ACHARYA NAGARJUNA UNIVERSITY

CENTRE FOR DISTANCE EDUCATION

NAGARJUNA NAGAR,

GUNTUR

ANDHRA PRADESH

PROGRAM PROJECT REPORT

59. BACHELOR OF SCIENCE (BOTANY, ZOOLOGY, CHEMISTRY)

Bachelor of Science - (Botany, Zoology, Chemistry)

PROGRAMME CODE: 59

MISSION :

To achieve a high level of excellence in the standards of education and to bring the same within the reach of rural poor.

To make meaningful innovations in the process of teaching and learning through active involvement of teachers and the taught.

To impart training in acquiring skills needed for employment/self employment at the undergraduate level.

OBJECTIVES :

This program allows students to combine studies in the unique and innovative Bachelor of Science program with a wide range of majors in the Science. The Bachelor of Science teaches students how to develop strategies to help find solutions to a range of Scientific issues at the local, national and international level.

RELEVANCE :

The Bachelor of Sciences Botany, Zoology, Chemistry programme offered through Open and Distance Learning mode is purely relevant and aligned with the goals and mission of CDE, ANU. This programme is designed to enhance the core potential of the learner in relating historic perspective with the contemporary socio linguistic scenario, which is globally ever dynamic. The student will learn contemporary applications in the relevant subjects and become eligible to handle every kind of institutional demands which is conforming to the University vission and mission.

NATURE OF PERSPECTIVE TARGET GROUP OF LEARNERS :

Aim of open and distance eduation is to enhance the academic competence in those who were deprived of higher education for various socio-economic reasons. This programme is designed for candidates to provide quality education at affordable cost to larger sections of population by facilitating the reach of education to the doorsteps of people living in remote and far-flung areas. House wives, Dropouts, rural dwellers unskilled men, low level income group people in the society etc. who are unable to continue their studies due to various reasons can continue their studies with this program.

SKILLS AND COMPETENCE OF THE PROGRAMME :

Inconsideration of the huge gap in education and industry and also in skill development now it is imperative on the part of every university to reach out every nooc and corner of the country where the institutions with significant infrastructure are not availble in order to elevate the status of the marginalised sections of the society especcially living in rural areas of the country. The only solution appears to be "open and distance education" and Acharya Nagarjuna University takes initiative by reaching out those unreached by ICT enabled blended mode of distance learning programmes. Bachelor of Sciences Botany, Zoology, Chemistry propgramme is an innovative programme. The learning outcomes of this programme are as follows:

- Professional development of teachers.
- Incorporating generic transferrable skills and competencies
- To develop critical learning, anylitical skills and research skills.

INSTRUCTIONAL DESIGN: Course structure and detailed syllabi

Acharya Nagarjuna University:: Centre for Distance Education

Nagarjuna Nagar, Guntur-522510

Bachelor of Science (Botany, Zoology, Chemistry)
Programme Code: 59
Programme Structure

Course code	Name of the Course	Internal Assessment	External Exams	Max Marks	Credits
SEMESTER – I					
	Part – I				
101ENG21	**English – A Course in Communication and Soft Skills**	**30**	**70**	**100**	**3**
102TEL21	**Second Language – Telugu – Pracheena Telugu Kavithvam**	**30**	**70**	**100**	**3**
102HIN21	**Second Language – Hindi - Prose**				
102SAN21	**Second Language – Sanskrit – Prose, Poetry & Grammar**				
103LSA21	**Life Skill Course : Human Values and Professional Ethics**	**-**	**50**	**50**	**2**
104SDI24	**Skill Development Courses : Electrical Appliances**	**-**	**50**	**50**	**2**
	Part – II				
101BOT24	**Botany-1: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)**	**30**	**70**	**100**	**3**
102BOT24	**Botany-1 Practical: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)**	**-**	**-**	**50**	**2**
101ZOO24	**Zoology-1:** Animal Diversity-I Biology of Non-Chordates	**30**	**70**	**100**	**3**
102ZOO24	**Zoology-1 Practical:** Animal Diversity-I Biology of Non-Chordates	**-**	**-**	**50**	**2**
101CHE24	**Chemistry-1: General and Inorganic Chemistry**	**30**	**70**	**100**	**3**
102CHE24	**Chemistry-1 Practical: General and Inorganic Chemistry**	**-**	**-**	**50**	**2**
SEMESTER - II					
	Part – I				
201ENG21	**English – A Course in Reading & Writing Skills**	**30**	**70**	**100**	**3**
202TEL21	**Second Language – Telugu – Aadhunika Telugu Sahityam**	**30**	**70**	**100**	**3**
202HIN21	**Second Language – Hindi - Prose**				
202SAN21	**Second Language – Sanskrit – Prose, Poetry & Grammar**				
203LSB21	**Life Skill Course : Indian Culture and Science**	**-**	**50**	**50**	**2**
204SDJ24	**Skill Development - Paper – 1 :Solar Energy**	**-**	**50**	**50**	**2**

