisation)
3. Treatment of seeds and seedlings both in kharif and rabi seasons.
4. Raising seedlings both in kharif and rabi seasons.
5. Controlling diseases and pests in nursery
6. Identification of vegetable crops in field.
7. Planting of vegetable seeds / seedlings.
8. Methods of application of manures and fertilizers (Basal and top dressing)
9. Study of types of manures and fertilizers.
10. Calculation of fertilizers for vegetable crops.
11. Use of growth regulators in vegetable crops (cucurbitaceous crops)
12. Identifying important disease and pests of vegetable crops and their control measures.
13. Calculation of cost of cultivation of important vegetable crops and floriculture crops.
14. Identification of ornamental plants. (trees, shrubs, creepers and annuals)
15. Preparation and maintenance of lawn.
16. Preparation of planting materials for rose and chrysanthemum.
17. Collection and storage of corms of gladiolus and pulles of tuberose.
18. Potting and repotting of ornamental plants.
19. Visit of different ornamental gardens.

**HORTICULTURE**  
**(PLANTATION CROPS, SPICES, MEDICINAL AND AROMATIC CROPS)**  
**SECOND YEAR**  
**Paper - IV Theory**

**Full Marks : 40**

**UNIT - I**

**Plantation Crops**

Importance, scope and future prospects of plantation crops in India as well as in Odisha. Details of cultivation aspects with special reference to origin, climate, soil, varieties, propagation, planting, after care, manuring, irrigation, weeding, inter culture, insect pests, diseases, intercropping, harvesting, yield, post harvest care, storage, processing, value addition, by products, utilization of important plantation crops like coconut, cashew nut and areca nut.

**UNIT - II**

**Spices**

Importance of spices, in India and Odisha, Classification of spices. Details of cultivation aspects of ginger, turmeric, black pepper, coriander (special reference to climate, soil, varieties, land preparation, sowing, planting, manuring, irrigation, weeding inter culture, plant protection measures, harvesting, yield, processing and storage.

**UNIT - III**

**Importance and classification of medicinal plant**

Details of cultivation aspects (as mentioned in case of spice crops) of aloe vera, brahmi, aswagandha and betel vine.

**UNIT - IV**

**Importance and classification of aromatic plants**

Cultivation practices, harvesting and oil extraction of lemon grass and palmarosa.

**HORTICULTURE**  
**PLANTATION CROPS, SPICES, MEDICINAL AND AROMATIC PLANTS**  
**SECOND YEAR**  
**Paper - IV Practical**

**Full Marks : 60**

**Units**

1. Identification of plantation crops, spices, medicinal plants.
2. Raising seedlings of plantation crops, spices, medicinal and aromatic crops.
3. Methods of propagation (seed, cuttings, budding and grafting)
4. Cost of cultivation of plantation crops.
5. Study of processing of areca nut.
6. Study of processing of cashew nut.
7. Study of processing of black pepper and white pepper.
8. Oil extraction methods of aromatic plants.
9. Preservation of oil of aromatic plants.
10. Study of medicinal value of different medicinal plants.

# **INLAND FISHERIES**

## **FIRST YEAR**

### **Paper - I (Theory)**

**Marks : 40**

#### **Unit - I**

Introduction to fisheries; importance of (global , India, Odisha context).

Types of Fisheries: Fresh water, Brackish water, estuaries, Riverine, Reservoirs, Lakes etc..

#### **Unit - II**

Inland fishery Resources, Fresh water Resources, Riverine Resources, Reservoirs, Lakes, Bheels, and wetlands, Ponds, Tanks and Canals.

#### **Unit - III**

Brackish water Resources, Lakes, Lagoons, Estuaries, Mud flats, Back waters.

Inland fishery resources of Odisha

#### **Unit - IV**

Species contributing to inland fisheries. a general account of economically important fresh water and brackish water fin and shell fishes and their distinguishing characters for identification.

#### **Unit - V**

Food and feeding habits, growth, reproduction, migration of fishes.

**INLAND FISHERIES  
FIRST YEAR  
Paper - I (Practical)**

**Marks : 60**

1. Study of morphometry of typical fin fish and shell fishes.
2. Identification of common fresh water, brackish water, marine fishes and prawns.
3. Gut content analysis of cultivable fishes.
4. Measurement of fish length and weight for growth studies.
5. Preparation of record.

**INLAND FISHERIES  
FIRST YEAR  
Paper - II (Theory)**

**Marks : 40**

**Unit - I**

Fisheries of Reservoirs and lakes, conservation of Fish stocks, Stocking with fish culture and capture management.

**Unit - II**

Flood plain wetlands as capture fishery resources, Present status of their exploitation and Management.

**Unit - III**

Fisheries Resources of Lake Chilika and Anshupa (Odisha)

**Unit - IV**

Cold water Fisheries Status, Important Species, Cold water fishery resources management.

**Unit - V**

Catching Devices, Common inland Fishery crafts and gears, their usefulness, operation, restriction of uses and Fish aggregating devices.

**INLAND FISHERIES**

**FIRST YEAR**

**Paper - II (Practical)**

**Marks : 60**

1. Common crafts and gears used in fishing activities.
2. Fabrication, repair and operation of common fishing crafts and gears.
3. Visit to net fabrication unit and observe different types of nets.
4. Visit to fish landing centres (Reservoirs, Lakes and Rivers), Fish Marketing and record Fish catch.
5. Preparation of Records.

**INLAND FISHERIES**

**SECOND YEAR**

**Paper - III (Theory)**

**Marks : 40**

**Unit - I**

History of aquaculture presents Global and national scenario, Principles of Aquaculture and Importance of aquaculture.

**Unit - II**

Culture Practices, conventional mono culture, and composite Fish culture, mixed culture, integrated aquaculture, criteria for selection of candidate species for aquaculture.

**Unit - III**

Sewage fed fisheries, Waste water aquaculture, Method of culture, Tradition / Extensive, Semi intensive and intensive aquaculture in inland water bodies.

**Unit - IV**

Types of fish farms, fresh water/brackish water, Types of Ponds, Nursery, Rearing, Grow out. Lay out design and construction of fish farm. Soil types, properties, classification, sampling methods and texture analysis, effect of seepage and their control.

**Unit - V**

Location, design and construction of hatcheries, design and construction of cage, and pens for the culture.

**INLAND FISHERIES**

**SECOND YEAR**

**Paper - III (Practical)**

**Marks : 60**

1. Collection, preservation and identification of major cultivable fin fish and shellfishes.
2. Identification of fish fry and fingerlings.
3. Identification of post larvae of fresh water prawn.
4. Identification of nauplius, mysis, zoea and juveniles of brackish water prawn
5. Identification of common aquatic weeds, insects, weed fishes and predatory fishes of culture pond.
6. Visit to fish farm and study culture practices, improvement of village tank for fish culture.
7. Preparation of record.

**INLAND FISHERIES**

**SECOND YEAR**

**Paper - IV (Theory)**

**Marks : 40**

**Unit - I**

Fresh water aquaculture resources-ponds, tanks, lakes and reservoirs, nursery, rearing and grow out pond preparation and management. control of aquatic weeds, predatory and weed fishes, algal blooms, liming, fertilization / manuring, use of bio-fertilizers, stocking, feeding to fishes, pond environment management, fish health management, harvesting.

**Unit - II**

Freshwater prawn culture and important species for culture, seed stocking and culture practices, brackish water aquaculture, important fin fish and shellfishes for culture, collection of seed, stocking, important species for culture, seed stocking culture practices.

**Unit - III**

Ornamental fish culture, important indigenous and exotic ornamental fishes, preparation of indoor system for culture and their rearing management.

**Unit - IV**

Cat fish and air breathing fish culture. Important species for culture, seed stocking and culture practices.

**Unit - V**

Integrated aquaculture, principle, fish cum poultry, fish cum duck culture and fish cum cattle rearing.

**INLAND FISHERIES**

**SECOND YEAR**

**Paper - IV (Practical)**

**Marks : 60**

1. Soil and water analysis; soil texture, structure, soil pH, water pH, carbon dioxide, total hardness, total alkalinity, salinity, nutrients.
2. Home aquarium preparation; construction, setting and maintenance.
3. Identification of different fish food organisms.
4. Identification of locally available fish feed ingredients and formulation of fish food.
5. Methods of sampling of fin fishes and shell fishes for disease diagnosis.
6. Identification of common fish diseases.
7. Methods of application of manures and fertilizers.
8. Preparation of record.

# **POULTRY FARMING**

## **FIRST YEAR**

### **PAPER – I (THEORY)**

Full Marks : 40

#### **Unit - I**

- Poultry industry in India and in Odisha.
- Importance of egg and meat in human diet

#### **Unit - II**

- External body parts of chicken.
- Anatomy and physiology – brief outlines of Digestive system, Excretory system and Reproductive system.

#### **Unit - III**

- Internal part of egg.
- Formation of egg and Composition of egg with its nutritional values.

#### **Unit - IV**

- Common breeds of chicken and other poultry birds.
- Breed characteristics and utility.

**POULTRY FARMING**  
**FIRST YEAR**  
**PAPER – I (PRACTICAL)**

Full Marks : 60

1. Body points of chicken and ducks.
2. Handling, catching, wing banding and leg banding, debeaking, dewinging.
3. Identification of internal organs : different parts of digestive and reproductive system.

**POULTRY FARMING**  
**FIRST YEAR**  
**PAPER – II (THEORY)**

Full Marks : 40

**Unit - I**

- Description of indigenous fowls and their value in rural farming. Specific strains developed for rural poultry production, their acceptability and importance in rural system.

**Unit - II**

- General management practices of duties, quality and guinea fowl.

**Unit - III**

- Preliminary idea on different breeding method practiced in poultry farm.
- Different systems of mating : Flock mating, Stud. mating and Sift mating.
- Preliminary idea on artificial insemination.

**Unit - IV**

- Estimation of egg production – Hen housed, Hen day and Survivor egg production.
- Recording of body weight and other body measurements in broiler birds.

**POULTRY FARMING**  
**FIRST YEAR**  
**PAPER – II (PRACTICAL)**

Full Marks : 60

1. Identification of poultry breeds – White Leghron (WLH), Rhode Island Red (RIR), Vanaraja, Giriraja, Grama Priya, Kadaknath, Aseel and some commercial broiler strains.
2. Identification of good layers, poor layers and non-layers.
3. Visit of duck, quail & Guirea fowl farms.

**POULTRY FARMING**  
**SECOND YEAR**  
**PAPER – III (THEORY)**

Full Marks : 40

**Unit - I**

- Poultry housing and equipments.
- Selection of site.
- Types of poultry houses – free range, semi intensive, intensive and backyard, low cost poultry houses.
- Cage, Slat and Deep litter system of housing, its advantages and disadvantages.

**Unit - II**

- Importance of use of Litter in poultry houses.
- Litter materials, Built-up litter as manure and its utility values, management of litter. Types of poultry equipment like feeder, water / drinker and brooder and chick guard etc.

**Unit - III**

- Feeding Management, Classification of nutrients
- Nutrient requirements and feed formulations.
- Additives and supplements.
- Feed restrictions.
- Utilisation of local available local ingredients used in poultry feed.

**Unit - IV**

- Factor affecting egg production
- Selection and care of hatching eggs
- Candling of eggs
- Incubation principles and practice
- Hatchery sanitation and management
- Disposal of hatchery wastes.
- Different fumigation process in hatchery.
- Factors affecting hatchability and fertility.

**POULTRY FARMING**  
**FIRST YEAR**  
**PAPER – III (PRACTICAL)**

Full Marks : 60

1. Different components of hatchers and setters and their utility.
2. Cleaning and fumigation of hatcher and setter..
3. Setting of eggs for hatching.
4. Candling of eggs.
5. Different method of culling procedure
6. Identification of common feed ingredients.
7. Visit to feed mixing centre mixing of feed

**POULTRY FARMING**  
**SECOND YEAR**  
**PAPER – IV (THEORY)**

Full Marks : 40

**Unit - I**

House preparation before and after arrival of chicks in the farm. Brooding and rearing of chicks. Rearing and management of grower, breeder / layers. Rearing and management of started pullet. Light management of broilers and layers.

**Unit - II**

Management and care under adverse conditions and seasonal managements. Preliminary idea of moulting of poultry birds and different moulting practices used for egg production. Culling of different age groups of stocks.

**Unit - III**

Signs of good health and ill health in poultry flock. Classification of poultry diseases. Common disease of poultry; Ranikhet Disease, Fowl Pox, Marker's disease, Infectious Bronchitis Disease, Avian Influenza (Bird Flu), Avian Leucosis Complex, Chronic Respiratory Disease (CRD), Salmonellosis, E.Coli, Fowl cholera, Aspergillosis their prevention & control.

**Unit - IV**

Round worm, Tape worm, lice, tick and mite infestation. Cannibalism, Bumble foot, Crop Impaction, Egg bound condition, different vices of poultry, vaccination schedule of layer and broiler birds. Biosecurity in poultry farms.

**POULTRY FARMING**  
**SECOND YEAR**  
**PAPER – IV (PRACTICAL)**

Full Marks : 60

1. Identification of different types of houses and equipments.
2. Visit to poultry farms.
3. Identification of different litter materials and quality assessment.
4. Vaccination
5. Identification of healthy & unhealthy birds.

**REPAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)**

**FIRST YEAR**

**PAPER – I (THEORY)**

**Marks - 40**

**Unit-I Primary Tillage Machinery**

Definition and objectives of tillage, Classification of tillage- Primary and secondary tillage. Requirements of primary tillage. Types of primary tillage machinery. Mould board plough: classification of MB ploughs, parts: share, mould board, land side, frog etc., materials of construction, accessories and their functions, jointer, coulter, furrow wheel, adjustment of plough- horizontal and vertical suction, setting of coulter and jointer. Disc plough, types, parts and functions – disc, frame, bearing, scraper, adjustment of disc and tilt angles.

