



## **ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION**

(A Statutory body of the Government of Andhra Pradesh)

3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> floors, Neeladri Towers, Sri Ram Nagar, 6<sup>th</sup> Battalion Road,  
Atmakur (V), Mangalagiri (M), Guntur-522 503, Andhra Pradesh  
**Web:** [www.apsche.org](http://www.apsche.org) **Email:** [acapsche@gmail.com](mailto:acapsche@gmail.com)

**REVISED SYLLABUS OF ENGLISH under (Part – I)  
UNDER CBCS FRAMEWORK WITH EFFECT FROM 2020-21**

**PROGRAMME: THREE-YEAR B.A. /B.Sc./B.Com/BCA/BBM/BHM & CT, etc.**

**Andhra Pradesh State Council of Higher Education, Mangalagiri,  
Guntur District**

**Revised English Syllabus from 2020-21 Onwards  
Under Choice Based Credit System**

**Introduction**

The turn of the twenty first century has made the English Language skills a passport to the job market to all job seekers. Ability to communicate well in English has become a hallmark of good educational foundation and a prerequisite for all graduates. The students are expected to possess a measurable knowledge and a set of skills in using English language in personal and professional life. The present course **English Praxis** in three parts offers suitable context to teach, learn and practise target language skills. Each part of the course aims at certain specified skills which are taught through various text-based classroom activities and the English Language Laboratory activities. The syllabus of the course offers an open platform to the teacher to facilitate active participatory learning to the students. Hence the whole course is offered in three semesters. The first part of the course offers fundamentals of the English language in five units: Listening, Speaking, Grammar, Writing and Soft Skills. These introductory units are developed into full length courses in the subsequent semesters in addition to Reading Skills so as to prepare the learner into a fully equipped individual.

In addition to the classroom interaction, the course also aims at language enhancement through various ICT based online and offline activities in the English Language Laboratory. Each Unit is reinforced with Laboratory activities. The College administration will bestow special attention to make the **English Praxis** course an activity oriented one. The innovative methods and creativity of the English faculty will enhance the learners' participation in teaching and learning.

**Semester-I** English Praxis Course-I : **A Course in Communication and Soft Skills**

**Semester-II** English Praxis Course -II : **A Course in Reading & Writing Skills**

**Semester-III** English Praxis Course -III: **A Course in Conversational Skills**

# English Syllabus-Semester-I

## English Praxis Course-I

### A Course in Communication and Soft Skills

#### Learning Outcomes

*By the end of the course the learner will be able to :*

- Use grammar effectively in writing and speaking.
- Demonstrate the use of good vocabulary
- Demonstrate an understating of writing skills
- Acquire ability to use Soft Skills in professional and daily life.
- Confidently use the tools of communication skills

#### **I. UNIT: Listening Skills**

- i. Importance of Listening
- ii. Types of Listening
- iii. Barriers to Listening
- iv. Effective Listening

#### **II. UNIT: Speaking Skills**

- a. Sounds of English: Vowels and Consonants
- b. Word Accent
- c. Intonation

#### **III. UNIT: Grammar**

- a) Concord
- b) Modals
- c) Tenses (Present/Past/Future)
- d) Articles
- e) Prepositions
- f) Question Tags
- g) Sentence Transformation (Voice, Reported Speech & Degrees of Comparison)
- h) Error Correction

#### **IV. UNIT: Writing**

- i. Punctuation
- ii. Spelling
- iii. Paragraph Writing

#### **V. UNIT: Soft Skills**

- a. SWOC
- b. Attitude
- c. Emotional Intelligence
- d. Telephone Etiquette
- e. Interpersonal Skills

# English Syllabus-Semester-II

## English Praxis Course-II

### A Course in Reading & Writing Skills

#### Learning Outcomes

*By the end of the course the learner will be able to :*

- Use reading skills effectively
- Comprehend different texts
- Interpret different types of texts
- Analyse what is being read
- Build up a repository of active vocabulary
- Use good writing strategies
- Write well for any purpose
- Improve writing skills independently for future needs

#### I. UNIT

|               |                                      |                  |
|---------------|--------------------------------------|------------------|
| <b>Prose</b>  | : 1. How to Avoid Foolish Opinions   | Bertrand Russell |
| <b>Skills</b> | : 2. Vocabulary: Conversion of Words |                  |
|               | : 3. One Word Substitutes            |                  |
|               | : 4. Collocations                    |                  |

#### II. UNIT

|                          |                            |                     |
|--------------------------|----------------------------|---------------------|
| <b>Prose</b>             | : 1. The Doll's House      | Katherine Mansfield |
| <b>Poetry</b>            | : 2. Ode to the West Wind  | P B Shelley         |
| <b>Non-Detailed Text</b> | : 3. Florence Nightingale  | Abrar Mohsin        |
| <b>Skills</b>            | : 4. Skimming and Scanning |                     |

#### III. UNIT

|               |                               |                     |
|---------------|-------------------------------|---------------------|
| <b>Prose</b>  | : 1. The Night Train at Deoli | Ruskin Bond         |
| <b>Poetry</b> | : 2. Upagupta                 | Rabindranath Tagore |
| <b>Skills</b> | : 3. Reading Comprehension    |                     |
|               | : 4. Note Making/Taking       |                     |

#### IV. UNIT

|               |                                   |                |
|---------------|-----------------------------------|----------------|
| <b>Poetry</b> | : 1. Coromandel Fishers           | Sarojini Naidu |
| <b>Skills</b> | : 2. Expansion of Ideas           |                |
|               | : 3. Notices, Agendas and Minutes |                |

#### V. UNIT

|                          |                                  |             |
|--------------------------|----------------------------------|-------------|
| <b>Non-Detailed Text</b> | : 1. An Astrologer's Day         | R K Narayan |
| <b>Skills</b>            | : 2. Curriculum Vitae and Resume |             |
|                          | : 3. Letters                     |             |
|                          | : 4. E-Correspondence            |             |

# English Syllabus-Semester-III

## English Praxis Course-III

### A Course in Conversational Skills

#### Learning Outcomes

*By the end of the course the learner will be able to :*

- Speak fluently in English
- Participate confidently in any social interaction
- Face any professional discourse
- Demonstrate critical thinking
- Enhance conversational skills by observing the professional interviews

#### I. UNIT

**Speech Skills** : 1. Tryst with Destiny Jawaharlal Nehru  
: 2. Greetings  
: 3. Introductions

#### II. UNIT

**Speech Interview Skills** : 1. Yes, We Can Barack Obama  
: 2. A Leader Should Know How to Manage Failure  
Dr.A.P.J.Abdul Kalam/ India Knowledge at Wharton  
: 3. Requests

#### III. UNIT

**Interview Skills** : 1. Nelson Mandela's Interview With Larry King  
: 2. Asking and Giving Information  
: 3. Agreeing and Disagreeing

#### IV. UNIT

**Interview Skills** : 1. JRD Tata's Interview With T.N.Ninan  
: 2. Dialogue Building  
: 3. Giving Instructions/Directions

#### V. UNIT

1. **Speech Skills** : 1. You've Got to Find What You Love Steve Jobs  
: 2. Debates  
: 3. Descriptions  
: 4. Role Play

## **SUBJECT EXPERTS**

*Prof. K.Ratna Shiela Mani,*  
Department of English,  
Acharya Nagarjuna University,  
Nagarjuna Nagar.

*Dr. I. Vijaya Babu,*  
Principal,  
Government Degree College,  
S.Kota, Vizianagaram District– 533255

## **SYLLABUS VETTED BY**

*Prof. C.L.L.Jayaprada,*  
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Andhra University,  
Visakhapatnam.



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**REVISED SYLLABUS OF TELUGU under (Part – I)  
UNDER CBCS FRAMEWORK WITH EFFECT FROM 2020-2021**

**PROGRAMME: THREE-YEAR B.A. /B.Sc./B.Com/BCA/BBM/BHM & CT**

*(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities & Model  
Q.P.)*

*For Fifteen Courses of 1, 2, 3 Semesters)*

**(To be Implemented from 2020-21 Academic Year)**

**TELUGU**

**Andhra Pradesh State Council of Higher Education**  
**B.A., B.Com., & B.Sc., etc., Programmes**

Revised Syllabus under CBCS Pattern  
w.e.f. 2020-21

**Language Subjects - TELUGU**  
Revised Syllabus of  
**GENERAL TELUGU**

ఆంధ్ర ప్రదేశ్ రాష్ట్ర ఉన్నత విద్యామండలి  
బి.ఎ., బి.కాం., బి.యస్.సి., తదితర ప్రోగ్రాములు  
సి.బి.సి.ఎస్.పద్ధతిలో సవరించబడిన పాఠ్యప్రణాళిక  
**2020-21 విద్యా సంవత్సరం నుంచి**  
జనరల్ తెలుగు - పాఠ్య ప్రణాళిక

**Subject Curricular Framework**

| Sem | Course | Title                      | Hrs/Wk | Credits | Max. Marks |    |     | Total |
|-----|--------|----------------------------|--------|---------|------------|----|-----|-------|
|     |        |                            |        |         | IA         | SE |     |       |
| I   | I      | Pracheena Telugu Kavithvam | 04     | 03      | 25         | 75 | 100 |       |
| II  | II     | Aadhunika Telugu Sahithyam | 04     | 03      | 25         | 75 | 100 |       |
| III | III    | Srujanaathmaka Rachana     | 04     | 03      | 25         | 75 | 100 |       |

పాఠ్యప్రణాళిక (3 కోర్సులు)

| సెమి. | కోర్సు | శీర్షిక                | పీరియడ్లు/వారానికి | క్రెడిట్లు | మొత్తం మార్కులు |    |     |
|-------|--------|------------------------|--------------------|------------|-----------------|----|-----|
| I     | I      | ప్రాచీన తెలుగు కవిత్వం | 04                 | 03         | 25              | 75 | 100 |
| II    | II     | ఆధునిక తెలుగు సాహిత్యం | 04                 | 03         | 25              | 75 | 100 |
| III   | III    | సృజనాత్మక రచన          | 04                 | 03         | 25              | 75 | 100 |



బి.ఏ., బి.కా., బి.యస్.సి., తదితర ప్రోగ్రాములు

అంశం: జనరల్ తెలుగు

సెమిస్టర్-1

కోర్సు-1 : ప్రాచీన తెలుగు కవిత్వం

యూనిట్ల సంఖ్య: 5

పీరియడ్ల సంఖ్య: 60

◆ అభ్యసన ఫలితాలు: -

ఈ కోర్సు విజయవంతంగా ముగించాక, విద్యార్థులు క్రింది అభ్యసన ఫలితాలను పొందగలరు.

1. ప్రాచీన తెలుగుసాహిత్యం యొక్క ప్రాచీనతను, విశిష్టతను గుర్తిస్తారు. తెలుగుసాహిత్యంలో ఆదికవినన్నయ కాలనాటి భాషాసంస్కృతులను, ఇతిహాసకాలం నాటి రాజనీతి విషయాలపట్ల పరిజ్ఞానాన్ని సంపాదించగలరు.
2. శివకవుల కాలనాటి మతపరిస్థితులను, భాషావిశేషాలను గ్రహిస్తారు. తెలుగు నుడికారం, సామెతలు, లోకోక్తులు మొదలైన భాషాంశాల పట్ల పరిజ్ఞానాన్ని పొందగలరు.
3. తిక్కన భారతనాటి మత, ధార్మిక పరిస్థితులను, తిక్కన కవితాశిల్పాన్ని, నాటకీయతను అవగాహన చేసుకోగలరు.
4. ఎఱ్ఱన సూక్తివైచిత్రిని, ఇతిహాస కవిత్వంలోని విభిన్న రీతులపట్ల అభిరుచిని పొందగలరు. శ్రీనాథుని కాలం నాటి కవితావిశేషాలను, మొల్ల కవితా విశిష్టతను గుర్తించగలరు.
5. తెలుగు పద్యం స్వరూప-స్వభావాలను, సాహిత్యాభిరుచిని పెంపొందించుకుంటారు. ప్రాచీన కావ్యభాషలోని వ్యాకరణాంశాలను అధ్యయనం చేయడం ద్వారా భాషాసామర్థ్యాన్ని, రచనల మెళకువలను గ్రహించగలరు.

## పాఠ్య ప్రణాళిక

యూనిట్-I

రాజనీతి - నన్నయ  
మహాభారతం-సభాపర్వం-ప్రథమాశ్వాసం-(26-57 పద్యాలు)

యూనిట్-II

దక్షయజ్ఞం - నన్నెచోడుడు  
కుమారసంభవం-ద్వితీయాశ్వాసం-(49-86 పద్యాలు)

యూనిట్-III

ధౌమ్య ధర్మోపదేశము - తిక్కన  
మహాభారతం-విరాటపర్వం-ప్రథమాశ్వాసం-(116-146) పద్యాలు

యూనిట్-IV

పలనాటి బెబ్బులి - శ్రీనాథుడు (పలనాటి వీరచరిత్ర-ద్విపద కావ్యం పుట 108-112  
'బాలచంద్రుడు భీమంబగు సంగ్రామం బొనర్చుట.. (108)..  
..... వెఱగంది కుంది' (112) సం. అక్కిరాజు ఉమాకాంతం  
ముద్రణ.వి.కె.స్వామి, బెజవాడ 1911.

యూనిట్-V

సీతారావణ సంవాదం - మొల్ల  
రామాయణము-సుందరకాండము-(40-87 పద్యాలు)

### ◆వ్యాకరణం

సంధులు: ఉత్ప, త్రిక, ద్రుతప్రకృతిక, నుగాగమ,ద్విరుక్తటకారాదేశ, యణాదేశ, వృద్ధి, శ్చుత్ప, జశ్చ, అనునాసిక సంధులు.

సమాసాలు: అవ్యయిభావ, తత్పురుష, కర్మధారయ, ద్వంద్వ, ద్విగు, బహువ్రీహి.

అలంకారాలు:

అర్థాలంకారాలు : ఉపమ, ఉత్పేక్ష, రూపక, స్వభావోక్తి, అర్థాంతరవ్యాస, అతిశయోక్తి.

శబ్దాలంకారాలు : అనుప్రాస (వృత్త్యనుప్రాస, ఛేకామప్రాస లాటానుప్రాస, అంత్యానుప్రాస)

ఛందస్సు

వృత్తాలు: ఉత్పలమాల, చంపకమాల, శార్దూలము, మత్తేభము;

జాతులు : కందం, ద్విపద; ఉపజాతులు : ఆటవెలది, తేటగీతి, సీసం మరియు ముత్యాలసరాలు

**ఆధార గ్రంథాలు:**

1. శ్రీమదాంధ్ర మహాభారతము : సభాపర్వము-తిరుమల తిరుపతి దేవస్థానం ప్రచురణ
2. శ్రీమదాంధ్ర మహాభారతము : విరాటపర్వము-తిరుమల తిరుపతి దేవస్థానం ప్రచురణ
3. కుమార సంభవం - నన్నెచోడుడు
4. పలనాటి వీరచరిత్ర - శ్రీనాథుడు
5. రామాయణము - మొల్ల

**✦ సూచించబడిన సహపాఠ్య కార్యక్రమాలు:**

1. నన్నయ్య, తిక్కన, ఎఱ్ఱన మొదలైన ప్రసిద్ధ కవుల పాఠ్యాంశేతర పద్యాలను ఇచ్చి, విద్యార్థులచేత సమీక్షలు రాయించడం; ఆయా పద్యాల్లోని యతిప్రాసాది ఛందోవిశేషాలను గుర్తింపజేయడం.
2. విద్యార్థులచేత పాఠ్యాంశాలకు సంబంధించిన వ్యాసాలు రాయించడం (సెమినార్/అసైన్మెంట్)
3. ప్రాచీన పాఠ్యాంశాలలోని సమకాలీనతను గూర్చిన బృంద చర్చ, ప్రాచీన సాహిత్యాన్ని నేటి సామాజిక దృష్టితో పునర్మూల్యాంకనం చేయించడం.
4. చారిత్రక, సాంస్కృతిక అంశాలకు సంబంధించిన పర్యాటక ప్రదేశాలను సందర్శించడం.
5. వ్యక్తిగత/బృంద ప్రాజెక్టులు చేయించడం. ప్రశ్నాపత్ర నిర్మాతలకు సూచనలు ప్రతిపదార్థ పద్యాలు, కంఠస్థ పద్యాలు “రాజనీతి, దక్షయజ్ఞం, ధౌమ్య ధర్మోపదేశం, సీతారావణ సంవాదం” అనే నాలుగు పాఠ్యాంశాల నుండి మాత్రమే ఇవ్వాలి.

**ప్రశ్నాపత్ర నమూనా**

|   |       |           |
|---|-------|-----------|
| అ. ప్రతిపదార్థ పద్యాలు-(అంతర్గత ఛాయెస్) (2-1) | 1×8=8 | మా        |
| ఆ. కంఠస్థ పద్యం-(అంతర్గత ఛాయెస్) (2-1)        | 1×3=3 | మా        |
| ఇ. సందర్భ వాక్యాలు-                           | (6-4) | 4×3=12 మా |
| ఈ. సంగ్రహ సమాధాన ప్రశ్నలు                     | (6-4) | 4×3=12 మా |
| ఉ. వ్యాస ప్రశ్నలు (అంతర్గత ఛాయెస్)            | (6-3) | 3×8=24 మా |
| ఊ. వ్యాకరణం-సంధులు                            | (6-4) | 4×1=4 మా  |
| సమాసాలు                                       | (6-4) | 4×1=4 మా  |
| అలంకారాలు                                     | (2-1) | 1×4=4 మా  |
| ఛందస్సు                                       | (2-1) | 1×4=4 మా  |

బి.ఏ., బి.కాం., బి.యస్.సి., తదితర ప్రోగ్రాములు  
అంశం: జనరల్ తెలుగు సెమిస్టర్-2  
కోర్సు-2 : ఆధునిక తెలుగు సాహిత్యం

యూనిట్ల సంఖ్య:5

పీరియడ్ల సంఖ్య:60

◆ అభ్యసన ఫలితాలు:-

ఈ కోర్సు విజయవంతంగా ముగించాక, విద్యార్థులు క్రింది అభ్యసన ఫలితాలను పొందగలరు.

1. ఆంగ్లభాష ప్రభావం కారణంగా తెలుగులో వచ్చిన ఆధునిక సాహిత్యాన్ని, దాని విశిష్టతను గుర్తిస్తారు.
2. సమకాలీన ఆధునిక సాహిత్య ప్రక్రియలైన “వచన కవిత్వం, కథ, నవల, నాటకం, విమర్శ”లపై అవగాహన పొందుతారు.
3. భావకవిత, అభ్యుదయ కవితాలక్ష్యాలను గూర్చిన జ్ఞానాన్ని పొందుతారు. అస్తిత్వవాద ఉద్యమాలపుట్టుకను, ఆవశ్యకతను గుర్తిస్తారు.
4. కథాసాహిత్యం ద్వారా సామాజిక చైతన్యాన్ని పొందుతారు. సిద్ధాంతాల ద్వారా కాకుండా, వాస్తవ పరిస్థితులను తెలుసుకోవడం ద్వారా సిద్ధాంతాన్ని సమీక్షించగలరు.
5. ఆధునిక తెలుగు కల్పనాసాహిత్యం ద్వారా సామాజిక, సాంస్కృతిక, రాజకీయ చైతన్యాన్ని పొందుతారు.