205SDK24	**Skill Development - Paper – 2 : Food Adulteration**	**-**	**50**	**50**	**2**
Part – II					
201BOT24	**Botany-2: Vascular Plants (Pteridophytes, Gymnosperms and Taxonomy of Angiosperms)**	**30**	**70**	**100**	**3**
202BOT24	**Botany-2 Practical: Vascular Plants (Pteridophytes, Gymnosperms and Taxonomy of Angiosperms)**	**-**	**-**	**50**	**2**
201ZOO24	**Zoology-2:** Cell and Molecular Biology	**30**	**70**	**100**	**3**
202ZOO24	**Zoology-2 Practical:** Cell and Molecular Biology	**-**	**-**	**50**	**2**
201CHE24	**Chemistry-2: Fundamentals in Organic Chemistry**	**30**	**70**	**100**	**3**
202CHE24	**Chemistry-2 Practical: Fundamentals in Organic Chemistry**	**-**	**-**	**50**	**2**
201FPA21	**First Phase of Apprenticeship Between 1st year and 2nd year**	**-**	**-**	**100**	**4**
SEMESTER - III					
Part – I					
301ENG21	**English – A Course in Conversational Skills**	**30**	**70**	**100**	**3**
302TEL21	**Second Language – Telugu- Srujanathmaka Rachana**	**30**	**70**	**100**	**3**
302HIN21	**Second Language – Hindi - Poetry**				
302SAN21	**Second Language – Sanskrit -Drama, Upanishad, Alankara and History of Literature**				
303LSC21	**Life Skill Course : Personality Development and Leadership**	**-**	**50**	**50**	**2**
304LSD21	**Life Skill Course : Environmental Education**	**-**	**50**	**50**	**2**
305SDL24	**Skill Development : Environment Audit**	**-**	**50**	**50**	**2**
Part – II					
301BOT24	**Botany-3: Anatomy and Embryology of Angiosperms**	**30**	**70**	**100**	**3**
302BOT24	**Botany-3 Practical: Anatomy and Embryology of Angiosperms**	**-**	**-**	**50**	**2**
301ZOO24	**Zoology-3:** Animal Diversity-II Biology of Chordates	**30**	**70**	**100**	**3**
302ZOO24	**Zoology-3 Practical:** Animal Diversity-II Biology of Chordates	**-**	**-**	**50**	**2**
301CHE24	**Chemistry-3: Physical Chemistry- Ii (States of Matter, Phase Rule & Surface Chemistry)**	**30**	**70**	**100**	**3**
302CHE24	**Chemistry-3 Practical: Physical Chemistry- Ii (States of Matter, Phase Rule & Surface Chemistry)**	**-**	**-**	**50**	**2**
SEMESTER - IV					

401BOT24	**Botany-4: Plant Ecology, Biodiversity and Phytogeography**	**30**	**70**	**100**	**3**
402BOT24	**Botany-4 Practical: Plant Ecology, Biodiversity and Phytogeography**	**-**	**-**	**50**	**2**
403BOT24	**Botany-5: Cell Biology and Genetics**	**30**	**70**	**100**	**3**
404BOT24	**Botany-5 Practical: Cell Biology and Genetics**	**-**	**-**	**50**	**2**
401ZOO24	**Zoology-4:** Principles of Genetics	**30**	**70**	**100**	**3**
402ZOO24	**Zoology-4 Practical:** Principles of Genetics	**-**	**-**	**50**	**2**
403ZOO24	**Zoology-5:** Animal Physiology: Life Sustaining Systems	**30**	**70**	**100**	**3**
404ZOO24	**Zoology-5 Practical:** Animal Physiology: Life Sustaining Systems	**-**	**-**	**50**	**2**
401CHE24	**Chemistry-4: General and Physical Chemistry**	**30**	**70**	**100**	**3**
402CHE24	**Chemistry-4 Practical: General and Physical Chemistry**	**-**	**-**	**50**	**2**
403CHE24	**Chemistry-5: Analytical Methods in Chemistry- Quantitative Analysis**	**30**	**70**	**100**	**3**
404CHE24	**Chemistry-5 Practical: Analytical Methods in Chemistry- Quantitative Analysis**	**-**	**-**	**50**	**2**
401SPA21	**Second Phase of Apprenticeship Between 2nd year and 3rd year**	**-**	**-**	**100**	**4**
SEMESTER - V					
Skill Enhancement courses					
501BOT24	**Botany-6: Plant Physiology and Metabolism**	**30**	**70**	**100**	**3**
502BOT24	**Botany-6 Practical: Plant Physiology and Metabolism**	**-**	**-**	**50**	**2**
503BOT24	**Botany-7: Seed Technology**	**30**	**70**	**100**	**3**
504BOT24	**Botany-7 Practical: Seed Technology**	**-**	**-**	**50**	**2**
501ZOO24	**Zoology-6:** Sustainable Aquaculture Management	**30**	**70**	**100**	**3**
502ZOO24	**Zoology-6 Practical:** Sustainable Aquaculture Management	**-**	**-**	**50**	**2**
503ZOO24	**Zoology-7:** Live Stock Management (Dairy Production and Management)	**30**	**70**	**100**	**3**
504ZOO24	**Zoology-7 Practical:** Live Stock Management-II (Dairy Production and Management)	**-**	**-**	**50**	**2**
501CHE24	**Chemistry-6: Chromatography and Instrumental Methods Of Analysis**	**30**	**70**	**100**	**3**
502CHE24	**Chemistry-6 Practical: Chromatography and Instrumental Methods Of Analysis**	**-**	**-**	**50**	**2**
503CHE24	**Chemistry-7: Synthetic Organic Chemistry**	**30**	**70**	**100**	**3**