**Unit-II Secondary Tillage Machinery**

Objectives and requirements of secondary tillage. Types of secondary tillage machinery. Harrows: types, parts, function, materials of construction, adjustment of gang angles leveling of harrow. Cultivators, types, parts, function and adjustment. Rotavator: parts, function and adjustment.

**Unit-III Sowing Machinery**

Methods of sowing, Seed drills: plain drills and seed cum fertilizer drills, various parts, function and materials of construction. Types of seed metering devices. Planters: types, parts, functions. Types of metering devices used in planters, setting up planters for row and plant spacing, Transplanters - its types, working principles, nursery raising technique.

**Unit-IV Plant Protection Equipment**

Use and application of agricultural chemicals. Types of power sprayers and their uses, construction and function, types of dusters and their uses, construction and function, safety precaution in handling of chemicals and operational techniques. Common faults and corrective measures.

**REPAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)**

**FIRST YEAR**

**PAPER- I (PRACTICAL)**

**Marks-60**

**Unit-I Primary Tillage Machinery**

**Mould Board Plough:** Identification of different parts of tractor operated mould board plough, dismantling of mould board plough, reconditioning/replacement of damaged/worn-out parts, assembling of different parts of mould board plough, adjustments of depth and width of cut. Setting of coulter, jointer and furrow wheel for better performance of the plough

**Disc Plough:** Identification of different parts of disc plough, dismantling of disc plough, reconditioning/replacement of damaged/worn out parts, assembling of different parts of disc plough, adjustments of disc and tilt angles, adjustments for depth and width.

**Unit-II Secondary Tillage Machinery**

**Harrows :** Identification of different parts of disc harrows, dismantling reconditioning/replacement of damaged/worn out parts, assembling and various adjustments.

**Rotavator :** Identification of different parts of rotavators and rotary tillers, dismantling of rotavators/rotary tillers, reconditioning/replacement of damaged/ worn out parts, assembling and lubrication, Adjustments for better performance.

**Cultivator :** Identification of different parts of a cultivator, arrangement of tynes in a cultivator, fore and aft adjustment of cultivator, replacement of cultivator tynes.

**Unit-III Sowing Machinery**

Identification of different parts of seed cum fertilizer drill, adjustment of furrow

opener and reconditioning/replacement of damaged/ worn out parts of the seed-cum-fertilizer drill, dismantling of seed and fertilizer metering mechanisms and study of its parts. servicing and maintenance after its use.

Identification of different parts of planters, adjustment of furrow opener and reconditioning/replacement of damage/worn out parts, familiarization with different types of furrow openers, selection of proper seed plates, drive gear and their fitting, servicing and maintenance after use.

Familiarization with different parts of rice transplanters. Study of seedling tray and finger movement mechanism, adjustment for number of seedlings and depth of planting.

#### **Unit-IV Plant Protection Equipment**

Identification of different parts of power sprayers, dismantling of sprayer, reconditioning/replacement of worn out/damaged parts, assembling of sprayer and resetting of nozzle and cut-off device, operation and calibration of sprayer for specific applications, method of controlling droplet size and spray volume, Safety precautions in using sprayers and dusters.

**REPAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)**

**FIRST YEAR**

**PAPER – II (THEORY)**

**Marks - 40**

**Unit-I Harvesting Machinery**

Reaper windrower. Vertical conveyor reaper, types of tractor and power tiller operated reaper windrower. Constructional details of reaper, functions of parts and materials of construction and adjustments. Safety precautions. Common faults and corrective measures.

**Unit-II Threshing Machinery**

Power threshers- types, working principles and constructional details of axial flow threshers. Types of threshing cylinders and their adjustments. Types of cleaning and grain handling systems and their adjustments. Care, maintenance and safety precautions. Common faults and corrective measures.

**Unit-III Combines**

Combines and its types. Constructional details and functions of different sub-assemblies of combine harvester. Adjustments in reel, cutter bar, conveyor, threshing units, separating and cleaning unit, grain augers, bagging units, power transmission mechanism. Care, maintenance and safety precautions. Common faults and remedies.

**Unit-IV Special Purpose Machinery**

*Sugarcane crusher*. Introduction, main parts of cane crushers, their functions and operation of crushers. Common faults and corrective measures. Safety and precautions in use of cane crushers.

*Maize shellers and Groundnut decorticators* : Parts of power operated maize shellers and groundnut decorticators and their function. Adjustment of various components of maize shellers and groundnut decorticators for their efficient uses. Common faults and their rectification. Safety and precaution in use of maize and groundnut decorticators.

**REPAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)**

**FIRST YEAR**

**PAPER- II (PRACTICAL)**

**Marks-60**

**Unit-I Harvesting Machinery**

Identification of different parts and components of reaper windrower, carrying out adjustments of cutter bar, registration and alignment, overload protection safety clutch, operation, care and maintenance. Identification of different parts and assemblies of combine harvester. Dismantling, checking, reconditioning, replacement of different components and assembly. Trouble shootings and their remedies.

**Unit-II Threshing Machinery**

Identification of different components of power operated threshers and axial flow threshers. Dismantling of power thresher, identification of different components, checking of damaged/worn out parts, their reconditioning, repair and/or replacement and assembly. Adjustments of different components for better threshing and cleaning efficiency, routine maintenance of threshers. Identification of different components of sugarcane crushers, their functions and adjustment. Identification of different components of maize shellers, their functions and adjustment. Identification of different components of power operated groundnut decorticator and their adjustments.

**Unit-III Combine**

Identification of different parts and sub-assemblies of combine harvester. Adjustments in reel, cutter bar, conveyor, threshing units, separating and cleaning unit, grain augers, power transmission mechanism. Trouble shooting in combines and their remedies. Care, maintenance and safety precautions in combine operation.

**Unit-IV Special Purpose Machinery**

*Sugarcane crusher.* Identification of different parts of sugarcane crusher, Common faults of sugarcane crusher and their corrective measures. Safety and precautions in use of sugarcane crushers.

**Maize shellers and Groundnut decorticators :** Identification of different parts of power operated maize shellers and groundnut decorticators. Adjustment of various components of maize shellers and groundnut decorticators for their efficient uses. Common faults and their rectification. Safety and precaution in use of maize and groundnut decorticators.

**REPAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)**

**SECOND YEAR**

**PAPER- III (THEORY)**

**Marks-40**

**Unit-I I C Engine**

Working principle and constructional features of I.C. engine, familiarization with principal parts. Principles of operation and salient features of two stroke and four stroke engines. Engine terminology, Multi-cylinders engine, firing order and valve arrangements.

**Unit-II** Fuel system, major components of fuel system, types of fuel injection system, different parts of injection system and their functions, Lubrication system, functions of lubricating systems and their main parts, crankcase ventilation.

**Unit-III** Cooling system: necessity and requirement of an efficient cooling system, types of cooling system- air cooling, water cooling and different parts of a cooling system.

Different components of an air intake system such as air cleaner, pre-cleaner, supercharger and intake manifold and their functions, components of an exhaust system such as exhaust manifold, muffler and their functions.

**Unit-IV Tractors**

Introduction to tractor, Familiarization with various gauges, instruments and controls of tractors, components and different systems of tractor, Safety and pre-cautions in operating tractors.

**REPAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)**

**SECOND YEAR**

**PAPER- III (PRACTICAL)**

**Marks-60**

- Unit-I** Dismantling of engine, Cleaning and inspection of various principal parts. Taking measurements of cylinder liner, piston, piston rings, piston pin, small and big end bearings of connecting rod, crank pins and cam shaft journals and bores to assess wear and tear for reconditioning and replacement. Fitting of liner, piston rings and connecting rod, inserting piston assembly into liner and tightening of big end bearing at required torques. Assembling cam shaft, checking timing gear chain and timing. Reconditioning of cylinder head, de-carbonising, checking valves and springs, replacement of worn out valve seats, seat cutting and lapping, fitting valve guide and valve spring, checking valve seat for leakage, checking and fitting of a rocker arm assembly.
- Unit-II** Tightening of cylinder head with proper sequence and torque, adjustment setting of tappet clearance and assembling other attachments.. Replacement of fuel and oil filters, damaged hoses, tightening of clamps, nuts and bolts, filling of fuel, oil and water.
- Unit-III** Visit to reputed tractor repair and service workshops to familiarize with the techniques of crank shaft grinding, honing, pump calibration etc. Checking of fuel and oil pumps for proper functioning and repair and calibration if required. Testing and pressure setting of injectors.
- Unit-IV** Engine trouble shooting: its causes and remedies. Causes and remedies of engine does not start, irregular performance and lack of power, smoky exhaust, engine suddenly stops/ stills/engine knocking, overheating, low and high oil pressure, non functioning of various gauges etc. Safety and pre-cautions to be taken during engine operation.

**REPAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)**

**SECOND YEAR**

**PAPER-IV (THEORY)**

**Marks-40**

**Unit-I Power Transmission System of Tractor**

Clutch- its function, types of clutches, various components and working of single and dual clutch systems, clutch adjustments. Gear box: types of gear boxes, different components, speed ratio. Differential and final drive: principles of operation of differential, function and working of differential lock, functional requirement of final drive, P.T.O. drive: its position and operational control.

**Unit-II Steering and Brake System**

Steering system and front axial, different components of the steering system, types of steering and steering gear boxes used in different tractors. Brakes: function of a brake system, classification of brakes, working of a hydraulic brake system. Tyres: its size, specification and ply rating, air inflation technique, size of rim, retreading of tyres and wheel ballasting,

**Unit-III Hydraulic and Electrical System of Tractor**

Function and merits of hydraulic system over a mechanical system, function of hydraulic controls. Hitching of trailers, Semi-mounted and mounted implements. Electrical system, different components of an electrical system and their placement on tractor, function of storage battery, dynamo, cut-out, starter and their proper maintenance.

**Unit-IV Power Tiller**

Importance of power tiller in Indian agriculture, Working principles of power tiller, different models of indigenously produced power tillers, their comparative specifications, power transmission, steering, various controls and operational techniques, various uses of power tillers. Rotavators, types of rotavators, Parts of rotavator and power transmission, arrangement of tynes and adjustment of rotavators for better performance

**REPAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)**

**SECOND YEAR**

**PAPER- IV (PRACTICAL)**

**Marks-60**

**Unit-I Tractor Systems**

Familiarization with different component systems and controls of a tractor. General cleaning, oiling and greasing of tractor, Checking and tightening of nuts and bolts. Checking fuel, oil and cooling systems and battery of tractor. Reconditioning of water pump, fan, checking of radiator, hoses etc. and their assembly, Checking and inflating tyres, Starting, running and stopping of engines, observation of different gauges and controls for functioning. Driving practice in forward and reverse direction. Familiarization with functioning of different systems like fuel, lubrication, cooling, hydraulic and electrical, their defects and remedies. Tractor trouble shooting.

**Unit-II** Study of clutch system of tractor, dismantling, inspection, repair, installation and adjustments of clutch of tractor. Adjustment and trouble shooting of clutch. Study of gear box of tractor, dismantling, inspection, repair, installation and adjustments of gear box of tractor. Study of differential and final drive of tractor, adjustment and trouble shooting.

**Unit-III** Repair and adjustments and servicing of steering systems, front axle and braking system. Study of steering system of tractor, adjustment of various steering geometry. Study of brake system of tractor and its trouble shooting. Study of hydraulic system of tractor. Study of different components of electrical systems of tractors, adjustment and their trouble shooting.

**Unit-V Power Tiller**

Dismantling and assembling of major components of power tiller, their adjustments, repair and trouble shooting. Dismantling and assembling of rotary tiller, their adjustments and repair. Routine maintenance of tractor and power tillers. Safety and precautions to be taken before, during and after operation of tractors and power tillers.

**FIRST YEAR**  
**INTRODUCTORY SERICULTURE**

**Paper - I (Theory)**

**Marks : 40**

**Unit - I**

Sericulture: its history, importance, origin (3), types of silk worms and their races, voltinism and moultnism (6); systematic position of various silk worms and their geographical distribution (6); salient feature of the silk worms (4)

**Unit - II**

Mulberry and non-mulberry host plants of different silk worms: Botanical nomenclature, origin and geographical distribution of various host plants (8); Distribution and systematic position of mulberry (1); Mulberry plant morphology – common varieties used in sericulture, their characters, yield and varietal improvement (6); Vegetative morphology: Characters of root, stem, bud and leaf (3); Reproductive morphology: Male and female reproductive organs, pollination, fertilization and development of seed, structure of seed and fruit; conditions required for mulberry growth (6).

**Unit - III**

Soil types their suitability; Soil properties and soil pH and reclamation of problem soil (6); Functions of essential macro and micronutrients; Sources of nutrients like manures, green manure, vermi-compost, fertilizers, and their composition (6), doses and methods of fertilizer application (4); Organic manures (FYM, compost, tank silt, night soil, sewage sludge, oil cakes, vermicompost) and their application (4).

**Unit - IV**

Insect pests of mulberry: Sucking insects like jassids, scales, white-flies, mealy bugs leaf eating insects like grasshoppers, hairy caterpillars, cut worms, beetles; internal borers like stem borer; nematodes; their seasonal occurrence, damage symptoms, extent of loss (8); Prophylactic and curative methods of insect pest control (5); Mulberry diseases: Root rot, stem rot, rust, leaf spot, powdery mildew, symptoms of various diseases, types of damage, extent of loss, seasonal occurrence (8); Disease management practices (4); Identification of deficiency symptoms in Mulberry (3); Pesticides and bio-pesticides (4), their formulation (2), various pest control appliances (5).

