

**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
2. Engineering Area
  - (viii) Audio Video Technique (AVT)
  - (ix) Building Maintenance (BM)
  - (x) Computer Technique
  - (xi) Repair & Maintenance of Electrical Domestic Appliances (EDA)

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

	Compulsory	1 <sup>st</sup> Year			2 <sup>nd</sup> Year	
1.	English	50 Marks			50 Marks	
2.	MIL	50 Marks			50 Marks	
3.	BFC – 300 Marks (any three subjects from the list) (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 (Any Two subjects from the list)	Trade Paper-I	Theory	40	Trade Paper II Theory	40
			Practical	60	Practical	60
		Trade Paper-III	Theory	40	Trade Paper IV Theory	40
			Practical	60	Practical	60

**E. Duration of the Examination & Periods required :**

	Marks	Duration
Theory	100 marks	3.00 Hrs
	70 Marks	3.00 Hrs
	60 Marks	
	50 Marks	2.30 Hrs
	40 Marks	2.30 Hrs
Practical		4.00 Hrs

Periods required for 100 marks      50 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 30<sup>th</sup> July by Post only.

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	(ii) Dairying	93
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**SYLLABUS FOR HIGHER SECONDARY EDUCATION IN ENGLISH  
FOR VOCATIONAL STREAM  
(2016 ADMISSION BATCH)**

**Full Mark : 50**

**+2 First Year (Detailed Syllabus)**

**Unit-I : Prose** **(20 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** **(20 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)**

- ii. Writing a Paragraph
- iii. Developing Ideas into Paragraphs
- iv. Writing Personal Letters and Notes
- v. Writing Applications, Official Letters and Business letters
- vi. Writing Telegrams, E-mails, Personal Advertisements, and Short Notices
- vii. Using Graphics

**(b) GRAMMER**

- ii. Countable and Uncountable Nouns
- iii. Tense Patterns

- iv. Modal Verbs
- v. Prepositions
- vi. 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 (20 Marks)**

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

**Unit -II : Poetry (20 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 : Writing Skills & Grammars (10 Marks)**

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

**MIL**  
**(ALTERNATIVE ENGLISH)**  
**FIRST YEAR**

**Unit -I Prose**

**(20 Marks)**

1. The Adventure of Learning
2. Men and Women
3. Modern Living
4. Food for Thought

**Unit -II Poetry**

**(20 Marks)**

1. Ecology (A.K. Ramanujan)
2. Dog's Death (John Updike)
3. The Fog (W.H. Davies)
4. Girl Lithe and Tawny (Pablo Neruda)
5. Ballad of the Landlord (Langston Hughes)

**Unit -III GRAMMAR & USAGE**

**(10 Marks)**

1. Tense and Aspect
2. Modals
3. Non-finite verb forms
4. The Passive

**MIL**  
**(ALTERNATIVE ENGLISH)**  
**SECOND YEAR**

**Unit -I Prose** **(20 Marks)**

1. The Wonder world of Science
2. Our Environment
3. The World of Business
4. The Changing World

**Unit -II Poetry** **(20 Marks)**

1. Indian Children Speak (Juanita Bell)
2. The Goat Paths (James Stephen)
3. Of a Questionable Conviction (Jayanta Mahapatra)
4. Mirror (Sylvia Plath)
5. Toads (Phili'p Larkin)

**Unit -III GRAMMAR & USAGE** **(10 Marks)**

1. Revision of Tense and Aspect'
2. Revision of Prepositions and Phrasal Verbs .
3. Clause-types
4. Linking Devices
5. Word Order and Emphasis

Books Prescribed : Approaches to English-I

Approaches to English-II

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

## **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. Bisarjan - Bankimchandra Chattopadhyaya
4. 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 - Duriya Chandidas
4. Avigir Akshep - Gyandas

#### **UNIT - III**

##### **Grammar & Essay**

**(10 Marks)**

**A. Grammar Proverbs, Sentence, Somas**

**B. Letter / Writing Skill**

**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
4. Aranyak - Bibhuti Bhusan Bandopadhyay

**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
4. Rupai - Jasimuddin

**UNIT - III**

**Grammar and Essay**

**(10 Marks)**

**M.I.L (HINDI) - I**  
**First Year**

Full Marks – 50

**Unit- I : गद्य भाग**

(20 marks)

१. प्रेमचंद - जीयन मे साहित्य का स्थान
२. जैनेन्द कुमार - बाजार दर्शन
३. रामधारी सिंह 'दिनकर' - ईष्या, तु न गई मेरे मन से
४. रामविलास शर्मा - अतिथि प्रश्न - पद्य पाठ के अनुस्प

**Unit- II : काव्य भाग**

(20 marks)

१. कबीरदास - दोहे
२. सूरदास - विनय तथा बाल लीला
३. मीरा - पद
४. बिहारी - दोहू
५. सुमित्रानंदन पंत - भारतमाता
६. नागार्जुन - बहुत दिनों के बाद
७. अशेय - हीरोशिमा
८. दुस्सन्त कुमार - हो गई है पीर पर्वत - सी
९. केदारनाथ सिंह - रोटी

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

(10 marks)

पाठ्य पुस्तक : अमृत भारती, भाग – 1

Published by Odisha State Bureau of Textbook Preparation and Production

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

**Full Marks - 50**

**Unit- I : गद्य भाग**

**(20 marks)**

1. बालकृष्ण भट्ट - आत्मानिर्भरता
2. रामचन्द्र सुवल - उत्साह
3. शरह जोशी - टुम जाओगे, अतिथि
4. बचेन्द्र पाल - एवरेस्य : मेरी शिखर यात्रा

**Unit- II : काव्य भाग**

**(20 marks)**

१. रहीम - दोहे
२. तुलसी दास - राम- विभीषण मिलन
३. मैथिलीशरण गुप्त - नर हो, न निःश करो मन को
४. निराला - वीणा वादिनी वट हे, बादल एग
५. बच्चन - अग्निपथ
६. सुनन्द कुमारी चौहान - साँसी की रानी
७. मुक्ति बोध - पूँजीवादी समाज के प्रति
८. मंगलेशडबराल - ताकत की दुनिया

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

**(10 marks)**

पाठ्य पुस्तक : अमृत भारती, भाग - २

Published by Odisha State Bureau of Textbook Preparation and Production.

ଆଧୁନିକ ଭାରତୀୟ ଭାଷା ଓଡ଼ିଆ  
ପ୍ରଥମ ବର୍ଷ (୧ମ ଭାଗ)

ପୂର୍ଣ୍ଣ ସଂଖ୍ୟା – ୫୦

ପ୍ରଥମ ଏକକ – ଗଦ୍ୟ

୨୦ ନମ୍ବର

୧. ‘ଶରଣୁ ପଦର’ - ଗୋପୀନାଥ ମହାନ୍ତ
୨. ଝେଲମ୍ ନଦୀରେ ସଂଧ୍ୟା - କୁଞ୍ଜବିହାରୀ ଦାଶ
୩. ମଧୁବାରୁ - ଚିନ୍ତାମଣି ଆଚାର୍ଯ୍ୟ
୪. ଗାଁ ମଜଲିସ୍ - ହରେକୃଷ୍ଣ ମହତାବ

ଦ୍ୱିତୀୟ ଏକକ – ପଦ୍ୟ

୨୦ ନମ୍ବର

୧. ସାହାଡ଼ା ବୃକ୍ଷ - ସାରଳା ଦାସ
୨. ଶାପ ମୋଚନ - ଜଗନ୍ନାଥ ଦାସ
୩. ହିମକାଳ - ଦୀନକୃଷ୍ଣ ଦାସ
୪. ମିତ୍ରତା - ଉପେନ୍ଦ୍ର ଭଞ୍ଜ
୫. ପୟରେ ପଶୁଛି ଶରଣ - ଭୀମଭୋଇ

ତୃତୀୟ ଏକକ : ପ୍ରବନ୍ଧ ଓ ବ୍ୟାକରଣ

୧୦ ନମ୍ବର

ପାଠ୍ୟଗ୍ରନ୍ଥ - ସାହିତ୍ୟ ଜ୍ୟୋତି, ପ୍ରଥମ ଭାଗ

ଓଡ଼ିଶା ରାଜ୍ୟ ପାଠ୍ୟ ପୁସ୍ତକ ପ୍ରଣୟନ ଓ ପ୍ରକାଶନ ସଂସ୍ଥା, ଭୁବନେଶ୍ୱର

ଆଧୁନିକ ଭାରତୀୟ ଭାଷା ଓଡ଼ିଆ  
ଦ୍ୱିତୀୟ ବର୍ଷ (୨ୟ ଭାଗ)

ପୂର୍ଣ୍ଣ ସଂଖ୍ୟା – ୫୦

ପ୍ରଥମ ଏକକ (Unit - I) - ଗଦ୍ୟ

୨୦ ନମ୍ବର

୧. ଇତିହାସ - ବିଶ୍ୱନାଥ କର

୨. ସ୍ୱାଧୀନ ଦେଶର ଶିକ୍ଷା ଚିନ୍ତା - ଗୋଲୋକ ବିହାରୀ ଧଳ

୩. ପୁଷ୍ପପୁରରେ ବର୍ଷାବରଣ - କୃଷ୍ଣଚନ୍ଦ୍ର ପାଣିଗ୍ରାହୀ

୪. ତିନି ତୁଣ୍ଡରେ - ଭୁବନେଶ୍ୱର ବେହେରା

ଦ୍ୱିତୀୟ ଏକକ (Unit - II) - ପଦ୍ୟ

୨୦ ନମ୍ବର

୧. ବଡ଼ପଣ - ରାଧାନାଥ ରାୟ

୨. ତପସ୍ୱିନୀର ପତ୍ର - ଗଙ୍ଗାଧର ମେହେର

୩. ବନ୍ଦୀର ବିରହ ବ୍ୟଥା - ଗୋପବନ୍ଧୁ ଦାସ

୪. ବା ି - ସଚ୍ଚିଦାନନ୍ଦ ରାଉତରାୟ

୫. ପିଙ୍ଗଳାର ଅଭିସାର - ରାଧାମୋହନ ଗଡ଼ନାୟକ

ତୃତୀୟ ଏକକ (Unit - III)

୧୦ ନମ୍ବର

ପ୍ରବନ୍ଧ ଓ ବ୍ୟାକରଣ

ପାଠ୍ୟଗ୍ରନ୍ଥ - ସାହିତ୍ୟ ଜ୍ୟୋତି, ଦ୍ୱିତୀୟ ଭାଗ

ଓଡ଼ିଶା ରାଜ୍ୟ ପାଠ୍ୟ ପୁସ୍ତକ ପ୍ରଣୟନ ଓ ପ୍ରକାଶନ ସଂସ୍ଥା, ଭୁବନେଶ୍ୱର

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

**Full Marks 50**

**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) चतुरश्रगालः (Chaturasrugalah)
- 3) संस्कृते किं नास्ति (Sanskrita kim nasti)
- 4) जाबालः सत्यकामः (Jabalah Satyakamah)

**UNIT – II**

**Poetry**

**(20 Marks)**

**Sanskrtaprabha (Podyabhagah)** संस्कृतप्रभा (पद्यभागः)

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

- 1) सुभाषितावली (Subhasitavali)
- 2) भाति मे भारतम् (Bhati me Bharatam)
- 3) वसन्तः (Vasantah)

**UNIT – III**

**GRAMMAR**

**(10 Marks)**

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

- 1) सन्धि - सन्धिविच्छेद Sandhi and Sandhi Viccheda

2) कारकविभक्ति (Karak Vibhakti)

3) प्रकृतिप्रत्यय (Prakrti Pratyaya)

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

4) स्त्रीप्रत्यय Stripratyaya

5) समास Samasa

6) 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

2) Translation into Odia/English from prose and Poetry, translation from Sanskrit to Odia/ English.