504CHE24	**Chemistry-7 Practical: Synthetic Organic Chemistry**	**-**	**-**	**50**	**2**
SEMESTER - VI					
601TPW21	**Third Phase of Apprenticeship- Entire 6th Semester (Project work)**	**-**	**-**	**100**	**6**
601TPV21	**Third Phase of Apprenticeship- Entire 6th Semester (Viva-Voce)**	**-**	**-**	**100**	**6**
	Total Credits	**-**	**-**	**-**	**159**

English Syllabus-Semester-I

English Praxis Course-I

101ENG21- 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

బి.ఏ., బి.కాం., బి.యస్‌సి., తదితర ప్రోగ్రాములు

అంశం: జనరల్ తెలుగు సెమిస్టర్-1

102TEL21 -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 ఆదికవి నన్నయ కాలంనాటి భాషాసంస్కృతులను, ఇతిహాసకాలం నాటి రాజనీతి విషయాలపట్ల పరిజ్ఞానాన్ని సంపాదించగలరు.

2. శివకవుల కాలంనాటి మతపరిస్థితులను, భాషావిశేషాలను గ్రహిస్తారు. తెలుగు నుడికారం, సామెతలు, లోకోక్తులు మొదలైన భాషాంశాల పట్ల పరిజ్ఞానాన్ని పొందగలరు.

3. తిక్కన భారతంనాటి 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.

<u>పాఠ్య ప్రణాళిక</u>

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: ఉత్వ, త్రిక, ద్రుతప్రకృతిక, సుగాగమ, ద్విరుక్తటకారాదేశ, యణాదేశ, వృద్ధి, శ్చుత్వ, జశ్త్వ, అనునాసిక సంధులు.

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

అలంకారాలుః

అర్థాలంకారాలు : ఉపమ, ఉత్ప్రేక్ష, రూపక, స్వభావోక్తి, అర్థాంతరన్యాస, అతిశయోక్తి.

శబ్దాలంకారాలు : అనుప్రాస (వృత్త్యనుప్రాస, ఛేకానుప్రాస లాటానుప్రాస, అంత్యానుప్రాస)

ఛందస్సు

వృత్తాలు: ఉత్పలమాల, చంపకమాల, శార్దూలము, మత్తేభము;

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

Note: I, III, V యూనిట్ల నుండి మాత్రమే ...

CHAIRMAN
Telugu B.O.S.
17.2.2021

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. చారిత్రిక, 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.

ACHARYA NAGARJUNA UNIVERSITY

Hindi Syllabus from the Academic Year 2020-21

B.A., B.Com., BBA & B.Sc. FIRST YEAR SEMESTER - I

SECOND LANGUAGE - HINDI

102HIN21 - PROSE - 1) GADYA SANDESH - V.L. Narasimha Sinha

2) KATHALOK - Dr. Ghanshyam

Unit-I : गद्य संदेश (Prose)

1. साहित्य की महत्ता – महावीर प्रसाद द्विवेदी
2. मित्रता – आचार्य रामचंद्र शुक्ल
3. वही की वही बात – रमेश बख्शी

Unit-II : कथा लोक (Short Stories)

1. मुक्तिधन – मुन्शी प्रेमचंद
2. उसने कहा था – चन्द्रधर शर्मा गुलेरी
3. पुरस्कार – जयशंकर प्रसाद

Unit-III : अनुवाद (Translation)

कार्यालयीन शब्दावली (Official Terminology)

प्रशासनिक शब्दावली (Administrative Terminology)

(अंग्रेजी से हिन्दी में - English to Hindi)

Unit-IV : व्याकरण (Grammar)

1. लिंग, वचन, काल, वाच्य, कारक
2. विलोम शब्द
3. शब्दों का वाक्यों में प्रयोग

Unit - V : पत्र लेखन (Letter Writing): वैयक्तिक पत्र (Personal letters)

1. हिन्दी सीखने की आवश्यकता को बताते हुए छोटी बहन के नाम पर पत्र।
2. विहार यात्रा का वर्णन करते अपने मित्र के नाम पत्र।
3. शुल्क भरने के लिए पैसे भेजने अपने पिता के नाम पत्र।

Dr. G. VIJAYA RATNA KUMAR

CBCS SEMESTER WISE SYLLABUS

Part I (B) Subject : **SANSKRIT**

SEMESTER – I

102SAN21 **- PAPER – I : POETRY, PROSE & GRAMMAR** . (**w.e.f. 2020-21**)

UNIT – I OLD POETRY: 1. "**Arya Padukabhishekaha**",

Valmiki Ramayanam- Ayodhya Kanda, Sarga-100 Geetha Press, Gorakhpur.