**FIRST YEAR**  
**INTRODUCTORY SERICULTURE**  
**Paper - I (Practical)**

**Marks : 60**

**Unit - I**

Acquaintance with various silk worms and their races and voltinism, Acquaintance with different food plants of silk worms (Mulberry, Tasar, Muga, Eri) (9); Identification of non-mulberry hosts and their package of practices (9); Study of different morphological traits of silk worm and their life stages (15); Study of various systems of silk worm (15); Morphology of mulberry root, stem, leaf and flowers (9); Function of leaf – photosynthesis, respiration and transpiration (9).

**Unit - II**

Identification of different types of Soils (9); Acquaintance with farm tools and implements, their uses (12); Acquaintance with different fertilizers and calculation of their doses (9); Method of compost and vermicompost preparation (9); Acquaintance with different plant protection equipments and their safe handling (12).

**Unit - III**

Identification of different types of weeds (9); Preparation of Herbarium *viz.*, Mulberry Leaf varieties and weeds (6); Identification of insect pests of Mulberry and collection and preservation of insect pests (12); Identification of leaf, stem and root diseases of Mulberry and Collection of disease samples (12).

**Unit - IV**

Identification of deficiency symptoms in Mulberry (6); Identification of nematodes (3); Acquaintance with various pesticides and their formulations (12); Acquaintance with bio-pesticides and bio-agents (9); Preparation of spray solutions and dust dilution (9); Preparation of calendar of control measures (9).

**FIRST YEAR**  
**INTRODUCTORY SERICULTURE**  
**Paper - II (Theory)**

**Marks : 40**

**Unit - I**

Cytology and Genetics of Mulberry – Introduction, cell organelles, their function in cell, mitosis and meiosis (3), Mendelian principles of genetics, importance of mulberry breeding (3) Cropping pattern- mono, companion cropping, mixed cropping, inter cropping and their uses (6); Influence of Agro-climatic factors on growth and development of mulberry: Edaphic factors – Soils of mulberry gardens, types of soil, profile structure, topography, porosity, aeration, soil water, organic matter and soil micro-organisms (6); Soil reaction – salinity, acidity and alkalinity, soil amendments (5); Climatic factors – Role of light, temperature, wind velocity, altitude, rainfall, relative humidity on growth and development of mulberry (6).

**Unit - II**

Cultivation and cultural practices: Introduction, garden implements, Package of practices for moriculture (under irrigated and rain fed conditions)(6): Selection of land, land preparation (digging, ploughing, disking, harrowing, leveling, lay out, pit making, bund making, ridge and furrow making) (6); Intercultural operations- weeding, pruning, irrigation and drainage methods and frequency of irrigation (6); Methods of conservation of soil moisture (3); Soil erosion and conservation (3); Systems of mulberry cultivation (pit, row, paired row and Kolar )(6), Inter cultivation and surface mulching (3).

### **Unit - III**

Nursery preparation: Selection of elite varieties for irrigated and rain fed conditions with their characteristic features and yield potentialities (6). Propagation of Mulberry- sexual propagation, asexual propagation (3); Selection of planting material (cuttings, saplings, grafts, layers) and their practical utility, planting method, spacing systems and their importance in leaf productivity under different field conditions (6); Organic manuring in mulberry cultivation and organic farming (3); Green manuring: green manure crops and their relevance in soil productivity(3); Biofertilizer: Types (Nitrogen, phosphate, cellulosytic), importance, application and limitation (3).

### **Unit - IV**

Leaf selection and leaf harvesting methods for silk worm rearing, transportation, preservation of leaves, seasonal influence on leaf yield (6); Estimation of leaf yield – methods of estimation (3); Economics of Mulberry cultivation per unit area (Rain-fed and irrigated), (3); Farm Management: Labour rules, maintenance of overseer's diary, muster roll preparation, wage calculation (6)

**FIRST YEAR**  
**INTRODUCTORY SERICULTURE**  
**Paper - II (Practical)**

**Marks : 60**

**Unit - I**

Study of different meteorological factors and their measurement (12); Soil sampling and recording of soil pH and soil moisture (12); Amendment of problematic soil; Water management practices in Mulberry cultivation, Surface irrigation, and Sprinkler and drip irrigation systems (15).

**Unit - II**

Propagation of mulberry: Selection of materials, preparation of cutting and treatment with root inducing chemicals, planting methods (15); Stem and root grafting (whip and tongue grafting techniques), Budding (patch and T-budding techniques) (15), Layering (ground and air layering techniques)(9); Seed collection, germination testing, seed bed preparation and sowing (12).

**Unit - III**

Raising of mulberry nursery(12); Transplanting in the field (Rain fed areas) (9); Plantation of cuttings in field (Irrigated conditions) (9); Maintenance – hoeing and weeding (12), fertilizer application (6); Green manuring and inter cultivation – sowing of green manuring crops Dhanicha/ Sanhemp and intercrops like green gram/black gram (12).

**Unit - IV**

Leaf harvesting- Leaf, branch and shoot harvesting methods in relation to cultivation and rearing practices; Estimation of leaf yield per unit area (acre/hectare) (15). Storage, transportation and preservation methods (12); Estimation of leaf yield; identification of type of leaf, leaf quality determination (12); Pruning methods - types, objectives, methods and practical relevance (15)

**SECOND YEAR**

**REARING AND INDUSTRIAL TECHNOLOGY IN SERICULTURE AND  
EXTENSION MANAGEMENT**

**Paper - III (Theory)**

**Marks : 40**

**Unit - I**

Study on metamorphosis: morphology of egg (external & internal morphology and colour change), larva (mouthparts, legs, prolegs, spiracles, eyes, claspers and integumentary hair and sexual markings), pupa (sexual dimorphism – male and female morphology) and moth (mouth parts, antenna, wings, external genitalia) of mulberry silk worms (9); Environmental requirement for rearing: temperature, humidity, air, light, optimum requirement for different stages, methods of maintenance (3); Rearing house :location & size, types of rearing houses, comparison with CSB model, requirements-orientation-utilization of locally available materials-modifications (3); Rearing (early-& late age) and feeding appliances and their uses (3); Preparation for disinfection: cleaning-washing-drying-disinfection, hygienic rearing. (3)

**Unit - II**

Silk worm rearing technology (Early age rearing): Characteristics of young age larvae; Commercial races - Multivoltine, bivoltine and hybrid races used in India (6); Collection of disease free layings (DFLs), cards, loose eggs, incubation light-humidity-air-temperature requirement (3); Uniform hatching and brushing methods for 1<sup>st</sup> instar larvae; Chawki rearing: methods of feeding and rearing of I,II and III instar larvae; advantages and disadvantages (6); Effect of seasons, environmental requirements, feeding schedule, selection of leaf-spacing, cleaning, care during moulting, use of bed disinfectants (6); Artificial hatching of silkworm eggs- common acid treatment (treatment after chilling, precautions, age of eggs and timing of acid treatment)(3);

### Unit - III

Silk worm rearing technology (Late age rearing): Characteristics of late age larvae, rearing methods, advantage, disadvantage (3); Effect of seasons, Environmental requirements, spacing, dusting, cleaning, feeding schedule, care during moulting, leaf requirement, quality and leaf preservation (6); Types of mountages- transfer of matured silk worms, method of mounting, density, care during mounting and spinning of cocoons (6); Harvesting and storage of cocoons: harvesting, cleaning, preservation, assessment of cocoon quality and storage (6); Record maintenance, transportation - care during transportation (3); Cost of production, leaf cocoon ratio (3).

### Unit - IV

Diseases of silk worm- pebrine, bacterial, viral, fungal - causal organisms, mode of infection, symptoms, prevention and control (6); Insect pests of silk worm - Indian Uzi fly and dermestid beetle their life cycle, type and extent of damage, control measures (3); Seeds Introduction, DFSL - types of seeds - commercial seed-reproductive seed, non- hibernating and hibernating eggs (3); Model grainage: basic requirements-plan of grainage; Equipments, Assessment of quality of seed cocoons and their transportation (3); Programming of seeds production: preparation of grainage - preliminary examination of seed cocoons- pupal gut examination and forced eclosion test for pebrine disease sorting of seed cocoons, sexing-preservation of seed cocoons / pupae- temperature, humidity, light, air requirements (3); Moth emergence, time of emergence, coupling- decoupling, oviposition, moth examination (3). Cellular method and loose eggs, importance of temperature, humidity and light - refrigeration of male moth (3); Concept of CRC organization - community chawki rearing - advantages, disadvantages- care during transportation (3) ; Seed organization, seed multiplication and organization of seed area- Seed Legislation Act (3)

**SECOND YEAR**  
**REARING AND INDUSTRIAL TECHNOLOGY IN SERICULTURE**  
**AND EXTENSION MANAGEMENT**

**Paper - III (Practical)**

**Marks : 60**

**Unit - I**

Study of morphology of Mulberry (*Bombyx mori*), Tasar (*Anthaeraea mylitta*), Muga (*Anthaeraea assama*) and Eri (*Philosamia ricini*) by specimen identification and making labeled sketches of their egg, larva, pupa and moth (12); Dissection of digestive system and silk glands of moth (9); study of mouth part of moth (3); Study of model rearing house-plan (6); Acquaintance with sketching of rearing appliances and their use (9); Disinfectants: identification and preparation for disinfection, disinfection methods, maintenance of hygienic conditions and appliances (9).

**Unit - II**

Surface sterilization of eggs; Identification of Blue egg stage and black boxing; synchronization- hatching and calculation of hatching percentage(9); Methods of brushing (9); Chawki rearing methods, quality of mulberry leaf, leaf selection (9); Feeding schedules, bed cleaning, spacing, moulting (12); Identification of mountages; Harvesting of cocoons after late worm rearing (3); Calculation of Effective Rate of Rearing (E.R.R.) by weight, calculation of E.R.R. by number, Calculation of Leaf Cocoon Ratio (L.C.R.) (9); Economics of rearing 300 DFLs or 1 acre mulberry, by products of sericulture and their utilization, rearing records (6); Visit to nearest rearing houses (3).

### Unit - III

Study plan of Model Grainage building (9); Identification of Grainage equipments; Preparation of Disinfectants and Disinfection of Grainage (12); Sex separation of pupa and moths; Synchronization of moth emergence; Coupling, Decoupling and oviposition (6); Artificial hatching of silkworm eggs- common acid treatment (treatment after chilling, precautions, age of eggs and timing of acid treatment) (3); Preparation of layings and loose eggs, Preparation of loose egg cards (6); Moth Examination (method of individual, mass, green, moth examination); Identification of perbrine spores; Sorting and Disinfection of eggs (6); Collection and preservation of *Bombyx mori* life stages (3); Maintenance of Grainage records, Visits to nearest Grainages (3).

### Unit - IV

Identification of parts of Cocoon (3); Cocoon characteristics-Mulberry, eri, tasar and muga. -colour, shape, size, compactness, grains, weight, shell ratio, filament length, denier, reliability, raw silk percentage, neatness(15); Assessment of commercial parameters and quality tests (9); Identification and calculation of good and defective cocoons (6); Defective cocoons, sorting; Cocoon assessment: cocoon weight, shell weight, shell percentage- types of defective cocoons (6); rendita-assessment of cocoon quality in tasar and eri (3); Processing and Preservation of Seed Cocoons (6).

**SECOND YEAR**  
**REARING AND INDUSTRIAL TECHNOLOGY IN SERICULTURE**  
**AND EXTENSION MANAGEMENT**  
**Paper - IV (Theory)**

**Marks : 40**

**Unit - I**

Raw materials for silk reeling: Selection of cocoon for reeling. assessment of renditta, cocoon gradation, cocoon procurement and transportation (12); Stifling / Drying: objective - various methods of stifling, steam stifling, sun drying , hot air drying- merits and demerits of each method (12); Cocoon sorting and preservation: separation of defective cocoons, deflossing, methods of storing and preservation of coons (9); Ideal conditions for cocoon storage- effect of defective storage- cocoons reelability - storage of hot air dried / steam stifled cocoons (3).

**Unit - II**

Cooking of cocoons: objectives & principles; various methods of cooking - open pan – three pan– pressurized cocoon cooking - characteristics of water for cocoon cooking - cooking methods for tasar and eri cocoons (9); cocoon brushing (hand and mechanical)(3);. Reeling appliances: Country charkha, Domestic machine, Cottage machine, Multi - end reeling machine, Automatic machine; Floating and sunken system of reeling (12); Reeling process for tasar cocoons; reeling of double cocoons - dupion silk; Re-reeling- objective, lacing, denier, skeining, booking and storage - standard hanks (12);

**Unit - III**

Collection and preservation of silk waste cooker waste - reeling waste- basin residue – burst open cocoon waste - cleaning of waste- drying- storage of waste (15); Silk examination and packing : Tracing of defects in skein- removal of defects - removal of gum spots- hank making - book making- balling (6). Spinning : raw materials - various forms of silk waste- cocoon waste- degumming- drying- spinning on pedal charkha- drafting- twisting - winding- various processes in spun silk mill-eri and tasar waste spinning processes (6); Filature management: organization - planning- costing (3); Raw silk testing: objective- various methods of testing - visual and mechanical testing- winding - size test- evenness, neatness and cleanliness test- tenacity and elongation- cohesion conditioned weight - grading of raw silk - ISI standards (9).