**(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 - darpanas - 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 proe pieces from the above mentioned book are to be studied

- 1) कपोतलुब्धककथा (Kapotalubdhakakatha)
- 2) सुश्रुतस्य यन्मकर्मशस्त्रकर्माणि (Susrutasya Yantrakarmasastrakarmini)
- 3) गुणगुणहीनविवेकः (Gunigunahinavivekah)
- 4) रामतपोवनाभिगमनम् (Ramatapovanabhigamanam)

**UNIT – II**

**Poetry**

**(20 Marks)**

**Poetry - Samskrutaprabha (Podyabhagah)**

संस्कृतप्रभा (पद्यभागः)

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

- 1) दशावतारस्तुतिः (Dasavatarastutih)
- 2) गीतासवरभम् (Gitasourabham)
- 3) रघुवंशम् (Raghuvamsam)

## UNIT – III

(10 Marks)

### GRAMMAR

- (a) 1. कारकविभक्ति (Karak Vibhakti)
2. सन्धि - सन्धिविच्छेद Sandhi and Sandhi Viccheda
- (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 pasages of संस्कृतप्रभा, Part-II
2. Translation into Odia/English from Prose and Poetry, Translation from Odia/English to Sanskrit
- (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 - darpanas - व्याकरण दर्पणः  
Published by Odisha State Bureau of Textbook Preparation and Production.

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

**Full Marks 50**

**UNIT – I**

**Prose**

**(20 Marks)**

1. MitraLabhamu - Paravastu Chhinnayasuri
2. Vemana - Dr. G.V.Krishna Rao
3. C.P. Brown Sahitya Seva - Prof. K. Sarvothama Rao
4. AIDS - Dr. Singupuram Narayana Rao
5. Teiugu Patrikala Purva Rangam - Namala Visveswara Rao

**UNIT – II**

**Poetry**

**(20 Marks)**

1. Ekalavyudu - Nannaya Bhattu
2. Balivamana Samvadamu - Bammaera Potana
3. Subhashitamulu - Enugu Lakshmana Kavi
4. Tokachukka - Gurajada Apparao
5. Gongali Purugulu - Balagangadhara Tilak
6. Pushpa Vilapamu - Jandhyala Papayya Sastri

**UNIT – III**

**(10 Marks)**

**A. GRAMMAR**

**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. Ahalya Sankrandanam Patra Chitrana - Dr. Nagabhairava Adinarayana
4. Veyipadagalu Samajika Drukpadham - Dr. Singupuram Nayayana Rao
5. 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
5. Jateeyata - Dr. Nagabhairava Koteswara Rao
6. Panjaramlo Amma - Dr. Bhusurapalli Venkateswarlu

**UNIT – III**

**(10 Marks)**

A. GRAMMAR

B. RE-TRANSLATION

**BOOKS PRESCRIBED**

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

Grammar : Vyakarana Parijatamu By Dr. Singupuram Narayana Rao

**MIL (URDU)  
1ST YEAR**

F.M. 50

**FIRST YEAR**

**Total Classes required- 40**

There shall be one paper carrying 50 marks consisting of 3 (three) groups and duration of examination will be of 2 ½ hours at the HSC (+2) level of the Vocational College

**Distribution of Marks**

**GROUP – A**

**(Objective type answer question) 20 Marks**

Objective type questions from all Units Prose, Poetry and Grammer.

Q1. Ten objective types & multiple choice question from prose and poetry. (1x10=10)

Q2. Ten objective types & multiple choice question from Grammer (1x10=10)

**Total 20 marks**

**GROUP – B**

**Short answer type question**

Q3. Six questions to be answered out of ten questions from prose and poetry.

(1½ x 6 = 9)

Q4. Two 'Ashaar's explanation to be answered out of two 'Ashaar'. (3 x 2 = 6)

**Total 15 marks**

**GROUP – C**

**Long answer type question**

Q5. Prose one long answer type question about 150 words with an alternative from prose portion. (7.5)

Q. 6 Poetry – One long answer type question about 150 words with an alternative from poetry. (7.5)

**Total Marks**

Group A : 20 Marks

Group B : 15 Marks

Group C : 15 Marks

## 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 (10 Classes)

### UNIT-I

#### 1. Prose Chapters to be studied :-

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

### UNIT - II

#### 2. (a) Poetry (15 Classes)

Chapter 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.

## MIL (URDU)

### 2ND YEAR

Total Classes required – 40

Time 2 ½ hrs

F.M. : 50

Three shall be one paper carrying 50 marks consisting of 3 Groups and duration of examination will be of 2 ½ (Two & Half hours) at the Vocational College / CHSE / +2 Level.

#### Distribution of Marks

##### GROUP 'A'

Objective type Questions from the Prose & Poetry portions.

Q. 1 10 Objective type questions from the Prose. (10 x 1 = 10)

Q. 2 Ten Objective type Questions from the Poetry. (10 x 1 = 10)

**Total 20 Marks**

##### GROUPS 'B'

Very Short answer within two to three sentences (15 marks)

Q. 3 Six questions to be answered out of ten question both from prose & poetry.

6x1 ½ = 9

Q. 4 Two explanation to be answered out of four from the Ghazliyat portion. 2x3=6

**Total 15 marks**

##### GROUP 'C'

Q. 5 There shall be either essay or letter writing or application carrying. 7½

Q. 6 One long type question to be answered either from prose or poetry within 150 words 1x 7½ =7½

#### Total Marks

Group A : 20 marks

Group B : 15 marks

Group C : 15 marks

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

**Edited by : Dr. Azizur Rahman**

**Mir Ashraf Ali**

Recommended Book “JADID ADAB PARE – PARE 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 : - Aktar Shiran
  - (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

# ENVIRONMENTAL 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 on 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. 7 hours

**For +2 1st year 50 marks theory examination and For +2 2nd year 50 marks practical examination. TOTAL HOURS: 30 (THEORY) AND 10 HOURS (PRACTICAL).**

#### **+2 2nd Year**

#### **PRACTICALS**

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

The grade secured taking together both the theory and Project/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

# YOGA (THEORY)

+2 1ST YEAR

Full Marks – 50

## UNIT- I

### CONCEPT YOGA

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 OF YOGA PRACTICE

10 marks

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

## UNIT-III

### BRANCHES OF YOGA

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

### YOGA AND PERSONALITY DEVELOPMENT

10 marks

Meaning, Definition of Personality

Dimension of Personality: physical, mental, emotional, intellectual and spiritual.

Personality Development in relation to external world civic, social, patriotic and global  
consciousness. Concept of Personality According to swami Vivekananda and Sri  
Aurobindo.(Practical)

# YOGA (THEORY)

## +2 SECOND YEAR

Full Marks - 50  
Time 2 hrs.

### 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, ardhamatsyendrasana.

**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 fullyyogic 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 Project/Practical marks will be reflected in the Marks sheet and the pass certificate of the Council.

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

**Books 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)

## Therory

### 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; Endomembrance system- endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, microbodies; Cytoskeleton, cilia, flagella, centrioles (ultra structure and function); nucleus' nuclear

- membrane, 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, dedifferentiation and redifferentiation; Sequence of developmental process in plant cell; Growth regulators-auxin, gibberellin, cytokinin, ethylene, Abscisic 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); Egestion; Nutritional and digestive disorders- PEM, indigestion, constipation, vomiting, jaundice, diarrhea.
- b. **Breathing and Respiration:** Respiratory organs in animals (tracheal, bronchial, 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:** Compositon 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, Liverwort, 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 Marsk : 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 samplesolution.
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)           |                 | : 06 marks |
| (Two from bit a, one from bit b and one from bit c) | - 1.5 marks x 4 |            |
| 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 leading 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 quadrature method.
12. Study of plant population frequency by quadrature 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)       | : 06 marks          |
|    |  | -1.5 marks each x 4 |
| 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

peroxid-e-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 alkalies, 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)

- Bunsen burner (different parts and their functions)
- Chemical balance - weighing with chemical balance by equal oscillation method.
- 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 :

- Equivalent mass of Mg by hydrogen displacement method.
- 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

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

# CHEMISTRY

## 2ND YEAR SCIENCE

### Course Structure

Unit	Title	Marks
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  $\text{K}_2\text{Cr}_2\text{O}_7$  and  $\text{KMnO}_4$ .

**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)copolymerization, 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-**Preservatives, 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 ( $\text{FeSO}_4, (\text{NH}_4)_2\text{SO}_4, 6\text{H}_2\text{O}$ ) crystal
- b) Preparation of potash alum [ $\text{K}_2\text{SO}_4, \text{Al}_2(\text{SO}_4)_3, 24\text{H}_2\text{O}$ ] 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-IIIa basic radicals :  $\text{Fe}^{3+}, \text{Al}^{3+}$  &  $\text{Cr}^{3+}$

Group-IIIb 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	
<b>3. Viva-Voce</b>	-	-	06 marks
<b>4. Record</b>	-	-	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  $R \times R$ ). 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  $i$ , 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 :**

1. 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)
2. 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)
3. 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.