## పాఠ్య ప్రణాళిక

### యూనిట్-I : ఆధునిక కవిత్వం

1. ఆధునిక కవిత్వం- పరిచయం
2. కొండవీడు - దువ్వూరి రామిరెడ్డి  
(‘కవికోకిల’ గ్రంథావళి-ఖండకావ్యాలు-నక్షత్రమాల సంపుటి నుండి)
3. మాతృసంగీతం - అనిసెట్టి సుబ్బారావు (‘అగ్నివీణ’ కవితాసంపుటి నుండి)
4. ‘తాతకో నూలుపోగు’ - బండారు ప్రసాదమూర్తి (‘కలనేత’ కవితాసంపుటి నుండి)

### యూనిట్-II: కథానిక

5. తెలుగు కథానిక - పరిచయం
6. భయం (కథ) - కాళీపట్నం రామారావు
7. స్వేదం ఖరీదు....? - (కథ) - రెంటాల నాగేశ్వరరావు

### యూనిట్-III: నవల

8. తెలుగు ‘నవల’ - పరిచయం
9. రథచక్రాలు (నవల) - మహీధర రామ్మోహన రావు (సంక్షిప్త ఇతివృత్తం మాత్రం)
10. రథచక్రాలు (సమీక్షా వ్యాసం) - డా॥ యల్లాప్రగడ మల్లికార్జునరావు

### యూనిట్-IV: నాటకం

11. తెలుగు ‘నాటకం’ - పరిచయం
12. యక్షగానము (నాటిక) - ఎం.వి.ఎస్. హరనాథరావు.
13. “అపురూప కళారూపాల విధ్వంసదృశ్యం ‘యక్షగానము’ (సమీక్షా వ్యాసం)”  
-డా॥కందిమళ్ళసాంబశివరావు

### యూనిట్-V: విమర్శ

14. తెలుగు సాహిత్య విమర్శ - పరిచయం
15. విమర్శ-స్వరూప స్వభావాలు; ఉత్తమ విమర్శకుడు-లక్షణాలు

**ఆధార గ్రంథాలు/వ్యాసాలు:**

1. ఆధునిక కవిత్వం-పరిచయం : చూ. 'దృక్పథాలు' పుట 1-22, ఆచార్య ఎస్సీ. సత్యనారాయణ
2. తెలుగు కథానిక-పరిచయం : చూ. మన నవలలు-మన కథానికలు, పుట 118-130,  
ఆచార్య రాచపాళెం చంద్రశేఖర రెడ్డి
3. తెలుగు నవల-పరిచయం : చూ. నవలాశిల్పం, పుట 1-17, వల్లంపాటి వెంకటసుబ్బయ్య
4. తెలుగు నాటకం-పరిచయం : చూ. తెలుగు నాటకరంగం, పుట 17-25 ఆచార్య ఎస్.గంగప్ప
5. తెలుగుసాహిత్య విమర్శ-పరిచయం: చూ.తెలుగుసాహిత్య విమర్శ-నాడు,నేడు పుట 213-217  
తెలుగువాణి, అయిదవ అఖిలభారత తెలుగు మహాసభల ప్రత్యేక సంచిక  
ఆచార్య జి.వి.సుబ్రహ్మణ్యం
6. నూరేళ్ళ తెలుగు నాటక రంగం - ఆచార్య మొదలి నాగభూషణశర్మ
7. నాటకశిల్పం - ఆచార్య మొదలి నాగభూషణశర్మ
8. సాంఘిక నవల-కథన శిల్పం - ఆచార్య సి.మృణాలిని.

**◆ సూచించబడిన సహపాఠ్య కార్యక్రమాలు:**

1. ఆధునిక కవిత్వానికి సంబంధించిన కొత్త కవితలను/అంశాలను ఇచ్చి, విద్యార్థులచేత వాటిమీద అసైన్మెంట్లు రాయించడం
2. పాఠ్యాంశాలకు సంబంధించిన విషయాలపై వ్యాసాలు రాయించడం (సెమినార్/అసైన్మెంట్)
3. తెలుగు సాహిత్యంలోని ప్రసిద్ధ కథలపై, కవితలపై సమీక్షలు రాయించడం.
4. ఆధునిక పద్యనిర్మాణ రచన చేయించడం.
5. విద్యార్థులను బృందాలుగా విభజించి, నాటకలపై/నవలలపై సమీక్షలు రాయించడం.
6. సాహిత్యవ్యాసాలు సేకరించడం, బృందచర్చ నిర్వహించడం, క్షేత్రపర్యటనలు.
7. ప్రసిద్ధుల విమర్శావ్యాసాలు చదివించి, వాటిని విద్యార్థుల సొంత మాటల్లో రాయించడం.
8. పాఠ్యాంశాలపై స్వీయ విమర్శావ్యాసాలు రాయించడం.

**◆ప్రశ్నాపత్ర నమూనా ◆**

**అ-విభాగము**

సంక్షిప్త సమాధాన ప్రశ్నలు - ప్రతి యూనిట్ నుంచి తప్పనిసరిగా ఒక ప్రశ్న ఇస్తూ, మొత్తం ఎనిమిది ప్రశ్నలు ఇచ్చి, ఐదింటికి సమాధానం రాయమనాలి. 5×5=25 మా.

**ఆ-విభాగము**

వ్యాసరూప సమాధాన ప్రశ్నలు-ప్రతి యూనిట్ నుంచి తప్పనిసరిగా రెండు ప్రశ్నలు ఇచ్చి ఒక ప్రశ్నకు సమాధానం రాయమనాలి. మొత్తం ప్రశ్నలు 5. 5×10=50 మా.

◆ మాదిరి ప్రశ్నాపత్రం ◆

అ-విభాగము

క్రింది వానిలో ఐదింటికి సంక్షిప్త సమాధానాలు రాయండి.

ప్రతి సమాధానానికి 5 మార్కులు.

5×5=25 మా.

1. కొండవీడు
2. తెలుగు నవల
3. తెలుగు నాటకం
4. ఆధునిక కవిత్వం
5. కథానిక
6. విమర్శ
7. అనిసెట్టి సుబ్బారావు
8. కాళీపట్నం రామారావు

ఆ-విభాగము

క్రింది వానిలో అన్ని ప్రశ్నలకు సమాధానాలు రాయండి.

ప్రతి సమాధానానికి 10 మార్కులు.

5×10=50 మా.

9. ఆధునిక కవిత్వ ఆవిర్భావ వికాసాలను వివరించండి.

(లేదా)

కొండవీడులో దువ్వూరి రామిరెడ్డి గారి సందేశాన్ని వివరించండి.

10. తెలుగు కథానికను పరిచయం చేయండి.

(లేదా)

భయం కథలోని రచయిత సందేశాన్ని రాయండి.

11. సాహిత్య ప్రక్రియగా నవల స్థానాన్ని విమర్శించండి.

(లేదా)

రథచక్రాలు నవలలోని ఇతివృత్తాన్ని విశ్లేషించండి.

12. తెలుగు నాటక పరిణామాన్ని గూర్చి రాయండి.

(లేదా)

యక్షగానం నాటికపై సమీక్షా వ్యాసం రాయండి.

13. తెలుగు సాహిత్య విమర్శను పరిచయం చేయండి

(లేదా)

విమర్శ స్వరూప స్వభావాలను వివరిస్తూ, ఉత్తమ విమర్శకుని లక్షణాలను రాయండి.

బి.ఏ., బి.కా., బి.యస్.సి., తదితర ప్రోగ్రాములు  
అంశం: జనరల్ తెలుగు సెమిస్టర్-3  
కోర్సు-3 : సృజనాత్మక రచన

యూనిట్ల సంఖ్య:5

పీరియడ్ల సంఖ్య:60

◆ అభ్యసన ఫలితాలు: -

- ఈ కోర్సు విజయవంతంగా ముగించాక, విద్యార్థులు క్రింది అభ్యసన ఫలితాలను పొందగలరు.
1. తెలుగు సాహిత్య అభ్యసన ద్వారా నేర్చుకున్న నైపుణ్యాలను, సృజనాత్మక నైపుణ్యాలను మార్చుకోగలరు.
  2. విద్యార్థులు భాషాతత్వాన్ని, భాష యొక్క ఆవశ్యకతను, భాష యొక్క ప్రాధాన్యాన్ని గుర్తిస్తారు. మనిషి వ్యక్తిగత జీవనానికి, సామాజికవ్యవస్థ పటిష్టతకు భాష ప్రధానమని తెలుసుకుంటారు. తెలుగుభాషలోని కీలకాంశాలైన 'వర్ణం-పదం-వాక్యాల' ప్రాధాన్యాన్ని గుర్తిస్తూ, వాగ్రూప- లిఖితరూప వ్యక్తీకరణ ద్వారా భాషానైపుణ్యాలను మెరుగుపరచుకోగలరు.
  3. భాషానైపుణ్యాలను అలవరచుకోవడంతోపాటు వినియోగించడం నేర్చుకుంటారు. రచనా, భాషానైపుణ్యాలను సృజనాత్మక రూపంలో వ్యక్తీకరించగలరు.
  4. ప్రాచీన పద్యరచనతో పాటు ఆధునిక కవిత, కథ, వ్యాసం, మొదలైన సాహిత్యప్రక్రియల నిర్మాణాలకు సంబంధించిన సిద్ధాంతవిషయాలను నేర్పడంతో పాటు వారిలో రచనా నైపుణ్యాలను పెంపొందించుకోగలరు.
  5. సృజన రంగం, ప్రసారమాధ్యమ రంగాల్లో ఉపాధి అవకాశాలను అందిపుచ్చుకోగలరు.
  6. అనువాద రంగంలో నైపుణ్యం సంపాదించగలరు.



## పాఠ్య ప్రణాళిక

### యూనిట్-I: వ్యక్తికరణ నైపుణ్యాలు

1. భాష-ప్రాథమికాంశాలు: భాష-నిర్వచనం, లక్షణాలు, ఆవశ్యకత, ప్రయోజనాలు
2. వర్ణం-పదం-వాక్యం', వాక్య లక్షణాలు, సామాన్య-సంయుక్త-సంశ్లిష్టవాక్యాలు
3. భాషా నిర్మాణంలో 'వర్ణం-పదం-వాక్యం' ప్రాధాన్యత

### యూనిట్-II సృజనాత్మక రచన

4. కవితా రచన : ఉత్తమ కవిత - లక్షణాలు
5. కథారచన : ఉత్తమ కథ - లక్షణాలు
6. వ్యాస రచన : ఉత్తమ వ్యాసం-లక్షణాలు

### యూనిట్-III: అనువాద రచన

7. అనువాదం-నిర్వచనం, అనువాద పద్ధతులు,
8. అనువాద సమస్యలు-భౌగోళిక,భాషా,సాంస్కృతిక సమస్యలు, పరిష్కారాలు
9. అభ్యాసము : ఆంగ్లం నుండి తెలుగుకు,తెలుగు నుండి ఆంగ్లానికి ఒక పేరాను అనువదించడం

### యూనిట్ IV మాధ్యమాలకు రచన-1 (ముద్రణామాధ్యమం/ప్రింట్ మీడియా)

10. ముద్రణామాధ్యమం (అచ్చుమాధ్యమం) : పరిచయం, పరిధి, వికాసం
11. వివిధ రకాల పత్రికలు-పరిశీలన, పత్రికాభాష, శైలి, వైవిధ్యం
12. పత్రికా రచన : వార్తా రచన, సంపాదకీయాలు, సమీక్షలు-అవగాహన

### యూనిట్ V మాధ్యమాలకు రచన-2 (ప్రసార మాధ్యమం/ఎలక్ట్రానిక్ మీడియా)

13. ప్రసారమాధ్యమాలు : నిర్వచనం, రకాలు, విస్తృతి, ప్రయోజనాలు
14. శ్రవణ మాధ్యమాలు - రచన: రేడియో రచన, ప్రసంగాలు, నాటికలు, ప్రసార సమాచారం
15. దృశ్యమాధ్యమాలు - రచన: వ్యాఖ్యానం (యాంకరింగ్), టెలివిజన్ రచన

## ఆధార గ్రంథాలు/వ్యాసాలు:

1. వ్యక్తీకరణ నైపుణ్యాలు - చూ. 1. ఆధునిక భాషాశాస్త్ర సిద్ధాంతాలు-ఆచార్య పి.ఎస్.సుబ్రహ్మణ్యం  
2. తెలుగు భాషా చరిత్ర - సం.ఆచార్య భద్రరాజు కృష్ణమూర్తి  
3. తెలుగు వాక్యం - డా. చేకూరి రామారావు
2. ఉత్తమ కవిత-లక్షణాలు - చూ. నవ్యకవిత్వ లక్షణములు- ఆచార్య సి.నారాయణరెడ్డి  
ఆధునికాంధ్ర కవిత్వము-సంప్రదాయములు, ప్రయోగములు: చతుర్థ ప్రకరణము.
3. ఉత్తమ కథ-లక్షణాలు - చూ.కథాశిల్పం-వల్లంపాటి వెంకటసుబ్బయ్య, పుటలు 11-17
4. ఉత్తమ వ్యాసం-లక్షణాలు- చూ.చదువు-సంస్కృతి (వ్యాసం) - కొడవటిగంటి కుటుంబరావు
5. అనువాద రచన - చూ.1. అనువాద సమస్యలు - రాచమల్లు రామచంద్రారెడ్డి  
పుటలు 61-75, 85-94  
2. అనువాదన పద్ధతులు ఆచరణ సమస్యలు-చేకూరి రామారావు  
“భాషాంతరంగం”, పుటలు 130-146, తెలుగు విశ్వవిద్యాలయం ప్రచురణ
6. ముద్రణా మాధ్యమం - చూ. మాధ్యమాలకు రచన, పుటలు 9-12  
- డా॥ బి.ఆర్.అంబేద్కర్ విశ్వవిద్యాలయ ప్రచురణ
7. పత్రికా భాష - చూ. మాధ్యమాలకు రచన, పుటలు 67-74  
- డా॥ బి.ఆర్.అంబేద్కర్ విశ్వవిద్యాలయ ప్రచురణ
8. పత్రికా రచన - చూ. తెలుగు- మౌలికాంశాలు, పుటలు 59-69  
- డా॥ బి.ఆర్.అంబేద్కర్ విశ్వవిద్యాలయ ప్రచురణ
9. ప్రసార మాధ్యమాలు - చూ. మాధ్యమాలకు రచన, పుటలు 3-10  
- డా॥ బి.ఆర్.అంబేద్కర్ విశ్వవిద్యాలయ ప్రచురణ
10. రేడియో రచన - చూ.మాధ్యమాలకు రచన, పుటలు 141-148  
- డా॥ బి.ఆర్.అంబేద్కర్ విశ్వవిద్యాలయ ప్రచురణ
11. వ్యాఖ్యానం (యాంకరింగ్) - చూ.మాధ్యమాలకు రచన, పుటలు 178-181  
- డా॥ బి.ఆర్.అంబేద్కర్ విశ్వవిద్యాలయ ప్రచురణ
12. టెలివిజన్ రచన - చూ.మాధ్యమాలకు రచన, పుటలు 153-160  
- డా॥ బి.ఆర్.అంబేద్కర్ విశ్వవిద్యాలయ ప్రచురణ
13. తెలుగు జర్నలిజం - డా॥ బూదరాజు రాధాకృష్ణ

## సూచించబడిన సహపాఠ్య కార్యక్రమాలు

1. భాషాంశాలపై, వాక్య నిర్మాణంపై అసైన్మెంట్లు రాయించడం, పత్రికల్లోని సాహిత్య/భాషాంశాలను సేకరింపజేయడం.
2. విద్యార్థులచేత తెలుగుభాషా సాహిత్యాలపై ప్రసంగవ్యాసం ఇప్పించడం (సెమినార్/ అసైన్మెంట్)
3. వ్యాసరచన, లేఖారచన, స్వీయకవితలు రాయించి, తరగతిలో చదివింపజేయడం మొదలైనవి.
4. వివిధ కార్యక్రమాల్లో విద్యార్థులచేత సదస్సు నిర్వహణ, వ్యాఖ్యానం (యాంకరింగ్) చేయించడం.
5. సమకాలీన భాషాసమస్యలపై / ఉద్యమాలపై/సాంఘిక సమస్యలపై 'బృందచర్చ' (Group Discussion) నిర్వహింపజేయడం.
6. తెలుగుభాషా దినోత్సవం/అంతర్జాతీయ మాతృభాషా దినోత్సవం మొదలైన రోజుల్లో జరిగే సాంస్కృతిక కార్యక్రమాలు విద్యార్థులచేత నిర్వహింపజేయడం, వాటిపై సమీక్షలు/పత్రికా ప్రకటనలు రాయించడం.
7. సమకాలీన సంఘటనలపై సామాజిక మాధ్యమాల్లో/ టి.వి.ల్లో జరిగే చర్చలను నమోదు చేయించి సంకలనం చేయడం.
8. సాంస్కృతిక / చారిత్రక ప్రాశస్త్యం కలిగిన కట్టడాలు , దేవాలయాలు, కళానిలయాలను 'బృందపర్యటన/ క్షేత్ర పర్యటన' ద్వారా విద్యార్థులచేత సందర్శింపజేయడం.

### ◆ప్రశ్నాపత్ర నమూనా ◆

#### అ-విభాగము

సంక్షిప్త సమాధాన ప్రశ్నలు - ప్రతి యూనిట్ నుంచి తప్పనిసరిగా ఒక ప్రశ్న ఇస్తూ, మొత్తం ఎనిమిది ప్రశ్నలు ఇచ్చి, ఐదింటికి సమాధానం రాయమనాలి.  $5 \times 5 = 25$  మా.

#### ఆ-విభాగము

వ్యాసరూప సమాధాన ప్రశ్నలు-ప్రతి యూనిట్ నుంచి తప్పనిసరిగా రెండు ప్రశ్నలు ఇచ్చి ఒక ప్రశ్నకు సమాధానం రాయమనాలి. మొత్తం ప్రశ్నలు 5.  $5 \times 10 = 50$  మా.

◆ మాదిరి ప్రశ్నాపత్రం ◆

అ-విభాగము

క్రింది వానిలో ఐదింటికి సంక్షిప్త సమాధానాలు రాయండి. 8వ ప్రశ్నకు తప్పనిసరిగా సమాధానం రాయాలి. ప్రతి సమాధానానికి 5 మార్కులు.  $5 \times 5 = 25$  మా.

1. భాష-ప్రయోజనాలు
2. వాక్యం-లక్షణాలు
3. టెలివిజన్ రచన
4. రేడియో రచన
5. ఉత్తమ వ్యాసం-లక్షణాలు
6. సంశ్లిష్ట వాక్యం
7. సంపాదకీయాలు
8. క్రింది అంశాన్ని తెలుగులోకి అనువదించి రాయండి.

To many, Indian thought, Indian manners, Indian customs, Indian Philoshophy, Indian Literature are repulsive at the first sight; but let them preservere, let them read, let them become familiar with the great principles underlying these ideas, and it is ninety-nine to one that the charm will come over them, and fascination will be the result. Slow and silent, as the gentle dew that falls in the morning, unseen and unheard yet producing, a most tremendous result, has been the work of the calm, patient, all-suffering spiritual race upon the World of thought.

ఆ-విభాగము

క్రింది వానిలో అన్ని ప్రశ్నలకు సమాధానాలు రాయండి.

ప్రతి సమాధానానికి 10 మార్కులు.

$5 \times 10 = 50$  మా.

9. భాషానిర్మాణంలో 'వర్ణం-పదం-వాక్యా'ల ప్రాధాన్యతను వివరించండి. (లేదా)

భాషను నిర్వచించి, లక్షణాలు రాసి, ప్రామాణిక భాషను పరిచయం చేయండి.

10. ఉత్తమ కవితా లక్షణాలను విశ్లేషించండి.

(లేదా)

ఉత్తమ కథా లక్షణాలను వివరించండి.

11. అనువాద సమస్యలను, వాటి పరిష్కారాలను గూర్చి రాయండి.

(లేదా)

అనువాద లక్షణాలను వివరిస్తూ, అనువాద పద్ధతులను గురించి రాయండి.

12. ముద్రణా మాధ్యమాన్ని పరిచయం చేస్తూ; దాని పరిధి, వికాసాలను వివరించండి.

(లేదా)

పత్రికా రచనను గురించి విశ్లేషణాత్మక వ్యాసం రాయండి.

13. ప్రసార మాధ్యమాల విస్తృతి, ప్రయోజనాలను సమీక్షించండి.

(లేదా)

యాంకరింగ్ నిర్వహణ, తీరుతెన్నులను వివరించండి.