**Unit - IV**

Definition of want, demand, supply, price value, utility, marks demand, elasticity of demand factors responsible for silk production- entrepreneurship (3); Role of sericulture in national economy - sericulture legislation - principles of accountancy, single and double entry system- maintenance of registers and records, preparation of balance sheets (6); Financial agencies involved in sericulture industry- terms and conditions of loan, crop insurance, developmental schemes and subsidies (3); Organization of cooperative sector in sericulture- aims and objectives, cooperative principles, organization of cooperative in rearing, reeling and other areas, Incentives and regulation (3); Management for effective participation in sericulture (3); Marketing- Principles of marketing, costs, defects - regulated markets, merits and demerits of cooperative marketing, stabilization of prices, marketing of cocoon and silk yarn (3); Extension education- objectives, methods of extension, communication (Definition and meaning, role of communication in extension education), training and visit (individual, group, & mass contact)(9); Extension programme formulation: Concept of PRA techniques; Demonstrations, use of audiovisual aids, conduct of field days (6). Role of Central Silk Board and Directorate of Sericulture in extension (3).

**SECOND YEAR**  
**REARING AND INDUSTRIAL TECHNOLOGY IN SERICULTURE**  
**AND EXTENSION MANAGEMENT**

**Paper - IV (Practical)**

**Marks : 60**

**Unit - I**

Identification of defective cocoons and their percentage in a lot, determination of shell ratio of good cocoon (9); Reeling techniques and preparation of cooked cocoons (9); Single cocoon reeling: determination of average filament length, denier and reelability (6); Practical demonstration of cooking, reeling and re-reeling of a sample cocoon (15); Practical demonstration of multi end silk reeling machine (9); Skein making, lacing, hank making, book making (9).

**Unit - II**

Silk spinning: degumming of waste cocoons, hand spinning on pedal spinning wheel (12); Yarn testing: Denier count and gradation of cocoons and silk (3). Visit to filatures and reeling establishments (6); Visit to sericulture cooperatives, chawki rearing cooperatives, reeling cooperatives, silk marketing cooperatives (15); Visit to different organizations offering technical services, supplying planting materials, laying seed cocoons and other inputs of sericulture (9); Visit to cocoon markets, silk merchants (9); Visit to seed area, private seed producers, silk farms, Government grainages (6).

**Unit - III**

Survey and collection of data, compilation, tabulation, presentation (15); Maintenance of machinery and records: Cleaning / oiling of machineries- repair - replacement of old machines- maintenance of various registers (15); Definition and scope of sericulture- statistics- collection of data sampling - survey- use of

questionnaires, proforma for collection of data- compilation- tabulation, preliminary analysis- report writing (9); Utilization of by-products for dairy, fisheries, gober gas, oil extraction, poultry feed, fuel (6).

#### **Unit - IV**

Practical training on project preparation-model bankable schemes for various sericulture programmes (15); Conducting survey on the role of Govt / C.S.B. and Voluntary organization for development of sericulture, afforestation for development of food plant area in respect of wild silk worm like tasar (12); Analysis of data, preparation of reports (9); Visit to technical service centers, farmers, participation in exhibitions, field days and institutions (6).

**AUDIO VIDEO TECHNIQUE**

**FIRST YEAR**

**Paper – I Theory**

**Full Marks : 40**

**UNIT- I**

**Common Materials and its Properties**

1. Materials
2. Conductor
3. Types of conductor
4. Properties of conductor
5. Applications of conductor
6. Types of switches
7. Fuses and fusing current
8. Insulators
9. Types of insulator
10. Applications of insulator
11. Properties of insulator
12. Spark and fuse
13. Soldering iron, flux and Soldering Material

**UNIT- II**

**Basic Electronic Components**

1. Resistance and its properties
2. Colour code of resistor
3. Types of resistor
4. Combination of resistors
5. Ohm's Law
6. Kirchhoff's Laws
7. Applications of Kirchhoff's Law
8. Inductor and its properties
9. Inductive reactance

10. Mutual Inductances
11. Transformer
12. Types of Transformer
13. Capacitor and its properties
14. Capacitive reactance
15. Types of capacitors
16. Combination of capacitors
17. Resonance
18. Types of resonant circuit
19. Applications of resonant circuit

### **UNIT- III**

#### **Semiconductor**

1. Semiconductor
2. Semiconductor Materials
3. Properties of Semiconductor
4. Applications of Semiconductor
5. Types of Semiconductor
6. Diode symbol and typical
7. Construction of P-N Junction Diode
8. Characteristics of a P-N Diode
9. Diode Specification
10. Diode Coding
11. Cut in Voltage
12. Diode Testing
13. Applications of Diode
14. Zener Diode
15. Photo Diode
16. Solar cell
17. Rectifiers
18. Half wave rectifier
19. Full wave bridge rectifiers

**AUDIO VIDEO TECHNIQUE  
FIRST YEAR  
Paper - I Practical**

**Full Mark : 60**

**Units**

1. Study of tools
2. Drawing of electrical and electronic symbols
3. Study of electrical and electronics measuring instruments
4. Identification, testing of components and devices
5. Soldering and de-soldering practices
6. Verification of ohm's law and Kirchhoff's law
7. Verification of V-I Characteristics of P-N junction.
8. Study of half wave Rectifier
9. Study of full wave Rectifier.

**AUDIO VIDEO TECHNIQUE  
FIRST YEAR  
Paper – II Theory**

**UNIT – I**

**Transistor and Junction Field Effect Transistor**

1. Types of Transistor
2. Construction and its properties of Transistor'
3. Transistor Terminal Identification
4. Testing of Transistors
5. Switching Times in Transistor
6. Applications of Transistor
7. Transistor as an Amplifier
8. Field Effect Transistor
9. Types of FET
10. Construction of JFET
11. JFET Characteristics
12. Testing and trouble shooting of JFET. n

**UNIT- II**

**Power Supply, Filtering and Measuring Instruments**

1. Filter
2. Different filter circuits
3. Power supply regulation
4. Power supply system
5. Switch Mode Power Supply
6. Power supply troubles
7. Volt meter
8. Ammeter
9. Ohm meter
10. Multi meter
11. Frequency meter
12. Function generator
13. Capacitance meter
14. Potention meter
15. Oscilloscope function
16. Applications of oscilloscope

**AUDIO VIDEO TECHNIQUE**  
**FIRST YEAR**  
**Paper – II Practical**

**Full Mark : 60**

**Units**

1. Study of transistor amplifier
2. Study of FET amplifier
3. Measurement of voltage and current using multi meter
4. Study of Oscilloscope
5. Design of power supply
6. Study of SMPS
7. Study of function generator

**AUDIO VIDEO TECHNIQUE**  
**Second Year**  
**Paper – III Theory**

**Full Marks : 40**

**UNIT- I**

**Radio**

1. Modulation
2. Different Types of Modulation
3. Different Types of Radio Transmitter
4. De-Modulation
5. Different Types of Radio Receiver
6. Nature of Sound
7. Acoustic
8. Microphones
9. Loud Speaker
10. System of Sound Recording
11. CD and DVD Player
12. CD and DVD Recorder
13. Hi-Fi System

**UNIT - II**

**Radio Propagation**

1. Radio Wave
2. Frequency And Wave Length Relation
3. Propagation Of Radio Waves
4. Ground Wave Propagation
5. Sky Wave Propagation
6. Space Wave Propagation

## UNIT - III

### Television

1. Television Broadcasting System
2. Synchronization
3. Blanking
4. Video Signal
5. Band Width Required For TV Signal
6. Vestigial Side Band Signal
7. TV Receiver
8. TV Transmitter
9. Led TV
10. LCD TV
11. Plasma TV
12. CCTV
13. Testing And Trouble Shooting in TV Receiver and Transmitter

**AUDIO VIDEO TECHNIQUE**

**Second Year**

**Paper – III Practical**

**Full Mark - 60**

**Units**

1. Study of Radio Receiver (AM & FM)
2. Study of radio Transmitter(AM & FM)
3. Study of different section in TV receiver
4. Verification of Different Signals of IF and AF sections in Radio Receiver.
5. Study of different types of Microphones and loud speakers.
6. Study of CD and DVD player
7. Study of CD and DVD recorder
8. Study of PA system
9. Study of CCTV system and playback equipment
10. Study of LCD, LED and Plasma TV

**AUDIO VISUAL TECHNIQUE**  
**Second Year**  
**Paper –IV Theory**

**Full Marks : 40**

**UNIT - I**

**Optical Communication**

1. Introduction And Historical Background of Optical Communication
2. Advantages of Optical Fiber Communication
3. Types of Optical Fiber
4. Fiber Material
5. Fiber Bending
6. Types of Optical Sources
7. Light Emitting Diode
8. Laser Diode
9. Pin Diode

**UNIT-II**

**Camera and Projector**

1. Camera Format(35mm,Focusing System, Image Sharpness, Lens Opening Exposure And Its Accessories)
2. Lens
3. Iris
4. Shutter
5. Film Chamber
6. View Finder
7. Light Meter
8. Lens Control
9. Sensitive Of Camera
10. White Balance
11. Audio Circuit
12. Camera Support
13. Working Principle Of Still And Motion Picture
14. Projection Lamp
15. Setting of LCD Projector System

**AUDIO VISUAL TECHNIQUE**

**Second Year**

**Paper –IV Practical**

**Full Mark -60**

**Units**

1. Study of optical communication
2. Study of different types of still and digital camera
3. Practice of taking hand held shot and camera movement
4. Study of still picture projector
5. Study of motion picture projector
6. Setting of LCD projector system

**BUILDING MAINTENANCE**

**FIRST YEAR**

**PAPER-I THEORY**

**Mark : 40**

**Unit - I**

1. Stone: Classification, composition, Characteristics, uses, method of quarrying and dressing.
2. Brick: Method of manufacture, classification, testing of bricks.
3. Cement: Classification, grades, quality tests and uses of concrete making materials (coarse aggregate, Fine aggregate, water) Test of cement and concrete (W/C ratio workability, Compressive and tensile strength) Properties of fresh and hardened concrete, Durability of concrete, Admixtures in concrete.

**Unit - II**

1. Timber, Plywood: Characteristics of suitability for different and allied purpose. Defects and decay, Seasoning and products preservation of Timber.

**Unit - III**

1. Tile: Method of manufacture, composition, testing and its suitability for different use with reference to building (clay, Terracotta, Glazed Tiles, Marble)

**Unit - IV**

1. Steel : Characteristics, composition, grades & testing.

**BUILDING MAINTENANCE**

**FIRST YEAR**

**PAPER- I, PRACTICAL**

**Mark : 60**

**Units**

**Building Drawing**

- Types of building, principles of site selection, orientation of building and distribution of space.
- Introduction to Auto Cad, Code provisions in IS 696, Construction of simple geometrical figures & engineering curves, development of surfaces like cubes, cuboids, spheres. Line plan of building, development of plan from line plan, details of doors, windows and staircase.

**Field Study of RCC Roof, Brick Work, Foundation Lintel, Stair Case Etc.**

- Field visit to near by building. To study RCC roof, Brick work, foundation, lintel, stair case et c.
- Drawing a simple two room official building, multi-storied residential building plan front and sectional elevation, Building drawing project.

**BUILDING SERVICES & INFRASTRUCTURAL ENGINEERING.**

**FIRST YEAR.**

**PAPER- II THEORY.**

**Marks: 40**

**Unit - I**

**Surveying** : Principles of surveying, classification, chain surveying, leveling principle, reduced level, bench mark, temporary adjustment of leveling, method of booking, error in leveling, contouring, National building Code:2005

**Unit - II.**

**Road** : Classification of road, carriage way, camber gradient, super elevation , specification of construction of earth road, macadam road, bituminous & concrete road (brief idea).

**Unit - III**

**Water Supply** : Introduction, Types of demand, quality of water, impurities in water, drinking water standard, disinfection of water (brief idea).

**Sewerage & its treatment** : Terminology physical chemical and Bacteriological characteristics, Aerobic and Anaerobic Treatment with reference to house hold and small colony.

**Unit - IV**

**House Plumbing Services** : Planning, Terminology, water supply pipe and fitting, fixtures and its house hold attributes, wash basin, sink, water closet, Flushing cistern, bath tubs etc. Sewerage construction, types laying and testing, Gully traps, Inspection chambers and low cost sanitation, septic tank soak pit, leach pit etc. Selection of domestic pump and its installation and maintenance.

**BUILDING MAINTENANCE  
FIRST YEAR  
PAPER-II PRACTICAL**

**Marks : 60**

**Units**

- (i) **Testing of Cement and Concrete:** Basic test for cement and concrete: Fineness, soundness, setting time, compressive, strength, heat of hydration, cube test, mix design of concrete of different grades.
- (ii) **Testing of water samples:**
  - a. Determination of pH.
  - b. Determination of turbidity by using Nephelometer.
  - c. Determination of alkalinity and acidity..
  - d. Total Hardness & permanent hardness.
- (iii) **Surveying & field work :**
  - a. Chain triangulation of a given area.
  - b. Plotting the chain triangulation.
  - c. Study of Dumpy level and Auto level.
  - d. Longitudinal sectioning and cross sectioning –Contouring.
  - e. Interpolation of contours and preparation of contour map of a given area.
- (iv) **Layout plan of Building in field :**
  - a. Setting the boundary of building as per the plan.
  - b. Mark the outer boundary of each room.

**ANALYSIS, DESIGN & DETAILING OF STRUCTURES**  
**SECOND YEAR**  
**PAPER- III (Theory)**

**Marks: 40**

**Unit - I**

**Shear Force and Bending, Moment Slope & Deflection** : Definition, types of support, shear force and bending, moment diagram for the structures. Inter-relations between shear force and Bending Moment. Brief idea on slope and deflection of simply supported, cantilever beams and fixed beams.