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

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

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

$$\sqrt{x^2-a^2} dx,$$

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

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

<b>Units</b>	<b>Subjects</b>	<b>Marks</b>
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.

	Max. Mark:
Time Allowed: -3 hours	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- II Current Electricity:****(20 Periods)**

Electric current, drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, conductance, resistivity, conductivity, effect of temperature on resistance,  $v$   $I$  characteristics (linear and non-linear), electrical energy and power, carbon resistors, colour code of carbon resistors, combinations of resistors in series and parallel.

EMF and potential difference, internal resistance of a cell, combination of cells in series and parallel, Kirchhoff's laws and simple applications. Wheatstone bridge and meter bridge. Potentiometer-Principle and its applications to measure potential difference and for comparing EMF of two cells; measurement of internal resistance of a cell.

**Unit-III Magnetic effect of Current and magnetism:****(22 Periods)****1. Moving charges and magnetism:**

Concept of magnetic field, Oersted's experiment, Biot-Savart law and its application to find magnetic field on the axis and at the centre of a current carrying circular loop, Ampere's law and its application to infinitely long straight wire. Straight and toroidal solenoid (qualitative treatment only); Force on a moving charge in uniform magnetic and electric fields, Cyclotron. Force on a current carrying conductor in a uniform magnetic field, force between two parallel current carrying conductors- definition of ampere, torque experienced by a current loop in uniform magnetic field, moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter.

**2. Magnetism and matter :**

Current loop as a magnetic dipole and its magnetic dipole moment, magnetic dipole moment of a revolving electron, magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, torque on a magnetic dipole (bar magnet) in a uniform magnetic field, bar magnet as an equivalent solenoid, magnetic field lines, earth's magnetic field and magnetic elements.

Para-, dia- and ferro- magnetic substances with examples, Electromagnets and factors affecting their strengths, permanent magnets.

**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 – I (THEORY)**

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

Full Marks 40

Time : 2.30 hours

**Unit – 1**

**Elementary Agronomy**

**Weather and Climate** : Elements of weather and climate, factors of climate, crop weather relationship, weather in relation to cultivation of crops, pests and diseases, weather forecasting, climate of Odisha and agro-climatic zones and their characteristics in relations to rainfall, temperature, soil types and major crops grown, area / districts under each zone. Agro climatic zones of India with reference to such characteristics. Cropping system, classification of crops, monocropping, multiple cropping, crop rotation, mixed cropping, inter cropping and relay cropping. Cropping intensity, cropping scheme, calendar of operation, distribution of crops in Odisha under different agro climatic zones. Dry farming technology. Farming system, its benefits and adoption.

**Unit – II**

**Tillage** : Types of tillage, objectives of tillage, tillage requirement of different crops, characteristics of good seedbed, 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.

Seed dormancy and methods to break dormancy.

### **Unit – III**

**Water Management** : Importance of irrigation and drainage, irrigation potential created and utilization in Odisha, consumptive use, water management and irrigation requirement of crops, factors affecting – irrigation requirement, methods of irrigation, quantity of irrigation, water measurement and irrigation appliances, irrigation scheduling for different crops, water logging, its caused and effects, types and methods of drainage.

### **Unit – IV**

**Weed Control** : Definition and classification of weeds, crop and weed competition, losses caused by weeds, principles and methods of weed control, cultural, mechanical, chemical and biological methods of weed control. Classification of herbicides, their application schedule for different crops, integrated weed management.

### **Unit – V**

**Rural Development** : Integrated Rural Development Programme (IRDP) Aims and objectives of IRDP, beneficiaries of IRDP, planning for IRDP and other related programmes. Training of Rural Youth for self employment (TRYSEM), its objectives and organization in rural development. Development of women and children in rural areas (DWCRA) its objectives and importance. Coverage of health programmes under DWCRA. Education and information dissemination programme for the DWCRA

groups. Panchayat Raj, Gram Panchayat acts, rules and elections, pension, insurance and social security schemes, Jawahar Rojgar Yojana, Cooperative institutions, their role in rural development, Monitoring and evaluation of rural development programmes.

## **CROP PRODUCTION**

### **FIRST YEAR**

Paper – I (Practical)

(Weekly Two Periods, Total – 34 classes per year)

Full Marks 60

Time – 2.30 Hrs

Study of crop weather observatory, identification and use of meteorological equipments, preparation of temperature, rainfall and humidity maps of Orissa.

Identification and study of primary, secondary and intertillage implements in the field.

Identification of crop plants and their seeds, seed treatment, and seed inoculation. Preparation of cropping scheme, cropping pattern, crop rotation and calendar of operation for different crops, Germination and purity test of seed.

Identification of weeds associated with upland, medium land and lowland crops. Preparation herbicide spray solutions and methods of their application. Mechanical and chemical methods of weed control.

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

IRDP survey, filling up application forms and their processing. Group study in TRYSEM. Study of the problems of women in rural areas. Visit to successful DWCRA Groups. Maintenance of Panchayat records. Implementation of different pension schemes.

Implementation of JRY and ICDS. Visit to primary agriculture cooperative societies in rural areas and study about their practical functioning. Study of different rural development programmes and record keeping.

## **CROP PRODUCTION**

### **SECOND YEAR**

#### **Paper – II (Theory)**

Full Marks – 40

Time – 2.30 hrs

(Weekly two periods Total – 68 periods per year)

#### **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 economics of production of the following crops.

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

**Pulses** : Greengram, Blackgram, Arhar, Horesgram, Cowpea, Bengalgram, Fieldpea, Lentil.

**Oilseeds** : Groundnut, Rapeseed and Mustard, Sesamum, Niger, Castor, Sunflower, Safflower, Soyabean, Linseed.

#### **Unit – II**

**Fibre Crops** : Jute, Mesta, Sunhemp, Cotton.

**Sugar Crops** : Sugarcane.

#### **Unit - III**

**Fodder Crops** : Maize Jowar, Teosinte, Oat, Cowpea, Berseem, Lucern, Paragrass, Sudangrass Guineagrass Napier, Guar.

## Unit – IV

### **Horticulture and Post Harvest Technology**

Importance and scope of Horticulture and its role in human nutrition. Basic concepts, principles and methods of plant propagation, plant propagation structures, media, stock-scion, relationship nursery technique of raising vegetable seedlings and fruit nursery.

Different cropping systems, Fruits and Vegetable, nutrient content of fruits and Vegetables and their use of human nutrition. Gardening, Pruning and training.

Study of origin, distribution, soil, climatic requirements, propagation, varieties, planting methods training and pruning, manuring and fertilizer application, irrigation, intercultural and weed control pest and disease control, intercultural and weed control, pest and disease control, harvesting and yield of major fruit crops (Mango, Jackfruit, Banana, Citrus, Guava, Papaya, Litchi, Pineapple sapota, ber etc)

**Plantation Crops** : Rubber, cashew, coconut, mulberry, and coffee, Vegetables (Brinjal, tomate, potato, okra, cucurbits, onion, beans, colecrops, root vegetables) and spices (chilli, turmeric and ginger).

## Unit – V

Principes and methods of fruits and vegetable preservation.

Post harvest handling of horticultural crops including grading, packing, transport, marketing and storage of horticultural produces.

## **CROP PRODUCTION**

### **SECOND YEAR**

Paper – II (Practical)

Full Mark 60

Time 2.30

**(Weekly two classes Total = 68 classes per year)**

Identification of crop plants at different stages of growth. Identification of varieties and seeds. Preparation of nursery and seed bed, seed treatment and sowing of seed by different methods broadcasting, dibbling, drilling, transplanting (paddy and Ragi)

Seed treatment with fungicides, rhizobium culture and bio-fertilizers.

Intercultural operations, weeding, use of herbicides and preparation of herbicide spray solutions. Study of the function of different parts of sprayer and spraying operation in the field.

Preparation of cotton seeds for sowing, treatment of sugarcane sets before sowing / planting, retting operation of jute, calculation of cost of cultivation of different field crops.

Identification of major horticultural crops, varieties, vegetable seeds, garden implements. Practical work for orchard layout, and lawn making, propagation method, technique and management of fruit nursery. Germination and testing of seed, calculation of seed rate.

Maturing and other cultural operations, raising vegetable crops in the student demonstration plot, their care and disposal.

Identification of important pests and diseases of major fruits and vegetables in the field. Packing and trading of fruits and vegetables and their market study.

Visit to horticultural farms and study of their activities on vegetables and fruit crop raising and interaction with them.

Visit of different agricultural farms and soil testing laboratories, maintenance of records and observations.

## DAIRYING (DAI)

### FIRST YEAR PAPER – I

Theory : 40

#### Dairying (DAI)

##### First Year

##### Paper – I

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

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

# PAPER – I

Marks : 60

- Practical
- Utility of milk in human diet.
  - External & Internal Anatomical outlines of cow
  - Identification with salient traits of important breeds of Indian Dairy, draft & dual cattle, Exotic donor breeds, Buffalo breeds.
  - Common terms used in Dairy Farming & cattle markets.
  - Diagrammatic representation to maintain blood level in Cross bred & Full blood animals.
  - Study of Dairy wedges
  - Preparation & use of score card for judging of milch cow.
  - Restraint, leading & handling of Cattle & buffaloes
  - Determination of age basing dentition.
  - Ear Tagging & branding of animals.
  - Study of a soundness certificate and Monetary transaction document at purchase of a milch cow.
  - Study & filling up of cattle insurance proposal form.
  - Enlisting of Mandatory requirements for animal transport.
  - Floor space requirements for different age & stage of dairy animals.
  - Preparation of Design for a Dairy farm & byres.
  - List of tools & equipments used in a milch cow byre.
  - Dairy farm-waste disposal designs
  - Study of a Biogas plant, Composition & utility of Biogas.
  - Study of Forage growing areas in India & Odisha
  - Identification of major forages & their productivity.
  - Identification of Fodder & their seeds /stumps
  - Preparation of a Design of a fodder plot.
  - Study of a chaff cutter.