**SUBJECT EXPERTS**

*Prof.N.V.Krishna Rao*  
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Nagarjuna Nagar

*Dr.K.N.Sundaeswara Rao,*  
Govt. College for Men(Autonomous),  
Kadapa

**SYLLABUS VETTED BY**

*Prof.S.Rajeswari,*  
Dept of Telugu Studies,  
S V University,  
Tirupati

# ANDHA UNIVERSITY

I B.A./B.Com./B.Sc., SEMESTER – I : GENERAL HINDI PAPER – I

w.e.f. 2020-21

(Prose, Short Stories and Grammar)

Credits : 03

Teaching Hrs/Week : 04

## SYLLABUS

### गद्य संदेश (PROSE)

१. भारतीय साहित्य की एकता - नन्द दुलारे वाजपायी
२. आत्मनिर्भरता - पं. बालकृष्ण भट्ट
३. अन्दर की पवित्रता - डॉ. हजारी प्रसाद द्विवेदी

### कथा लोक (SHORT STORIES)

४. ठाकुर का कुआँ - प्रेमचंद
१. वापसी - उषा प्रियंवदा
२. सदाचार का तावीज - हरिशंकर परसाई

### व्याकरण (GRAMMAR)

लिंग, वचन,

काल

विलोम शब्द

कार्यालयीन शब्दावली - अंग्रेजी से हिन्दी, हिन्दी से अंग्रेजी

पत्र लेखन - व्यक्तिगत पत्र (छुट्टी पत्र , पिता, मित्र के नाम पत्र, पुस्तक विक्रेता के नाम पत्र )

**ANDHRA UNIVERSITY**

I B.A./B.Com./B.Sc., SEMESTER – I : GENERAL HINDI PAPER – I

**w.e.f. 2020-21**

**(Prose, Short Stories and Grammar)**

Time : 3hrs

Max Marks :75

**MODEL QUESTION PAPER**

**PART - A**

- I. किन्ही पाँच प्रश्नों के उत्तर दीजिए | 5 X 5 = 25  
Short Q & ANS
1. Annotation - Prose
  2. Annotation - Prose
  3. Short Question - Prose
  4. Short Question - Short Stories(Non-detailed)
  5. Short Question - Short Stories(Non-detailed)
  6. Short Question - Short Stories(Non-detailed)
  7. Short Question – Grammar
  8. Short Question - Grammar

**PART - B**

- II. निम्न लिखित सभी प्रश्नों के उत्तर दीजिए | 5 X10 = 50
1. PROSE  
(अथवा)  
PROSE
  2. PROSE  
(अथवा)  
Short Stories(Non-detailed)
  3. Short Stories(Non-detailed)  
(अथवा)  
Short Stories(Non-detailed)

4. LETTER WRITING पत्र लेखन

(अथवा)

LETTER WRITING पत्र लेखन

5. a ) निम्न लिखित शब्दों के विलोम शब्द लिखिए ।

1. 2. 3. 4. 5. 6. 7. 8. 9. 10

b ) काल

(अथवा)

निम्न लिखित अंग्रेजी शब्दों का हिन्दी में अनुवाद कीजिए ।

(a ) 1. Part time 2. Memorandum 3. Conference 4. Certificate 5. Circular

(b ) निम्न लिखित हिन्दी शब्दों का अंग्रेजी में अनुवाद कीजिए

6. चुनाव 7. सचिव 8. लेखाकार 9. राज्यपाल 10. नगर निगम



## **ANDHRA UNIVERSITY**

II B.A./B.Com./B.Sc., SEMESTER – II : GENERAL HINDI PAPER – I

**2020-21**

(Prose, Short Stories, Grammar and Letter writing)

Credits : 03

Teaching Hrs/Week : 4

### **SYLLABUS**

#### **गद्य संदेश (PROSE)**

१. भारत में संस्कृति संगम - रामधारी सिंह दिनकर
३. समय पर मिलाने वाले - हरिशंकर परसाई
२. HIV /AIDS

#### **कथा लोक (SHORT STORIES)**

३. हार की जीत - सुदर्शन

४. पुरस्कार - जयशंकर प्रसाद

५. सेवा - ममता कालिया

### व्याकरण (GRAMMAR)

कार्यालयीन हिन्दी शब्दावली - अंग्रेजी से हिन्दी, हिन्दी से अंग्रेजी

पदनाम

कारक,

पत्र लेखन (आवेदन पत्र, शिकायती पत्र )

**ANDHRA UNIVERSITY**  
II B.A./B.Com./B.Sc., SEMESTER – II : GENERAL HINDI PAPER – I  
**w.e.f.2020-21**

(Prose, Short Stories, Grammar and Letter writing)

Time : 3hrs

Max Marks :75

**MODEL QUESTION PAPER**

**PART - A**

- I. किन्ही पाँच प्रश्नों के उत्तर दीजिए | 5 X 5 = 25  
Short Q & ANS
9. Annotation - Prose
10. Annotation - Prose
11. Short Question - Prose
12. Short Question - Short Stories(Non-detailed)
13. Short Question - Short Stories(Non-detailed)
14. Short Question - Short Stories(Non-detailed)
15. Short Question - Grammar
16. Short Question - Grammar

**PART - B**

- II. निम्न लिखित सभी प्रश्नों के उत्तर दीजिए | 5 X10 = 50
17. PROSE  
(अथवा)  
PROSE
18. PROSE  
(अथवा)  
Short Stories(Non-detailed)
19. Short Stories(Non-detailed)  
(अथवा)  
Short Stories(Non-detailed)
20. LETTER WRITING पत्र लेखन ( आवेदन पत्र, शिकायती पत्र )  
(अथवा)  
LETTER WRITING पत्र लेखन
21. कारक कितने प्रकार के हैं ? समझाइए |

(अथवा)

a) निम्न लिखित हिन्दी शब्दों का अंग्रेजी में अनुवाद कीजिए ।

1.            2.            3.            4.            5.

b) निम्न लिखित हिन्दी पदनामों का अंग्रेजी में अनुवाद कीजिए ।

1.            2.            3.            4.            5.

**Signature of the members**

# ANDHRA UNIVERSITY

II B.A./B.Com./B.Sc., SEMESTER – III : GENERAL HINDI PAPER – II

w.e.f. 2022-23

(Old & Modern Poetry, History of Hindi Literature, Essays, Translation and Official Letters)

Credits : 03

Teaching Hrs/Week : 4

## SYLLABUS

### 1. काव्यदीप : साखी - १-१०

सूरदास - बाल वर्णन

आगे बढ़, आगे - मैथिलीशरण गुप्त

भिक्षुक - निराला

चरण चले, ईमान अचल हो ! - माखनलाल चतुर्वेदी

### 2. हिन्दी साहित्य का इतिहास :

भक्तिकाल : स्वर्ण युग

जानाश्रयी शाखा - कबीर, प्रेमाश्रयी शाखा - जायसी

### 3. साधारण निबंध :

नारी शिक्षा का महत्त्व

प्रदूषण का खतरा

विश्व भाषा के रूप में हिन्दी

भारत की वर्तमान समस्याएँ

स्वच्छ भारत

### 4. अनुवाद : अंग्रेजी से हिन्दी ( 3-4 lines)

तेलुगु से हिन्दी

### 5. प्रयोजन मूलक हिन्दी : सरकारी पत्र (Official letters )

ज्ञापन, परिपत्र, सूचना

**ANDHRA UNIVERSITY**

II B.A./B.Com./B.Sc., SEMESTER – III : GENERAL HINDI PAPER – II

**w.e.f. 2022-23**

(Old & Modern Poetry, History of Hindi Literature, Essays, Translation and Official Letters)

Time : 3hrs

Max Marks :75

**MODEL QUESTION PAPER**

PART - A

II. किन्ही पाँच प्रश्नों के उत्तर दीजिए | 5 X 5 = 25  
Short Q & ANS

1. .Annotation – Old Poetry
2. Annotation - Old Poetry
3. Annotation - Modern Poetry
4. Annotation - Modern Poetry
5. Short Question – Old Poetry
6. Short Question - Modern Poetry
7. Short Question - Official Letter ( Functional Hindi )
8. Short Question – History of Hindi Literature

PART - B

II. निम्न लिखित सभी प्रश्नों के उत्तर दीजिए | 5 X10 = 50

9. Modern Poetry – Summary

(अथवा)

Modern Poetry – Summary

10. History of Hindi Literature

(अथवा)

History of Hindi Literature

11. Translation ( English to Hindi)

(अथवा)

Translation ( Telugu to Hindi)

12. General Essay

(अथवा)

General Essay

13. Official Letter ( Functional Hindi )

(अथवा)

Official Letter ( Functional Hindi )

**Signature of the members**

## **ANDHRA UNIVERSITY**

II B.A./B.Com./B.Sc., SEMESTER-IV : GENERAL HINDI PAPER – II

**w.e.f. 2022-23**

(Old & Modern Poetry, History of Hindi Literature, Essays, Translation and Official Letters)

Credits : 03

Teaching Hrs/Week : 4

### **SYLLABUS**

1. काव्यदीप : तुलसी दास के दोहे (१-१०)

रहीम के दोहे (१-१०)

सुख - दुःख - सुमित्रानंदन पंत

कलम और तलवार - रामधारी सिंह दिनकर

भारत - जयशंकर प्रसाद

2. हिन्दी साहित्य का इतिहास :

भक्तिकाल : रामभक्ति शाखा - तुलसी दास,

कृष्ण भक्ति शाखा - सूर दास

3. साधारण निबंध : समाज में नारी का स्थान,

भाषा की समस्या,

मेरा प्रिय कवि/ साहित्यकार



विज्ञान से हानि - लाभ,

राष्ट्र - निर्माण में विद्यार्थियों का योगदान

4. अनुवाद : अंग्रेजी से हिन्दी ( 3-4 lines)

तेलुगु से हिन्दी

5. प्रयोजन मूलक हिन्दी : सरकारी पत्र (Official letters )

अधि सूचना, अर्ध सरकारी पत्र, नीलाम

### ANDHRA UNIVERSITY

II B.A./B.Com./B.Sc., SEMESTER-IV : GENERAL HINDI PAPER – II  
w.e.f.2022-23

(Old & Modern Poetry, History of Hindi Literature, Essays, Translation and Official Letters)

Time : 3hrs

Max Marks :75

### MODEL QUESTION PAPER

#### PART - A

III. किन्ही पाँच प्रश्नों के उत्तर दीजिए |

5 X 5 = 25

Short Q & ANS

14. .Annotation – Old Poetry

15. Annotation - Old Poetry

16. Annotation - Modern Poetry

17. Annotation - Modern Poetry

18. Short Question – Old Poetry

19. Short Question - Modern Poetry

20. Short Question - Official Letter ( Functional Hindi )

21. Short Question – History of Hindi Literature

#### PART - B

II. निम्न लिखित सभी प्रश्नों के उत्तर दीजिए |

5 X10 = 50

22. Modern Poetry – Summary

(अथवा)

Modern Poetry – Summary

23. History of Hindi Literature

(अथवा)

History of Hindi Literature

24. Translation ( English to Hindi)

(अथवा)

Translation ( Telugu to Hindi)

25. General Essay

(अथवा)

General Essay

26. Official Letter ( Functional Hindi )

(अथवा)

Official Letter ( Functional Hindi )

**Signature of the Members**

**ANDHRA UNIVERSITY:: VISAKHAPATNAM**

B.Sc., Biotechnology Course Structure for the Academic year 2020-21

| <b>Semester</b> |    | <b>Title of the paper</b>                |
|-----------------|----|--|
| I               |    | Bio-molecules & Analytical Techniques    |
| II              |    | Microbiology, Cell & Molecular Biology   |
| III             |    | Immunology & r-DNA technology            |
| IV              | i  | Plant & Animal Biotechnology             |
|                 | ii | Environmental & Industrial Biotechnology |

## **B.Sc., Biotechnology: Choice based credit system**

### **B.Sc., I Semester W.E.F. 2020-21**

#### **BT-101: Bio-molecules & Analytical Techniques**

**Course Objectives:** To ensure students gain knowledge about the structure, properties and functions of biomolecules and characterization of biomolecules using analytical techniques.

#### **Unit-I-Carbohydrates, Protein and Lipids**

Classification, structure, properties of carbohydrates. Classification, structure and properties of amino acids, peptide bond and peptides. Classification, structure (primary, secondary, tertiary, quaternary) and functions of proteins. Denaturation and renaturation of proteins. Classification structure and properties of saturated and unsaturated fatty acids. Structure and functions of glycolipids, phospholipids, and cholesterol.

#### **Unit-II- Nucleic acid, Vitamins and Bioenergetics**

Structure and functions of DNA and RNA. Source, structure, biological role and deficiency manifestation of vitamin A, B, C, D, E and K. Free energy, entropy, enthalpy and redox potential. High energy compounds, Glycolysis, TCA cycle, Electron-Transport System and Oxidative Phosphorylation.

#### **Unit-III-Centrifugation, Chromatography and Electrophoresis**

Basic principles of sedimentation and types of centrifugations. Principle, instrumentation and application of partition, absorption, paper, TLC, ion exchange, gel permeation, affinity chromatography. Introduction to HPLC, GCMS and LCMS. Basic principles and types of electrophoresis, factors affecting electrophoretic migration. PAGE (Native, SDS-PAGE). Introduction to 2D & Isoelectric Focusing.

#### **Unit - IV-Spectroscopy, Microscopy and Laser Techniques**

Beer-Lambert law, light absorption and transmission. Extinction coefficient, Design and application of photoelectric calorimeter and UV-visible spectrophotometer. Introduction to crystallography and application. Types and design of microscopes - compound, phase contrast, fluorescent electron microscopy (TEM, SEM). Introduction to radioisotopes, measurement of radioactivity (scintillation counter and autoradiography).

## **Unit –V- Biostatistics**

Mean, median, mode, standard deviation, One-way Anova, Two-way Anova, t-test, F-test and chi-square.

### **List of Practicals:-**

1. Introduction to basic instruments (Principle standard operation procedure) demonstration and record
2. Calculation of molarity, normality and molecular weight of compounds.
3. Qualitative analysis of carbohydrates (sugars)
4. Quantitative analysis of carbohydrates
5. Quantitative estimation of protein - Lowery method
6. Estimation of DNA by diphenylamine reagent
7. Estimation of RNA by orcinol reagent
8. Assay of protease activity
9. Preparation of starch from potato and its hydrolyze by salivary amylase
10. Preparation of standard buffer and pH determination
11. Separation of amino acids by paper chromatography
12. Separation of lipids of TLC
13. Agarose gel electrophoresis
14. Calculation of mean, median and mode

### **Textbooks for Biomolecules and Analytical Techniques**

1. Outlines of Biochemistry, 5th Edition, (2009), Eric Conn & Paul Stumpf; John Wiley and Sons, USA
2. Principles of Biochemistry, 4th edition, (1997), Jeffery Zubey; McGraw-Hill College, USA
3. Principles of Biochemistry, 5th Edition (2008), Lehninger, David Nelson & Michael Cox; W.H. Freeman and Company, NY
4. Fundamentals of Biochemistry, 3rd Edition (2008), Donald Voet & Judith Voet; John Wiley and Sons, Inc. USA
5. Biochemistry, 7th Edition, (2012), Jeremy Berg & Lubert Stryer; W.H.Freeman and Company, NY
6. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu. Pvt.Ltd. New Delhi, India
7. Biochemical Methods, 1st Edition, (1995), S.Sadashivam, A.Manickam; New Age International Publishers, India
8. Textbook of Biochemistry with Clinical Correlations, 7th Edition, (2010), Thomas M. Devlin; John Wiley and Sons, USA
9. Proteins: biotechnology and biochemistry, 1<sup>st</sup> edition, (2001), Gary Walsch; Wiley, USA
10. Biochemical Calculations, 2nd Ed., (1997), Segel Irvin H; John Wiley and Sons, NY
11. Biophysical Chemistry Principles & Techniques Handbook, (2003), A. Upadhyay, K. Upadhyay, and N. Nath

12. Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001), Palmer Trevor, Publisher: Horwood Pub. Co., England.
13. Analytical Biochemistry, 3<sup>rd</sup> edition, (1998), David Holmes, H. Peck, Prentice-Hall, UK
14. Introductory Biostatistics, 1<sup>st</sup> edition, (2003), Chap T. Le; John Wiley, USA.
15. Methods in Biostatistics, (2002), B. K. Mahajan –Jaypee Brothers.
16. Statistical methods in biology, (1995), Bailey, N. T.; Cambridge university press

## **B.Sc., Biotechnology: Choice based credit system**

### **B.Sc., -II Semester W.E.F. 2020-21**

#### **BT-201: Microbiology, Cell and Molecular Biology**

**Course Objectives:** To acquaint students with concepts of microbiology, cell and molecular biology. This course is aimed to give an understanding of the basics of microbiology, dealing types of microbes, classification and their characterization, structure and function of prokaryotic and eukaryotic cell organelles, cell division and basics of molecular biology including DNA replication, transcription, translation and regulation of gene expression.

#### **Unit-I- Scope and Techniques of Microbiology**

History and contribution of Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Alexander Fleming. Ultrastructure of bacteria and growth curve. Pure culture techniques. Sterilization techniques, principles and application of physical methods (autoclave, hot air oven, incineration), chemical methods and radiation methods. Simple, gram and acid-fast staining.

#### **Unit-II-Microbial Taxonomy and Metabolism**

Concepts of microbial species and strains. Classification of bacteria based on morphology, nutrition and environment. General characteristics, transmission and cultivation of viruses. Structure and properties of plant (tobacco mosaic virus, TMV), animal (Newcastle disease virus, NDV), human (Human immunodeficiency virus, HIV) and bacterial viruses (T4 phage). Emerging and reemerging viruses (dengue virus), zoonotic viruses (rabies, SARS-CoV-2). Microbial production of penicillin. Bacterial toxins, tuberculosis, typhoid. Introduction to fungi, algae and mycoplasma.

#### **Unit-III- Cell Structure and Functions**

Structure, properties and functions of cellular organelles (E.R, Golgibodies, Mitochondria, Ribosomes and Vacuoles) of eukaryotic cells. Cell cycle and cell division (mitosis and meiosis). Chemical composition and dynamic nature of the membrane, cell signaling and communication, endocytic pathways.

## **Unit-IV- DNA Replication, Repair and Regulation of Gene Expression**

DNA replication in prokaryotes and eukaryotes (semiconservative, dispersive, conservative, uni and bi-direction, rolling circle). Mechanism of DNA replication, enzymes and protein involved in DNA replication. DNA damage and repair. Regulation of gene expression in prokaryotes Lac and Trip operon concept.

## **Unit – V - Central Dogma of Molecular Biology**

Genome organization of prokaryotic and eukaryotic organisms. Genetic code, prokaryotic and eukaryotic transcription, enzymes involved in transcription. Post-transcriptional modification (Capping Poly adenylation) and splicing.

Translation: mechanism of translation in prokaryotic and eukaryotic cells (initiation, elongation, termination). Post-translational modification (glycosylation and phosphorylation).

### **List of Practicals:-**

1. Cleaning and preparation of glassware
2. Preparation of nutrient agar medium for bacteria
3. Preparation of PDA medium for fungi
4. Sterilization techniques (autoclave, hot air oven, filter)
5. Isolation of bacteria from soil
6. Simple staining technique
7. Differential staining technique
8. Microbial counting by Haemocytometer
9. Identification of different bacteria
10. Motility test by hanging drop
11. Biochemical identification of bacteria
12. Preparation of pure culture by slab, slant, streak culture
13. Study of stages of mitotic cell division
14. Study of stages of meiotic cell division
15. Isolation of chloroplast
16. Extraction and isolation of DNA from bacteria.

### **Textbooks for Microbiology, Cell and Molecular Biology**

1. Microbiology–6th Edition, (2006), Pelczar M.J., Chan E.C.S., Krieg N.R.; The McGrawHill Companies Inc. NY
2. Prescott's Microbiology, 8th edition, (2010), Joanne M Willey, Joanne Willey, Linda Sherwood, Linda M Sherwood, Christopher J Woolverton, Chris Woolverton; McGrawHill Science Engineering, USA
3. Textbook of Microbiology, Anantnarayan and Paniker (2017)
4. Brock biology of microorganisms, 2003, Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J.; Upper Saddle River (NJ): Prentice-Hall, 2003.