2. " **YakshaPrasnaha**", Mahabharatam of Vedavyasa, Vanaparva, Adhyaya -313, Geeta Press, Gorakhpoor.

UNIT – II MODERN POETRY: 1." **Mevada Rajyastapanam"** 4th Canto, Srimat Pratapa Ranayanam, Mahakavyam, Pt.Ogeti Parikshit sarma, Published by, Pt.Ogeti Parikshitsarma, 10/11, Sakal nagar, Pune, 1989.

2.**"VivekanandaSuktayaha**", Vivekanandasuktisudha by Dr.SamudralaLakshmanaiah, Published by Author, 18-1-84, Yasoda Nagar, Tirupati. Selected Slokas 25.

UNIT – III PROSE: 1. "**Atyutkataihi papapunyairihaiva phalamasnute**",

Hitopadesaha-Mitralabha 2 & 3 stories, Pages 61-84.

2. '' **Sudraka -Veeravarakatha''**, Hitopadesaha-Vigraham, 8th story, Pages 63-70,Chowkhamba krishadas academy,Varanasi, 2006.

UNIT - IV GRAMMAR: 1.**DECLENSIONS** Nouns ending in vowels Deva, Kavi, Bhanu, Dhatru, Pitru, Go, Ramaa, Mati.

2.CONJUGATIONS

1st Conjugation - Bhoo, Gam, Shtha, Drusir, Labh, Mud.

2nd Conjugation - As. 10th Conjugation – Bhaash.

UNIT – V GRAMMAR: 1. **SANDHI** - **Swara Sandhi** : Savarnadeergha, ayavayava, Guna,Vruddhi, yaanadesa.

-**Halsandh**i:Schutva, Stutva, Anunasika.2.**SAMASA**

Dwandwa, Tatpurusha, Karmadharaya,, Dwigu.

103LSA21 - HUMAN VALUES AND PROFESSIONAL ETHICS (HVPE)

(SYLLABUS)

Learning Outcome:

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

- ✓ Understand the significance of value inputs in a classroom and start applying them in their life and profession
- ✓ Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
- ✓ Understand the value of harmonious relationship based on trust and respect in their life and profession
- ✓ Understand the role of a human being in ensuring harmony in society and nature.
- ✓ Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

UNIT: 1 Introduction – Definition, Importance, Process & Classifications of Value Education

- ❖ Understanding the need, basic guidelines, content and process for Value Education
- ❖ Understanding the thought provoking issues; need for Values in our daily life
- ❖ Choices making – Choosing, Cherishing & Acting
- ❖ Classification of Value Education: understanding Personal Values, Social Values, Moral Values & Spiritual Values.

UNIT: 2 Harmony in the Family – Understanding Values in Human Relationships

- ✓ Understanding harmony in the Family- the basic unit of human interaction
- ✓ Understanding the set of proposals to verify the Harmony in the Family;
- ✓ Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
- ✓ Present Scenario: Differentiation (Disrespect) in relationships on the basis of body, physical facilities, or beliefs.
- ✓ Understanding the Problems faced due to differentiation in Relationships
- ✓ Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals
- ✓ Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family.

UNIT: 3Professional Ethics in Education

- ✓ Understanding about Professional Integrity, Respect & Equality, Privacy, Building Trusting Relationships.
- ✓ Understanding the concepts; Positive co-operation, Respecting the competence of other professions.
- ✓ Understanding about Taking initiative and Promoting the culture of openness.
- ✓ Depicting Loyalty towards Goals and objectives.

Text Books:

R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Bhatia, R. & Bhatia, A (2015) Role of Ethical Values in Indian Higher Education.

References:

- Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, U
- E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
- Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
- Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
- A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.
- P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
- A N Tripathy, 2003, Human Values, New Age International Publishers.

Mode of Evaluation:

Assignment/ Seminar/Continuous Assessment Test/Semester End Exam.

Co curricular Activities:

1. Visit to an Old Age Home and spending with the inmates for a day.
2. Conduct of Group Discussions on the topics related to the syllabus.
3. Participation in community service activities.
4. Working with a NGO like Rotary Club or Lions International, etc.