## DAIRYING (DAI)

### SECOND YEAR

#### PAPER – II

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><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</li><li>• 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 II</b> | Care & Management of Dairy cattle | <ul style="list-style-type: none"><li>• Importance of timely proper 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>  |

- Necessity of proper Health care of dairy animals. Losses due to health hazards. Signs of health & illness.
- 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.
- Concepts of animal reproduction. Merits of A I mediated planned breeding of female animals in the farm. Vet- Embryo -transfer,
- Synchronized mass AI concept & facilities available.
- Broad idea on Anatomy & physiology of reproductive system in cattle & buffaloes.
- Oestrus symptoms & detection. Choice of semen & Timing of AI.
- Pregnancy diagnosis & special care of Pregnant animals and udder development regimes.
- AI techniques, Idea on Frozen semen straw production, handling, transport & storage ..
- Infertility and other breeding failures in the farm. Causes & remedial steps. Parturition- Symptoms and Mechanism. Dystokea & ROP etc. problems and points to intervene.

**Unit III** Dairy cattle head & Milk production. Idea on Quality improvement & value addition of milk.

- Unit IV** Dairy entrepreneurship & Organized Marketing and extension
- Importance of economic viability in a dairy enterprise. General principles of accounts keeping. Maintaining of traditional and e- accounts & records and balance sheets.
  - Structure & functions of organized Dairy Cooperative setups in Odisha.
  - 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 tress pass, 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 of training to employees & other stakeholders. Crises management & conflict resolution in workers.

**Marks : 60**

- PAPER - II** Practical
- Identification of feed stuff with TDN & DCP values for cattle.
  - Identification of feed additives & promoters.
  - Computation of ration with locally available feed stuff.
  - Recognition of inedibility in feedstuff by organoleptic test.
  - BIS standard for cattle feeds of diff categories.
  - Study of water provisions & sanitization in farm. (VISIT)
  - Study of cattle feed manufacturing (VISIT)
  - Formulation of concentrate mix using Pearson's Square
  - Preparation of hand mixed feed concentrate at farm.
  - Preparation of Artificial colostrums & calf starter.

- Feeding calves using sterilized feeding bottles. (VISIT)
- Maintenance of pedigree sheet for a milch cow of a dairy farm.
- Steps to combat stress to farm animals in hot humid weather.
- Observation & trial of hand milking & udder care. (VISIT)
- Observing vital steps to clean milk production(VISIT)
- Study of Process of Weaning, Drying off.
- Familiarizing with Maintenance of different records.
- Sample Routine of Daily & Casual works.
- Observing Vaccination of animals & study of Vaccine calendar
- Administration of medications- drenching, spray etc.
- Performing Castration(closed), dehorning , hoof trimming.
- Enlisting First -aid steps to animals in emergencies
- Observing parenteral administration of drugs to animals
- Practice of drain of abscess, wound dressing & bandaging.
- Knowing medicaments - label, Expiry date & storage etc.

# HORTICULTURE (HORT)

## FIRST YEAR

### PAPER – I

Theory – 40

#### Unit – I

##### Fruit Cultivation

- Horticulture – Meaning and definition
- Division of Horticulture
- Fruit cultivation in India with special reference to Odisha
- Cultivation aspects – Major fruit crops
  - Mango
  - Banana
  - Citrus fruits
  - Guava
  - Sapota
  - Litchi
  - Papaya
  - Pine apple
  - Amla
  - Jack fruit

#### Unit – II

- Climate

#### Unit – III

- Soil
- Varieties of major fruits
- Land preparation
- Propagation and transplantation
- Intercultural
- Nutrient management

#### Unit – IV

- Integrated pest and disease control and management
- Irrigation

#### Unit – V

- Harvest and Post – harvest management
- Assimilating marketing information

## **PAPER – I**

### **Practical**

**Marks : 60**

- Identification of fruit trees
- Different method of grafting and budding, raising of root, stock for grafting and budding of fruit plants.
- Method of planting of fruit plants
- Lay out of different irrigation system of fruit plants.
- Calculation of fertilizers requirement and study of manuring and fertilizer application in fruits plant
- Method of application of growth regulators and calculation for different concentrations
- Training and pruning in fruit plants.
- Study of fruit setting and fruit drop in mango, guava and citrus fruits
- Selection of site, planning, soil and soil management and lay out of orchards
- Study of different intercultural operations in fruit plants

**HORTICULTURE**  
**SECOND YEAR**  
**PAPER – I**

Theory-40

**UNIT – I**

**Plantation Crops, Spices, Medicinal and aromatic crops**

- Importance of plantation crops, spices, medicinal and aromatic crops grown in India as well as in Odisha.
- Scope of plantation crops, classification of spices, medicinal and aromatic plants

**Unit –II**

**Details of cultivation aspects**

- Plantation Crops
  - Coconut
  - Cashewnut
  - Arecanut
- Spices
  - Blackpeper
  - Coriander
  - Cinnamon
  - Cardamom
- Medicinal
  - Aloevera
  - Brahmi

- Aswagandha
- Aromatic
  - Lemongrass
  - Pamarosa

With special reference to

- Origin
- Climate
- Soil
- Varieties
- Land Preparation
- Propagation and transplantation
- After care
- Inrculture
- Nutrient management
- Irrigation
- Moisture conservation
- Integrated pest and disease management
- Intercropping
- Harvest and post-harvest care
- storage and processing
- value addition and byproduct utilization

## Unit –III

### Vegetable Production & Preservation of Vegetable & Fruits

- 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
- Detail of vegetable cultivation of different vegetable such as
  - Potato
  - Brinjal
  - Tamato
  - Cilli
  - Okara
  - Raddish
  - Onion
  - Garlic
  - Turmeric
  - Ginger
  - Sweet Potato
  - Yam
  - Elephant foot yam
  - Cabbage
  - Curly flower

- Broccoli
- Cowpea
- Beans
- Pea
- Pumpkin
- Cucumber
- Different gourds
- Water melons
- Green

With special reference of

- Food value
- Climate
- Soil
- Varieties
- Nursery raising
- Sowing
- Planting
- Manuring
- Intercultural
- Irrigation
- Drainage
- Integrated pest & diseases Management
- Physiological disorders
- Harvesting and post-harvesting care
- Assimilating market information
- Maintain health and safety measures at workplace.

## **Unit – IV**

### **Preservation**

- Importance of preservation
- Maturity standards of fruits and vegetables
- Handling, grading, packaging and transportation of fruits and vegetables
- Use of growth regulators and emulsion for extending the storage life
- Principles and methods of preservation by low temperature, chemical additives, salt, sugar, heat and drying etc.

## **Unit - V**

### **Preparation and preservation of**

- Fruit Juice
- Syrups
- Squashes
- Cordials
- Jams
- Jelly
- Marmalade
- Chatney
- Ketchup
- Pickles & Sources

## **PAPER – II**

### **Practical**

**Marks : 60**

- Study of different preparation structures, equipments, farm complements and horticultural tools.
- Media and soil mixture for raising seedlings and cuttings.
- Testing the seed germination, viability and viability of seeds.
- Seed treatment methods, preparations of seeds beds, sowing of seed sin shallow pots.
- Study of vegetative propagation of plants by modified plant structure such as bulbs corns, rhizomes, tubers, suckers and runner.
- Propagation of plants by cutting with and without use of growth regulators.
- Methods of plant propagation by air layering.
- Potting of seedlings in pots, polythen bags and other containers and planting in nursery beds.
- Selection of scion and pre-conditioning and collection of scion for grafting.
- Estimation of cost of production of grafts.
- Planning for developing nursery.
- Planting and management of mother plants
- Site selection for nursery
- Raising of nursery plants
- Management of grafts in nursery and after care.
- Water management in nursery
- Protection of plants from heat by using shadings
- Plant protection measure in nursery

- Identification of plantation crops, spices, medicinal and aromatic plants
- Studying different problems of plantation crops in orchards
- Identification of vegetables seeds, chemicals, preservations etc.
- Preparation & management of nursery beds (Soil sollarisaiton)
- Raising of seedlings in polyhouse for off-season and early vegetable cultivation.
- Method of application of manure and fertilizers and calculation of fertilizers.
- Study of types of manures and fertilizers.
- Use of growth regulators in vegetables crops
- Study of deficiency symptoms, disorders in vegetables crops.
- Calculation of cost of cultivation of important vegetable crops
- Preparation of preserved products such fruit juices, syrups, squash, jam jelly, chutney, pickles and sauce

Study zero energy storage, low cost storage structure of onion, potato, ginger, turmeric etc

**FIRST YEAR  
INLAND FISHERIES (IF)  
THEORY PAPER – I**

Theory : 40

**Introduction to Inland Fisheries**

**Unit-I**

Introduction to fisheries; importance of fish, present status (global, India and Odisha context). Types of fisheries: freshwater, brackish water, estuaries, riverine, reservoirs, lakes, etc.

**Unit-II**

Inland fisheries resources, Freshwater resources, Riverine resources, reservoirs, lakes, bheels, wetlands, ponds, tanks and canals. Brackish water resources, lakes, lagoons, estuaries, mudflats, backwaters. Inland fishery resources of Odisha.

**Unit-III**

Species contributing to inland fisheries: A general account of economically important freshwater and brackish water fin and shell fishes and their distinguishing characters for identification, food and feeding habits, growth, reproduction and migration.

**Unit-IV**

Fisheries of reservoirs and lakes, conservation of fish stocks, stocking with fish culture and capture management. Floodplain wetlands as capture fishery resources, present status of their exploitation and management. Fisheries resources of Chilika lake and Ansupa.

**Unit-V**

Coldwater fisheries status, important species, cold water fishery resource management. Fish catching devices, common inland fishery crafts and gears their usefulness, operation, restriction of use, fish aggregating devices.

## **PAPER - I**

### **Practical**

**Marks : 60**

1. Study of morphometry of typical finfish and shellfishes.
2. Identification of common freshwater/brackish water/marine fishes and prawns.
3. Gut content analysis of cultivable fishes.
4. Common crafts and gears used in fishing activities.
5. Fabrication, repair and operation of common fishing crafts and gears.
6. Visit to net fabrication unit and observe different types of nets.
7. Measurement of fish length and weight for growth studies.
8. Visit to fish landing centres (Reservoir, lakes and rivers), fish marketing and record fish catch.
9. Preparation of record.

**SECOND YEAR**  
**INTRODUCTION TO AQUACULTURE**  
**Paper-II (Theory)**

**Theory: 40M**

**Unit-I**

History of aquaculture, present global and national scenario, principles of aquaculture, importance of aquaculture, culture practices, conventional monoculture, composite fish culture, mixed culture, integrated aquaculture, criteria for selection of candidate species for aquaculture, sewage fed fisheries, waste water aquaculture. Method of culture: traditional/extensive, semi-intensive, intensive aquaculture in inland water bodies.