5. Genes XI, 11th edition, (2012), Benjamin Lewin; Publisher - Jones and Barlett Inc. USA
6. Molecular Biology of the Gene, 6th Edition, (2008), James D. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R.; Cold Spring Harbour Lab. Press, Pearson Pub.
7. Molecular Biology, 5th Edition, (2011), Weaver R.; McGraw Hill Science. USA
8. Fundamentals of Molecular Biology, (2009), Pal J.K. and Saroj Ghaskadbi; Oxford University Press.
9. Molecular Biology: Genes to Proteins, 4th edition (2011), Burton E Tropp Jones& Bartlett Learning, USA.
10. Cell and Molecular Biology: Concepts and Experiments, 6th Edition, Karp, G. 2010.; John Wiley & Sons. Inc.
11. Cell and Molecular Biology, 8th edition. De Robertis, E.D.P. and De Robertis, E.M.F. 2006; Lippincott Williams and Wilkins, Philadelphia.
12. Cell Biology, (2017), De Robertis & De Roberis, Blaze Publishers & Distributors Pvt. Ltd.
13. The Cell: A Molecular Approach. 5th edition. Cooper, G.M. and Hausman, R.E. 2009. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
14. The World of the Cell, 7<sup>th</sup> edition, Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 Pearson Benjamin Cummings Publishing, San Francisco.
15. David A. Thompson. 2011. Cell and Molecular Biology Lab. Manual.
16. P.Gunasekaran. 2007. Laboratory Manual in Microbiology. New Age International.
17. D O Hall, S E Hawkins. 1974. Laboratory Manual of Cell Biology. British Society for Cell Biology, Published by Crane, Russia.
18. Mary L. Ledbetter. 1993. Cell Biology: Laboratory Manual. Edition: 2. Published by Ron Jon Publishing. Incorporated.
19. Gunasekaran, P. 2009. Laboratory Manual in Microbiology. 1st Edition. New Age International Publishers.
20. Dr. T. Sundararaj. Microbiology Laboratory Manual. 2005. Dr.A.L. MPGIBMS, University of Madras, Taramani, Chennai – 600 113.
21. James G. Cappuccino and Natalie Sherman. 2013. Microbiology: A Laboratory Manual. 10th Edition. Benjamin Cummings.
22. Dr. David A Thompson. 2011. Cell and Molecular Biology Lab Manual.
23. George M. Malacinski. 2013. Freifeder's Essentials of Molecular Biology. Narosa Publishing House.

## **B.Sc., Biotechnology: Choice based credit system**

**B.Sc., -III- Semester W.E.F. 2020-21**

### **BT-301: Immunology and rDNA technology**

**Course Objectives:** To acquaint students with concepts of immunology and recombinant DNA technology. This course is aimed to give an understanding of the basics of immunology dealing cells and organs of the immune system, types of immune responses, antigen-antibody interactions, vaccines and tools, techniques and strategies and applications of genetic engineering.

#### **Unit- I –Concepts, Cells and Organs of the Immune System**

Terminology, antigen, hapten, antibody (types), antigenicity, immunogenicity and types of immunity. Innate and adaptive immunity. Hematopoiesis, organs, tissues, cells and mediators of the immune system (primary and secondary lymphoid organs, lymphocytes and cytokines). Introduction to complement components, MHC. Basic concepts of humoral and cell-mediated immune response.

#### **Unit-II-Vaccinology and Clinical Immunology**

Live, killed, attenuated, subunit and recombinant vaccines. Role and properties of adjuvants. Hybridoma technology, monoclonal antibodies and their application in immunodiagnosis. Antigen and antibody interactions - precipitation, agglutination, immune diffusion and ELISA. Introduction to hypersensitivity and autoimmunity.

#### **Unit-III –Introduction, Tools and Techniques of rDNA Technology**

Introduction to rDNA technology, steps involved in cloning, tools of genetic engineering (Genes, Cloning vectors - plasmids and cosmids, Enzymes – restriction endonucleases and DNA Ligase, Hosts – bacteria and yeast). Principles and application of PCR. Southern, Northern and Western Blotting. Introduction to DNA sequencing (Sanger Sequencing) and Site-directed Mutagenesis.

#### **Unit-IV-Cloning Strategies and Application of rDNA Technology**

cDNA library, construction, methods of transformation, recombinant selection and screening methods. Applications of rDNA technology in agriculture (transgenic plants, edible vaccines and antibodies) and medicine (disease diagnosis and DNA fingerprinting).

## **Unit-V-Bioinformatics**

Databases (PubMed, NCBI, EMBL and ExPASy), nucleotide and protein BLAST analysis, CLustal W and phylogenetic tree construction. Introduction to omics (proteomics, genomics and transcriptomics). Introduction to nanotechnology.

### **List of Practicals:-**

1. Determination of Blood Groups
2. Pregnancy test
3. Widal test
4. Ocuteroloney immunodiffusion
5. Radial immune diffusion
6. ELISA
7. Production of antibodies (theory exercise)
8. Bleeding, separation of serum and storage
9. Lymphoid organs (theory exercise)
10. Isolation of plasmid DNA (alkaline lysis method)
11. Analysis of plasmid DNA by Agarose gel electrophoresis
12. Southern blotting (theory exercise)
13. PCR Amplification (theory exercise)

### **Textbooks for Immunology and rDNA technology**

1. Kuby immunology, Judy Owen, Jenni Punt, Sharon Stranford., 7th edition (2012), Freeman and Co., NY
2. Textbook of basic and clinical immunology, 1st edition (2013), Sudha Gangal and Shubhangi Sontakke, University Press, India
3. Immunology, 7th edition (2006), David Male, Jonathan Brostoff, David Roth, Ivan Roitt, Mosby, USA.
4. Immuno diagnostics, 1996, By S.C. Rastogi, Publ: New Age
5. Introduction to Immunology- 2002, C. V. Rao- Narosa Publishing House
6. Textbook of Biotechnology - 2007, By H.K. Das (Wiley Publications)
7. Principles of Gene Manipulation - 7<sup>th</sup> edition, 2006, By R.W. Old & S.B. Primrose, Publ: Blackwell
8. Molecular Biology & Biotechnology- 1996, By H.D. Kumar, Publ: Vikas
9. Molecular Biotechnology - 4<sup>th</sup> edition, 2010, G.R. Click and J.J. Pasternak, Publ: Panima

10. Genes and Genomes – 1991, By Maxine Singer and Paul Berg
11. Genes VII- 2000, By B. Lewin - Oxford Univ. Press
12. Molecular Biology - 4<sup>th</sup> Edition, 2008, By D. Freifelder, Publ: Narosa Publishing house New York, Delhi
13. Brown TA. (2006). Gene Cloning and DNA Analysis. 5th edition. Blackwell Publishing, Oxford, U.K.
14. Clark DP and Pazdernik NJ. (2009). Biotechnology-Appling the Genetic Revolution. Elsevier Academic Press, USA.
15. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington
16. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7<sup>th</sup> edition. Blackwell Publishing, Oxford, U.K.
17. Sambrook J, Fritsch EF and Maniatis T. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press.
18. Introduction to Bioinformatics – 2007, By V. Kothekar
19. Introduction to Bioinformatics – 2013, By Arthur M. Lesk
20. Bioinformatics: 2001, Sequence and Genome Analysis by David W. Mount, Cold Spring Harbor Laboratory Press
21. Biological Sequence Analysis: 1<sup>st</sup> Edition, 1998, Probabilistic Models of Proteins and Nucleic Acids by Richard Durbin, Sean R. Eddy, Anders Krogh, Graeme Mitchison, Cambridge University Press
22. Bioinformatics: 2004, A Practical Guide to the Analysis of Genes and Proteins, Andreas D. Baxevanis, B. F. Francis Ouellette, Wiley-Interscience
23. Bioinformatics tools and Resources – free online tools, software packages, Bioinformatics books and Journals, Bioinformatics web-portals

## **B.Sc., Biotechnology: Choice based credit system**

**B.Sc., -IV Semester W.E.F. 2020-21**

### **BT-401 (i) Plant and Animal Biotechnology**

#### **Course Objectives**

The objectives of this course are to introduce students to the principles, practices and application of animal biotechnology, plant tissue culture, plant and animal genomics, genetic transformation.

#### **Unit – I**

##### **Plant tissue culture techniques & secondary metabolites production**

Plant tissue culture: totipotency , media preparation – nutrients and plant hormones; sterilization techniques; establishment of cultures – callus culture, cell suspension culture ,applications of tissue culture-micro propagation; Somatic embryogenesis; synthetic seed production; protoplast culture and somatic hybridization - applications. Cryopreservation,Plant secondary metabolites- concept and their importance

#### **Unit – II**

##### **Transgenesis and Molecular markers**

Plant transformation technology-- Agrobacterium mediated Gene transfer (Ti plasmid), hairy root features of Ri plasmid,Transgenic plants as bioreactors. Herbicide resistance – glyphosphate, Insect resistance- Bt cotton,,**Molecular markers - RAPD, RFLP and DNA fingerprinting-principles and applications.**

#### **Unit – III**

##### **Animal tissue culture techniques**

Animal cell culture: cell culture media and reagents; culture of mammalian cells, tissues and organs; primary culture, secondary culture, cell lines,stem cell cultures; Tests: cell viability and cytotoxicity, Cryopreservation. Transfection methods (calcium phosphate precipitation, electroporation, Microinjection) and applications.

## **Unit – IV**

### **Transgenic animals & Gene Therapy**

**Production of vaccines, diagnostics, hormones and other recombinant DNA products in medicine (insulin,somatostatin, vaccines),IVF, Concept of Gene therapy, Concept of transgenic animals – Merits and demerits -Ethical issues in animal biotechnology**

## **Unit V**

### **Bioethics,Biosafety and IPR**

Bioethics in cloning and stem cell research, Human and animal experimentation, animal rights/welfare. Bio safety-introduction to biological safety cabinets; primary containment for biohazards; biosafety levels; GLP,GMP, Introduction to IP-Types of IP: patents, trademarks & copyright

### **Student Learning Outcomes**

Students should be able to gain fundamental knowledge in animal and plant biotechnology and their applications.

## **PLANT AND ANIMAL BIOTECHNOLOGY-PRACTICALS**

- plant culture media and composition of MS media
  - Raising of aseptic seedlings
  - Induction of callus from different explants
  - Plant propagation through Tissue culture (shoot tip and Nodal culture)
- Establishing a plant cell culture (both in solid and liquid media)
- suspension cell culture
- Cell count by hemocytometer.
- Establishing primary cell culture of chicken embryo fibroblasts.
- Animal tissue culture – maintenance of established cell lines.
- Animal tissue culture – virus cultivation.
- Estimation of cell viability by dye exclusion (Trypan blue).
- ELISA – Demonstration

### **List of Reference Books ;**

1. Introduction to Plant Tissue Culture, M.K. Razdan, 2003, Science Publishers
2. Plant Tissue Culture, kalyan Kumar De, 199 M7, New Central Book Agency
3. Plant Tissue Culture : Theory and Practice By S.S. Bhojwani and A. Razdan, 1998
4. Biotechnology – By U. Satyanarayana ; 1997
5. Plant Cell, Tissue and Organ Culture, Applied and Fundamental Aspects By Y.P.S. Bajaj and A. Reinhard , 2001
6. Introduction to Plant Tissue Culture, M. K. Razdan, 2003, Science Publishers
7. A Textbook of Biotechnology, R C Dubey, S. 2014, Chand Publishing
8. Elements of Biotechnology, P. K. Gupta, 1994, Rastogi Publications
9. R. Ian Freshney, “Culture of animal cells – A manual of basic techniques” 4<sup>th</sup> edition, John Wiley & Sons, 2000 ,Inc, publication, New York
10. Daniel R. Marshak, Richard L. Gardner, David Gottlieb “Stem cell Biology” edited by Daniel 2001, Cold Spring Harbour Laboratory press, New York
11. M.M. Ranga, Animal Biotechnology; Agrobios (India) , 2006.

## **B.Sc., Biotechnology: Choice based credit system**

**B.Sc., -IV Semester W.E.F. 2020-21**

### **BT-401 (ii) Environmental & Industrial Biotechnology**

#### **Learning Objective**

This course aims to introduce fundamentals of Environmental Biotechnology. The course will also give an insight in introducing major groups of microorganisms and their industrial applications

#### **Unit – I**

##### **Pollution Types and Control**

Environmental Biotechnology-Environmental Pollution : Types of pollution, air pollution & its control through Biotechnology, Biofilters, Bioscrubbers, Biotrickling filter. Water pollution and its management: Measurement of water, pollution, sources of water pollution. Microbiology of waste water treatment, aerobic processes, activated sludge, oxidation ponds, trickling filters, and rotating biological contactors. Anaerobic processes: Anaerobic digesters, upward flow anaerobic sludge blanket reactors.

#### **UNIT-II**

##### **Bioremediation**

Biodegradation and Bioremediation – Concepts & principles of Bioremediation, Bioremediation of Hydrocarbons and its applications Degradation of pesticides and other toxic chemicals by microorganism. Role of genetically Engineered microbes, Concept of Phytoremediation, , environmental safety guidelines.

#### **UNIT III**

##### **Biofuels**

Bio fuels-biogas, microbial groups involved in biogas production & interactions, factors affecting biogas production, Biofertilizers, Vermiculture.



## **Unit IV**

### **Basic principles of Microbial technology**

Industrially important microbes, its screening, selection and identification. Maintenance and preservation of industrially important microbial cultures. Strain Improvement, Basic concepts of fermentation; Design of fermenter and applications

## **Unit V**

### **Commercial Production of Microbial products**

Microbial technology products and applications; Microbial production of Organic acids (Lactic acid, citric acid), Amino acids (Glutamic acid, Aspartic acid and Lysine). Fermentation by microbes for food additives: dairy products (Cheese, Yogurt), beverages (Beer, Wine) and antibiotics (Streptomycin, Penicillin)

**Student Learning Outcomes** Students should be able to gain fundamental knowledge in animal and plant biotechnology and their applications.

## **ENVIRONMENTAL AND INDUSTRIAL BIOTECHNOLOGY -PRACTICALS**

- Detection of coliforms for determination of the purity of potable water.
- Determination of total dissolved solids of water
- Determination of Hardness and alkalinity of water sample.
- Determination of dissolved oxygen concentration of water sample
- Determination of biological oxygen demand of sewage sample
- Determination of chemical oxygen demand (COD) of sewage sample.
- Isolation of industrially important microorganisms from soil.
- Isolation of amylase producing organisms from soil.
- Production of  $\alpha$  – amylase from *Bacillus* Spp. by shake flask culture.
- Production of alcohol or wine using different substrates.
- Estimation of citric acid by titrimetry.

**List of reference books;**

1. K. Vijaya Ramesh, Environmental Microbiology, 2004,MJP Publishers, Chennai.
2. A.G. Murugesan, C. Raja Kumari, Environmental Science & Biotechnology - Theory & Techniques, 2005,MJP Publishers
3. Environmental microbiology by Raina M.Maier Ian L.Pepper & Charles P.Gerba,2000,Academic press
4. Environmental Chemistry, A.K. De. Wiley Eastern Ltd.,2001, New Delhi
5. Introduction of Biodeterioration, D. Allsopp and K.J. Seal, ELBS/Edward Arnold,2008
6. Power un seen: How microbes rule the world. By Dixon, B. Freeman/ Spectrum, 1994,Oxford.
7. Environmental Microbiology. By. Mitchell. R. Wiley,1992, New York
8. Introduction to Environmental Sciences, Y. Anjaneyulu ,2004, BS Publications
9. Industrial Microbiology by A.H.Patel,2009
10. Prescott & Dum (2002) Industrial Micrbiology, Agrabios (India) ,2005,Publishers
11. Creueger W. & Cruieger A.A Text of Industrial Microbiology,2000, 2nd Edition, Panima Publishers corp.



## **ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION**

(A Statutory body of the Government of Andhra Pradesh)

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### **REVISED SYLLABUS OF BOTANY UNDER CBCS FRAMEWORK WITH EFFECT FROM 2020-2021**

#### **PROGRAMME: THREE-YEAR BOTANY**

*(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities &  
Model Q.P.)*

*For Fifteen Courses of 1, 2, 3 & 4 Semesters)*

**(To be Implemented from 2020-21 Academic Year)**

**APSCHE/ REVISION OF C.B.C.S – BOTANY COURSE W.E.F.2020-21**

| <b>S. No.</b> | <b>Semester</b>                  | <b>Title of the Course (Paper)</b>   | <b>Hours /week</b> | <b>Max. Marks (SEE)</b>                                    | <b>Marks in CIA</b> | <b>Credits</b> |
|---------------|----------------------------------|--|--------------------|--|---------------------|----------------|
| 1.            | Sem.-I/<br>Course-1              | Fundamentals of Microbes and Non-vascular Plants   | 04                 | 75   | 25                  | 03             |
|               | Course-1<br>Practical            | Fundamentals of Microbes and Non-vascular Plants   | 03                 | Max. Marks-50<br>Internal assessment<br>at Semester end    |                     | 02             |
| 2.            | Sem.-II/<br>Course-2             | Basics of Vascular plants and Phytogeography   | 04                 | 75   | 25                  | 03             |
|               | Course-2<br>Practical            | Basics of Vascular plants and Phytogeography   | 03                 | Max. Marks-50<br>External<br>assessment at<br>Semester end |                     | 02             |
| 3.            | Sem.-III/<br>Course-3            | Anatomy and Embryology of Angiosperms,<br>Plant Ecology and Biodiversity   | 04                 | 75   | 25                  | 03             |
|               | Course-3<br>Practical            | Anatomy and Embryology of Angiosperms,<br>Plant Ecology and Biodiversity   | 03                 | Max. Marks-50<br>Internal assessment<br>at Semester end    |                     | 02             |
| 4.            | Sem.-IV<br>Course-4              | Plant Physiology and Metabolism  | 03                 | 75   | 25                  | 03             |
|               | Course-4<br>Practical            | Plant Physiology and Metabolism  | 03                 | Max. Marks-50<br>External<br>assessment at<br>Semester end |                     | 02             |
| 5.            | Sem.- IV<br>Course- 5            | Cell Biology, Genetics and Plant Breeding  | 04                 | 75   | 25                  | 03             |
|               | Course-5<br>Practical            | Cell Biology, Genetics and Plant Breeding  | 03                 | Max. Marks-50<br>External<br>assessment at<br>Semester end |                     | 02             |
| 6.            | Sem.- V<br><br>Course –<br>6 & 7 | Domain related Skill Enhancement Courses (02)  | 03                 | 75   | 25                  | 03             |
|               |                                  | - Three (3) pairs of courses (each pair has 2 related courses) will be offered, student has to choose a pair of courses. | 03                 | Max. Marks-50<br>Internal assessment<br>at Semester end    |                     | 02             |
|               |                                  |  | 03                 | 75   | 25                  | 03             |
|               |                                  |  | 03                 | Max. Marks-50<br>Internal assessment<br>at Semester end    |                     | 02             |

**CBCS / Semester System (w.e.f. 2020-'21 Admitted Batch)**

**I Semester /Botany Core Course - 1**

**Fundamentals of Microbes and Non-vascular Plants**

**(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)**

(Total hours of teaching – 60 @ 04 Hrs./Week)

**Theory:**

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**Learning Outcomes:**

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

- Explain origin of life on the earth.
  - Illustrate diversity among the viruses and prokaryotic organisms and can categorize them.
  - Classify fungi, lichens, algae and bryophytes based on their structure, reproduction and life cycles.
  - Analyze and ascertain the plant disease symptoms due to viruses, bacteria and fungi.
  - Recall and explain the evolutionary trends among amphibians of plant kingdom for their shift to land habitat.
  - Evaluate the ecological and economic value of microbes, thallophytes and bryophytes.
- 

**Unit – 1: Origin of life and Viruses**

**12Hrs.**

1. Origin of life, concept of primary Abiogenesis; Miller and Urey experiment. Five kingdom classification of R.H. Whittaker
2. Discovery of microorganisms, Pasteur experiments, germ theory of diseases.
3. Shape and symmetry of viruses; structure of TMV and Gemini virus; multiplication of TMV; A brief account of Prions and Viroids.
4. A general account on symptoms of plant diseases caused by Viruses. Transmission of plant viruses and their control.
5. Significance of viruses in vaccine production, bio-pesticides and as cloning vectors.