I YEAR – 1 SEMESTER-SYLLABUS

104SDI24: SKILL DEVELOPMENT COURSES: ELECTRICAL APPLIANCES

Learning Outcomes:

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

- *Acquire necessary skills/hand on experience/ working knowledge on multimeters, galvanometers, ammeters, voltmeters, ac/dc generators, motors, transformers, single phase and three phase connections, basics of electrical wiring with electrical protection devices.*
- *Understand the working principles of different household domestic appliances.*
- *Check the electrical connections at house-hold but will also learn the skill to repair the electrical appliances for the general troubleshoots and wiring faults.*

UNIT-I

Voltage, Current, Resistance, Capacitance, Inductance, Electrical conductors and Insulators, Ohm's law, Series and parallel combinations of resistors, Galvanometer, Ammeter, Voltmeter, Multimeter, Transformers, Electrical energy, Power, Kilowatt hour (kWh), consumption of electrical power

UNIT-II

Direct current and alternating current,RMS and peak values, Power factor, Single phase and three phase connections , Basics of House wiring , Star and delta connection , Electric shock, First aid for electric shock, Overloading , Earthing and its necessity, Short circuiting , Fuses , MCB , ELCB, Insulation, Inverter, UPS

UNIT-III

Principles of working, parts and servicing of Electric fan, Electric Iron box, Water heater; Induction heater, Microwave oven; Refrigerator, Concept of illumination, Electric bulbs, CFL, LED lights, Energy efficiency in electrical appliances, IS codes & IE codes.

Reference Books:

1. A Text book on Electrical Technology, B.L.Theraja, S.Chand& Co.,
2. A Text book on Electrical Technology, A.K.Theraja.
3. Performance and design of AC machines, M.G.Say, ELBSEdn.,
4. Handbook of Repair & Maintenance of domestic electronics appliances; BPB Publications
5. Consumer Electronics, S.P.Bali, Pearson
6. Domestic Appliances Servicing, K.P.Anwer, Scholar Institute Publications

English Syllabus-Semester-II

English Praxis Course-II

201ENG21 -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

Prose	: 1. How to Avoid Foolish Opinions	Bertrand Russell
Skills	: 2. Vocabulary: Conversion of Words	
	: 3. One Word Substitutes	
	: 4. Collocations	

II. UNIT

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

III. UNIT

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

IV. UNIT

Poetry	: 1. Coromandel Fishers	Sarojini Naidu
Skills	: 2. Expansion of Ideas	
	: 3. Notices, Agendas and Minutes	

V.UNIT

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

బి.ఏ., బి.కాం., బి.యస్‌సి., తదితర ప్రోగ్రాములు

అంశం: జనరల్ తెలుగు సెమిస్టర్-2

202TEL21 - **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.

CHAIRMAN
TELUGU B.O.S.

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

Chairman
Tel. B.O.S

ఆధార గ్రంథాలు/వ్యాసాలు:

1. ఆధునిక కవిత్వం-పరిచయం : చూ. 'దృక్పథాలు' పుట 1-22, ఆచార్య ఎస్వీ. 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.మృణాళిని.

✦ **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.

ACHARYA NAGARJUNA UNIVERSITY

Hindi Syllabus from the Academic Year 2020-21

B.A., B.Com., BBA & B.Sc. FIRST YEAR SEMESTER - II

SECOND LANGUAGE - HINDI

202HIN21 - PROSE - 1) GADYA SANDESH - V.L. Narasimha Sinha

2) KATHALOK - Dr. Ghanshyam

Unit-I : गद्य संदेश (Prose) :

1. भारत एक है – रामधारी सिंह 'दिनकर'
2. बेईमानी की परत – हरिशंकर परसाई
3. एच.आई.वी. / एड्स – डॉ. प्रकाश भातल बंडे

Unit-II : कथा लोक (Short Stories) :

1. भूख हड़ताल – श्री बालशौरी रेड्डी
2. परमात्मा का कुत्ता – मोहन राकेश
3. वापसी – उषा प्रियंवदा

Unit-III : अनुवाद (Translation)

कार्यालयीन हिन्दी (Functional Hindi)

प्रशासनिक शब्दावली (Administrative Terminology)

(हिन्दी से अंग्रेजी में) (Hindi to English)

Unit-IV : व्याकरण (Grammar)

1. वाक्यों को शुद्ध कीजिए
2. संधि विच्छेद
3. शब्दों का वाक्यों में प्रयोग

Unit - V : पत्र लेखन (Letter Writing) : शिकायती, आवेदन पत्र

1. नौकरी के लिए आवेदन पत्र।
2. नगर पालिका के अधिकारी के नाम शिकायती पत्र।
3. पुस्तक विक्रेता के नाम पर पत्र।

Dr. G. VIJAYA RATNA KU...
CHAIRMAN
Board of Studies, Hindi & Urdu (U.G)
Acharya Nagarjuna University
Nagarjuna Nagar-522 510.

CBCS SEMESTER WISE SYLLABUS

Part I (B) Subject : **SANSKRIT**

SEMESTER – II

202SAN21 - **PAPER – II : POETRY, PROSE & GRAMMAR.**

UNIT – I OLD POETRY:

1."Indumateeswayamvaram'', Raghuvamsam of kalidasa, 6th canto, Chowkhamba krishadas academy, Varanasi-2012.