**Unit - II**

Properties of concrete. Basic idea on compressive of concrete strength, tensile strength, shrinking, creeps, Grade of concrete, Reinforcing steel, its type and grade, basic concept on concrete design, limit state of safety and serviceability, single and double reinforced concrete, brief idea on design and details of beam, column, slab, stair case, column footing, mix design (brief idea) shrinkage and creep of concrete.

**Unit - III**

**Reinforcement** : Reinforcement detailing for structure elements and detailing of their joints. Codal provisions.

**Unit - IV**

**Painting** : Types of paint (all types of paint i.e. cement paint varnishes enamel paint distemper etc.) composition, primer characteristics, method of application of adhesive. Relevant codes to be followed.

**ANALYSIS, DESIGN & DETAILING OF STRUCTURES.  
SECOND YEAR.  
PAPER- III PRACTICAL.**

**Marks : 60**

**Units**

1. Structural design practice:
  - a. Design & Detailing of beams.
  - b. Design & Detailing of slabs.
  - c. Design & Detailing of Columns.
2. Application of Painting : Survey and Collection of data

**ESTIMATION & SAFETY OF BUILDINGS**

**SECOND YEAR.**

**PAPER- IV THEORY**

**Marks : 40**

**Unit - I**

**Construction Planning** : Introduction, types of estimation, principles of estimation, various item of work in building work road, short wall and long wall method, centre line method, rate analysis for different item and lead statement.

**Unit - II**

**Estimation** : Estimation of quantities for building, details of specification for different building items, analysis of rates, analysis of rates for earthwork, cement concrete, RCC, brick work, plastering etc. and work contract.

**Unit - III**

**Environment Engineering** : Nature & Scope of environment problems. Eco system effects, Environmental management and tools for sustainable building engineering.

**Unit - IV**

**Health & Safety** : Introduction, background, accident causation theories, safety programme plan, fire fighting measures, electrical safety. Need of community health and safety.

**ESTIMATION & SAFETY OF BUILDINGS**  
**SECOND YEAR**  
**PAPER- IV PRACTICAL**

**Marks : 60**

**Units**

1. Preparation of estimate for a building.
2. Preparation of schedule of activities by CPM & Bar Chart.
3. Demonstration of fire fighting techniques.
4. Demonstration of Safety Evacuation Plan.

# COMPUTER TECHNIQUE

## FIRST YEAR PAPER- I (THEORY) COMPUTER FUNDAMENTALS

**Marks : 40**

### Unit - I

**Introduction to computer:** History of computer, Evolution of computer, Generation of computer, components of computer system, Different Input/output devices i.e. mouse, keyboard, monitor, printers, CPU, Plotter, joystick, MICR and its other peripherals, Machine language, Assembly language and High level language.

### Unit - II

**Introduction to Numbers system:** Binary, octal, Decimal, hexadecimal, addition, subtraction and its conversion. Computer codes (1'S, 2'S, 9's and 10's complements and EBCDIC, ASCII codes, Alphanumeric codes)

### Unit - III

**Logic gates and Truth Tables:** AND, OR, NOT, XOR, XNOR, NAND, NOR, Combinational circuits, logical expression using NAND and NOR gates, Half adder and Full adder circuit design.

### Unit - IV

**Memory:** Main memory-RAM and its types, cache-memory. Secondary memory: Hard disk, floppy disk, Compact disk, USB Storage, Virtual memory, Memory hierarchy.

**FIRST YEAR  
PAPER-I (PRACTICAL)  
OFFICE AUTOMATION**

**Marks : 60**

|                               |  |
|-------------------------------|--|
| <b>MS-Windows</b>             | Working with Window  |
| <b>MS-WORD</b>                | Starting MS-Word, Creating and operating, Saving a document, Editing Text, formatting documents: Line spacing, paragraph Spacing, Setting tabs, Indenting text, Aligning text, Adding Proofing a document, mail merge.   |
| <b>Editing text</b>           | Viewing a presentation in different view, Adding and deleting slides, Selecting text, Inserting and Deleting Text, Moving and copying text Changing text Case spell Checking.  |
| <b>MS-Powerpoint</b>          | Starting power point, Operating and existing presentation, Creating, Closing and Saving a presentation. Existing Power Point Using master - Slide, Title, Handout, Notes   |
| <b>MS-Excel</b>               | Introducing starting MS-EXCEL, Opening of Worksheet, Saving a Worksheet, and Spreadsheet operation: Entering Numbers, Text, Dates and Times Formulas Editing Worksheet: Deleting cells, Rows, Columns, Inserting cells, Rows and columns, Printing a Worksheet.  |
| <b>Formatting Text</b>        | Changing text Attribute Styles, Changing Bullet, Characteristic aligning, Line setting, Paragraph Setting, Changing slide color scheme, More about Presentation, Drawing object like lines, Arcs, Rectangles, Ellipse, Drawing Free from shapes, Using Auto shape, Rotating objects, Modifying colours and lines. Adding header and footer, inserting MS-Word tables or MS-EXCEL Worksheet, Printing presentation component. |
| <b>Formulas and Functions</b> | Absolute and relative Reference of cell, Entering a formulas, Mixed Entering Function, Calculation using functions Different type of functions in EXCEL, charts: Creating Editing, Inserting, Deleting, Saving, Printing   |

## **DESKTOP PUBLISHING (DTP)**

**Concept of DTP** Introduction to DTP - What is Desktop Publishing? Uses of DTP and print Documents, Uses of fonts, Frames, page layout, etc. Advantages of DTP over Word processing.

Document Planning: Page layout, Margin, Header and Footer, Fonts Styling

**Desktop Publishing using PageMaker** Page make and minimum configuration require for installation use of file, edit, page frame, font, graphic and option menus, creation of style sheet: preparation of tables of contents, index, usages of width table, add or remove fonts, command for printing.

**Corel Draw** Installation of Corel draw and minimum configuration, requirements, Surfing through opening interface for all tools and menus, working with texts, edit special effects, fonts and choosing artistic and paragraph text.

**Using the Coral board** Working with objects, zooming, dragging and other features, special effects. Appetizers, object prospective, movements of objects, use of depth-width and contour and lens effects, cropping and bitmaps.

**FIRST YEAR**

**PAPER II (THEORY)**

**C- PROGRAMMING**

**Marks : 40**

**Unit- I**

**Introduction to programming:** History of C, structure of C

**C language fundamental:** character set, key word, identifier, data types, constant, variables, input/ output statements, escape sequences, declaration and initialization statements, structure of C program, simple program in C.

**Unit - II**

**Operators and expression:** assignment, arithmetic, module, increment and decrement, logical, relational, bitwise and conditional operators. Type conversion, type casting.

**Unit - III**

**Decision making and looping:** switch case, if, if-else, if-else-if, while, do-while, for loop, break, goto, continue, exit statements, simple program using control statement.

**Unit - IV**

**Arrays:** Declaration, memory representation of array, one-dimensional array, multidimensional array, Strings and string handling function.

**Function and its use:** introduction to function, categories of function, function prototype, function call (call by value) program using function, Recursion, storage classes.

**FIRST YEAR**  
**PAPER – II (PRACTICAL)**

**C- PROGRAMMING**

**Marks : 60**

**Units**

1. Write a program to find the sum and average of two numbers.
2. Write a program for swapping two variables without using third variable.
3. Write a program to calculate simple Interest and Compound Interest.
4. Write a program to convert temperature entered into centigrade to Fahrenheit.
5. Write a program to find maximum of three numbers.
6. Write a program to read in a three digit number produce following output  
(assuming that the input is 539) 5 hundreds 3 tens 9 units
7. Write a program to find sum of digits of accepted number.
8. Write a program to find student grade using IF-ELSE ladder
9. Write a program that prints given three integers in ascending order using IF-  
ELSE
10. Write a program for simple calculator using switch/case loop.
11. Write a program for print Fibonacci series up to N number.
12. Write a program to find sum of first 50 odd numbers and even numbers.
13. Write a program to find reverse of given number.
14. Write a program to find factorial of accepted number.
15. Write a program to find all prime number between two given numbers
16. Write a program to print the prime numbers between 100.

17. Display the following output on the screen

a. 1 1 1 1  
2 2 2 2  
3 3 3 3  
4 4 4 4

b. \*  
\*\*  
\*\*\*  
\*\*\*\*  
\*\*\*\*\*

c.           1  
          1 2 1  
        1 2 3 2 1  
      1 2 3 4 3 2 1

18. Write a program to find minimum, maximum, sum and average of given one dimensional array.

19. Write a program to find addition, subtraction, multiplication of matrix.

20. Write a program to print terms of each of the following series i.  $\sin(x)$  ii.

$\cos(x)$

**SECOND YEAR  
PAPER - III (THEORY)  
DATABASE MANAGEMENT SYSTEM**

**Marks : 40**

**Unit - I**

**Data processing concept and file structure:** Definition, field, record, and files.

File organization: Sequential file, direct file, index sequential files.

File utilities: Searching, Sorting, Merging

**Unit - II**

**Architecture of database system:** Database concept, view/schema, logical, conceptual and their relations, DDL, DML, data dictionary, database manager, structuring technique, advantage and limitation of database system

**Unit - III**

**Data Models:** Data Models (Hierarchical, Network, Relational data model, Object oriented data model, Entity-Relationship data model), ER-diagram

**Unit - IV**

**Query Language:** Different types of key, Defining database in SQL, Inserting, Updating and Deleting data, Internal Schema definition, Processing single tables, Processing multiple tables.

**SECOND YEAR**  
**PAPER - III (PRACTICAL)**  
**DATABASE**

**Marks : 60**

**Unit - I**

**Writing Basic SQL SELECT Statements**

Basic SELECT Statement, Selecting All Columns, Selecting Specific Columns, Writing SQL Statements, Column Heading Defaults, Arithmetic Expressions, Using Arithmetic Operators, Operator Precedence, Using Parentheses, Defining a Null Value, Null Values in Arithmetic, Expressions, Defining a Column Alias, Using Column Aliases, Concatenation Operator, Using the Concatenation Operator, Literal Character Strings, Using Literal Character Strings, Duplicate Rows, Eliminating Duplicate Rows,

**Unit - II**

**Restricting and Sorting Data**

Limiting Rows Using a Selection, Limiting the Rows Selected, Using the WHERE Clause, Character Strings and Dates, Comparison Conditions, Using Comparison Conditions, Other Comparison Conditions, Using the BETWEEN Condition, Using the IN Condition, Using the LIKE Condition, Using the NULL Conditions, Logical Conditions, Using the AND Operator, Using the OR Operator, Using the NOT Operator, Rules of Precedence, ORDER BY Clause, Sorting in Descending Order, Sorting by Column Alias, Sorting by Multiple Columns.

**Unit - III**

**Single-Row Functions**

SQL Function, Two Types of SQL Functions, Single-Row Functions, Single-Row Functions, Character Functions, Character Functions, Case Manipulation Functions, Using Case Manipulation Functions, Character-Manipulation Functions, Using the Character-Manipulation Functions, Number Functions, Using the ROUND

Function, Using the TRUNC Function, Using the MOD Function, Working with Dates, Arithmetic with Dates, Using Arithmetic Operators with Dates, Date Functions, Using Date Functions, Conversion Functions, Implicit Data Type Conversion, Explicit Data Type Conversion,

#### **Unit - IV**

##### **Displaying Data from Multiple Tables**

Obtaining Data from Multiple Tables, Cartesian Products, Generating a Cartesian Product, Types of Joins, Joining Tables Using Oracle Syntax, Retrieving Records with Equijoins, Qualifying Ambiguous Column Names, Using Table Aliases, Joining More than Two Tables, Non-Equijoins, Retrieving Records with Non-Equijoins, Outer Joins Outer Joins LEFT OUTER JOIN, RIGHT OUTER JOIN, FULL OUTER JOIN

#### **Unit - V**

##### **Aggregating Data Using Group Functions**

What Are Group Functions?, Types of Group Functions, Group Functions Syntax, Using the AVG and SUM Functions, Using the MIN and MAX Functions, Using the COUNT Function, Using the DISTINCT Keyword, Group Functions and Null Values, Creating Groups of Data, Creating Groups of Data: The GROUP BY Clause, Using the GROUP BY Clause, Grouping by More Than One Column, Using the GROUP BY Clause on Multiple Columns, Illegal Queries Using Group Functions, Excluding Group Results, Excluding Group Results: The HAVING Clause, Using the HAVING Clause, Nesting Group Functions.

#### **Unit - VI**

##### **Manipulating Data**

Data Manipulation Language, Adding a New Row to a Table, The INSERT Statement, Inserting New Rows, Inserting Rows with Null Values, Inserting Special

Values, Inserting Specific Date Values, Creating a Script, Copying Rows from Another Table, Changing Data in a Table, The UPDATE Statement Syntax, Updating Rows in a Table, Updating Two Columns with a Subquery, Updating Rows Based on Another Table, Updating Rows: Integrity Constraint Error, Removing a Row from a Table, The DELETE Statement, Deleting

### **Unit - VII**

#### **Creating and Managing Tables**

The CREATE TABLE Statement, Referencing Another User's Tables, The DEFAULT Option, Creating Tables, Tables in the Oracle Database, Data Types.

### **Unit - VIII**

#### **Including Constraints**

Defining Constraints, NOT NULL Constraint, UNIQUE Constraint, PRIMARY KEY Constraint, FOREIGN KEY Constraint, CHECK Constraint, Adding a Constraint Syntax, Adding a Constraint

**SECOND YEAR  
PAPER IV (THEORY)  
COMPUTER NETWORK**

Marks ; 40

**Unit - I**

**Introduction to computer Networks:** Data communication components. What is computer network, uses and application of networks, types of connection between devices in a network. Types of networks: LAN, MAN, WAN, satellite network.