**Unit – 2: Special groups of Bacteria and Eubacteria**

**12Hrs.**

1. Brief account of Archaeobacteria, Actinomycetes and Cyanobacteria.
2. Cell structure and nutrition of Eubacteria.

3. Reproduction- Asexual (Binary fission and endospores) and bacterial recombination (Conjugation, Transformation, Transduction).
4. Economic importance of Bacteria with reference to their role in Agriculture and industry (fermentation and medicine).
5. A general account on symptoms of plant diseases caused by Bacteria; Citrus canker.

### **Unit – 3: Fungi & Lichens**

**12 Hrs.**

1. General characteristics of fungi and Ainsworth classification (upto classes).
2. Structure, reproduction and life history of (a) *Rhizopus* (Zygomycota) and (b) *Puccinia* (Basidiomycota).
3. Economic uses of fungi in food industry, pharmacy and agriculture.
4. A general account on symptoms of plant diseases caused by Fungi; Blast of Rice.
5. Lichens- structure and reproduction; ecological and economic importance.

### **Unit – 4: Algae**

**12 Hrs.**

1. General characteristics of Algae (pigments, flagella and reserve food material); Fritsch classification (upto classes).
2. Thallus organization and life cycles in Algae.
3. Occurrence, structure, reproduction and life cycle of (a) *Spirogyra* (Chlorophyceae) and (b) *Polysiphonia* (Rhodophyceae).
4. Economic importance of Algae.

### **Unit – 5: Bryophytes**

**12 Hrs.**

1. General characteristics of Bryophytes; classification upto classes.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of (a) *Marchantia* (Hepaticopsida) and (b) *Funaria* (Bryopsida).
3. General account on evolution of sporophytes in Bryophyta.

**Text books:**

- Botany – I (Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-I*, S. Chand Publishing, New Delhi
- Hait,G., K.Bhattacharya&A.K.Ghosh (2011) *A Text Book of Botany, Volume-I*, New Central Book Agency Pvt. Ltd., Kolkata
- Bhattacharjee, R.N., (2017) *Introduction to Microbiology and Microbial Diversity*, Kalyani Publishers, New Delhi.

**Books for Reference:**

- Dubey, R.C. &D.K.Maheswari (2013) *A Text Book of Microbiology*,S.Chand& Company Ltd., New Delhi
- Pelczar Jr., M.J., E.C.N. Chan &N.R.Krieg (2001)*Microbiology*, Tata McGraw-Hill Co, New Delhi
- Prescott, L. Harley, J. and Klein, D. (2005)*Microbiology, 6th edition*, Tata McGraw –Hill Co. New Delhi.
- Alexopoulos, C.J., C.W.Mims&M.Blackwell (2007) *Introductory Mycology*,Wiley& Sons, Inc., New York
- Mehrotra, R.S. & K. R. Aneja (1990)*An Introduction to Mycology*. New Age International Publishers, New Delhi
- Kevin Kavanagh (2005) *Fungi ; Biology and Applications* John Wiley & Sons, Ltd.,West Sussex, England
- John Webster & R. W. S. Weber (2007) *Introduction to Fungi*,Cambridge University Press, New York
- Fritsch, F.E. (1945)*The Structure & Reproduction of Algae (Vol. I & Vol. II)*Cambridge UniversityPress Cambridge, U.K..
- Bold, H.C. & M. J. Wynne (1984)*Introduction to the Algae*, Prentice-Hall Inc., New Jersey
- Robert Edward Lee (2008)*Phycology*. Cambridge University Press, New York
- Van Den Hoek, C., D.G.Mann&H.M.Jahns (1996)*Algae : An Introduction to Phycology*. Cambridge University Press, New York
- Shaw, A.J.&B.Goffinet (2000)*Bryophyte Biology*.Cambridge University Press, New York.

## **Practical syllabus of Botany Core Course – 1/ Semester – I**

### **Fundamentals of Microbes and Non-vascular Plants**

(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)

(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs./Week)

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**Course Outcomes:** On successful completion of this practical course, student shall be able to;

1. Demonstrate the techniques of use of lab equipment, preparing slides and identify the material and draw diagrams exactly as it appears.
2. Observe and identify microbes and lower groups of plants on their own.
3. Demonstrate the techniques of inoculation, preparation of media etc.
4. Identify the material in the permanent slides etc.

#### **Practical Syllabus:**

1. Knowledge of Microbiology laboratory practices and safety rules.
2. Knowledge of different equipment for Microbiology laboratory (Spirit lamp, Inoculation loop, Hot-air oven, Autoclave/Pressure cooker, Laminar air flow chamber and Incubator) and their working principles. (In case of the non-availability of the laboratory equipment the students can be taken to the local college/clinical lab. with required infrastructural facilities or they can enter a linkage with the college/lab for future developments and it will fetch credits during the accreditation by NAAC).
3. Demonstration of Gram's staining technique for Bacteria.
4. Study of Viruses (Corona, Gemini and TMV) using electron micrographs/ models.
5. Study of Archaeobacteria and Actinomycetes using permanent slides/ electron micrographs/diagrams.
6. Study of *Anabaena* and *Oscillatoria* using permanent/temporary slides.
7. Study of different bacteria (Cocci, Bacillus, Vibrio and Spirillum) using permanent or temporary slides/ electron micrographs/ diagrams.
8. Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts :
  - a. Fungi : *Rhizopus*, *Penicillium* and *Puccinia*



- b. Lichens: Crustose, foliose and fruticose
  - c. Algae : *Volvox*, *Spirogyra*, *Ectocarpus* and *Polysiphonia*
  - d. Bryophyta : *Marchantia* and *Funaria*
9. Study of specimens of Tobacco mosaic disease, Citrus canker and Blast of Rice.

## Model Question Paper for Practical Examination

Semester – I/ Botany Core Course – 1

### Fundamentals of Microbes and Non-vascular Plants

(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)

Max. Time: 3 Hrs.

Max. Marks: 50

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1. Take the T.S. of material 'A' (Fungi), make a temporary mount and make comments about identification. 10 M
2. Identify any 2 algae from the mixture (material 'B') given with specific comments about identification. 10 M
3. Take the T.S. of material 'C' (Bryophyta), make a temporary mount and make comments about identification. 10 M
4. Identify the following with specific reasons. 4x 3 = 12 M
  - D. A laboratory equipment of Microbiology
  - E. Virus
  - F. Archaeobacteria /Ascomycete /Cyanobacteria/ Eu-Bacteria
  - G. Lichen
5. Record + Viva-voce 5+3 = 8 M

### Suggested co-curricular activities for Botany Core Course-1 in Semester-I:

#### A. Measurable :

##### a. Student seminars :

1. Baltimore classification of Viruses.
2. Lytic and lysogenic cycle of T- even Bacteriophages.
3. Viral diseases of humans and animals.
4. Retroviruses
5. Bacterial diseases of humans and animals.
6. Significance of Bacteria in Biotechnology and Genetic engineering.
7. Fungi responsible for major famines in the world.
8. Poisonous mushrooms (Toad stools).
9. Algae as Single Cell Proteins (SCPs)
10. Parasitic algae

11. Origin of Bryophytes through : Algae vsPteridophytes
12. Fossil Bryophytes
13. Evolution of gametophytes in Bryophyta.
14. Ecological and economic importance of Bryophytes.

**b. Student Study Projects :**

1. Isolation and identification of microbes from soil, water and air.
2. Collection and identification of algae from fresh /estuarine /marine water.
3. Collection and identification of fruiting bodies of Basidiomycetes and Ascomycetes.
4. Collection and identification of Lichens from their native localities.
5. Collection of diseased plants/parts and identification of symptoms.
6. Collection and identification of Bryophytes from their native localities.

- c. Assignments:** Written assignment at home / during '0' hour at college; preparation of charts with drawings, making models etc., on topics included in syllabus.

**B. General :**

1. Visit to Agriculture and/or Horticulture University/College/Research station to learn about microbial diseases of plants.
2. Visit to industries working on microbial, fungal and algal products.
3. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course.

**II Semester /Botany Core Course – 2**  
**Basics of Vascular plants and Phytogeography**  
**(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)**  
(Total hours of teaching – 60 @ 02 Hrs./Week)

**Theory:**

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**Learning Outcomes:**

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

- Classify and compare Pteridophytes and Gymnosperms based on their morphology, anatomy, reproduction and life cycles.
  - Justify evolutionary trends in tracheophytes to adapt for land habitat.
  - Explain the process of fossilization and compare the characteristics of extinct and extant plants.
  - Critically understand various taxonomical aids for identification of Angiosperms.
  - Analyze the morphology of the most common Angiosperm plants of their localities and recognize their families.
  - Evaluate the ecological, ethnic and economic value of different tracheophytes and summarize their goods and services for human welfare.
  - Locate different phytogeographical regions of the world and India and can analyze their floristic wealth.
- 

**Unit – 1: Pteridophytes**

**12 Hrs.**

1. General characteristics of Pteridophyta; classification of Smith (1955) into divisions.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) *Lycopodium* (Lycopsida) and (b) *Marsilea* (Filicopsida).
3. Stellar evolution in Pteridophytes;
4. Heterospory and seed habit.

**Unit – 2:Gymnosperms** **14 Hrs.**

1. General characteristics of Gymnosperms; Sporneclassification upto classes.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) *Cycas*(Cycadopsida) and (b) *Gnetum* (Gnetopsida).
3. Outlines of geological time scale.
4. A brief account on *Cycadeoidea*.

**Unit – 3:Basic aspects of Taxonomy** **13Hrs.**

1. Aim and scope of taxonomy; Species concept: Taxonomic hierarchy, species, genus and family.
2. Plant nomenclature: Binomial system, ICBN- rules for nomenclature.
3. Herbarium and its techniques,BSI herbarium and Kew herbarium; concept of digital herbaria.
4. Bentham and Hooker system of classification;
5. Systematic description and economic importance of the following families:  
(a) Annonaceae (b) Curcubitaceae

**Unit – 4: Systematic Taxonomy** **13 Hrs.**

1. Systematic description and economic importance of the following families:  
(a) Asteraceae (b) Asclepiadaceae (c)Amaranthaceae(d) Euphorbiaceae  
(e) Arecaceaeand (f) Poaceae
2. Outlines of Angiosperm Phylogeny Group (APG IV).

**Unit – 5:Phytogeography** **08 Hrs.**

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)
2. Endemism – types and causes.
3. Phytogeographic regions of World.
4. Phytogeographic regions of India.
5. Vegetation types in Andhra Pradesh.

**Text books:**

- Botany – I (Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Botany – II (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Acharya, B.C., (2019) *Archhegoniates*, Kalyani Publishers, New Delhi
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- Pandey, B.P. (2013)*College Botany, Volume-I*, S. Chand Publishing, New Delhi
- Pandey, B.P. (2013)*College Botany, Volume-II*, S. Chand Publishing, New Delhi

**Books for Reference:**

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## Practical syllabus of Botany Core Course – 2/ Semester – II

### Basics of Vascular plants and Phytogeography

(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography) (Total hours of laboratory exercises 30 Hrs. @ 02 Hrs. /Week)

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#### Course Outcomes:

On successful completion of this course students shall be able to:

1. Demonstrate the techniques of section cutting, preparing slides, identifying of the material and drawing exact figures.
2. Compare and contrast the morphological, anatomical and reproductive features of vascular plants.
3. Identify the local angiosperms of the families prescribed to their genus and species level and prepare herbarium.
4. Exhibit skills of preparing slides, identifying the given twigs in the lab and drawing figures of plant twigs, flowers and floral diagrams as they are.
5. Prepare and preserve specimens of local wild plants using herbarium techniques.

#### Practical Syllabus:

1. Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts :
  - a. Pteridophyta : *Lycopodium* and *Marselia*
  - b. Gymnosperms : *Cycas* and *Gnetum*
2. Study of fossil specimens of *Cycadeoidea* and *Pentoxylon* (photographs /diagrams can be shown if specimens are not available).
3. Demonstration of herbarium techniques.
4. Systematic / taxonomic study of locally available plants belonging to the families prescribed in theory syllabus. (Submission of 30 number of Herbarium sheets of wild plants with the standard system is mandatory).
5. Mapping of phytogeographical regions of the globe and India.



## Model Question Paper for Practical Examination

Semester – II/ Botany Core Course – 2

### Basics of Vascular plants and Phytogeography

(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)

Max. Time: 3 Hrs.

Max. Marks: 50

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1. Take T.S. of the material 'A' (Pteridophyta), make a temporary slide and justify the identification with apt points. 10 M
2. Take T.S. of the material 'B' (Gymnosperms), make a temporary slide and justify the identification with apt points. 10 M
3. Describe the vegetative and floral characters of the material 'C' (Taxonomy of Angiosperms) and derive its systematic position. 10 M
4. Identify the specimen 'D' (Fossil Gymnosperm) and give specific reasons. 5 M
5. Locate the specified phytogeographical regions (2x2M) in the world / India (E) map supplied to you. 4 M
6. Record + Herbarium & Field note book + Viva-voce 5 +4+3 = 12 M

### Suggested co-curricular activities for Botany Core Course-2 in Semester-II:

#### A. Measurable :

##### a. Student seminars :

1. Fossil Pteridophytes.
2. Aquatic ferns and tree ferns
3. Ecological and economic importance of Pteridophytes
4. Evolution of male and female gametophytes in Gymnosperms.
5. Endemic and endangered Gymnosperms.
6. Ecological and economic importance of Gymnosperms.
7. Floras and their importance: Flora of British India and Flora of Madras Presidency.
8. Botanical gardens and their importance: National Botanic garden and Royal Botanic garden.
9. Artificial, Natural and Phylogenetic classification systems.
10. Molecular markers used in APG system of classification.
11. Vessel less angiosperms.

12. Insectivorous plants.
13. Parasitic angiosperms.
14. Continental drift theory and species isolation.

**b. Student Study Projects :**

1. Collection and identification of Pteridophytes from their native locality/ making an album by collecting photographs of Pteridophytes.
  2. Collection and identification of Gymnosperms from their native locality/ making an album by collecting photographs of Gymnosperms.
  4. Collection of information on famous herbaria in the world and preparation of a report.
  5. Collection of information on famous botanic gardens in the world and preparation of a report.
  6. Collection of data on vegetables (leafy and fruity) plants in the market and preparation of a report on their taxonomy.
  7. Collection and identification of fresh and dry fruits plants in the market and preparation of a report on their taxonomy.
  7. Collection of data on plants of ethnic and ethnobotanical importance from their native locality.
  9. Preparation of a local flora by enlisting the plants of their native place.
- c. Assignments:** Written assignment at home / during '0' hour at college; preparation of charts with drawings, making models etc., on topics included in syllabus.

**B. General :**

1. Visit to Botanic garden in a Research institute/University to see the live plants.
2. Virtual tour in websites for digital herbaria and botanic gardens.
3. Acquaint with standard floras like – Flora of Madras Presidency, Flora of their respective district in Andhra Pradesh.
4. Looking into vegetation of different phytogeographical regions using web resources.
5. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course.

### III Semester /Botany Core Course - 3

#### Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

(Total hours of teaching – 60 @ 04 Hrs./Week)

#### Theory:

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#### Learning outcomes:

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

- Understand on the organization of tissues and tissue systems in plants.
  - Illustrate and interpret various aspects of embryology.
  - Discuss the basic concepts of plant ecology, and evaluate the effects of environmental and biotic factors on plant communities.
  - Appraise various qualitative and quantitative parameters to study the population and community ecology.
  - Correlate the importance of biodiversity and consequences due to its loss.
  - Enlist the endemic/endangered flora and fauna from two biodiversity hot spots in India and assess strategies for their conservation.
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#### Unit – 1: Anatomy of Angiosperms

12 Hrs.

1. Organization of apical meristems: Tunica-carpus theory and Histogen theory.
2. Tissue systems—Epidermal, ground and vascular.
3. Anomalous secondary growth in *Boerhaavia* and *Dracaena*.
4. Study of timbers of economic importance - Teak, Red sanders and Rosewood.

#### Unit – 2: Embryology of Angiosperms

12 Hrs.

1. Structure of anther, anther wall, types of tapetum. Microsporogenesis and development of male gametophyte.
2. Structure of ovule, megasporogenesis; monosporic (*Polygonum*), bisporic (*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.
3. Outlines of pollination, pollen – pistil interaction and fertilization.
4. Endosperm - Types and biological importance - Free nuclear, cellular, helobial and ruminant.
5. Development of Dicot (*Capsella bursa-pastoris*) embryo.

**Unit – 3: Basics of Ecology****12 Hrs.**

1. Ecology: definition, branches and significance of ecology.
2. Ecosystem: Concept and components, energy flow, food chain, food web, ecological pyramids.
4. Plants and environment: Climatic (light and temperature), edaphic and biotic factors.
5. Ecological succession: Hydrosere and Xerosere.

**Unit – 4: Population, Community and Production Ecology****12 Hrs.**

1. Population ecology: Natality, mortality, growth curves, ecotypes, ecads
2. Community ecology: Frequency, density, cover, life forms, biological spectrum
3. Concepts of productivity: GPP, NPP and Community Respiration
4. Secondary production, P/R ratio and Ecosystems.

**Unit – 5: Basics of Biodiversity****12 Hrs.**

1. Biodiversity: Basic concepts, Convention on Biodiversity - Earth Summit.
  2. Value of Biodiversity; types and levels of biodiversity and Threats to biodiversity
  3. Biodiversity Hot spots in India. Biodiversity in North Eastern Himalayas and Western Ghats.
  4. Principles of conservation: IUCN threat-categories, RED data book
  5. Role of NBPGR and NBA in the conservation of Biodiversity.
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**Text books:**

- Botany – III (Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Botany – IV (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-II*, S. Chand Publishing, New Delhi
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- Bhattacharya, K., G. Hait & Ghosh, A. K., (2011) *A Text Book of Botany, Volume-II*, New Central Book Agency Pvt. Ltd., Kolkata

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- A. K. Agrawal & P.P. Deo (2010) *Plant Ecology*, Agrobios (India), Jodhpur
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**Practical syllabus of Botany Core Course – 3 /Semester – III**  
**Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity**

(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs./Week)

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**Course Outcomes:**

On successful completion of this practical course students shall be able to:

1. Get familiarized with techniques of section making, staining and microscopic study of vegetative, anatomical and reproductive structure of plants.
2. Observe externally and under microscope, identify and draw exact diagrams of the material in the lab.
3. Demonstrate application of methods in plant ecology and conservation of biodiversity and qualitative and quantitative aspects related to populations and communities of plants.

**Practical Syllabus**

1. Tissue organization in root and shoot apices using permanent slides.
2. Anomalous secondary growth in stems of *Boerhavia* and *Dracaena*.
3. Study of anther and ovule using permanent slides/photographs.
4. Study of pollen germination and pollen viability.
5. Dissection and observation of Embryo sac haustoria in *Santalum* or *Argemone*.
6. Structure of endosperm (nuclear and cellular) using permanent slides / Photographs.
7. Dissection and observation of Endosperm haustoria in *Crotalaria* or *Coccinia*.
8. Developmental stages of dicot and monocot embryos using permanent slides / photographs.
9. Study of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, rain gauge, and lux meter. (visit to the nearest/local meteorology station where the data is being collected regularly and record the field visit summary for the submission in the practical).
10. Study of morphological and anatomical adaptations of hydrophytes and xerophytes (02 each).
11. Quantitative analysis of herbaceous vegetation in the college campus for frequency, density and abundance.

12. Identification of vegetation/various plants in college campus and comparison with Raunkiaer's frequency distribution law.
13. Find out the alpha-diversity of plants in the area
14. Mapping of biodiversity hotspots of the world and India.



## Model paper for Practical Examination

Semester – III/ Botany Core Course – 3

### Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

Max. Time: 3 Hrs.