2. "Deekshaapradanam'', Buddacharitam of Aswagosha, 16th canto. Selected verses.

UNIT – II MODERN POETRY:

1. "Gangavataranam'', Bhojas Champu Ramayanam, Balakanda.
2. "Mohapanodaha'', 4th cant. Dharma Souhrudam by P.Pattabhi Ramarao, , Published by Author, Ramanth Nagar.
3. "VandeKasmeerabharatam'', by Doolypala Ramakrishna from Samskrita pratibha, sahitya academy , New Delhi -2018.

UNIT – III PROSE:

1. "Avantisundarikatha'', 5th Chapter. Dasakumara Charitam, Purva peetika.
2. ''Charudattacharitam'', Bhasakathasaraha by Y.Mahalingasastry.

UNIT - IV GRAMMAR:

1. DECLENSIONS :Nouns ending in vowels
   Nadee, Janu, vadhoo, Matru, Phala, Vaari & Madhu.
2. CONJUGATIONS
   III Conjugation- Yudh, IV Conjugation- Ish, VIII Conjugation- Likh, Kru, IX Conjugation-Kreen X, Conjugation-Kath, Ram, Vand.

UNIT – V GRAMMAR:

1. SANDHI - Halsandhi : Latva, Jastva
   -Visarga sandhi: Utva, Visargalopa, Rephadesa, Ooshma.

2.SAMASA
Avyayeebhava, Bahruvrihi.

A.P. State Council of Higher Education
B.A., B. Com & B. Sc Programmes

Revised CBCS w.e.f 2020-21
LIFE SKILL COURSE

203LSB21 - **Indian Culture & Science**
Total 30 hrs (02 h/wk, 02 Cr & Max 50 Marks)

Learning Outcomes:

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

1. Understand the evolution of India's culture
2. Analyze the process of modernization of Indian society and culture from past to future
3. Comprehend objective education and evaluate scientific development of India in various spheres
4. Inculcate nationalist and moral fervor and scientific temper

Syllabus:

Unit – I: Unity in Diversity in India: (09 hrs)

Coexistence of various religions since ancient times - Hinduism, Buddhism, Jainism and Atheism, and later Sikhism, Islam and Christianity

The Bhakti (Vishnavite and Saivaite) and Sufi Movements

The concepts of seela, karuna, kshama, maitri, vinaya, santhi and ahimsa Achievements in Literature, Music, Dance, Sculpture and Painting - Craftsmanship in cloth, wood, clay, metal and ornaments

Cultural diversity, Monogamy, Family system, Important seasonal festivals

Unit – II: Social Reforms and Modern Society: (09 hrs)

Reforms by Basaveswara - Raja Rama Mohan Roy – Dayananda Saraswathi –Swamy Vivekananda –Mahatma Gandhi - B. R. Ambedkar - Reforms in Andhra by Vemana,Veerabrahmam, Gurajada, Veeresalingam and GurramJashua (only reforms in brief, biographies not needed)

Modern Society: Family unity, Community service, Social Harmony, Civic Sense, Gender Sensitivity, Equality, National Fervor

Unit – III: Science and Technology: ((09 hrs)

Objectivity and Scientific Temper – Education on Scientific lines (Bloom's Taxonomy) - Online Education

Developments in Industry, Agriculture, Medicine, Space, Alternate Energy, Communications, Media through ages

Co-curricular Activities Suggested: (03 hrs)

1. Assignments, Group discussions, Quiz etc
2. Invited Lecture by a local expert
3. Visit to a scientific institutions, local heritage sites, museums, industries etc

Reference Books:

1. History of India and Culture (Upto 1526 A.D), Telugu Academy
2. History of India and Culture (1526 A.D to 1964), Telugu Academy
3. Basham, A.L (ed), A Cultural History of India
4. Hana S. Noor Al-Deen&J.A.Hendricks, Social Media : Usage and Impact
5. Bipan Chandra, Aditya Mukherjee, Mridula Mukherjee, India After Independence
6. S.K.Thakur, ISRO: History and Acheivements
7. V. Ramakrishna, Social Reform Movement Andhra, Vikas Publications

I YEAR – 2 SEMESTER-SYLLABUS

204SDJ24: SKILL DEVELOPMENT – PAPER-1: SOLAR ENERGY

Learning Outcomes:

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

- *Acquire knowledge on solar radiation principles with respect to solar energy estimation.*
- *Get familiarized with various collecting techniques of solar energy and its storage*
- *Learn the solar photovoltaic technology principles and different types of solar cells forenergy conversion and different photovoltaic applications.*
- *Understand the working principles of several solar appliances like Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses*

UNIT-I – Solar Radiation:

Sun as a source of energy, Solar radiation, Solar radiation at the Earth's surface, Measurement of Solar radiation-Pyroheliometer, Pyranometer, Sunshine recorder, Prediction of available solar radiation, Solar energy-Importance, Storage of solar energy, Solar pond

UNIT-II – Solar Thermal Systems:

Principle of conversion of solar radiation into heat, Collectors used for solar thermal conversion: Flat plate collectors and Concentrating collectors, Solar Thermal Power Plant, Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses.