**Unit-II**

Types of fish farms: freshwater/brackish water, type of ponds- nursery, rearing, grow-out. Layout design and construction of fish farm. Soil types, properties, classification, sampling methods and texture analysis, effects of seepage and their control, location, design and construction of hatcheries, design and construction of cage and pens for fish culture.

**Unit-III**

Freshwater 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-IV**

Freshwater prawn culture and important species for culture, seed stocking and culture practices, brackish water aquaculture, important finfishes and shellfishes for

culture, collection of seed, stocking, important species for culture, seed stocking, culture practices.

### **Unit- V**

Ornamental fish culture, important indigenous and exotic ornamental fishes, preparation of indoor system for culture and their rearing management. Catfish and air breathing fish culture. Important species for culture, seed stocking and culture practices. Integrated aquaculture principle, fish cum poultry, fish-cum-duck culture and fish cum cattle rearing.

### **PAPER - II**

### **PRACTICAL**

**Marks : 60**

1. Collection, preservation and identification of major cultivable finfish 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. Soil and water analysis: soil texture, structure, soil pH, water pH: carbon dioxide, total hardness, total alkalinity, salinity, nutrients.
8. Home aquarium preparation: construction, setting and maintenance.
9. Identification of different fish food organisms.
10. Identification of locally available fish feed ingredients and formulation of fish food.
11. Methods of sampling of fin fishes and shell fishes for disease diagnostic.
12. Identification of common fish diseases.
13. Methods of application of manures and fertilizers.
14. Preparation of record.

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

Full Marks – 40  
Theory 68 Period

**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.

Different systems of mating : Flock meeting, Stud mating and Sift mating.

**Unit – V**

Preliminary idea on different breeding method practiced in poultry farm.

Preliminary idea on artificial insemination.

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**  
**PRACTICAL (PAPER – I)**

Full Marks – 60  
Time – 4 Hrs  
Practical – 34 Classes  
**(1 Class Per Week)**

1. Body points of chicken and ducks.
2. Handling, catching, wing banding and leg banding, debeaking, dewinging
3. Identification of poultry breeds – White Leghorn (WLH), Rhode Island Red (RIR), Vanaraja, Giriraja, Grama Priya, Kadaknath, Aseel and some commercial broiler strains.
4. Identification of internal organs : different parts of digestive and reproductive system.
5. Identification of good layers, poor layers and non-layers.

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

**Full Marks – 40**  
**Theory – 68 Periods**

**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 equipments like feeder, waterer / drinker and brooder and chick guard etc.

**Unit –III**

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

#### **Unit-IV**

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 –V**

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.

General management practices of Ducks, Quail and Guinea fowl.

### **POULTRY FARMING PAPER – II PRACTICAL**

**Full Marks – 60  
Time – 4 Hrs  
Theory – 34 Periods  
(1 Class Per Week)**

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. Identification of different types of houses and equipments
6. Different method of culling procedure
7. Visit to poultry farms.
8. Identification of different litter materials and quality assessment

**REPAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)  
FIRST YEAR  
PAPER – I THEORY)**

**Marks-40**

**Unit-I**

**Tillage Machinery**

Definition and objectives of tillage, Classification of tillage- Primary and secondary tillage. 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 I and tilt angles. Harrows: types, parts, function, materials of construction, adjustment of gang angles leveling of harrow. Cultivators, parts, function and adjustment. Rotavator parts, function and adjustment.

**Unit-II**

**Sowing Machinery**

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

**Unit-III**

**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.

#### **Unit-IV**

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

#### **Unit-V**

##### **Threshing and other Special Purpose 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. *Sugarcane crusher*: Introduction, main parts of cane crushers, their functions and operation I of crushers. Common faults and corrective measures. Safety and precautions in use of cane crushers. I Maize shellers and Groundnut decorticators : Parts of power operated maize shellers and ground nut 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 - I  
PRACTICAL**

**Marks-60**

**Unit-I**

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

Rotavator and Cultivator: 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, Identification of different parts of a cultivator, replacement of cultivator tynes.

**Unit-II**

**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. Calibration of seed-cum-fertilizer drill in shop, 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-III**

#### **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, identification of different parts of duster, reconditioning replacement of worn out/damaged parts, setting and operation of duster. Safety precaution in using sprayers and dusters.

### **Unit-IV**

#### **Harvesting Machinery**

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

### **Unit-V**

#### **Threshing and other special machinery**

Identification. of different components of po.wer .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.

**PAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)  
SECOND YEAR  
Paper – II (Theory)**

**Marks-40**

**Unit-I**

**Engine**

Constructional features of I.C. engine and familiarization with principal parts. Principles of operation and salient features of four stroke engine. Multi-cylinders engine, firing order and valve arrangements. Fuel system, major components of fuel system, systems of fuel injection, different parts of injection system and their functions, governing system, function of a governor, principles of operation and classification. Lubrication system, functions of lubricating systems and their main parts, crankcase ventilation. 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-II**

**Tractors**

Availability of indigenous tractors, models and horse powers, role of tractors in farm mechanization. Familiarization with various components and systems, gauges instruments and controls of tractors. Safety in driving tractors and road signals.

**Unit-III**

**Power Transmission System**

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

## **Unit-IV**

### **Other Systems**

Steering system and front axial, different components of the system, types of steering and steering gear box of different tractors. Brakes: function of a brake system, classification of brakes, working of a hydraulic brake system. Tyres tubes and wheel ballasting, constructional features of pneumatic tyres, size and ply rating, air inflation technique, size of rim, retreading of tyres. 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. Function and merits of hydraulic system over a mechanical system, function of hydraulic controls. Hitching of trailers, Semi-mounted and mounted implements.

## **Unit-V**

### **Power Tiller**

History and development of power tillers, 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, maintenance and safety measures. Matching implements of power tillers.

**PAIR AND MAINTENANCE OF POWER DRIVEN FARM MACHINERY (PDFM)**  
**SECOND YEAR**  
**Paper – II (Practical)**

**Marks-60**

**Unit-I**

**Engine Overhauling**

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. Reconditioning of water pump, fan, checking of radiator, hoses etc. and their assembly. Checking of fuel and oil pumps for proper functioning and repair and calibration if required. Testing and pressure setting of injectors. Replacement of fuel and oil filters, damaged hoses, tightening of clamps, nuts and bolts, filling of fuel, oil and water, final checking level if any. Starting operation and observing performance.

**Unit-III**

Visit to reputed tractor repair and service workshop to familiarize with the techniques of crank shaft grinding, honing, pump calibration etc. Cause and remedy of engine troubles. Does not start, irregular performance and lack of power, smoky exhaust, engine suddenly stops/ stalls/engine knocking, overheating, low and high oil pressure, non functioning of various gauges etc.

## **Unit-IV**

### **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. Checking and inflating tyres, starting. 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. Dismantling, inspection, repair, installation and adjustments of clutch, gear box, differential and final drive. Repair and adjustments and servicing of steering systems, front axle and braking system.

## **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. Study of different power tiller matching implements like mould board ploughs, reversible plough, post hole diggers, SCFD, pump, boom sprayers, reapers, axial flow threshers etc.

**SERICULTURE**  
**INTRODUCTORY SERICULTURE**  
**FIRST YEAR**  
**PAPER –I THEORY**

Full Marks – 60  
Total 102 Periods

**Unit – I**

**Sericulture** : its history, importance, origin (2) types of silk worms and their races, voltinism (4) multivoltinism, systematic position of various silk worms and their geographical distribution (5) salient feature of the silk worms (3) Cropping pattern- mono, companion cropping, mixed cropping, inter cropping and their uses (2)

**Unit-II**

Botanical nomenclature, origin and geographical distribution of mulberry and non-mulberry host plants of different silk worms (6) Distribution and systematic position of mulberry, morphology of mulberry, mulberry varieties, their characters, yield and varietal improvement (6) conditions required for mulberry growth, Cytology and Genetics of Mulberry - Introduction, cell organelles, their function in cell (3) mitosis and meiosis (1) Mendelian principles of genetics, importance of mulberry breeding (1)

**Unit – III**

Soil types their suitability, Soil properties and soil pH and their reclamation (3) Package of practices for moriculture (under irrigated and rain fed conditions) : Selection of land, land preparation (digging, ploughing, disking, harrowing, leveling, layout, pit making, ridge and furrow making) (6) Nursery preparation : Selection of elite varieties for irrigated and rainfed conditions with their characteristic features and yield potentialities (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 (3) Cultivation and cultural practices:

- Introduction, garden implements, soil erosion, moisture conservation (2)  
Propagation of Mulberry sexual propagation, asexual propagation (2) Functions of essential macro and micronutrients, Sources of nutrients like manures, green manure, vermin-compost, fertilizers, and their composition (3) doses, method of application (3) Organic manures and their application (FYM, compost, tank silt, night soil, sewage sludge, oil cakes, vermicompost) Organic manuring in mulberry cultivation and organic farming, Green manuring: green manure crops and their relevance in soil productivity, Biofertilizer: Types (Nitrogen, Phosphate, Cellulosytic) importance, application and limitation intercultural operations – weeding, pruning, irrigation, methods and frequency of irrigation, methods of conservation of soil moisture (6)

#### **Unit – IV**

Leaf selection and leaf harvesting methods for silk worm rearing, transportation, preservation of leaves, seasonal influence on leaf yield (9) Estimation of leaf yield – methods of estimation (3) Economics of Mulberry cultivation (Rain-fed and irrigated) Economics of 1 acre Mulberry (9)

#### **Unit-V**

Mulberry disease : Root rot, stem rot, rust, leaf spot, powdery mildew, symptoms of various diseases, types of damage, extent of loss, seasonal occurrence, Disease management practices (4) 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, prophylactic and curative methods of control (6) identification of deficiency symptoms in Mulberry, Pesticides, bio-pesticides (2) , their formulation (2) various pest control appliances (3)

# **INTRODUCTORY SERICULTURE**

## **FIRST YEAR**

### **PAPER – I PRACTICAL**

Full Marks – 60  
Total 102 Periods

#### **Unit – I**

Morphology Mulberry root, stem, leaf and flowers (9) Acquaintance with different food plants of silk worms (Mulberry, Tasar, Muga, Eri) (9) Study of different morphological traits of silk worm and their life stages (9) Study of various systems of silk worm (9) Study of different meteorological factors and their measurement (12)