Max. Marks: 50

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1. Take T.S. of the material 'A' (Anatomy), prepare a temporary slide and justify the identification with specific reasons. 10 M
2. Write the procedure for the experiment 'B' (Embryology) and demonstrate the same. 10 M
3. Take T.S. of the material 'C', prepare a temporary slide and justify the identification with specific reasons. 10 M
4. Identify the following with specific reasons. 4 x 3 = 12 M
  - D. Anatomy/Embryology
  - E. Ecology instrument
  - F. Mapping of Biodiversity hot spot
  - G. Endemic/endangered plant/animal
5. Record + Viva-voce 5 + 3 = 8 M

## **Suggested co-curricular activities for Botany Core Course-3 in Semester-III:**

### **A. Measurable :**

#### **a. Student seminars :**

1. Anatomy in relation to taxonomy of Angiosperms.
2. Nodal anatomy
3. Floral anatomy
4. Embryology in relation to taxonomy of Angiosperms.
5. Apomictics and polyembryony.
6. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.
7. Deforestation and Afforestation.
8. Green house effect and ocean acidification.
9. The Montreal protocol and the Kyoto protocol.
10. Productivity of aquatic ecosystems.
11. Mangrove ecosystems in India.
12. Kollerulake – Ramsar site.
13. Biodiversity hotspots of the world.
14. Origin of Crop plants - Vavilov centers
15. Agrobiodiversity
16. International organizations working on conservation of Biodiversity
17. Nagoya protocol – ABS system.
18. Endemic and endangered plants in Andhra Pradesh.

#### **b. Student Study Projects :**

1. Stomata structure in plants from college campus/ their native place.
2. Report on xylem elements in plants using maceration technique.
3. Collection of information on famous herbaria in the world and preparation of a report.
4. Microscopic observations on pollen morphology from plants in college Campus/ their native locality.
5. Study report on germination and viability of pollen in different plants.
6. Observation of anthesis time in different plants and their pollinators.
7. A report on autecology and synecology of some plants in college campus or their native place.
8. Collection of photos of endemic/endangered plant and animal species to Make an album.

9. Biodiversity of the college or their own residential/ native area.
10. Collection of seeds/vegetative organs of rare plant species from their localities and to raise/grow in college garden

**c. Assignments:** Written assignment at home / during '0' hour at college; preparation of charts with drawings, making models etc., on topics included in syllabus.

**B. General :**

1. Visit to an arboretum/silviculture station/Forest research institute to see the live timber yielding plants or to visit a local timber depot. to observe various woods.
2. Field visit to a nearby ecosystem to observe the abiotic-biotic relationships.
3. Visit to National park/Sanctuary/Biosphere reserve etc., to observe in-situ conservation of plants and animals.
4. Visit to a Botanical garden or Zoo to learn about ex-situ conservation of rare plants or animals.
5. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course.

## IV Semester/ Botany Core Course – 4

### Plant Physiology and Metabolism

(Total hours of teaching – 60 @ 04 Hrs./Week)

#### Theory:

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#### Learning outcomes:

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

- Comprehend the importance of water in plant life and mechanisms for transport of water and solutes in plants.
  - Evaluate the role of minerals in plant nutrition and their deficiency symptoms.
  - Interpret the role of enzymes in plant metabolism.
  - Critically understand the light reactions and carbon assimilation processes responsible for synthesis of food in plants.
  - Analyze the biochemical reactions in relation to Nitrogen and lipid metabolisms.
  - Evaluate the physiological factors that regulate growth and development in plants.
  - Examine the role of light on flowering and explain physiology of plants under stress conditions.
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#### Unit – 1: Plant-Water relations

10 Hrs.

1. Importance of water to plant life, physical properties of water, diffusion, imbibition, osmosis. water potential, osmotic potential, pressure potential.
2. Absorption and lateral transport of water; Ascent of sap
3. Transpiration: stomata structure and mechanism of stomatal movements ( $K^+$  ion flux).
4. Mechanism of phloem transport; source-sink relationships.

#### Unit – 2: Mineral nutrition, Enzymes and Respiration

14 Hrs.

1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency
2. Absorption of mineral ions; passive and active processes.
3. Characteristics, nomenclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics.

4. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation, Pentose Phosphate Pathway (HMP shunt).

**Unit – 3: Photosynthesis and Photorespiration**

**12 Hrs.**

1. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect
2. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation
3. Carbon assimilation pathways (C<sub>3</sub>, C<sub>4</sub> and CAM);
4. Photorespiration - C<sub>2</sub> pathway

**Unit – 4: Nitrogen and lipid metabolism**

**12 Hrs.**

1. Nitrogen metabolism: Biological nitrogen fixation – asymbiotic and symbiotic nitrogen fixing organisms. Nitrogenase enzyme system.
2. Lipid metabolism: Classification of Plant lipids, saturated and unsaturated fatty acids.
3. Anabolism of triglycerides,  $\beta$ -oxidation of fatty acids, Glyoxylate cycle.

**Unit – 5: Plant growth - development and stress physiology**

**12 Hrs.**

1. Growth and Development: Definition, phases and kinetics of growth.
  2. Physiological effects of Plant Growth Regulators (PGRs) - auxins, gibberellins, cytokinins, ABA, ethylene and brassinosteroids.
  3. Physiology of flowering: Photoperiodism, role of phytochrome in flowering.
  4. Seed germination and senescence; physiological changes.
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**Text books:**

- Botany – IV (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-III*, S. Chand Publishing, New Delhi
- Ghosh, A. K., K. Bhattacharya & G. Hait (2011) *A Text Book of Botany, Volume-III*, New Central Book Agency Pvt. Ltd., Kolkata

**Books for Reference:**

- Aravind Kumar & S.S. Purohit (1998) *Plant Physiology – Fundamentals and Applications*, AgroBotanica, Bikaner
- Datta, S.C. (2007) *Plant Physiology*, New Age International (P) Ltd., Publishers, New Delhi
- Hans Mohr & P. Schopfer (2006) *Plant Physiology*, Springer (India) Pvt. Ltd., New Delhi
- Hans-Walter Heldt (2005) *Plant Biochemistry*, Academic Press, U.S.A.
- Hopkins, W.G. & N.P.A. Huner (2014) *Introduction to Plant Physiology*, Wiley India Pvt. Ltd., New Delhi
- Noggle Ray & J. Fritz (2013) *Introductory Plant Physiology*, Prentice Hall (India), New Delhi
- Pandey, S.M. & B.K. Sinha (2006) *Plant Physiology*, Vikas Publishing House, New Delhi
- Salisbury, Frank B. & Cleon W. Ross (2007) *Plant Physiology*, Thomsen & Wadsworth, Australia & U.S.A
- Sinha, R.K. (2014) *Modern Plant Physiology*, Narosa Publishing House, New Delhi
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- Verma, V. (2007) *Text Book of Plant Physiology*, Ane Books India, New Delhi

## **Practical Syllabus of Botany Core Course – 4 / Semester – IV**

### **Plant Physiology and Metabolism**

(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs. /Week)

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**Course outcomes:** On successful completion of this practical course, students shall be able to:

1. Conduct lab and field experiments pertaining to Plant Physiology, that is, biophysical and biochemical processes using related glassware, equipment, chemicals and plant material.
2. Estimate the quantities and qualitative expressions using experimental results and calculations
3. Demonstrate the factors responsible for growth and development in plants.

#### **Practical Syllabus**

1. Determination of osmotic potential of plant cell sap by plasmolytic method using *Rhoeo/ Tradescantia* leaves.
2. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
3. Determination of rate of transpiration using Cobalt chloride method / Ganong's potometer (at least for a dicot and a monocot).
4. Effect of Temperature on membrane permeability by colorimetric method.
5. Study of mineral deficiency symptoms using plant material/photographs.
6. Demonstration of amylase enzyme activity and study the effect of substrate and Enzyme concentration.
7. Separation of chloroplast pigments using paper chromatography technique.
8. Demonstration of Polyphenol oxidase enzyme activity (Potato tuber or Apple fruit)
9. Anatomy of C<sub>3</sub>, C<sub>4</sub> and CAM leaves

10. Estimation of protein by biuret method/Lowry method

11. Minor experiments – Osmosis, Arc-auxonometer, ascent of sap through xylem, cytoplasmic streaming.



## Model Question Paper for Practical Examination

Semester – IV/ Botany Core Course – 4

### Plant Physiology and Metabolism

Max. Time: 3 Hrs.

Max. Marks: 50

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1. Conduct the experiment 'A' (Major experiment), write aim, principle, material and apparatus/equipment, procedure, tabulate results and make conclusion. 20 M
2. Demonstrate the experiment 'B' (Minor experiment), write the principle, procedure and give inference. 10 M
3. Identify the following with apt reasons. 3 x 4 = 12 M
  - C. Plant water relations / Mineral nutrition
  - D. Plant metabolism
  - E. Plant growth and development
4. Record + Viva-voce 5 + 3 = 8 M

### Suggested co-curricular activities for Botany Core Course-4 in Semester-IV:

#### A. Measurable :

##### a. Student seminars :

1. Antitranspirants and their significance in crop physiology and horticulture.
2. Natural chelating agents in plants.
3. Criteria of essentiality of elements and beneficial elements.
4. Hydroponics, aquaponics and aeroponics.
5. Mycorrhizal association and mineral nutrition in plants.
6. Non-proteinaceous enzymes.
7. Respiratory inhibitors.
8. Structure of ATPase and Chemiosmotic hypothesis.
9. Transpiration and photosynthesis – a compromise.
10. Amphibolic pathways and bypass pathways in plants.
11. Non-biological nitrogen fixation.
12. Role of Hydrogenase in nitrogen fixation.
13. Plant lectins – their role in plants and use in medicine and medical research.

**b. Student Study Projects :**

1. Stomatal densities among different groups of plants.
2. Various treatments (salt, cold, high temperature, heavy metals) and their effects on seed germination.
3. Effects of plant hormones (IAA, Gibberellin and Kinetin) on Seed Germination.
4. Diurnal variation of stomatal behavior in CAM and C3 plants found in local area.
5. Effects of nitrogen fertilizer on plant growth.
6. Enumeration of C3, C4 and CAM plants in the local area.
7. Effect of different light wavelengths (red light, green light, blue light) on apparent photosynthesis in terms of growth.
8. Light effects on leaf growth and leaf orientation.
9. Artificial Fruit Ripening Process by various treatments (carbide and ethylene).
10. Study of relative water content and water retention by leaves under different environments.
11. Study of soil nutrients in local agricultural fields.
12. Study of mineral deficiency symptoms of various crops of local area.
13. Study of local weeds in crop fields.
14. Studies on seed storage proteins, oils and starch in local millets and pulse crops.
15. Making a report on LDPs, SDPs and DNPs in their locality.

**c. Assignments:** Written assignment at home / during '0' hour at college; preparation of charts with drawings, making models etc., on topics included in syllabus.

**B. General :**

1. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course.
2. Visit to a Plant Physiology laboratory in a University or Physiology division in a Agriculture/Horticulture University/Research station.

**IV Semester / Botany Core Course –5**  
**Cell Biology, Genetics and Plant Breeding**  
(Total hours of teaching – 60 @ 04 Hrs./Week)

**Theory:**

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**Learning outcomes:**

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

- Distinguish prokaryotic and eukaryotic cells and design the model of a cell.
  - Explain the organization of a eukaryotic chromosome and the structure of genetic material.
  - Demonstrate techniques to observe the cell and its components under a microscope.
  - Discuss the basics of Mendelian genetics, its variations and interpret inheritance of traits in living beings.
  - Elucidate the role of extra-chromosomal genetic material for inheritance of characters.
  - Evaluate the structure, function and regulation of genetic material.
  - Understand the application of principles and modern techniques in plant breeding.
  - Explain the procedures of selection and hybridization for improvement of crops.
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**Unit – 1: The Cell**

**12 Hrs.**

1. Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on ultra-structure of a plant cell.
2. Ultra-structure of cell wall.
3. Ultra-structure of plasma membrane and various theories on its organization.
4. Polymorphic cell organelles (Plastids); ultrastructure of chloroplast. Plastid DNA.

**Unit – 2: Chromosomes**

**12 Hrs.**

1. Prokaryotic vs eukaryotic chromosome. Morphology of a eukaryotic chromosome.
2. Euchromatin and Heterochromatin; Karyotype and ideogram.
3. Brief account of chromosomal aberrations - structural and numerical changes
4. Organization of DNA in a chromosome (solenoid and nucleosome models).

**Unit – 3:Mendelian and Non-Mendelian genetics****14Hrs.**

1. Mendel's laws of inheritance. Incomplete dominance and co-dominance; Multiple allelism.
2. Complementary, supplementary and duplicate gene interactions (plant based examples are to be dealt).
3. A brief account of linkage and crossing over; Chromosomal mapping - 2 point and 3 point test cross.
4. Concept of maternal inheritance (Corren's experiment on *Mirabilis jalapa*); Mitochondrial DNA.

**Unit – 4:Structure and functions of DNA****12 Hrs.**

1. Watson and Crick model of DNA. Brief account on DNA Replication (Semi-conservative method).
2. Brief account on Transcription, types and functions of RNA. Gene concept and genetic code and Translation.
3. Regulation of gene expression in prokaryotes - Lac Operon.

**Unit – 5:Plant Breeding****12 Hrs.**

1. Plant Breeding and its scope; Genetic basis for plant breeding. Plant Introduction and acclimatization.
  2. Definition, procedure; applications and uses; advantages and limitations of :(a) Mass selection, (b) Pure line selection and (c) Clonal selection.
  3. Hybridization – schemes, and technique; Heterosis(hybrid vigour).
  4. A brief account on Molecular breeding – DNA markers in plant breeding. RAPD, RFLP.
-

**Text books :**

- Botany – III (Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-III*, S. Chand Publishing, New Delhi
- Ghosh, A.K., K.Bhattacharya & G. Hait (2011) *A Text Book of Botany, Volume-III*, New Central Book Agency Pvt. Ltd., Kolkata
- Chaudhary, R. C. (1996) *Introduction to Plant Breeding*, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi

**Books for Reference:**

- S. C. Rastogi (2008) *Cell Biology*, New Age International (P) Ltd. Publishers, New Delhi
- P. K. Gupta (2002) *Cell and Molecular biology*, Rastogi Publications, New Delhi
- B. D. Singh (2008) *Genetics*, Kalyani Publishers, Ludhiana
- A.V.S.S. Sambamurty (2007) *Molecular Genetics*, Narosa Publishing House, New Delhi
- Cooper, G.M. & R.E. Hausman (2009) *The Cell – A Molecular Approach*, A.S.M. Press, Washington
- Becker, W.M., L.J. Kleinsmith & J. Hardin (2007) *The World of Cell*, Pearson Education, Inc., New York
- De Robertis, E.D.P. & E.M.F. De Robertis Jr. (2002) *Cell and Molecular Biology*, Lippincott Williams & Wilkins Publ., Philadelphia
- Robert H. Tamarin (2002) *Principles of Genetics*, Tata McGraw –Hill Publishing Company Limited, New Delhi.
- Gardner, E.J., M. J. Simmons & D.P. Snustad (2004) *Principles of Genetics*, John Wiley & Sons Inc., New York
- Micklos, D.A., G.A. Freyer & D.A. Cotty (2005) *DNA Science: A First Course*, I.K. International Pvt. Ltd., New Delhi
- Chaudhari, H.K. (1983) *Elementary Principles of Plant Breeding*, TMH publishers Co., New Delhi
- Sharma, J.R. (1994) *Principles and Practice of Plant Breeding*, Tata McGraw- Hill Publishers, New Delhi
- Singh, B.D. (2001) *Plant Breeding : Principles and Methods*, Kalyani Publishers, Ludhiana

- Pundhan Singh (2015) *Plant Breeding for Undergraduate Students*, Kalyani Publishers, Ludhiana
- Gupta, S.K. (2010) *Plant Breeding : Theory and Techniques*, Agrobios (India), Jodhpur
- Hayes, H.K., F.R. Immer & D.C. Smith (2009) *Methods of Plant Breeding*, Biotech Books, Delhi

## Practical Syllabus of Botany Core Course – 5/IVSemester

### Cell Biology, Genetics and Plant Breeding

(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs. /Week)

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**Course Outcomes:** After successful completion of this practical course the student shall be able to:

1. Show the understanding of techniques of demonstrating Mitosis and Meiosis in the laboratory and identify different stages of cell division.
2. Identify and explain with diagram the cellular parts of a cell from a model or picture and prepare models
3. Solve the problems related to crosses and gene interactions.
4. Demonstrate plant breeding techniques such as emasculation and bagging

#### Practical Syllabus:

1. Study of ultra structure of plant cell and its organelles using Electron microscopic Photographs/models.
2. Demonstration of Mitosis in *Allium cepa*/*Aloe vera* roots using squash technique; observation of various stages of mitosis in permanent slides.
4. Demonstration of Meiosis in P.M.C.s of *Allium cepa* flower buds using squash technique; observation of various stages of meiosis in permanent slides.
4. Study of structure of DNA and RNA molecules using models.
5. Solving problems monohybrid, dihybrid, back and test crosses.
6. Solving problems on gene interactions (at least one problem for each of the gene interactions in the syllabus).
7. Chromosome mapping using 3- point test cross data.
8. Demonstration of emasculation, bagging, artificial pollination techniques for hybridization.

**Model paper for Practical Examination**

Semester-IV / Botany Core Course – 5

**Cell Biology, Genetics and Plant Breeding**

Max. Time: 3 Hrs.

Max. Marks: 50

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1. Make a cytological preparation of given material 'A' (mitosis or meiosis in Onion) by squash technique, report any two stages, draw labeled diagrams and write the reasons.

15 M

2. Solve the given Genetic problem (Dihybrid cross/ Interaction of genes/ 3-point test cross) 'B' and write the conclusions.

15 M

3. Identify the following and justify with apt reasons.

3 x 4 = 12 M

C. Cell Biology (Cell organelle)

D. Genetics (DNA/RNA)

E. Plant Breeding

4. Record + Viva-voce

5 + 3 = 8 M

**Suggested co-curricular activities for Botany Core Course- 5 in Semester-IV:**

**A. Measurable :**

**a. Student seminars :**

1. Light microscopy : bright field and dark field microscopy.
2. Scanning Electron Microscopy (SEM).
3. Transmission Electron Microscopy (TEM).
4. Mitosis and Meiosis
5. Cell cycle and its regulation.
6. Cell organelles bounded by single membrane.
7. Prokaryotic chromosomes
8. Special types of chromosomes :Polytene, Lampbrush and B-chromosomes.
9. Different forms of DNA.
10. Gene mutations.
11. DNA damage and repair mechanisms.
12. Reverse transcription.
13. Protein structure.



14. Modes of reproduction in plants.

15. Modes of pollination in plants

**b. Student Study Projects :**

1. Study of mitotic cell cycle in roots of *Allium cepa*

2. Study of mitotic cell cycle in roots of *Aloe vera*

3. Observation of chromosomal aberrations in *Allium cepa* root cells exposed to industrial effluent(s).

4. Observation of chromosomal aberrations in *Allium cepa* root cells exposed to heavy metal(s).

5. Observation of polyembryony in *Citrus* spp. and *Mangifera indica*.

**c. Assignments:** Written assignment at home / during '0' hour at college; preparation of charts with drawings, making models etc., on topics included in syllabus.

**B. General :**

1. Field visit to Agriculture/Horticulture University/ Research station to observe Plant breeding methods.

2. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course.

## RECOMMENDED ASSESSMENT OF STUDENTS:

### **Recommended continuous assessment methods for all courses:**

Some of the following suggested assessment methodologies could be adopted. Formal assessment for awarding marks for Internal Assessment in theory.

#### **(a) Formal:**

1. The oral and written examinations (Scheduled and surprise tests),
2. Simple, medium and Critical Assignments and Problem-solving exercises,
3. Practical assignments and laboratory reports,
4. Assessment of practical skills,
5. Individual and group project reports,
6. Seminar presentations,
7. Viva voce interviews.