UNIT-III – Solar Photovoltaic Systems:

Conversion of Solar energy into Electricity - Photovoltaic Effect, Solar photovoltaic cell and its working principle, Different types of Solar cells, Series and parallel connections, Photovoltaic applications: Battery chargers, domestic lighting, street lighting and water pumping

Reference Books:

1. Solar Energy Utilization, G. D. Rai, Khanna Publishers
1. Solar Energy- Fundamentals, design, modeling & applications, G.N. Tiwari, Narosa Pub.,2005.
2. Solar Energy-Principles of thermal energy collection & storage, S.P. Sukhatme, Tata Mc-Graw Hill Publishers, 1999.
3. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHILearning Pvt. Ltd.,
4. Science and Technology of Photovoltaics, P. Jayarama Reddy, BS Publications, 2004.

I YEAR – 2 SEMESTER-SYLLABUS

205SDK24: SKILL DEVELOPMENT-PAPER-2: FOOD ADULTERATION

Learning Outcomes:

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

1. *Get basic knowledge on* various *foods and about adulteration.*
2. *Understand the adulteration of common foods and their adverse impact on health*
3. *Comprehend certain skills of detecting adulteration of common foods.*
4. *Be able to extend their knowledge to other kinds of adulteration, detection and remedies.*
5. *Know the basic laws and procedures regarding food adulteration and consumer protection.*

UNIT-I – : Common Foods and Adulteration:

Common Foods subjected to Adulteration - Adulteration – Definition – Types; Poisonous substances, Foreign matter, Cheap substitutes, Spoiled parts. Adulteration through Food Additives – Intentional and incidental. General Impact on Human Health.

UNIT-II –: Adulteration of Common Foods and Methods of Detection:

Means of Adulteration Methods of Detection Adulterants in the following Foods; Milk, Oil, Grain, Sugar, Spices and condiments, Processed food, Fruits and vegetables. Additives and Sweetening agents (at least three methods of detection for each food item).

UNIT-III –: Present Laws and Procedures on Adulteration:

Highlights of Food Safety and Standards Act 2006 (FSSA) –Food Safety and Standards Authority of India–Rules and Procedures of Local Authorities.
Role of voluntary agencies such as, Agmark, I.S.I. Quality control laboratories of companies, Private testing laboratories, Quality control laboratories of consumer co-operatives.
Consumer education, Consumer's problems rights and responsibilities, COPRA 2019 - Offenses and Penalties – Procedures to Complain – Compensation to Victims.

Reference e Books and Websites:

1. A firstcourseinFoodAnalysis–A.Y.Sathe,NewAgeInternational(P)Ltd.,1999
2. Food Safety, case studies–Ramesh.V.Bhat,NIN,1992
3. https://old.fssai.gov.in/Portals/0/Pdf/Draft_Manuals/Beverages_and_confectionary.pdf
4. https://cbseportal.com/project/Download-CBSE-XII-Chemistry-Project-Food-Adulteration#gsc.tab=0 (Downloadable e material on food adulteration)
5. https://www.fssai.gov.in/
6. https://indianlegalsolution.com/laws-on-food-adulteration/
7. https://fssai.gov.in/dart/
8. https://byjus.com/biology/food-adulteration/
9. Wikiepedia
10. Vikaspedia

English Syllabus-Semester-III

English Praxis Course-III

301ENG21 -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	: 1. Tryst with Destiny	Jawaharlal Nehru
Skills	: 2. Greetings	
	: 3. Introductions	

II. UNIT

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

III. UNIT

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

IV. UNIT

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

V. UNIT

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

బి.ఏ., బి.కాం., బి.యస్‌సి., తదితర ప్రోగ్రాములు

అంశం: జనరల్ తెలుగు **సెమిస్టర్-3**

302TEL21 - 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 నైపుణ్యాలుగా మార్చుకోగలరు.
2. విద్యార్థులు భాషాతత్వాన్ని, భాష యొక్క ఆవశ్యకతను, భాష యొక్క ప్రాధాన్యాన్ని గుర్తిస్తారు. మనిషి వ్యక్తిగత జీవనానికి, సామాజికవ్యవస్థ పటిష్టతకు భాష ప్రధానమని తెలుసుకుంటారు. తెలుగుభాషలోని కీలకాంశాలైన 'వర్ణం-పదం-వాక్యా'ల ప్రాధాన్యాన్ని గుర్తిస్తూ, వాగ్రూప- లిఖితరూప వ్యక్తీకరణ ద్వారా భాషానైపుణ్యాలను మెరుగుపరచుకోగలరు.
3. భాషానైపుణ్యాలను అలవరచుకోవడంతోపాటు వినియోగించడం నేర్చుకుంటారు. రచనా, భాషణానైపుణ్యాలను సృజనాత్మక రూపంలో వ్యక్తీకరించగలరు.
4. ప్రాచీన పద్యరచనతో పాటు ఆధునిక కవిత, కథ, వ్యాసం, మొదలైన సాహిత్యప్రక్రియల నిర్మాణాలకు సంబంధించిన సిద్ధాంతవిషయాలను నేర్వడంతో పాటు వారిలో రచనా నైపుణ్యాలను పెంపొందించుకోగలరు.
5. సృజన రంగం, ప్రసారమాధ్యమ రంగాల్లో ఉపాధి అవకాశాలను అందిపుచ్చుకోగలరు.
6. అనువాద రంగంలో నైపుణ్యం సంపాదించగలరు.