#### **Unit-II**

Identification of Different types of Soils; Soil sampling and recording of soil pH and soil moisture (6); Acquaintance with farm tools and implements, their uses (6); Farming practices: land preparation (layout preparation, digging, hoeing, ploughing, leveling, bund making, harrowing) (9), Pit, row, paired row and Kolar systems of mulberry cultivation (6), Inter cultivation and surface mulching (3); Water management practices in Mulberry cultivation, Surface irrigation, Sprinkler and drip irrigation systems (6); Acquaintance with different fertilizers and calculation of their doses (6); Method of compost and vermicompost preparation (9)

#### **Unit-III**

Propagation of mulberry: Stem and root grafting (whip and tongue grafting techniques), Budding (patch and T -budding techniques) (3), Layering (ground and air layering techniques) (6); Selection of materials, preparation of cutting and treatment with root inducing chemicals, planting methods (6); Seed collection, seed bed preparation, sowing (3); Leaf harvesting- Leaf, branch and shoot harvesting

methods in relation to cultivation and rearing practices (9). Storage, transportation and preservation methods (6); Estimation of leaf yield; identification of type of leaf, leaf quality determination (6); Pruning methods: Types, Objectives, methods and practical relevance (6)

#### **Unit-IV**

Identification of non-mulberry hosts and their package of practices (6); Identification of different types of weeds (6); Preparation of Herbarium *viz.*, Mulberry Leaf varieties and weeds; Farm Management: Labour rules, maintenance of overseer's diary, muster roll preparation, wage calculation (6).

#### **Unit-V**

Identification of leaf, stem and root diseases of Mulberry and Collection of disease samples (6), Identification of insect pests of Mulberry and collection and preservation of insect pests (6); Identification of deficiency symptoms in Mulberry (3); identification of nematodes (3); Acquaintance with various pesticides, their formulations (6), Bio-pesticides, bio-agents (6); Preparation of spray solutions and dust dilution (3); Acquaintance with different plant protection equipments and their safe handling (6); Preparation of calender of control measures (3)

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

**SECOND YEAR**

**Paper - II (Theory)**

**Full Marks - 60  
Total- 102 periods**

**Unit –I**

Study on metamorphosis: morphology of egg, larva, pupa and moth of mulberry silk worms. (3); Environmental requirement for rearing: temperature, humidity, air, light, optimum requirement for different stages, methods of maintenance (2); Rearing house :location, types of rearing houses, comparison with model rearing house, requirements- orientation-utilization of locally available materials-modifications (3); Rearing appliances and their uses (2); Preparation for disinfection: cleaning-washing-drying- disinfection, hygienic rearing. (2)

**Unit-II**

Commercial races: Multivoltine, bivoltine and hybrid races used in India; Incubation: light-humidity-air-temperature requirement; Silk worm rearing technology (Early age rearing): (2); Uniform hatching and methods of brushing for I “ instar larvae; Chawki rearing: methods of rearing of I, II and III instar larvae; advantages and disadvantages; Effect of seasons, environmental requirements, feeding schedule, selection of leaf- spacing, cleaning, care during moulting, use of bed disinfectants (4); Artificial hatching of silkworm eggs- common acid treatment (treatment after chilling, precautions, age of eggs and timing of acid treatment)(3); Concept of CRC organization - community chawki rearing - advantages, disadvantages- care during

transportation (1) Rearing of late age silk worm : rearing methods, advantage, disadvantage (1); Effect of seasons, Environmental requirements, spacing, dusting, cleaning, feeding schedule, care during moulting leaf requirement, quality and leaf preservation (2); Types of mountages- transfer of matured silk worms, method of mounting, density, care during mounting and spinning of cocoons (3); Harvesting and storage of cocoons: harvesting, cleaning, preservation, assessment of cocoon quality and storage (3); Record maintenance, transportation - care during transportation (4); Cost of production, leaf cocoon ratio (3)

### **Unit-III**

Diseases of silk worm- pebrine, bacterial, viral, fungal - causal organisms, mode of infection, symptoms, prevention and control (3); 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 (2); Model grainage: basic requirements-plan of grainage; Equipments, Assessment of quality of seed cocoons and their transportation (6); 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 (2). Cellular method and loose eggs importance of temperature, humidity and light - refrigeration of male moth (2); Seed organization, seed multiplication and organization of seed area- Seed Legislation Act (2).

### **Unit-IV**

Cocoons: properties of cocoons and their impact on reeling performance - cocoons assessment, defective cocoons (2); Stifling / Drying: objective - various methods of stifling, steam stifling, sun drying, hot air drying- merits and demerits of each method (3); Storage and preservation of cocoons: Ideal conditions for cocoon storage- effect of defective storage- cocoons reliability, use of certain chemicals etc. - storage of hot air dried / steam stifled cocoons (3); Cooking of cocoons: objective: various methods of cooking - open pan - 3 pan - pressurized cocoon cooking - characteristics of water for cocoon cooking - cooking methods for tasar and eri cocoons (3); Reeling : various systems of reeling - floating and sunken system of reeling - reeling process for tasar cocoons - various types of reeling equipments - charkha - cottage basin- tasar reeling charkha multi end basin - semi automatic reeling - automatic reeling- reeling calculation - production - denier - renditta, reeling of double cocoons - dupion silk - re-reeling- objective - standard hanks (6); Collection and preservation of silk waste cooker waste - reeling waste- basin residue - burst open cocoon waste - cleaning of waste- drying- storage of waste (3); Silk examination and packing: Tracing of defects in skein- removal of defects - removal of gum spots- hank making - book making. balling (3).

## **Unit-V**

Filature management: organization - planning- costing (2); Raw silk testing: objective- various methods of testing - visual and mechanical testing- winding - size test- evenness, neatness and cleantiness test- Tenacity and elongation- cohesion conditioned weight- grading of raw silk ISI standards.(4); 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 tsar waste spinning processes (4); Definition of want, demand, supply, price value, utility,

marks demand, elasticity of- demand factors responsible for silk production- entrepreneurship (2); 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 (2); Financial agencies involved in sericulture industry- terms and conditions of loan, crop insurance, developmental schemes and subsidies (1); Organization of cooperative sector in sericulture- aims and objectives, cooperative principles, organization of cooperative in rearing, reeling and other areas, Incentives and regulation (2); Management for effective participation in sericulture (1); 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), Extension programme formulation: Concept of PRA techniques; Demonstrations, use of audiovisual aids, conduct of field days (3).

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

**Paper - II (Practical)**

**Full Marks - 60  
Total - 204 periods**

**Unit-I**

Study of morphology of Mulberry (*Bombyx mori*), Tasar (*Anthaeraea mylittay*, Muga (*Anthaeraea assama*) and Eri (*Philosamia ricini*) by specimen identification and making labeled sketches of their egg, larva, pupa and moth (3); Dissection of digestive system and silk glands of moth (6); study of mouth part of moth (3); Study of model rearing house-plan (3); Acquaintance with sketching of rearing appliances and their use (3); 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; Methods of brushing (9); Chawki rearing methods, quality of mulberry leaf, leaf selection (9); Feeding schedules, bed cleaning, spacing, moulting (9); 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.) (10); 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); 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 (3); Identification of Grainage equipments; Preparation of Disinfectants and Disinfection of Grainage (6); Processing and Preservation of Seed Cocoons (6); Sex separation of pupa and moths; Synchronization of moth emergence; Coupling, Decoupling and oviposition (3); 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 (3); 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; Assessment of commercial parameters and quality tests; Identification and calculation of good and defective cocoons (6); Stifling of cocoons; Cooking and Brushing of Cocoons (6); Reeling - Charaka and Multi-end Reeling machines (3); Yarn testing- Denier count and gradation of cocoons and silk reeling (6), Silk Examination, Lacing, Skeining, Booking; Degumming and Silk Dyeing; Collection and Preservation of Bye products of Reeling (6); Observation on external symptoms of diseased larvae (Pebrine, Grasserie, Flatcherie and Muscardine) - gut and haemolymph test, preparation of smear, identification of pathogens of various diseases (9).

## Unit-V

Visit to filatures and reeling establishments (3): Visit to sericulture cooperatives, chawki rearing cooperatives, reeling cooperatives, silk marketing cooperatives (6); Survey and collection of data, compilation, tabulation, presentation (6); Maintenance of machinery and records: Cleaning / oiling of machineries- repair - replacement of old machines- maintenance of various registers (6); Defination and scope of sericulture- statistics- collection of data sampling - survey- use of questionnaires, proforma for collection of data- compilation- tabulation, preliminary anaysis- report writing (4); Utilization of by- products for dairy, fisheries, gober gas, oil extraction, poultry feed, fuel (3); Visit to different organizations offering technical services, supplying planting materials, laying seed cocoons and other inputs of sericulture (6); Practical training on project preparation-model bankable schemes for various sericulture programmes, 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 (6); Analysis of data, preparation of reports(3); Visit to technical service centers, farmers, participation in exhibitions, field days and institutions (4).

**AUDIO VIDEO TECHNIQUE  
FIRST YEAR  
Theory Paper - I**

Full Marks : 40  
Time : 2.30 Hrs

**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

### **Unit- IV**

#### **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.

#### **UNIT- V**

#### **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  
PRACTICAL PAPER - I**

Full Marks : 60  
Time : 2.30 Hrs

1. Study of hand 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 Practice.
6. Verification of Ohm's Law and Kirchhoff's Laws.
7. Verification of V-I Characteristics of P-N Junction.
8. Study of Half Wave Rectifier.
9. Study of Full Wave Rectifier.
10. Study of Oscilloscope.
11. Design of power supply.
12. Study of SMPS.