**Unit - II**

**Transmission Terminology:** Transmission Mode (simplex, half duplex, full duplex), digital and analog data, transmission media and its characteristics, twisted pair wire, co-axial cables, optical fibers networks. Network devices: Hub, switch, gateway, router, bridge, repeaters, multiplexer, de-multiplexer, multiplexing, modem, Network topology.

**Unit - III**

**Introduction to Internet:** History, Services, applications and architecture of Internet, WWW, Websites, Web Pages, Search Engine, E-mail, FTP, facsimile, EDI talk, OSI model. Web browsers: Mosaic, Netscape navigator, Google Chrome, Mozilla Firefox and Microsoft Internet explorer.

**Introduction to HTML:** Creation of web page.

**Unit - IV**

**Network Safety Concern:** Network security tools and services, cyber security, Virus, Worm, Trojan, Anti-Virus, Social networking and safe practices on social networks.

**Web-based application:** E-Commerce, E-Governance, OLAP, Safety issue in web based applications.

**SECOND YEAR  
PAPER- II (PRACTICAL)  
NETWORKING**

**Marks : 60**

**Units**

1. Study of Hardware Component used in Networking.
2. Crimping of UTP Cable, Patch Panel Punching, Junction I/O Boxes.
3. Installation of Network Interface Card (NIC).
4. Peer-to-Peer Networking & Working in Peer-to-Peer Environment.
5. Sharing Resources, Accessing Shares and Share Level Security.
6. Troubleshooting (Cable Connectivity, Upgrading NIC Driver Software).
7. Installation of Wireless Devices -LAN Card, Router, Access Point.
8. Identifying valid IP Addresses, Defining Subnet Ids and Host Ids.
9. Using TCP / IP Utilities & Commands (PING, IPCONFIG, HOSTNAME, ROUTE)
10. Study of TCP/IP Configuration Settings on Windows XP System

# **ELECTRICAL DOMESTIC APPLIANCES (EDA)**

**FIRST YEAR**

**(Paper-I) Theory**

**(Basic Electrical Engineering)**

**Marks: 40**

## **UNIT- I**

### **Current Electricity**

Electricity as a source of energy, Definition of Resistance, Voltage, Current, Power, Energy and their units, Relation between electrical, mechanical and thermal units, Factors affecting resistance of a conductor, Temperature co- efficient of resistance, Difference between AC and DC voltage and current.

### **D.C. Circuit**

Ohm's Law. Series - parallel resistance circuits, calculation of equivalent resistance, Kirchhoff's Laws and their applications.

### **Electric Cells**

Primary cell, wet cell, dry cell, battery, series and parallel connections of cells, Secondary cells, Lead Acid Cell, Discharging and recharging of cells, common charging methods, preparation of electrolyte, care and maintenance of secondary cells.

## **UNIT- II**

Capacitor and its capacity, Concept of charging and Discharging of capacitors, Types of Capacitors and their use in circuits, Series and parallel connection of capacitors, Energy stored in a capacitor.

### **Heating and Lighting (Illumination) Effects of Current**

Joule's Law of electric heating and its domestic applications, heating efficiency, lighting effect of electric current, filaments used in lamps, and gaseous discharge lamps, their working and applications.

Laws of Illuminations, terminology used, Illumination factors intensity of light - importance of light human eye factor, units. Types of illumination. Type of lamps -

Neon sign Halogen, Mercury vapour, sodium vapour, Fluorescent tube, CFL, LED, Solar lamp & photo cell applications, Decoration lighting, Drum Switches, efficiency in lumens per watt, Calculations of lumens.

### **UNIT-III**

#### **Electromagnetic Effects:**

Permanent magnets and Electromagnets, their construction and use, Polarities of an electromagnet and rules for finding them. Faraday's Laws of Electromagnetic Induction, Dynamically induced e.m.f., its magnitude and induction, Static induction, self-induced e.m.f., its magnitude and direction, inductance and its unit. Mutually induced e.m.f., its magnitude and direction, Energy stored in an inductance.

Force acting on a current carrying conductor in magnetic field, its magnitude and direction, Torque produced on a current carrying coil in a magnetic field.

### **UNIT-IV**

#### **A.C Circuits**

Generation of a.c. voltage, its generation and wave shape. Cycle, frequency, peak value (maximum value), average value, instantaneous value, r.m.s. value, form factor, crest factor, phase, phase difference, power and power factor, A.C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance, Q factor of R.L.C. series circuits.

#### **Polyphase Circuits**

Generation of three phase voltage, phase sequence, Numbering of phases, Interconnection of phases, Star and Delta connection, Voltages and currents in star and Delta connection, Comparison of Star and Delta connection. Power in three phase system.

**FIRST YEAR**  
**(Paper-I) Practical**  
**(Basic Electrical Engineering)**

**Marks: 60**

**Units**

1. Verify that resistance of conductor is directly proportional to resistivity and length and inversely proportional to cross-sectional area of the conductor.
2. Verification of Ohm's Law.
3. Verification of temperature co-efficient of resistance: (i) Positive for Tungsten and Nichrome and (ii) Negative for carbon
4. Study of series resistive circuits.
5. Study of parallel resistive circuits.
6. Study of series and parallel connection of cells in circuits.
7. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer
8. To find heat efficiency of an electric kettle
9. Charging and Discharging of a capacitor
10. Verification of magnetic field of a Solenoid with (i) Iron core and (ii)
11. Verification of Faraday's Laws of electromagnetic induction.
12. Verification of Torque development in a current carrying coil in magnetic field
13. Study of R.L. series circuit and measurement of power and power factor
14. Study of R.C. series circuit and measurement of power and power factor
15. Study of R.L.C. series circuit and measurement of power and power factor
16. Study of R.L.C. series circuit for calculation of inductive reactance, capacitive reactance, impedance and Q-Factor.
17. Connection of fluorescent tube-light circuit.
18. Test and repair of (i) table lamp (ii) fluorescent tube-light

**PRACTICAL MARKS DISTRIBUTION**

| <b>Parameters</b>                                   | <b>:</b> | <b>Marks</b> |
|---|----------|--------------|
| Project / Practical Activities                      | :        | 15           |
| Viva  | :        | 10           |
| Practical Record                                    | :        | 10           |
| Demonstration of Skill Competency in lab Activities | :        | 25           |
| <b>Total</b>  |          | <b>60</b>    |

**FIRST YEAR  
(Paper-II) Theory  
(Engineering Science)**

**Marks: 40**

**UNIT- I**

**Dimensioning Techniques**

Necessity of techniques, methods holes, irregular figures, scales. and principles, dimensioning of chamfered portions, hatched figures, countersunk

**Principles of Projections**

Third angle projections- principles of orthographic projections, three views of given object, six views, exercise in auxiliary views, centre line and extension line.

**Sections**

Importance, methods of representing, conventional sections of various materials, classification of sections, conventions.

**UNIT-II**

**Pictorial and Isometric views**

Isometric axis, oblique drawing axonometric views, pictorial view from two or three views, isometric views (introduction) and exercise, conical projections, tracing, blue printing and ammonia printing.

**Electrical Engineering Drawing**

Schematic and wiring diagram for domestic simple wiring, symbols used for different electrical devices and equipments.

**Working Drawing / Details and Assemble**

Principles of detailed and assembly drawing, detailed working drawing by actual measurement of a job already prepared practical exercise in drawing from detailed assembly and vice versa using actual job prepared in workshop.

**UNIT-III**

**Insulating Materials**

What is insulating materials ?, Insulation resistance, Di-electric strength, Breakdown voltage, Classification of insulating materials on the basis of operating

temperature, PYC, Porcelain, Mica, Bakelite, Asbestos, Transformer oil, Air as insulating materials, their properties and uses.

### **Soldering and Brazing**

General characteristics of soldering, brazing joints, processes and their characteristics, brief description of soldering and brazing tools equipment, types of solders and fluxes and their uses, soldering defects and their remedies, brazing materials, advantages and disadvantages of soldering and brazing.

### **Measuring instruments**

Construction and working principles of moving iron and moving coil voltmeters and ammeters, Dynamometer type wattmeter, Ohm meter, Megger and Induction type energy meter- their circuit connection and application for measurement of electrical quantities.

## **UNIT-IV**

### **Electrical Accessories**

Common electrical accessories, their specifications, Explanation of switches, lamp holders, plugs and sockets. Developments of domestic circuits. Alarm and switches, with individual switches, Two way switch. Security surveillance, fire alarm, MCB, MCCB, ELCB and fuses.

### **Electrical Wiring (Domestic & Industrial)**

Types of domestic wiring- Cleat wiring, casing and capping, C.T .. / T.R.S. wiring, metal sheath wiring. conduit wiring and concealed wiring - their procedure.

Factors of selection of a particular wiring system, Importance of switch, fuse and earthing of wiring system, types of faults, their causes and remedies

Industrial Wiring- Code of practice and relevant span. Wiring of electric motors, Control panel, Contactors etc.

Types of earthing- Plate Earthing and Pipe Earthing, their procedure and application. Methods of finding numbers of circuits and circuit distribution by distribution board system, Loop in system of wiring connections IE Rules related to wiring.

*BIS regulations, recommendations and NE pertaining to wiring installation IE regulation related to Earthing.*

**FIRST YEAR  
(Paper-II) Practical  
(Engineering Science)**

**Marks: 60**

**Units**

1. Fitting Shop: Introduction to tools and measuring instruments, their safe keeping, safety precautions, practical exercises involving sawing, fitting, marking, squareness, chipping.
2. Description of work bench, work holding devices, care and maintenance of various tools used in fitting, fitting practice, checking by straight edge and tri square, specifications of files, precautions while filing, jobs on drilling and tapping.
3. Sheet Metal Shop: Description of tools and operations involved in sheet metal fabrication such as shearing, bending, joining (locked grooves, joint, riveting, soldering, brazing, exercise) like tray mug, funnel etc.
4. Measurement of resistance by ammeter and voltmeter method and Ohm meter.
5. Identification of insulating materials.
6. Calibration of ammeter, voltmeter and wattmeter with the help of standard meters.
7. Calibration of single phase energy meter with the help of standard wattmeter and stop watch.
8. Controlling lamps in series, parallel and series parallel
9. Controlling lamp from two or three places (Stair case wiring and godown wiring)
10. Drawing schematic diagram to give supply to consumers
11. Practice on casing and capping wiring
12. Practice on cleat wiring
13. Practice on CTS / TRS wiring
14. Practice on metal sheet weather proof rigid PYC wiring
15. Practice on conduit wiring
16. Practice on concealed wiring \

17. Measurement of insulation resistance of wiring installation by megger
18. Polarity test of wiring installation
19. Testing of wiring installation
20. Installation of pipe earthing for wiring installation
21. Installation of plate earthing for wiring installation
22. To prepare series test board
23. Fixing of switches, holder, plugs etc. In PVC & NANO board.
24. Testing of earth leakage by ELCB and relay.
25. Measurement of earth resistance by earth tester.
26. To fit MCB in a circuit in place of fuse.

**SECOND YEAR  
(Paper-III) Theory  
(Electrical Machines)**

**Marks: 40**

**UNIT- I**

**Single phase Transformer**

Working principles and Construction, Components, auxiliary parts i.e breather, conservator. buchholze relay, other protective devices. Types of transformer - step-up and step-down transformer, voltage and current transformer, auto- transformer. Applications of different types of transformers, rewinding of transformers, cooling of transformers.

**UNIT-II**

**D.C. Machines**

General concept of electrical machines i.e Generator and Motor. D.C. Generator- working principle & emf equation, construction- Armature, field coil, polarity, yoke, cooling fan, commutator, slipring, brushes, laminated core etc.

Types of motor - series, shunt, compound and universal, construction, working principles, characteristics, winding details and applications of different types of motors including fractional horse power, starting and starters for D.C Motors. Installation of D.C motor and testing, speed reversal and speed control of D.C motors, Common faults, their causes, testing and repairs.

## UNIT-III

### Three Phase Induction Motor

Working principle -Production of rotating magnetic field, Squirrel Cage Induction motor, Slip-ring induction motor. Construction, characteristics and Speed control, Slip & Torque. Control & Power circuit of starters D.O.L Starter, Star *Delta* starter, Autotransformer starter, Rotor resistance starter, etc Single phasing preventer. Losses & efficiency. Application of Induction Motor Care, Routine & preventive maintenance.

### Common Hand Tools 4

Familiarizing the students with common hand tools, safe and proper use of tools, their adjustment and applications, crimping and crimping tools.

## UNIT- IV

### Single Phase A.C. Motors

Types of A.C Motors - induction motor (Split phase and repulsion start), Capacitor motor, shaded pole motor, universal motor, construction, working principles, special characteristics, winding details and applications of different types of fractional horse power motors. Starting and starters for different motors. Speed reversal and speed control of A.C Motors, Installation of A.C motor and testing, common faults, their causes, testing and repairs, Rewinding of fractional h.p. motors.

**SECOND YEAR**  
**(Paper-III) Practical**  
**(Electrical Machines)**

**Marks: 60**

**Units**

1. To test and repair a defective cycle dynamo.
2. Dismantling, study and reassembling of a D.C motor.
3. Measurement of resistance of series, shunt field and armature of a given D.C motor and identification of terminals by multi meter.
4. Measurement of insulation resistance of armature and field.
5. Testing, fault finding and repair of a d.c. motor.
6. Overhauling of a d.c. motor.
7. Dismantling, study and reassembling of a d.c. motor starter.
8. To study d.c. series motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
9. To study d.c. shunt motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
10. To study d.c. compound motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
11. To study d.c. universal motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
12. Identification of common hand Tools.
13. Study of (i) Voltage transformer, (ii) Current Transformer and (iii) Auto-Transformer.
14. To rewind the given 230/112 v transformer.
15. Dismantling, study and reassembling of an A.C motor.