#### **(b) Informal:**

1. Computerized adaptive testing, literature surveys and evaluations,
2. Peers and self-assessment, outputs from individual and collaborative work
3. Closed-book and open-book tests,

**Common pattern for Question Paper for Theory Examination(s) at Semester end**

Max. Time: 3 Hrs.

Max. Marks: 75 M

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**Section – A**

**Answer all the following questions.**

**5 x 2 = 10 M**

- ✓ One question should be given from each Unit in the syllabus.

**Section – B**

**Answer any three of the following questions. Draw a labeled diagram wherever necessary**

**3 x 5 = 15 M**

- ✓ One question should be given from each Unit in the syllabus.

**Section – C**

**Answer any five of the following questions. Draw a labeled diagram wherever necessary**

**5 x 10 = 50 M**

- ✓ Two questions (a & b) are to be given from each Unit in the syllabus (internal choice in each unit). Student has to answer 5 questions by choosing one from a set of questions given from a Unit.

**Note:** Questions should be framed in such a way to test the understanding, analytical and creative skills of the students. All the questions should be given within the frame work of the syllabus prescribed.

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## *Annexure*

### **Objectives and General Outcomes of Programme and Domain Subject**

**Programme(B.Sc.) Objectives:** The objectives of bachelor's degree programme with Botany are:

1. To provide a comprehensive knowledge on various aspects related to microbes and plants.
2. To deliver knowledge on latest developments in the field of Plant sciences with a practical approach.
3. To produce a student who thinks independently, critically and discuss various aspects of plant life.
4. To enable the graduate to prepare and pass through national and international examinations related to Botany.
5. To empower the student to become an employee or an entrepreneur in the field of Botany /Biology and to serve the nation.

### **Programme Outcomes:**

1. Understand the basic concepts of Botany in relation to its allied core courses.
2. Perceive the significance of microbes and plants for human welfare, and structural and functional aspects of plants.
3. Demonstrate simple experiments related to plant sciences, analyze data, and interpret them with the theoretical knowledge.
4. Work in teams with enhanced inter-personal skills.
5. Develop the critical thinking with scientific temper.
6. Effectively communicate scientific ideas both orally and in writing.

### **Domain Subject(Botany) Objectives :**

1. To impart knowledge on origin, evolution, structure, reproduction and interrelationships of microbes and early plant groups.
2. To provide knowledge on biology and taxonomy of true land plants within a phylogenetic framework.
3. To teach aspects related to anatomy, embryology and ecology of plants, and importance of Biodiversity.
4. To explain the structural and functional aspects of plants with respect to the cell organelles, chromosomes and genes, and methods of plant breeding.

5. To develop a critical understanding on SPAC, metabolism and growth and development in plants.
6. To enable the students proficient in experimental techniques and methods of analysis appropriate for various sub-courses in Botany.

**Domain Subject(Botany) Outcomes:**

1. Students will be able to identify, compare and distinguish various groups of microbes and primitive plants based on their characteristics.
2. Students will be able to explain the evolution of trachaeophytes and also distribution of plants on globe.
3. Students will be able to discuss on internal structure, embryology and ecological adaptations of plants, and want of conserving Biodiversity.
4. Students will be able to interpret life processes in plants in relation to physiology and metabolism.
5. Students will be able to describe ultrastructure of plant cells, inheritance and crop improvement methods.
6. Students will independently design and conduct simple experiments based on the knowledge acquired in theory and practicals of the different sub-courses in Botany.

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**SUBJECT EXPERTS**

*Prof. C.Sudhakar*  
Dept of Botany,  
Sri Krishnadevaraya University,  
Anantapur

*Dr.A.Srinivasa Rao*  
Lecturer in Botany,  
Govt Degree College,  
Mandapeta

**SYLLABUS VETTED BY**

*Prof.M.Vijaya Lakshmi,*  
Dept of Botany and Microbiology,  
Acharya Nagarjuna University,  
Nagarjuna Nagar



## **ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION**

(A Statutory body of the Government of Andhra Pradesh)

3<sup>rd</sup>,4<sup>th</sup> and 5<sup>th</sup> floors, Neeladri Towers, Sri Ram Nagar,6<sup>th</sup> Battalion Road,  
Atmakur (V), Mangalagiri (M), Guntur-522 503, Andhra Pradesh  
**Web:** www.apsche.org **Email:** acapsche@gmail.com

### **REVISED SYLLABUS OF B.Sc (Chemistry) UNDER CBCS FRAMEWORK WITH EFFECT FROM 2020-2021**

#### **PROGRAMME: THREE-YEAR B.Sc. (B.Sc Chemistry)**

*(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities &  
Model Q.P.)*

*For Fifteen Courses of 1, 2, 3 & 4 Semesters)*

**(To be Implemented from 2020-21 Academic Year)**

**Andhra Pradesh State Council of Higher Education**

## B.Sc. Chemistry Revised Syllabus under CBCS

w.e.f. 2020-21

### Structure of Chemistry Core Syllabus under CBCS

| YEAR | SEMESTER | COURSE | TITLE   | MARKS | CREDITS |
|------|----------|--------|---|-------|---------|
| I    | I        | I      | Inorganic and Physical Chemistry                                | 100   | 03      |
|      |          |        | Practical – I Analysis of SALT MIXTURE                          | 50    | 02      |
|      | II       | II     | Organic and General Chemistry                                   | 100   | 03      |
|      |          |        | Practical – II Volumetric Analysis                              | 50    | 02      |
| II   | III      | III    | Organic Chemistry and Spectroscopy                              | 100   | 03      |
|      |          |        | Practical – III Organic preparations and IR Spectral Analysis   | 50    | 02      |
|      | IV       | IV     | Inorganic, Organic and Physical Chemistry                       | 100   | 03      |
|      |          |        | Practical – IV Organic Qualitative analysis                     | 50    | 02      |
|      |          | V      | Inorganic and Physical Chemistry                                | 100   | 02      |
|      |          |        | Practical-V Course Conductometric and Potentiometric Titrimetry | 50    | 02      |



## SEMESTER – I

**Course I (Inorganic & Physical Chemistry)**

**60 hrs. (4h/w)**

### **Course outcomes:**

At the end of the course, the student will be able to;

1. Understand the basic concepts of p-block elements
2. Explain the difference between solid, liquid and gases in terms of intermolecular interactions.
3. Apply the concepts of gas equations, pH and electrolytes while studying other chemistry courses.

### **INORGANIC CHEMISTRY**

**24 h**

#### **UNIT –I**

#### **Chemistry of p-block elements**

**8h**

**Group 13:** Preparation & structure of Diborane, Borazine

**Group 14:** Preparation, classification and uses of silicones

**Group 15:** Preparation & structures of Phosphonitrilic halides  $\{(\text{PNCl}_2)_n\}$  where  $n=3, 4$

**Group 16:** Oxides and Oxoacids of Sulphur (structures only)

**Group 17:** Pseudohalogens, Structures of Interhalogen compounds.

#### **UNIT-II**

#### **1. Chemistry of d-block elements:**

**6h**

Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states.

#### **2. Chemistry of f-block elements:**

**6h**

Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

#### **3. Theories of bonding in metals:**

**4h**

Valence bond theory and Free electron theory, explanation of thermal and electrical conductivity of metals based on these theories, Band theory- formation of bands, explanation of conductors, semiconductors and insulators.

## **PHYSICAL CHEMISTRY**

**36h**

### **UNIT-III**

#### **Solidstate**

**10h**

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Powder method. Defects in crystals. Stoichiometric and non-stoichiometric defects.

### **UNIT-IV**

#### **1. Gaseous state**

**6h**

van der Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Relationship between critical constants and vander Waal's constants. Law of corresponding states. Joule- Thomson effect. Inversion temperature.

#### **2. Liquid state**

**4h**

Liquid crystals, mesomorphic state. Differences between liquid crystal and solid/liquid. Classification of liquid crystals into Smectic and Nematic. Application of liquid crystals as LCD devices.

### **UNIT-V**

#### **Solutions, Ionic equilibrium & dilute solutions**

#### **1. Solutions**

**6h**

Azeotropes-HCl-H<sub>2</sub>O system and ethanol-water system. Partially miscible liquids-phenol-water system. Critical solution temperature (CST), Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

#### **2. Ionic equilibrium**

**3h**

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.

#### **3. Dilute solutions**

**7h**

Colligative properties- RLVP, Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile

solute using osmotic pressure, Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.

### **Co-curricular activities and Assessment Methods**

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. Semester-end Examination: critical indicator of student's learning and teaching methods adopted by teacher throughout the semester.

### **List of Reference Books**

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Advanced physical chemistry by Bahl and Tuli
6. Inorganic Chemistry by J.E. Huheey
7. Basic Inorganic Chemistry by Cotton and Wilkinson
8. A textbook of qualitative inorganic analysis by A.I. Vogel
9. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry Ed., Oxford University Press  
10th Ed (2014).
10. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).
11. Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).
12. Barrow, G. M. Physical Chemistry

**LABORATORY COURSE -I**

**30hrs (2 h / w)**

**Practical-I Analysis of SALT MIXTURE**

(At the end of Semester-I)

**Qualitative inorganic analysis (Minimum of Six mixtures should be analysed)**

**50 M**

**Course outcomes:**

At the end of the course, the student will be able to;

1. Understand the basic concepts of qualitative analysis of inorganic mixture
2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
3. Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis

**Analysis of SALT MIXTURE**

**50 M**

Analysis of mixture salt containing two anions and two cations (From two different groups) from the following:

**Anions:** Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate.

**Cations:** Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Potassium and Ammonium.

**MODEL PAPER**

**FIRST YEAR B.Sc., DEGREE EXAMINATION**

**SEMESTER-I**

**CHEMISTRY Course-I: INORGANIC & PHYSICAL CHEMISTRY**

Time: 3 hours

Maximum Marks: 75

**PART- A5 X 5 = 25 Marks**

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

1. Explain the preparation & structures of Phosphonitrilic compounds.
2. Explain in brief, catalytic properties & stability of various oxidation states of d-block elements.
3. Write short note on Bravais lattices and crystal systems.
4. What are Smectic & Nematic liquid Crystals? Explain.

5. Write account on Common ion effect & Solubility product.
6. Describe Andrew's isotherms of carbon dioxide.
7. Explain Actinide Contraction.
8. Explain the structure of Borazine.

**PART- B5 X 10 = 50 Marks**

Answer **ALL** the questions. Each carries **TEN** marks

- 9 (a). Explain Classification, Preparations & uses of Silicones

(or)

- (b). (i) What are Pseudohalogens.  
(ii) Explain the Structures of any one  $AX_3$  &  $AX_5$  interhalogen compounds.

- 10 (a). What is Lanthanide Contraction? Explain the Consequences of Lanthanide Contraction.

(or)

- (b). (i) Explain the magnetic properties of d- block elements.  
(ii) Explain about Conductors, Semi-Conductors & Insulators using Band Theory.

- 11.(a). Write an essay on Crystal defects.

(or)

- (b). What is Bragg's Law. Explain the determination of structure of a crystal by powder method.

- 12.(a). Derive the relationship between Critical constants & Vanderwaal constants

(or)

- (b).(i) Write any 5 differences between liquid crystals & liquids, solids  
(ii) Write the applications of Liquid crystals.

- 13.(a). Explain Nernst distribution Law. Explain its applications

(or)

- (b). What are colligative properties. Write experimental methods for determination of molar mass of a non-volatile solute by using Elevation in boiling point & depression in freezing point.

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## SEMESTER – II

### Course II – (Organic & General Chemistry) 60 hrs (4h/w)

#### Course outcomes:

At the end of the course, the student will be able to;

1. Understand and explain the differential behavior of organic compounds based on fundamental concepts learnt.
2. Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
3. Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.
4. Correlate and describe the stereochemical properties of organic compounds and reactions.

#### **ORGANIC CHEMISTRY**

**36h**

##### **UNIT-I**

##### **Recapitulation of Basics of Organic Chemistry**

##### **Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)**

**12h**

General methods of preparation of alkanes- Wurtz and Wurtz-Fittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Isomerism and its effect on properties, Free radical substitutions; Halogenation, concept of relative reactivity v/s selectivity. Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane and butane). General molecular formulae of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram, Conformations of monosubstituted cyclohexane.

##### **UNIT-II**

##### **Carbon-Carbon pi Bonds (Alkenes and Alkynes)**

**12h**

General methods of preparation, physical and chemical properties. Mechanism of E1, E2, E1cB reactions, Saytzeff and Hoffmann eliminations, Electrophilic Additions, mechanism (Markownikoff/Antimarkownikoff addition) with suitable examples, *syn* and *anti*- addition; addition of H<sub>2</sub>, X<sub>2</sub>, HX. oxymercuration-

demercuration, hydroboration-oxidation, ozonolysis, hydroxylation, Diels Alder reaction, 1,2- and 1,4-addition reactions in conjugated dienes.

Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.

### **UNIT-III**

#### **Benzene and its reactivity**

**12h**

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation)

Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedel-Craft's alkylation and acylation. Orientation of aromatic substitution - ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like  $\text{NO}_2$  and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens

(Explanation by taking minimum of one example from each type)

### **GENERAL CHEMISTRY**

**24 h**

#### **UNIT-IV**

##### **1. Surface chemistry and chemical bonding**

###### **Surface chemistry**

**6h**

**Colloids**- Coagulation of colloids- Hardy-Schulze rule. Stability of colloids, Protection of Colloids, Gold number.

**Adsorption**- Physical and chemical adsorption, Langmuir adsorption isotherm, applications of adsorption.

###### **2. Chemical Bonding**

**6h**

Valence bond theory, hybridization, VB theory as applied to  $\text{ClF}_3$ ,  $\text{Ni}(\text{CO})_4$ , Molecular orbital theory - LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules ( $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{CO}$  and  $\text{NO}$ ).

### **3. HSAB**

**2h**

Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard and Soft-Soft combinations.

### **UNIT-V**

#### **Stereochemistry of carbon compounds**

**10h**

Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae.

Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation.

Chiral molecules- definition and criteria(Symmetry elements)- Definition of enantiomers and diastereomers – Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

D,L, R,S and E,Z- configuration with examples.

Definition of Racemic mixture – Resolution of racemic mixtures (any 3 techniques)

#### **Co-curricular activities and Assessment Methods**

Continuous Evaluation: Monitoring the progress of student's learning

Class Tests, Worksheets and Quizzes

Presentations, Projects and Assignments and Group Discussions: Enhance critical thinking skills and personality

Semester-end Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

#### **List of Reference Books**

##### **Theory:**

Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994.

Kalsi, P. S. Stereochemistry Conformation and Mechanism; New Age International, 2005.

##### **Practical:**



Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).

Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)

#### **Additional Resources:**

Solomons, T. W. G.; Fryhle, C. B. & Snyder, S. A. Organic Chemistry, 12th Edition, Wiley.

Bruice, P. Y. Organic Chemistry, Eighth Edition, Pearson.

Clayden, J.; Greeves, N. & Warren, S. Organic Chemistry, Oxford.

Nasipuri, D. Stereochemistry of Organic Compounds: Principles and Applications, Third Edition, NewAge International.

Gunstone, F. D. Guidebook to Stereochemistry, Prentice Hall Press, 1975.

### **LABORATORY COURSE-II**

**30hrs (2 h / w)**

#### **Practical-II Volumetric Analysis**

(At the end of Semester-II)

#### **Course outcomes:**

At the end of the course, the student will be able to;

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Understand and explain the volumetric analysis based on fundamental concepts learnt in ionic equilibria
3. Learn and identify the concepts of a standard solutions, primary and secondary standards
4. Facilitate the learner to make solutions of various molar concentrations. This may include: The concept of the mole; Converting moles to grams; Converting grams to moles; Defining concentration; Dilution of Solutions; Making different molar concentrations.

#### **Volumetric analysis**

**50 M**

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Determination of Fe (II) using  $\text{KMnO}_4$  with oxalic acid as primary standard.

3. Determination of Cu (II) using  $\text{Na}_2\text{S}_2\text{O}_3$  with  $\text{K}_2\text{Cr}_2\text{O}_7$  as primary standard.
4. Estimation of water of crystallization in Mohr's salt by titrating with  $\text{KMnO}_4$

**MODEL PAPER**  
**FIRST YEAR B.Sc., DEGREE EXAMINATION**  
**SEMESTER-II**  
**CHEMISTRY COURSE -II: ORGANIC & GENERAL CHEMISTRY**

Time: 3 hours

Maximum Marks: 75

**PART- A**

5 X 5 = 25 Marks

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

1. Write different conformations of n-butane. Explain their relative stability..
2. Explain 1,2- & 1,4- addition reactions of conjugated dienes.
3. Explain the orientation effect of halogens on mono substituted benzene.
4. Explain the mechanism of  $\text{E1}^{\text{CB}}$  elimination reaction.
5. Explain the structure of  $\text{ClF}_3$  by Valency Bond theory.
6. What are Hard & soft acids & bases? Explain with examples.
7. Draw the Wedge, Fischer, Newmann & saw-Horse representations for Tartaric acid.
8. Define Enantiomers and Diastereomers and give two examples for each.

**PART- B**

5 X 10 = 50 Marks

Answer **ALL** the questions. Each carries **TEN** marks

- 9 (a). (i) Write the preparation of alkanes by Wurtz and Corey-House reaction.  
(ii) Explain Halogenation of alkanes. Explain the reactivity and selectivity in free radical substitutions.  
(or)
  - (b). (i) Explain Baeyer Strain Theory  
(ii) Draw the conformations of Cyclohexane and explain their stability by drawing energy profile diagram.
- 10 (a). (i) Write any two methods of preparation of alkenes.  
(ii) Explain the mechanism of Markownikoff and Anti-Markownikoff addition of  $\text{HBr}$  to alkene.  
(or)

- (b). (i) Explain the acidity of 1-alkynes  
(ii) How will you prepare acetaldehyde and acetone from alkynes?  
(iii) Write alkylation reaction of terminal alkene.
- 11.(a). Define Huckel rule of aromatic compounds. What are benzenoid and non-benzenoid aromatic compounds? Give examples.  
(or)
- (b). Explain the mechanisms of Nitration and Friedel-Craft's alkylation of Benzene.
- 12.(a). (i) Define Hardy-Schulze rule & Gold number.  
(ii) Differentiate Physisorption & Chemisorption. Explain Langmuir adsorption isotherm.  
(or)
- (b). Construct the Molecular Orbital diagram for O<sub>2</sub> and NO and explain their bond order and magnetic property.
- 13.(a). Define racemic mixture. Explain any two techniques for resolution of racemic mixture.  
(or)
- (b). (i) Define Optical activity and Specific rotation.  
(ii) Draw the R- & S- isomers of Alanine, Glyceraldehyde.  
(iii) Write the E- & Z- isomers of 2-butene.

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### SEMESTER - III

#### Course III (ORGANIC CHEMISTRY & SPECTROSCOPY) 60hrs (4 h / w)

#### Course outcomes:

At the end of the course, the student will be able to;

1. Understand preparation, properties and reactions of haloalkanes, haloarenes and oxygen containing functional groups.
2. Use the synthetic chemistry learnt in this course to do functional group transformations.
3. To propose plausible mechanisms for any relevant reaction

# ORGANIC CHEMISTRY

34h

## UNIT – I

### 1. Chemistry of Halogenated Hydrocarbons: 6h

Alkyl halides: Methods of preparation and properties, nucleophilic substitution reactions –  $S_N1$ ,  $S_N2$  and  $S_Ni$  mechanisms with stereochemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination, Williamson's synthesis.

Aryl halides: Preparation (including preparation from diazonium salts) and properties, nucleophilic aromatic substitution;  $S_NAr$ , Benzyl mechanism.

Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

### 2. Alcohols & Phenols 6h

Alcohols: preparation, properties and relative reactivity of  $1^\circ$ ,  $2^\circ$ ,  $3^\circ$  alcohols, Bouvaelt Blanc Reduction; Oxidation of diols by periodic acid and lead tetra acetate, Pinacol-Pinacolone rearrangement;

Phenols: Preparation and properties; Acidity and factors affecting it, Ring substitution reactions, Reimer-Tiemann and Kolbe's-Schmidt Reactions, Fries and Claisen rearrangements with mechanism;

## UNIT-II

### Carbonyl Compounds 10h

Structure, reactivity, preparation and properties;

Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonium derivatives

Mechanisms of Aldol and Benzoin condensation, Claisen-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann haloform reaction and Baeyer-Villiger oxidation,  $\alpha$ -substitution reactions, oxidations and reductions (Clemmensen, Wolff-Kishner, with  $LiAlH_4$  &  $NaBH_4$ ).

Addition reactions of  $\alpha, \beta$ -unsaturated carbonyl compounds: Michael addition.

Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate.

## UNIT-III

### Carboxylic Acids and their Derivatives 12h

General methods of preparation, physical properties and reactions of monocarboxylic acids, effect of substituent on acidic strength. Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids.

Preparation and reactions of acid chlorides, anhydrides, esters and amides;

Comparative study of nucleophilic substitution at acyl group - Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Reformatsky reactions and Curtius rearrangement

Reactions involving H, OH and COOH groups - salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Hunsdiecker reaction, decarboxylation by Schmidt reaction, Arndt-Eistert synthesis, halogenation by Hell-Volhard-Zelinsky reaction.

## **SPECTROSCOPY**

**26 h**

### **UNIT-IV**

#### **Molecular Spectroscopy:**

**18h**

Interaction of electromagnetic radiation with molecules and various types of spectra;

**Rotation spectroscopy:** Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution.

**Vibrational spectroscopy:** Classical equation of vibration, computation of force constant, Harmonic and anharmonic oscillator, Morse potential curve, vibrational degrees of freedom for polyatomic molecules, modes of vibration. Selection rules for vibrational transitions, Fundamental frequencies, overtones and hot bands.

**Electronic spectroscopy:** Energy levels of molecular orbitals ( $\sigma$ ,  $\pi$ ,  $n$ ). Selection rules for electronic spectra. Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore. bathochromic and hypsochromic shifts. Beer-Lambert's law and its limitations.

**Nuclear Magnetic Resonance (NMR) spectroscopy:** Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

**Application of Spectroscopy to Simple Organic Molecules****Application of visible, ultraviolet and Infrared spectroscopy in organic molecules.**

Application of electronic spectroscopy and Woodward rules for calculating  $\lambda_{\max}$  of conjugated dienes and  $\alpha,\beta$  – unsaturated compounds.

Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on  $>C=O$  stretching absorptions).

**Co-curricular activities and Assessment Methods**

Continuous Evaluation: Monitoring the progress of student's learning

Class Tests, Worksheets and Quizzes

Presentations, Projects and Assignments and Group Discussions: Enhance critical thinking skills and personality

Semester-end Examination: critical indicator of student's learning and teaching methods adopted by teacher throughout the semester.

**List of Reference Books**

1. A Text Book of Organic Chemistry by Bahl and Arunbahl
2. A Text Book of Organic chemistry by I L Finar Vol I
3. Organic chemistry by Bruice
4. Organic chemistry by Clayden
5. Spectroscopy by William Kemp
6. Spectroscopy by Pavia
7. Organic Spectroscopy by J. R. Dyer
8. Elementary organic spectroscopy by Y.R. Sharma
9. Spectroscopy by P.S. Kalsi
10. Spectrometric Identification of Organic Compounds by Robert M Silverstein, Francis X Webster
11. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
12. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012)

13. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).

**LABORATORY COURSE -III**

**30hrs (2 h / w)**

**Practical Course-III Organic preparations and IR Spectral Analysis**

(At the end of Semester- III)

**Course outcomes:**

On the completion of the course, the student will be able to do the following:

1. how to use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. how to calculate limiting reagent, theoretical yield, and percent yield
3. how to engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately
4. how to dispose of chemicals in a safe and responsible manner
5. how to perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.
6. how to create and carry out work up and separation procedures
7. how to critically evaluate data collected to determine the identity, purity, and percent yield of products and to summarize findings in writing in a clear and concise manner

**Organic preparations:**

**40M**

i. Acetylation of one of the following compounds:

amines (aniline, o-, m-, p-toluidines and o-, m-, p-anisidine) and phenols ( $\beta$ -naphthol, vanillin, salicylic acid) by any one method:

- a. Using conventional method.
- b. Using green approach

ii. Benzoylation of one of the following amines

(aniline, o-, m-, p-toluidines and o-, m-, p-anisidine)

iii. Nitration of any one of the following:

- a. Acetanilide/nitrobenzene by conventional method
- b. Salicylic acid by green approach (using ceric ammonium nitrate).

**IR Spectral Analysis**

**10M**

IR Spectral Analysis of the following functional groups with examples

- a) Hydroxyl groups
- b) Carbonyl groups
- c) Amino groups
- d) Aromatic groups

**MODEL PAPER**  
SECOND YEAR B.Sc., DEGREE EXAMINATION  
**SEMESTER-III**  
**CHEMISTRY COURSE-III: ORGANIC CHEMISTRY &**  
**SPECTROSCOPY**

Time: 3 hours

Maximum Marks: 75

**PART- A**

5 X 5 = 25 Marks

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

1. Discuss two methods for preparation of aryl halides.
2. Explain the mechanism for Pinacol-Pinacolone rearrangement.
3. Discuss the mechanism for Bayer-villiger oxidation reaction.
4. Explain the effect of substituents on acidic strength of mono-carboxylic acids.
5. Write the mechanism for Claisen Condensation reaction.
6. Write the selection rules in rotational spectroscopy.
7. Explain Spin – Spin coupling and Coupling Constant.
8. Explain types of electronic transitions in UV spectroscopy.

**PART- B**

5 X 10 = 50 Marks

Answer **ALL** the questions. Each carries **TEN** marks

- 9 (a). Give the mechanism & stereochemistry of  $SN^1$  &  $SN^2$  reactions of alkyl halides with suitable example.

(or)

- (b). Explain the following reactions with mechanism.  
(i) Reimer-Tiemann reaction (ii) Fries rearrangement.

- 10 (a). Discuss the mechanism for following reactions.  
(i) Perkin reaction. (ii) Cannizzaro reaction



(or)

(b). Write the preparation and any three synthetic applications of diethyl malonate.

11.(a). Explain acid and base hydrolysis reaction of esters with mechanism.

(or)

(b). Explain the mechanisms of Curtius rearrangement & Arndt –Eistert reaction.

12.(a). (i) Write a note on vibrational degrees of freedom for polyatomic molecules.  
(ii) Explain different modes of vibrations & selection rules in IR spectroscopy.

(or)

(b).(i) Define Bathochromic shift. Explain the effect of conjugation in U.V. spectroscopy.

(ii) Discuss the principle of NMR spectroscopy.

13.(a). Write Woodward-Fieser rules for calculating  $\lambda_{\max}$  for conjugated dienes and  $\alpha,\beta$  – unsaturated carbonyl compounds, and apply them for one example each.

(or)

(b).(i) What is Fingerprint region. Explain its significance with an example.(ii)  
Write IR spectral data for any one alcohol, aldehyde and ketone

## SEMESTER - IV

**Course IV (INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY) 60hrs (4 h / w)**

### Course outcomes:

At the end of the course, the student will be able to;

1. To learn about the laws of absorption of light energy by molecules and the subsequent photochemical reactions.
2. To understand the concept of quantum efficiency and mechanisms of photochemical reactions.

### UNIT - I

**Organometallic Compounds**

**8h**

Definition and classification of organometallic compounds on the basis of bond type, Concept of hapticity of organic ligands. Metal carbonyls: 18 electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods of preparation of mono and binuclear carbonyls of 3d series. P-acceptor behaviour of carbon monoxide. Synergic effects (VB approach) - (MO diagram of CO can be referred to for synergic effect to IR frequencies).

## **UNIT – II**

### **Carbohydrates 8h**

Occurrence, classification and their biological importance, Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation; Disaccharides – Elementary treatment of maltose, lactose and sucrose. Polysaccharides – Elementary treatment of starch.

## **UNIT- III**

### **Amino acids and proteins 6h**

Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Gabriel Phthalimide synthesis c) strecker's synthesis.

Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating- peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

### **Heterocyclic Compounds 7h**

Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole - Aromatic character – Preparation from 1, 4, -dicarbonyl compounds, Paul-Knorr synthesis.

Properties: Acidic character of pyrrole - electrophilic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan.

Pyridine – Structure - Basicity - Aromaticity- Comparison with pyrrole- one method of preparation and properties - Reactivity towards Nucleophilic substitution reaction.

#### **UNIT- IV**

#### **Nitrogen Containing Functional Groups**

Preparation, properties and important reactions of nitro compounds, amines and diazonium salts.

##### **1. Nitro hydrocarbons**

**3h**

Nomenclature and classification-nitro hydrocarbons, structure -Tautomerism of nitroalkanes leading to aci and keto form, Preparation of Nitroalkanes, reactivity -halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Michael addition and reduction.

##### **2. Amines:**

**11h**

Introduction, classification, chirality in amines (pyramidal inversion), importance and general methods of preparation.

Properties : Physical properties, Basicity of amines: Effect of substituent, solvent and steric effects.

Distinction between Primary, secondary and tertiary amines using Hinsberg's method and nitrous acid. Discussion of the following reactions with emphasis on the mechanistic pathway: Gabriel Phthalimide synthesis, Hoffmann-

Bromamide reaction, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction and Cope elimination.

##### **Diazonium**

**Salts:** Preparation and

synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, cyano and nitro compounds. Coupling reactions of diazonium salts (preparation of azo dyes).

#### **UNIT- V**

##### **Photochemistry**

**5h**

Difference between thermal and photochemical processes, Laws of photochemistry- Grothuss-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield- Photochemical reaction mechanism- hydrogen- chlorine and hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Jablonski diagram, Photosensitized reactions- energy transfer processes (simple example).

## **Thermodynamics**

**12 h**

The first law of thermodynamics-statement, definition of internal energy and enthalpy, Heat capacities and their relationship, Joule-Thomson effect- coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes, State function. Temperature dependence of enthalpy of formation- Kirchoff's equation, Second law of thermodynamics Different Statements of the law, Carnot cycle and its efficiency, Carnot theorem, Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes. Third law of thermodynamics, Nernst heat theorem, Spontaneous and non-spontaneous processes, Helmholtz and Gibbs energies-Criteria for spontaneity.

## **Co-curricular activities and Assessment Methods**

Continuous Evaluation: Monitoring the progress of student's learning

Class Tests, Worksheets and Quizzes

Presentations, Projects and Assignments and Group Discussions: Enhance critical thinking skills and personality

Semester-end Examination: critical indicator of student's learning and teaching methods adopted by teacher throughout the semester.

## **List of Reference Books**

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G. Mareloudan, Purdue Univ
4. Text book of physical chemistry by S Glasstone
6. Concise Inorganic Chemistry by J.D. Lee
7. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
8. A Text Book of Organic Chemistry by Bahl and Arunbahl
9. A Text Book of Organic chemistry by I L Finar Vol I
10. A Text Book of Organic chemistry by I L Finar Vol II
11. Advanced physical chemistry by Gurudeep Raj

**LABORATORY COURSE -IV    30hrs(2 h / w)**

**Practical Course-IV Organic Qualitative analysis**

**50 M**

(At the end of Semester- IV)

**Course outcomes:**

At the end of the course, the student will be able to;

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Determine melting and boiling points of organic compounds
3. Understand the application of concepts of different organic reactions studied in theory part of organic chemistry

**Organic Qualitative analysis****50 M**

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives.

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic primary amines, amides and simple sugars

**MODEL PAPER**  
**SECOND YEAR B.Sc., DEGREE EXAMINATION**  
**SEMESTER-IV**  
**CHEMISTRY COURSE -IV: INORGANIC, ORGANIC & PHYSICAL**  
**CHEMISTRY**

Time: 3 hours

Maximum Marks: 75

**PART- A**

5 X 5 = 25 Marks

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

1. Describe the 18 electron rule of mono nuclear and polynuclear metal carbonyls with suitable examples.
2. What are epimers and anomers. Give examples.
3. Discuss about iso electric point and zwitter ion.
4. Discuss the Paul-Knorr synthesis of five membered heterocyclic compounds.
5. Explain Tautomerism shown by nitro alkanes
6. Discuss the basic nature of amines.
7. Write the differences between thermal and photochemical reactions.
8. Derive heat capacities and derive  $C_p - C_v = R$

**PART- B**

5 X 10 = 50 Marks

Answer **ALL** the questions. Each carries **TEN** marks

- 9 (a). What are organometallic compounds? Discuss their Classification on the basis of type of bonds with examples.  
(or)
- (b). Discuss the general methods of preparations of mono & bi-nuclear carbonyls of 3d series.
- 10 (a). Discuss the constitution, configuration and ring size of glucose. Draw the Haworth and Conformational structure of glucose.  
(or)
- (b). (i) Explain Ruff's degradation.  
(ii) Explain Kiliani- Fischer synthesis.
- 11.(a). What are amino acids? Write any three general methods of preparation of amino acids.  
(or)
- (b). Discuss the aromatic character of Furan, Thiophene and Pyrrole.
- 12.(a). Write the mechanism for the following.  
(i) Nef reaction                      (ii) Mannich reaction  
(or)
- (b).(i) Explain Hinsberg separation of amines.  
(ii) Discuss any three synthetic applications of diazonium salts.
- 13.(a). What is quantum yield? Explain the photochemical combination of Hydrogen-Chlorine and Hydrogen - Bromine.  
(or)
- (b). Define entropy. Describe entropy changes in the reversible and irreversible process.

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## SEMESTER - IV

Course V (INORGANIC & PHYSICAL CHEMISTRY) 60 hrs (4 h / w)

### Course outcomes:

At the end of the course, the student will be able to;

1. Understand concepts of boundary conditions and quantization, probability distribution, most probable values, uncertainty and expectation values
2. Application of quantization to spectroscopy.
3. Various types of spectra and their use in structure determination.

## INORGANIC CHEMISTRY

26 h

### UNIT –I

#### Coordination Chemistry

12 h

IUPAC nomenclature of coordination compounds, Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory (VBT): Inner and outer orbital complexes. Limitations of VBT, Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry, Factors affecting the magnitude of crystal field splitting energy, Spectrochemical series, Comparison of CFSE for Octahedral and Tetrahedral complexes, Tetragonal distortion of octahedral geometry, Jahn-Teller distortion, square planar coordination.

### UNIT –II

#### 1. Inorganic Reaction Mechanism:

4h

Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reactions -  $SN^1$  and  $SN^2$ , Substitution reactions in square planar complexes, Trans-effect, theories of trans effect and its applications

#### 2. Stability of metal complexes:

2h

Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

#### Bioinorganic Chemistry:

8h

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals, Sodium/K-pump, carbonic anhydrase and carboxypeptidase.

Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its application in bio-systems, Haemoglobin, Myoglobin. Storage and transfer of iron.

## **PHYSICAL CHEMISTRY**

**34 h**

### **UNIT-III**

#### **1 .Phase rule**

**6h** Concept of phase, components, degrees of freedom. Thermodynamic derivation of Gibbs phase rule. Phase diagram of one component system - water system, Study of Phase diagrams of Simple eutectic systems i) Pb-Ag system, desilverisation of lead ii) NaCl-Water system, Congruent and incongruent melting point- Definition and examples for systems having congruent and incongruent melting point , freezing mixtures.

### **UNIT-IV**

#### **Electrochemistry**

**14h**

Specific conductance, equivalent conductance and molar conductance- Definition and effect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications, Definition of transport number, determination of transport number by Hittorf's method. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only), Application of conductivity measurements- conductometric titrations.

Electrochemical Cells- Single electrode potential, Types of electrodes with examples: Metal-metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements - Potentiometric titrations.

Fuel cells- Basic concepts, examples and applications

### **UNIT-V**

#### **Chemical Kinetics:**

**14 h**

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). Enzyme catalysis- Specificity,



factors affecting enzyme catalysis, Inhibitors and Lock & key model. Michaels- Menten equation- derivation, significance of Michaelis-Menten constant.

#### **Co-curricular activities and Assessment Methods**

Continuous Evaluation: Monitoring the progress of student's learning

Class Tests, Worksheets and Quizzes

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Semester-end Examination: critical indicator of student's learning and teaching methods adopted by teacher throughout the semester.

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2. Concise Inorganic Chemistry by J.D.Lee
3. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
4. Advanced physical chemistry by Gurudeep Raj
5. Principles of physical chemistry by Prutton and Marron
6. Advanced physical chemistry by Bahl and Tuli
7. Inorganic Chemistry by J.E.Huheey
8. Basic Inorganic Chemistry by Cotton and Wilkinson
9. A textbook of qualitative inorganic analysis by A.I. Vogel
10. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry Ed., Oxford University Press  
10th Ed (2014).
11. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).
12. Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).
13. Barrow, G. M. Physical Chemistry

#### **SEMESTER - IV**

|                            |   |                         |
|----------------------------|---|-------------------------|
| <b>Course V</b>            | <b>LABORATORY COURSE</b>                            | <b>30 hrs (2 h / w)</b> |
| <b>Practical-Course -V</b> | <b>Conductometric and Potentiometric Titrimetry</b> | <b>50 M</b>             |

**Course outcomes:**

At the end of the course, the student will be able to;

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Apply concepts of electrochemistry in experiments
3. Be familiar with electroanalytical methods and techniques in analytical chemistry which study an analyte by measuring the potential (volts) and/or current (amperes) in an electrochemical cell containing the analyte

**Conductometric and Potentiometric Titrimetry****50 M**

1. **Conductometric titration**- Determination of concentration of HCl solution using standard NaOH solution.
2. **Conductometric titration**- Determination of concentration of CH<sub>3</sub>COOH Solution using standard NaOH solution.
3. **Conductometric titration**- Determination of concentration of CH<sub>3</sub>COOH and HCl in a mixture using standard NaOH solution.
4. **Potentiometric titration**- Determination of Fe (II) using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution.
5. Determination of rate constant for acid catalyzed ester hydrolysis.

**MODEL PAPER**

SECOND YEAR B.Sc., DEGREE EXAMINATION

**SEMESTER-IV****CHEMISTRY COURSE V: INORGANIC & PHYSICAL CHEMISTRY**

Time: 3 hours

Maximum Marks: 75

**PART- A5 X 5 = 25 Marks**

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

1. Write note on Jahn-Teller distortion.
2. Explain Labile & inert complexes.
3. Explain Job's method for determination of composition of complex.
4. Explain Thermodynamic derivation of Gibb's phase rule.
5. Explain any two conductometric titrations.
6. Write note on Fuel Cells with examples and applications.
7. What is enzyme catalysis? Write any three factors effecting enzyme catalysis.

8. Derive Michaels- Menten equation.

**PART- B**  
Marks

5 X 10 = 50

Answer **ALL** the questions. Each carries **TEN** marks

9 (a). Explain Valence Bond theory with Inner and Outer orbital complexes. Write limitations of VBT.

(or)

(b). Define CFSE. Explain the factors effecting the magnitude of crystal field splitting energy.

10 (a). Explain Trans effect. Explain the theories of trans effect and write any two applications of trans effect.

(or)

(b). (i) Write the biological functions of Haemoglobin and Myoglobin.  
(ii) Write note on use of chelating agents in medicines.

11.(a). Define Phase rule and terms involved in it. Explain phase diagram of Pb-Ag system.

(or)

(b). (i) Explain phase diagram for NaCl-water system.  
(ii) Explain briefly about Freezing mixtures.

12.(a). Define Transport number. Write experimental method for the determination of transport number by Hittorf method.

(or)

(b).(i) Define single electrode potential.  
(ii) Explain four types of electrodes with examples.

13.(a). Explain general methods for determination of order of a reaction.

(or)

(b).Explain Collision theory and Activated complex theory of bimolecular reactions.

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### **SUBJECT EXPERTS**

*Prof. C. Suresh Reddy*  
Professor, Department of Chemistry  
S.V. University  
Tirupati.

*Dr. M. Mahaboob Pacha*  
Lecturer in Chemistry  
Government Degree College  
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### **SYLLABUS VETTED BY**

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