**AUDIO VIDEO TECHNIQUE**  
**SECOND YEAR**  
**THEORY PAPER - II**

Full Marks : 60  
Time : 2.30 Hrs

**UNIT-I**

**Modulation and De-Modulation**

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. Acoustics
8. Microphones
9. Loud speakers
10. Systems of Sound Recording
11. Tape Recorders
12. Cassette Tape Recorders
13. Disc Recording.
14. Film Recording.
15. Hi-Fi Systems

**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**

#### **Basic Principle of Television**

1. Television Broadcasting System
2. Synchronisation
3. Blanking
4. Video Signal
5. Bandwidth Required for TV Signals
6. Vestigial Sideband system
7. TV Receiver
8. TV Transmitter
9. LED TV
10. LCD TV
11. PLASMA TV
12. Closed Circuit Television
13. Testing and Trouble Shooting in TV Receiver and Transmitter

### **UNIT- IV**

#### **Optical Communication**

1. Introduction and Historical Background of Optical Communication
2. Advantages of Optical Fibre Communication
3. Types of Optical Fibre
4. Fibre Materials
5. Fibre Bending
6. Types of Optical Sources

7. Light Emitting Diode
8. Laser Diode
9. PIN Diode

## **UNIT-V**

### **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 the Camera
10. White Balance
11. Audio Circuit
12. Camera Supports
13. Working Principle of still and motion pictures
14. Projection Lamps
15. Setting of a LCD Projector System

**AUDIO VIDEO TECHNIQUE**  
**SECOND YEAR**  
**Practical PAPER - II**

Full Marks : 60  
Time : 2.30 Hrs

1. Study of Radio Receiver (AM& FM)
2. Study of Radio Transmitter (AM&FM)
3. Verify the different signals of RF, IF and AF Sections in a Radio Receiver.
4. Study of Tape Recorder and Mechanical Systems of Tape Recorder.
5. Study of Recording in Tape Recorder.
6. Study of Stereophonic Recording and playback equipment.
7. Study of different types of Microphones and Loudspeakers
8. Study of PA Systems
9. Study of different sections in TV Receiver
10. Study of different sections in TV Transmitter
11. Study of optical communication
12. Practice in Fuse replacement and their rating.

# **BUILDING MAINTENANCE**

## **FIRST YEAR**

### **PAPER – I THEORY**

Full Mark : 40  
Time : 2.30 Hrs

#### **Unit – I**

**Stone :** Classification, composition, characteristics, uses, method of quarrying and dressing

**Brick :** Method of manufacture, classification, testing of bricks.

**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**

Timber, Plywood : Characteristics and suitability for different and allied purpose. Defects and decay, Seasoning and Products preservation of Timber.

#### **Unit –III**

**Tile :** Method of manufacture, composition, testing and its suitability for different use with reference to building (Clay, Terracotta, Glazed Tiles, Marble)

#### **Unit-IV**

**Steel :** Characteristics, composition, grades & testing

#### **Unit-V**

**Paints :** Types of paint (All types of paint i.e. cement paint varnishes enamel paint distemper etc.) composition, primers characteristic, method of application adhesive.

**BUILDING MAINTENANCE**  
**FIRST YEAR**  
**PAPER – I PRACTICAL**

Full Mark : 60

- Building Drawing
- Field Study of RCC roof, Brick work, foundation, lintel, stair case etc.

**BUILDING SERVICES & INFRASTRUCTURAL ENGINEERING**

**SECOND YEAR**

**PAPER – II THEORY**

Full Mark : 40  
Time : 2.30 Hrs

**Unit – I**

**Surveying** : Principle 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, morum, water bound macadam road, bituminous & concrete road. (brief idea)

**Unit-III**

**Water -Supply** : Introduction, Type 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, its installation and maintenance.

## **Unit -V**

**Construction Planning and Management Estimation** : Introduction, types of estimation, principle of estimation, various item of work in building work, road short wall and long wall method, centre line method, rate analysis for different item, lead statement.

### **BUILDING MAINTENANCE SECOND YEAR PAPER – II PRACTICAL**

Full Mark : 60

#### **Practical**

- (i) Testing of Cement and Concrete
- (ii) Testing of water samples
- (iii) Surveying and field work
- (iv) Lay out plan of Building in field

# COMPUTER TECHNIQUE

## FIRST YEAR (THEORY)

### PAPER – I

Marks : 40

Periods : 68

#### Unit - I

**Computer Organization** : Introduction to computer, Generation of modern computers, Characteristics of computers, Classification of computers, Structure and functions of digital computers.

**Input / Output devices** : Keyboard, Mouse, Touch Screen, MICR, OCR, Light Pen, Joystick, VDU, Printer (Impact and non-impact), Dot matrix, Line printer, Daisy wheel printer, Laser Printer, Inject and plotters.

**Computer memory** : Primary memory, Storage hierarchy, storage location and Address, Storage, RAM, ROM, PROM, EPROM, EEROM, Cache memory, Buffer memory.

**Secondary Storage** : Sequential and direct access devices, Magnetic disk, Floppy disk, Winchester disk, Magnetic drum, Mass storage, Optical disk, Magnetic bubble memory.

#### Unit - II

**Introduction to computer language** : Machine language, Assembly language and High level language, 4GL translator, Compiler, interpreter, Assembler, Characteristics of good programming language.

### **Unit - III**

**Number System** : Positional and non-positional number system, Types of numbers, Conversion (Binary, Octal, Decimal, Hexadecimal) Computer Codes (BCD, ASCII, EBCDIC), Sign magnitude representation 1st and 2nd complement representation, Computer Arithmetic (Binary addition, Subtraction, Multiplication and Division) Algorithm and Flow Chart.

### **Unit - IV**

**Operating System** : Definition, Evolution of Operating System, Batch processing system. On-line processing, Operating system controlled software. job control language, spooling.

### **Unit - V**

**Accounting by using Tally** : Introduction to Accounting, Definition of book keeping, Accounting as a business language.

**Types of Accounts** : Journal and ledge, Objectives of accounting, Types of Accounts, Personal real, normal accounts, Account concept using Tally.

## **COMPUTER TECHNIQUE FIRST YEAR (PRACTICAL) PAPER – I**

Marks : 60

Periods : 38

1. Installation and fine – tuning of MS-Dos
2. Use of Internal and external commands of MS- DOS.
3. Installation of Window.
4. Creates window, edit format and print document file, using MS-Word.
5. Designing spreadsheet and manipulation using different arithmetic function.
6. Role of Account sheet using MS-Excel.
7. Account concept using Tally.

**COMPUTER TECHNIQUE  
OFFICE AUTOMATION  
SECOND YEAR (THEORY)  
PAPER-II**

**Marks : 40**

**Unit - I**

**MS-Window** : Working with Window

**MS-Word** : 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.

**Unit- II**

**MS- Excel** : Introduction starting MS-Excel, Opening of Worksheet, Saving a Worksheet, Spreadsheet operation, Entering Numbers, Text, Dates and Times Formulas Editing Worksheet : Deleting cells, Rows Columns, Inserting cells, Rows and columns, Printing a Worksheet

**Formulas and Functions** : Absolute and relative Reference of cell, Entering a formula, Mixed Entering Function, Calculation using functions Different type of functions in EXCEL, charts : Creating, Editing, Inserting, Deleting, Saving, Printing.

**Unit - III**

**MS-PowerPoint** : Starting power point, Operating and existing presentation, Creating, Closing and saving a presentation, Existing Power , Point Using master – Slide, Title, Handout, Notes.

**Editing text** : 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.

**Formatting Text** : 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, Ellips, Drawing free from shapes. Using Auto space, Rotating objects, Modifying colours and lines. Adding header and footer, inserting MS-Word tables or MS-Excel, Worksheet, Printing presentation component.

#### **Unit-IV**

##### **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, WYSIWYG, 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.

#### **Unit - V**

**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.

## **Unit - VI**

**Principles of Double Entry** : Characteristics of double entry, book keeping, double entry and single entry, advantages of double entry system, rules of debit and credit, examples – transaction and personal, real and normal accounts, journal and ledger, recording of transaction – journal, format, debit and credit, sides, journalizing a transaction, narration, types of transaction, payments and receipts, payment in cash and cheque, buying goods / assets – payments to expenditure, sales and sales return examples, trial balance, trading and profit and loss account, balance sheet.

### **COMPUTER TECHNIQUE SECOND YEAR (PRACTICAL) PAPER – II**

Marks : 60

Periods : 38

1. Installation of MS-Office
2. Create a document files using all the options of MS-Word
3. Speed sheet operation using reference of cell, Entering formula and function.
4. Charts creating editing, inserting, deleting, saving, printing, using the function of MS-Excel.
5. Operating and existing presentation of MS-Power Point.
6. Viewing a presentation in different view using MS-Power Point.
7. Formula and uses of Desk Top Publishing.
8. Installation procedure of Core-Draw and minimum configuration, requirements of Corel-Draw.
9. Use of the Corel board and all its functions.

**ELECTRICAL DOMESTIC APPLIANCES (EDA)  
FIRST YEAR  
THEORY**

**Theory - 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 effecting resistance of a conductor, Temperature co-efficient of resistance, Difference between AC and DC voltage and current

**DC Circuits**

Ohm's Law, Series and parallel resistance circuit and their equivalent resistance, Kirchhoff's Laws and their applications.

**Heating and lighting effects of currents**

Joule's laws of electric heating and its domestic applications, Heating efficiency, Lighting effect of electric current, Filaments used in lamps, Different types of filament lamps and gaseous discharge lamps, their working and applications.

**Capacitors**

Capacitors and its capacity, types of capacitors and their use in circuits, series and parallel connection of capacitors, energy stored in a capacitor

**Electromagnetic Effects**

Permanent magnet and Electromagnets, their construction and use, Polarities of an electromagnet and rules of finding them. Faraday's Laws of Electromagnetic Induction, Dynamically induced emf, its magnitude and direction; Static induction, Self-induced emf, its magnitude and direction, Inductance and its units, Mutually induced emf, its magnitude and direction; energy stored in an inductance. Force acting on a current carrying conductor in a magnetic field, its magnitude and direction; Torque produced on a current carrying coil in a magnetic field; Principle and construction of Dynamo

## **Unit - II**

### **AC Circuits**

Generation of AC 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 difference, Power & Power factor (leading and lagging), Identification of phase, neutral and earthing.

### **AC Circuit with**

(i) Resistance and inductance; (ii) Resistance and capacitance & (iii) Resistance, inductance and capacitance in series.

### **Polyphase Circuits**

Generation of three-phase voltages, 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. Construction and working principle of moving iron and moving coil voltmeters and ammeters, Dynamometer type Wattmeter, Ohm meter, Megger, Earth Tester and Induction type energy meter - their circuit connection and application for measurement of electrical quantities.

## **Unit - III**

### **Electrical Wiring**

Types of wiring - Cleat wiring, Casing and Capping, C.T.S, F.T.R.S. wiring, Metal sheath wiring, Conduit wiring and concealed wiring- their procedure of installation.