16. Overhauling of an AC motor
17. Dismantling, study and reassembling of an AC motor starter.
18. Testing, fault finding and repair of an AC motor starter
19. Connecting, starting, running and reversing of a 3 phase squirrel cage induction motor.
20. Connecting, starting, running of a shaded pole motor.
21. Connecting, starting, running and reversing of a capacitor start/run motor.
22. Connecting, starting, running and reversing of an AC Universal motor.
23. Installation of D.C motor.
24. Installation of AC motor.
25. Study of DOL / Star-Delta / Auto-transformer / Rotor resistance starter for starting 3 phase induction motor.

**SECOND YEAR**  
**(Paper-IV) Theory**  
**(Electrical Appliances)**

**Marks: 40**

**UNIT- I**

**Electric room heater**

Construction and working principle of reflector type room heater, common defects, testing and repairs.

**Electric iron**

Types of electric iron - ordinary type and automatic/thermostat control type - construction and working principles of electric irons. Common defects testing and repairs.

**Electric stove**

Types of electric stoves- coiled type, covered type, hot plate, grill/oven, cooking range - construction and working principle of electric stoves. Common defects, testing and repairs. Induction heater, OTG & microwave oven.

**Electric toaster**

Types of toasters - ordinary and automatic. Construction and application of Bimetallic Relay and Thermocouples for control of temperature and current.

**Bimetallic Relay and Thermocouple**

Construction and application of Bimetallic Relay and Thermocouples for control of temperature and current

## **UNIT-II**

### **Immersion heater and geyser**

Construction, working principle and use of immersion heater. Common faults - their causes, testing and repairs. Construction, working principles and use of geyser and thermostat, common defects, their causes, testing and repairs. Testing and installation of geyser. Precautions in using immersion heater and geyser.

### **Electric kettle and coffee percolator**

Working principle and use of electric kettle (all types) and coffee percolator. Common faults, their causes, testing and repair.

### **Electric fans**

Types of fans - ceiling fan, pedestal fan, table fan, bracket fan, exhaust fan, construction, working principles. Characteristics and applications of electric fans. Common faults, their causes testing and repairs, installation of all purpose fan and exhaust fan.

### **Electric Mixer, grinder and blender**

Construction, working principles, characteristics and applications of electric mixer, grinder and blender. Common faults, their causes, testing and repairs, Servicing, maintenance and over.

## **UNIT- III**

### **Hair dryer/curler**

Construction and working principles of hair dryer/curler, Common faults, their causes testing and repair.

### **Vacuum Cleaner**

Construction and working principles of vacuum cleaner, common faults, their causes, testing and repair.

### **Electric Bell**

Calling bell, buzzer, alarms, their Construction, Common faults, testing and repair.

### **Electric washing machine**

Construction, working principle of ordinary, semi-automatic & fully automatic, special features and applications of washing machine, Common faults, their causes, testing and repair, Repairing, servicing, maintenance and overhauling of washing machine.

### **Room Cooler**

Construction and working details of room cooler, desert cooler, Common cooler faults, their causes, testing and repair, Installation of room cooler/desert cooler.

## **UNIT-IV**

### **Emergency light and voltage stabilizer**

Construction and working principles of emergency light and voltage stabilizer (manual and automatic), Common faults - their causes, testing and repair.

### **Electric hand drill**

Construction and working principles of electric hand drill, common faults, their causes, testing and repair

### **Basic Occupational and safety Practices:**

Safety signs, lighting and handling loads, moving heavy equipments, Electrical safety- safety practices- first aid, Practice safe methods- lifting and handling of heavy objects, Rescue a person from live wire, Artificial respiration- Nelson's arm and Schafer's Method. Hazard identification and avoidance, use of fire extinguishers.

**SECOND YEAR**  
**(Paper-IV) Practical**  
**(Electrical Appliances)**

**Marks: 60**

**Units**

1. Dismantling reassembling of reflector type room heater.
2. Testing and repair of reflector type room heater.
3. Dismantling and reassembling of electric iron (i) Ordinary type and (ii) Automatic thermostat control type.
4. Testing and repair of electric iron (i) ordinary type and (ii) automatic/thermostat control type.
5. Dismantling and reassembling of electric stove (i) coiled type, (ii) covered type- (a) Hot plate, (b) grill or hot case.
6. Testing and repair of electric stove (i) coiled type, (ii) covered type - (a) hot plate, (b) grill or hot case
7. Dismantling and reassembling of cooking range/oven.
8. Testing and repair of cooking range/oven.
9. Dismantling and reassembling of electric roaster: (i) Ordinary, (ii) semi automatic, (iii) automatic with thermostat.
10. Testing and repair of electric roaster: (i) Ordinary, (ii) semi automatic, (iii) automatic.
11. Dismantling and reassembling of geyser: (i) instant, (ii) storage.
12. Testing and repair of geyser: (i) storage, (ii) instant.
13. Dismantling and reassembling of electric kettles (all types) and coffee percolator.
14. Testing and repair of: (i) electric kettle (all types) and (ii) coffee percolator.
15. Testing and repair of: (i) electric bell, (ii) buzzer, and (iii) door chim
16. To connect fan regulator with a ceiling fan.
17. Identification of faults of wiring, installation and rectification.
18. Testing, fault finding, repair and overhauling of blower type room heater and heat connector.
19. Testing, fault finding, repair and overhauling of electrical fans.

20. Testing, fault finding, repair and overhauling (i) electric mixer, (ii) grinder, and (iii) blender.
21. Testing, fault finding, repair and overhauling of washing machine.
22. Testing, fault finding, repair and overhauling of Hair Dryer.
23. Testing, fault finding, repair and overhauling of room cooler/desert cooler.
24. Testing, fault finding, repair and overhauling of vacuum cleaner.
25. Testing, fault finding, repair of emergency light and voltage stabilizer (manual and automatic).
26. Testing, fault finding, repair and overhauling of electric hand drill machine.
27. Artificial respiration and shock treatment.
28. Technique of removing persons in contact with live wire suffering from electric shock.
29. To test the given fan with the help of Megger insulation resistance tester for: (i) Insulation resistance between body of the fan and winding. (ii) Continuity of windings - starting and running.
30. To study emergency light circuit.

### **PRACTICAL MARKS DISTRIBUTION**

| <b>Parameters</b>                                   | <b>:</b> | <b>Marks</b> |
|---|----------|--------------|
| Project / Practical Activities                      | :        | 15           |
| Viva  | :        | 10           |
| Practical Record                                    | :        | 10           |
| Demonstration of Skill Competency in lab Activities | :        | 25           |
| <b>Total</b>  |          | <b>60</b>    |

**PARAMEDICAL HEALTH CARE (PHC)  
AND  
MEDICAL LABORATORY TECHNIQUES (MLT)  
First Year  
PAPER – 1**

**Theory - 40**

**Unit - I : Human Anatomy**

❖ Introduction to Anatomy

- Different parts of Human Body,
- Anatomical position, Directional terms, Common anatomical places
- Systemic and regional anatomy

❖ Histology

- Typical animal cell-structure and functions
- Tissues of the body classification and function

❖ Skeletal System

- Bones of the skull, vertebral column, shoulder girdle, thoracic cage and pelvic girdle
- Bones of the limbs
- Joints and movements

❖ Muscular system

- Types of muscles
- Principle muscles of the body; tendons, fascias

**Unit - II : Nervous system**

- Central nervous system, Brain meninges, CSF, Spinal cord
- Peripheral nervous system cranial, spinal nerves system,
- autonomic nervous system

- Sympathetic and para sympathetic
- ❖ Cardiovascular system
  - Heart
  - Blood Vessels
- ❖ Lymphatic and RE system, Spleen
- ❖ Respiratory system
  - Nose, Pharynx, Larynx, Tonsils
  - Trachea, Bronchi
  - Lungs and Pleura
- ❖ Alimentary System
  - Mouth and Oesophagus,
  - Stomach,
  - Pancreas, liver and gall bladder
  - Intestines, peritoneum
- ❖ Urinary system
  - Kidneys
  - Ureter, urinary bladder and urethra
- ❖ Reproductive System
  - Male genital system
  - Female genital system and accessory organs
- ❖ Skin
- ❖ Special Senses
  - Eye and vision
  - Ears and hearing equilibrium
  - Taste, Smell, General Sensibility Viz. touch etc. surface anatomy'

### **Unit - III : Head and neck**

- Thorax{Heart and lungs) and abdomen (Stomach, Spleen liver, kidney and bladder)
- Places and regions of abdomen and location of different organs in stomach
- Surface marking of important blood vessels, nerves and muscles for injection

### **Unit-IV : Human Physiology**

#### ❖ Blood

- Composition and general functions of blood
- Description of blood cells- normal counts and functions steps of coagulation
- Anticoagulants
- Cerebrospinal fluid, formation, composition and function, Blood groups ABO and RH basis for classification, importance of blood groups, compositions and functions of lymph

#### ❖ Respiratory System

- Name and structures involved in respiration and their function. External and internal respiration
- How inspiration expiration are brought about
- Transport of O<sub>2</sub> and CO<sub>2</sub> in the blood
- Definition of respiratory rate, Tidal volume, vital capacity
- Hypoxia

❖ Excretory System

- Functions of kidney
- Nephron - functions of glomerulus and tubules, Composition of Urine, normal and abnormal

❖ Skin

- Functions of skin

❖ Digestive Systems

- Composition and functions of saliva, mastication and deglutition
- Functions of stomach, composition of gastric juice, pancreatic juice
- Bile and success enteritis
- Digestion of food by different enzymes, absorption and defecation

❖ Endocrine - glands

- Definition of endocrine gland, name of the endocrine glands and the hormones secreted by them
- Major actions of each hormone
- Reproductive system
- Name of primary and accessory organs in male and female
- Name of secondary sexual characters in male and female
- Functions of ovary-formation of ova, actions of ovarian hormones, Menstrual cycle
- Function of Testis - Spermatogenesis and actions of Testosterone, Fertilisation
- Vasectomy and Tubectomy

**PARAMEDICAL HEALTH CARE (PHC)  
AND  
MEDICAL LABORATORY TECHNIQUES (MLT)**

**FIRST YEAR**

**Paper - I Practical**

**Marks : 60**

**Units**

- Exhibition of Human Anatomy and identification report.
- Cleansing of glasswares (Pipettes, slides, and cover slips, syringes and needles, blood cell diluting pipettes, glassware used for bacteria investigation)
- Making simple glass items in the laboratory (pasteur pipette, stirring bending glass and preparing a wash bottle)
- Demonstration of use and care of instruments, cautions precautions to be taken
- Demonstration of safety measures during work in laboratory in various fields

**PARAMEDICAL HEALTH CARE (PHC)  
AND  
MEDICAL LABORATORY TECHNIQUES (MLT)  
Paper – II (Theory)**

**Marks : 40**

**Unit-I : Laboratory Management and Ethics**

- ❖ Role of laboratory in health care deliver
  - General
  - Human health and diseases
    - Types of diseases
    - Process of diagnosis
  - Laboratory at different level
  - Duties and responsibility of laboratory persons
- ❖ Laboratory services in the health delivery system
  - Laboratory service in India
  - The health administration system in India
    - At the National level
    - At the state level
    - At the district level
    - At the village level
    - Voluntary health organisations in India
    - Health programmes in india

**Unit - II : Laboratory Planning**

- General principles
- Laboratory goals

- Operational data
  - Market potential
  - Hospital/laboratory relatives
  - Competitions
  - Laboratory trends

### **Unit - III : Planning at different levels**

#### ❖ Hospital laboratory services

- Factors
- Guiding principles for planning
- Functions criteria
- Operational demand
- Sections of a hospital laboratory
- Common areas
- Design aspect
- Space requirement

#### ❖ Planning for 3 basic health laboratory

### **Unit - IV**

- Health and Sanitation
- Disease Prevention & Community Organisation

**PARAMEDICAL HEALTH CARE (PHC)  
AND  
MEDICAL LABORATORY TECHNIQUES (MLT)**

**Paper – II (Partical)**

**Marks : 60**

**Units**

- Demonstration of safe handling of specimens and infections agents including HBs Ag (Hepatitis) and AIDs (HIV)
- Specimen handing collection, preservation, transportation, disposal
- Laboratory safety and First Aid
- Biomedical waste Treatment.
- Computer application
- Study of Community Health Awareness programme (Any Five Programmes)

**PARAMEDICAL HEALTH CARE (PHC)  
AND  
MEDICAL LABORATORY TECHNIQUES (MLT)**

**Second Year  
Paper – III (Theory)**

**Theory - 40**

**Unit-I  
Biochemistry**

**Unit - I : Inorganic and physical aspects of biochemistry, structure of atoms,  
symbol, valency and formula**

- Chemical units- Atomic weight, molecular weight, gram mole  
Equivalent weight, gram equivalent
- Fundamental laws of Chemistry
- Acids, bases and salts
- Hydrogen concentration and pH Measurement - Indicators and pH  
meter
- Buffers, preparation
- Solutions - solute and solvent, saturated solutions, solubility Temp.  
effects
- Concentrations of solutions in different ways viz molar normal  
percentage etc.
- Simple qualitative analysis - captions Anions
- Volumetric (Titrimetric) analysis
- Primary and secondary standards
- Acid-base titrations, permanaganometry
- Rules in volumetric analysis
- Isotopes definition/examples/uses