Factor for selection of a particular wiring system; Importance of switch, fuse and earthing of wiring system; Types of faults, their causes and remedies.

Methods of finding numbers of circuits and circuit distribution by distribution board system, Loop in system of wiring connections; IE Rules related to wiring.

Single phase wiring from three phase supply system. Three phase wiring in power circuits such as heaters and motors from three phase supply system.

## **Electric Iron**

Type of Electric Iron - Ordinary type and automatic/Thermostat Control type/steam iron, Construction and working principle 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 and Microwave oven; Three phase heater, star and Delta connections.

## **Electric Toasters**

Types of Toaster - Ordinary and Automatic; Construction and working principles of electric toaster; common defects, testing and repairs.

## **Table Lamp and Tube Light**

Construction, working principles and use of Table Lamp, Night Lamp and Tube Light; Common faults, their causes, testing and repair, LED Table lamp

## **Unit-IV**

### **Electric Fan:**

Type of Fans - ceiling fan, Pedestal fan, Bracket Fan, Exhaust Fan; Construction working principles, special characteristics and applications of Electric fans; Common faults, their causes, testing and repairs; Installation of Bracket Fan and Exhaust Fan.

### **Electric Mixer, Grinder and Blender**

Construction, working principles, special characteristics and applications of Electric Mixer, Grinder and Blender; Common Faults, their causes, testing and repairs; Servicing maintenance and overhauling of Electric Mixer, Grinder and Blender.

### **Electric Washing Machine**

Constructions, working principles special features and applications of Washing Machine; common faults, their causes, testing and repairs; Servicing and overhauling of Washing Machine.

### **Emergency Light and Stabilizer:**

Constructions and working principles of Emergency Light and Stabilizer;  
Common faults, their causes, testing and repairs.

## **ELECTRICAL DOMESTIC APPLIANCES (EDA) FIRST YEAR PRACTICAL**

**Marks : 60**

### **Practical**

- Study of series resistive circuit
- Study of parallel resistive circuit
- Study of series and parallel connection of cells
- Preparation of electrolyte for Lead Acid battery and its charging and measurement of specific gravity with the help of hydrometer
- To find heat efficiency of a kettle.
- Verification of magnetic field of a solenoid with (i) iron core and (ii) air core.
- Verification of torque developed in a current carrying coil placed in a magnetic field.
- Measurement of resistance by ammeter and Voltmeter methods and Ohm meter.
- Dismantling and reassembly of dynamo
- Connecting lamps in series, parallel and series-parallel circuits
- Study of R-L series circuit and measurement of power and power factor
- Study of R-C series circuit and measurement of power and power factor
- Study of R-L-C series circuit and measurement of power and power factor
- Drawing schematic diagram to give supply to consumers for single phase and three phase.
- Practice on casing & capping wiring
- Practice on cleat, wiring.
- Practice on C.T.S./T.R.S. wiring.
- Practice on conduit wiring.
- Practice on concealed wiring.
- Controlling a lamp from two and three places (staircase and godown wiring).
- To prepare series/parallel test board.

- Measurements of insulation resistance of wiring installation by megger.
- Earth testing and measurement of earth resistance.
- Polarity test of wiring installation.
- Testing of wiring installation.
- Installation of pipe earthing for wiring installation.
- Installation of plate earthing for wiring installation.
- Testing and finding faults of wiring installation and rectification.
- Dismantling and reassemble of reflector type room Heater.
- Dismantling and reassembling of Electric Iron (i) Ordinary type (ii) Automatic/Thermostat control type
- Testing and repair of Electric Iron (i) Ordinary type (ii) Automatic/Thermostat control type
- Dismantling and reassembling of Electric Stove (i) Coiled type (ii) Covered type (a) Hot plate (b) Grill (iii) Induction Heater (iv) Microwave oven, (v) Three phase heater star and delta connection
- Testing and repairs of Electric Stove (i) Coiled type (ii) Covered Type (a) Hot plate (b) Grill (iii) Induction Heater (iv) Microwave oven, (v) Three phase heater star and delta connection
- Connection of Fluorescent tube light (FTL) circuit.
- Testing and repair of (i) Table Lamp (ii) Night Lamp and (ii) Tube Light (iv) LED table lamp
- Testing fault finding, repair and overhauling of electric fans.
- Testing fault finding, repair and overhauling of (i) electric mixer (ii) grinder (iii) blender.
- Testing fault finding, repair and overhauling of washing machine.
- Testing fault finding, repair and overhauling of emergency light
- Testing fault finding, repair and overhauling of voltage stabilizer (manual and automatic)

**ELECTRICAL DOMESTIC APPLIANCES (EDA)  
SECOND YEAR  
THEORY**

**Marks : 40**

**Unit - I**

**DC Motors:**

Types of Motors - series, shunt, Compound and Universal; Construction, Working Principles, characteristics, winding details and applications of different types of motors (fractional horse power); Starters and starting of DC motors, Installation of DC motors and testing, Speed reversal and Speed control of DC motors; Common faults, their causes, testing and repairs.

**Single Phase AC Motor:**

Types of AC Motors - Induction Motor ( Split phase and Repulsion Start), Capacitor Motor, Shaded Pole Motor, Universal Motors; Constructions, working principles, special characteristics, winding details and applications of different types of fractional horse power motor; Starting and starters for different motors; Speed reversal and speed control of single phase AC motor; Installation of AC motors and testing; Common faults, their causes, testing and repairs; Rewinding of fractional horse power motors.

**Three Phase Motors**

General Principle, construction; Production of rotating field, working and starting of three phase induction motor, Manual and automatic star delta starter for three phase induction motor.

**Unit - II**

**Conducting Materials**

Copper and aluminum is Low Resistivity material, their electrical characteristics and applications; Eureka, Selenium and Carbon as High Resistivity material, their electrical characteristics and applications; Electric resistance materials.

## **Insulating Materials**

Distinction between conductor, Insulator and Semi-conductor; Insulation Resistance, Dielectric Strength, Breakdown Voltage, Mechanical and Physical Properties and Classification of Insulating Materials; Paper, plastic coated paper, PVC, Porcelain, Bitumen, Mica, Bakelite, Ebonite, Marble, Glass, Asbestos, Fiber Glass - their electrical characteristics and applications; Insulating Tapes; Sleeves; Insulating and impregnations with Varnishes and Paints, their uses and applications.

## **Magnetic Materials**

Classification of materials as Ferromagnetic materials; Soft and Hard Magnetic Materials; Losses in magnetic materials and procedure to reduce losses; Mild Steel, Silicon Steel, Mumetal, Premalloy, Alnico as magnetic materials; their properties and uses.

## **Fuse and Soldering Materials**

Silver, Copper, Lead, Tin and Alloys as fuse materials; their properties and application. General characteristics of soldering and brazing joints, processes and their characteristics; brief description of soldering and brazing tools, equipment; types of solders and fluxes and their uses; procedure of Soldering and Brazing; soldering defects and their remedies; advantages and disadvantages of soldering and brazing; precautionary measures while soldering and brazing. Soldering practice of electronic components on P.C.B.

## **Unit - III**

### **Trouble Shooting of electrical power tools**

Insulation, testing of armature, field starter, winding, noise of beaming, carbon brush changing, prevention and break down maintenance of power tools.

### **Safety Precaution and Shock Treatment**

Familiarizing the student with shop discipline; layout of Shops, Safety Precautions; Use of Firefighting equipment; First Aid Practice; Causes of Eclectic fire and shock; procedure for removal of person from contact of live wire; Treatment of Electric Shock and Burns. Lifting and handling of light and heavy equipment.

## **Common Tools**

Familiarizing the students with common tools, safe and proper use of tools, their adjustments and applications, crimping and crimping tools.

## **Corrosion Protective Paints**

Components of Paints and methods of preparation; Application of Paint for corrosion protection and precaution in painting.

## **Transmission of Power**

Belt Drive, Shaft Drive, Gear Drive, Chain Drive, Friction Drive and their applications in Domestic appliances.

## **Unit-IV**

### **Bimetallic Relay and Thermocouple**

Construction and application of Bimetallic Relays and Thermocouples for control of temperature and current.

### **Repair Shop**

Tools, Machines, Equipment and Instruments requires for Repair shop; their working and use; planning Layout and setting of a Repair Shop; Rules and methods of repair, servicing and overhauling domestic appliances; Safety precautionary measures in Repair Shop; Up-keeping of Repair Shop.

## **ELECTRICAL DOMESTIC APPLIANCES (EDA) SECOND YEAR PRACTICAL**

**Marks : 60**

### **Practicals**

- To test and repair defective cycle dynamo
- Measurement of resistance of series, shunt field and armature of a DC Motor and identification of terminals by multi meter.
- Safety practices- lifting and handling, fire fighting.
- Technique of removing persons in contact with live wire suffering from electric shock

- Artificial respiration and shock treatment
- Identification of common hand tools, make simple twist joint married joint in stranded conductors,
- Varnishing of Insulating coil winding
- Identification of different electrical symbols
- Drawing schematic diagram of electrical wiring of a house with 6 points
- Familiarization with gears and its movements
- Dismantling and reassembling pulley on motor shaft and practice on adjustment of belt tension.
- Drawing layout of (i) Repair shop and (ii) Winding Shop.
- Prepare estimate for repair, service and overhauling of domestic appliances, its costing and billing
- Single layer winding of 3-phase induction motor (squirrel cage type) ( 4 pole and 6 pole)
- Double layer concentric rewinding of 3-phase induction motor (4 pole & 6 pole)
- Testing, fault finding and repair of a DC motor.
- Overhauling of a DC motor
- Dismantling, study and reassembling of a DC motor starter
- To study DC series motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
- To study DC shunt motor, its running, speed control and reversing direction of rotation, measurement of voltage, current and speed.
- To study DC compound motor, its running, speed control and reversing rotation and measurement of current voltage and speed.
- Join the supplied wires by soldering
- Wind and test the field coil of a DC motor
- Identification of semi-conductor devices
- To draw forward and reverse characteristics of a semiconductor diode.
- Study of transistor circuits: (i) common base, (ii) common emitter and (iii) common collector
- Study of half wave rectifier circuit with and without filter

- Study of full-wave rectifier circuit with centre-tap transformer with and without filter
- Study of a bridge rectifier circuit with and without filter
- Study of transistor amplifier circuit (i) common base (ii) common emitter (Common collector)
- Study of an AC motor starter.
- Testing, fault finding and repair of an AC motor