**Unit - II : Chemistry of Biomolecules - carbohydrates, lipids, amino-acids, proteins, nucleic acids, Vitamins**

- ❖ Isotopes

**Unit - III : Clinical Biochemistry**

- Bioenergetics - Respiratory Chain, Oxidative, Phosphorylation
- Overview of Metabolism
- Carbohydrate Metabolism
  - Glycolysis and TCA cycle
  - Blood glucose homeostasis
  - Measurement of blood glucose
  - Glycosuria, Diabetes mellitus
- Lipid Metabolism
  - Cholesterol
  - Triglycerides
  - Lipoproteins
  - Ketone bodies - formation, ketosis, ketonuria
- Amino acid & Protein metabolism
  - Urea synthesis - uremia
  - Other non operation nitrogenous compound like vaginate uvicacid
  - Biochemical veactions of aminoacids Transamination, deamination
  - Synthese of physiologically important substances from aminoacids

**Unit - IV**

- Metabolic inter-relationships
- Principles of inborn errors of metabolism
- Water, Na+K=and Cl, Bicarbonates, Acid Base Balance, calcium and Phosporous
- Role and iron, Iodine and other Trace elements

**PARAMEDICAL HEALTH CARE (PHC)  
AND  
MEDICAL LABORATORY TECHNIQUES (MLT)**

**Paper - III (Practical)**

Marks : 60

- Visit of a pathological laboratory and submission of a report analysis of pathologic test with the help of a computer
- Analysis of CBC, Lipid Profile, Vitamin D, Calcium

**PARAMEDICAL HEALTH CARE (PHC)  
AND  
MEDICAL LABORATORY TECHNIQUES (MLT)**

**Paper – IV (Theory)**

**Marks : 40**

**Unit - I General Principles of Laboratory Technology**

- Role of laboratory in health care delivery - human health and diseases
- Role of laboratory in diagnosis of disease in health delivery system
  - Duties and responsibility of laboratory personal
- Laboratory services in the health delivery system in India
- Laboratory planning
  - General principles
  - Laboratory goals
  - Operational date
  - Guiding principles for planning hospital laboratory services particularly for basic health laboratory

**Unit – II : Laboratory organization**

- General principles
- Components and functions of a laboratory
- Staffing the laboratory
- Job description- job specifications
- Work schedule- personal rearrangement and work load assessment
- Care of laboratory glassware, equipments and chemicals verbal
- Different types of glassware and plastic ware
  - Care and cleaning of glass wares
  - Making simple glasswares in the laboratory
  - Care of equipments and apparatus
  - Laboratory chemicals, their proper use and care, storage
  - Labeling
- Specimen handling

- Collection techniques and containers for specimen collection
- Types of specimen
  - Entry, handling
  - Specimen transport
  - Specimen disposal
  - Specimen preservation

### **Unit – III : Laboratory safety**

- General principles
- Laboratory hazards
- Safety programme
- First aid
- Safety measure - mechanical, electrical, chemical, Biological & radioactive
- Communication: Personnel Development and Relations, general principles
  - Inter/intra departmental communications request/report forms
- Basic Principles of quality control
  - General Principles
  - Non-analytical functions
  - Request specifications
  - Specimen specification
  - Distribution of tests
  - Analytical function
  - Methods, equipment, reagents and material controls, proficiency testing

- Materials management
- General principles
- Basic Medical Nursing

**Unit. IV : Clinical Pathology**

- Urine analysis
  - Physical, Chemical, Microscopic
- Faecal analysis
  - Physical
  - Chemical- Occult blood exam.
  - microscopic
- Sputum analysis - physical and microscopic
  - Seminal Fluid analysis
  - Examination of aspiration fluid
    - Ascitic fluid
    - Pleural fluid
    - CSF
    - others
- Pregnancy tests

**PARAMEDICAL HEALTH CARE (PHC)  
AND  
MEDICAL LABORATORY TECHNIQUES (MLT)**

**Paper – IV Practical**

**Marks : 60**

**Units**

- Routine analysis of urine
- Examination of sputum
- Seminal fluid analysis
- Analysis of aspiration fluid
- Pregnancy test - urine for HCG
- FISH – Fluorescence in Sites hybridization
  - PCR – Polyclonal Chain reaction
  - CD41CD8 Level
  - Flow Cytometry
  - Immuno histochemistry (IHC)
  - ELISA
  - Electrophoresis
    - ❖ Hb
    - ❖ Serum

**MICROBIOLOGY AND SEROLOGY**  
**First Year**  
**Paper - I Theory**

**Marks : 40**

**Unit – I**

- **Introduction of Microbiology**
  - History, scope and definition
  - Microbes and their classification
  - Bacteria
  - Nutritional and growth requirements
  - Bacterial genetic & drug resistance
  - Bacterial infection and pathogen city
  - Culture media, their preparations & uses

Culture methods and identification of bacteria.

- Collection of clinical specimens for microbiological investigations.
- Sterilisation and disinfection :  
(Physical, Chemical and Mechanical Methods, Sterilisation of syringes, glasswares etc. and disposal of contaminated media and other materials)

**Unit – II**

**Laboratory Investigation in Bacteriology**

- Uses of common laboratory equipments
- Different microscopes incubator, Refrigerators & Deep Freeze, Hot air oven, autoclave, Inspissator, Incinerator, Bacterial filter, water bath, VDRL rotator, anaerobic Jar Centrifuge, Vacuum Pump, media pouring chamber, Elisa reader etc.

- Methods of laboratory investigations
- Study of morphology  
(Hanging drop preparation and various staining procedures simple, differential and special stains)
- Different techniques of inoculation into culture media, sub-culture and maintenance of stock culture.
- Anaerobic cultivation
- Culture of various clinical specimens in the Laboratory
- Isolation and identification of Bacteria  
(Culture Characters, biochemical reactions, serotyping and special tests)
- Antimicrobial sensitivity tests
- Study of epidemiology and use of transport media
- Bacteriological examination of water and milk etc.

### Unit – III

#### (a) Systemic Bacteriology

- Cocci : Gram positive (Staphylococci, Streptococci Pneumococci etc.), Gram negative (Neisseria group –Gonococci, Meningococci)
- Bacilli : (Gram positive and gram negative bacilli)
  - ❖ Corynebacterium
  - ❖ Clostridium
- Nonsporing anaerobes
  - ❖ Enterobacteriaceae  
(E. coli, Klebsiella & Coliforms, Proteus, Salmonella, Shigella etc.)
- Pseudomonas

- Pasteurella, Yersinia, francisella
- Haemophilus Bordetella & Bovcella (Mycobacteria, tuberculosis, M Leprae etc.)
- Miscellaneous bacteria
- Spirochaets (Treponema, Leptospira and Borrelia etc.)
- Actinomycetes
- Rickettsiaceae
- Chlamydia

(b) Medical Mycology

- Classification & Morphology of common pathogenic fungi of medical importance and diseases produced by them
- Laboratory diagnosis including culture of pathogenic fungi.

**Unit –IV**

**Immunology and Serology :**

- Immunity – Basic principles & classification
- Structure & functions of Immunue system and Immune response
- Antigens, Antibodies (immunoglobulins) and complement system
- Antigen – Antibody reactions  
(Agglutination, Precipitation, Complement fixation Nutralisation etc. and their applications in the diagnosis of disease)
- Hypersensitivity (classification & skin tests used in diagnosis)
- Auto immunity
- Immunology of Transplantation malignancy
- Immunohaematology
- Immunodeficiency diseases including AIDS
- Immunoprophylaxis and Immunisation schedule  
(Vaccines classification & uses)

# **MICROBIOLOGY AND SEROLOGY**

**First Year**

**Paper - I Practical**

**Marks : 60**

## **Units**

- (i) Haematology
- (ii) Immunoheamatology
- (iii) Blood Transfusion
- (iv) Histotechnology

## **MICROBIOLOGY AND SEROLOGY**

### **First Year**

### **Paper- II Theory**

**Marks : 40**

#### **Unit – I**

#### **Parasitology**

- Introduction to Parasitology and classification of parasites of medical importance.
- Intestinal and tissue protozoa
- Malarial parasites
- Trypanosomes
- Leishmanial Parasites
- Tapeworms
- Flukes of liver, intestinal tract and lungs
- Schistosomes
- Intestinal nematodes
- Filarial worms and other tissue nematodes
- Insect vectors and medical importance  
(Flies, mosquitoes, fleas, bugs, lice, cockroaches) and Arachnids (ticks, mites, spiders, scorpions etc.)
- Zoonosis – their importance for human infections

## **Unit – II**

### **Virology**

- General characters of viruses, classification, virus culture and isolation procedures.
- Common viruses of medical importance
- DNA viruses  
(Pox viruses, herpes viruses, Adenoviruses, Papovaviruses etc.)
- RNA viruses  
(Toga viruses, Rotaviruses, Bunya viruses, Arboviruses, rhinoviruses, Rhabdoviruses, paramyxoviruses and orthomyxoviruses, Coronaviruses, retroviruses)
- Miscellaneous Viruses  
(RNA & DNA viruses – Hepatitis)
- Oncogenic viruses
- HIV viruses and AIDS
- Collection and Transport of Virological specimens
- Laboratory diagnosis of viral infections

## **Unit – III**

### **Clinical Microbiology**

- Collection and transport of clinical specimens
- Collection and preliminary processing of clinical specimens
- Diagnostic Microbiology an approach to laboratory diagnosis of various infective syndromes
- Normal microbial flora of the human body
- Bacteraemia, Pyaemia and Septicaemia

- Pyrexia of unknown Origin (P.U.O.)
- Respiratory tract infections (Sore throat, pneumonitis, Pulmonary tract infections)
- Wound Infections
- Meningitis
- Encephalitis
- Infective diarrhea
- Food poisoning
- Nosocomial infections
- Opportunistic infections

#### **Unit – IV**

##### **Animal Care**

- Handling, feeding and breeding of laboratory animals
- Maintenance of sanitation and cleaning of cages
- Common Animal Inoculation tests for diagnosis of diseases
- Procedures for drawing blood
- Post-mortem and safe disposals

# **MICROBIOLOGY AND SEROLOGY**

**First Year**

**Paper - II Practical**

**Marks : 60**

**Units :**

- (i) Parasitology
- (ii) Clinical Microbiology
- (iii) Virology
- (iv) Animal Care

# **MICROBIOLOGY AND SEROLOGY**

## **Second Year**

### **Paper - III Theory**

**Marks : 40**

#### **Unit – I**

##### **Histotechnology**

- (a) Introduction
- (b) Cell Tissues and their function
- (c) Methods of examination of tissues and cells

#### **Unit – II**

##### **Fixation of Tissue**

- (a) Classification of fixatives
- (b) Simple fixative and their properties
- (c) Tissue Processing
  - (i) Collection of specimen
  - (ii) Labelling and fixation
  - (iii) Dehydration
  - (iv) Clearing
  - (v) Impregnation
  - (vi) Embedding
- (d) Section Cutting
  - (i) Microtomes and microtome knives – sharpening of knife
  - (ii) Techniques of section cutting
  - (iii) Mounting of sections
  - (iv) Frozen section

- (e) Staining
  - (i) Dyes and their properties
  - (ii) Theory of staining
  - (iii) Staining techniques with haemotoyline and eosin
  - (iv) Mounting of sections
  - (v) Common special stains

### **Unit - III**

#### **Decalcification**

- (i) Fixation
- (ii) Decalcification
- (iii) Detection of end point
- (iv) Neutralization and processing

### **Unit - IV**

- (a) Exfoliative Cytology & Fine needle aspiration cytology
  - i. Types of specimens and preservation
  - ii. Preparation and fixation of smears
  - iii. Papanicolaous starting technique / MGG staining / HE
  - iv. Sex chromatin staining
- (b) Museum Techniques
  - (a) Reception of specimen
  - (b) Preparation of fixation
  - (c) Preservation
  - (d) Presentation
  - (e)
- (c) Autopsy techniques
  - (a) Assisting in autopsy
  - (b) Preservation of organs and processing of the tissue
- (d) Waste disposal and safety in laboratory

## **MICROBIOLOGY AND SEROLOGY**

### **Paper – III Practical**

#### **Units**

- (i) Fixation, staining
- (ii) Section cutting, mounting of sections
- (iii) Decalcification
- (iv) Exfoliative cytology

**MICROBIOLOGY AND SEROLOGY**

**SECOND YEAR**

**PAPER – IV THEORY**

**Marks : 60**

**Unit – I**

**Museum Study**

- (i) Necessity of Museum & Museum techniques
- (ii) Preservation & storage of specimen
- (iii) Arrangement & Display
- (iv) Proper care & maintenance

**Unit – II**

**Laboratory Management and Ethics**

- 1. Role of laboratory in health care delivery
  - (a) General
  - (b) Human health and diseases
    - (i) Types of diseases
    - (ii) Process of diagnosis
  - (c) Laboratory at different level
  - (d) Duties and responsibility of Laboratory persons
- 2. Laboratory services in the health delivery system in India
  - (a) Laboratory services in India

### **Unit – III**

#### **The health administration system in India**

- (a) At the national level
- (b) At the state level
- (c) At the district level
- (d) At the village level
- (e) Voluntary health organization in India
- (f) Health programmes in India

### **Unit – IV**

- (a) Laboratory Planning
- (b) Laboratory goals
- (c) Planning at different levels
- (d) Guiding principles for planning hospital laboratory services
- (e) Planning for 3 basic health laboratory

# **MICROBIOLOGY AND SEROLOGY**

## **Paper – IV Practical**

### **Units**

1. Necessity of Museum
2. Preservation and storage of specimen
3. Arrangement and display
4. Proper care and maintenance