CHAIRMAN
B.O.S. Telugu.

పాఠ్య ప్రణాళిక

యూనిట్-I: వ్యక్తీకరణ నైపుణ్యాలు

1. భాష-ప్రాథమికాంశాలు: భాష-నిర్వచనం, లక్షణాలు, అవశ్యకత, 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 పేరానుఅనువదించడం

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 భద్రిరాజు 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 చదివింపచేయడం మొదలైనవి.
4. వివిధ కార్యక్రమాల్లో విద్యార్థులచేత సదస్సు నిర్వహణ, వ్యాఖ్యానం (యాంకరింగ్) చేయించడం.
5. సమకాలీన భాషాసమస్యలపై / ఉద్యమాలపై/సాంఘిక సమస్యలపై 'బృందచర్చ' (Group Discussion) నిర్వహింపచేయడం.
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.

ACHARYA NAGARJUNA UNIVERSITY

Hindi Syllabus from the Academic Year 2021-22

B.A., B.Com., BBA & B.Sc. SECOND YEAR SEMESTER - III

SECOND LANGUAGE - HINDI

302HIN21 - POETRY - KAVYADEEP - B. Radha Krishna Murthy

Unit-I : काव्यदीप (Ancient & Modern Poetry) :

1. साखी – दोहे (1 से 10 तक) – कबीरदास
2. दोहे (1 से 10 तक) – रहीम
3. मातृभूमि – मैथिलीशरण गुप्त
4. तोड़ती पत्थर – सूर्यकांत त्रिपाठी 'निराला'
5. ओ दीपक! बुझने के पहले – प्रो. पी. आदेश्वर राव

Unit-II : हिन्दी साहित्य का इतिहास (History of Hindi Literature) :

भक्तिकाल – निर्गुण भक्ति धारा

1. ज्ञानाश्रयी शाखा – कबीर
2. प्रेमाश्रयी शाखा – जायसी

Unit-III: साधारण निबन्ध (General Essays) :

1. समाचार पत्र
2. बेकारी की समस्या
3. कंप्यूटर
4. पर्यावरण और प्रदूषण
5. साहित्य और समाज

Unit-IV : अनुवाद (Translation) :

अनुवाद (अंग्रेजी से हिन्दी में) (Five Sentences)

Unit - V : प्रयोजनमूलक हिन्दी (Functional Hindi) :

1. परिपत्र (Circular)
2. ज्ञापन (Memorandum)

Dr. G. VIJAYA RATNA KUMI
CHAIRMAN
Board of Studies, Hindi & Urdu (UG)
Acharya Nagarjuna University
Nagarjuna Nagar-522 510.

CBCS SEMESTER WISE SYLLABUS

Part I (B) Subject : **SANSKRIT**

SEMESTER – III

PAPER – III : Drama, Upanishad, Alankara and History of Literature.- 302SAN21

UNIT – I : **OLD DRAMA**

1.''**Madhyamavyayogaha**''. Bhasa Natakachakram. krishadas academy, Varanasi 1998.

UNIT – II : **MODERN DRAMA**

''Sankalpabalam'' by Prof.G.S.R.Krishna Murthy, Published by Semushi, R.S.Vidyapeetam, Tirupati-2019.

UNIT – III : **UPANISHAD**

1.''**Sishyanusasanam**'' – Sikshavalli of Taittireeyopanishad.

2. **''Sraddatrayavibhagayoga''**,

17th Chapter, Bhagavadgita, Geetapress, Gorakhpoor.

UNIT - IV : **ALANKARAS**:

1. Upama 2. Ananvaya 3. Utpreksha 4. Deepakam

5. Aprastutaprasamsa 6.Drushtanta 7. Prateepa.

UNIT – V : **HISTORY OF SANSKRIT LITERATURE**

1.Panini 2.Kautilya 3.Bharatamuni 4. Bharavi 5.Magha

6.Bhavabhuti 7. Sankaracharya, 8.Jagannatha. 9. Dandi.

A.P. STATE COUNCIL OF HIGHER EDUCATION
B.A., B. Com & B. Sc Programmes

Revised CBCS w.e.f 2020-21
LIFE SKILL COURSE

303LSC21 - **Personality Enhancement & Leadership**
Total 30 hrs (02 h/wk, 02 Cr & Max 50 Marks)

Learning Outcomes:

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

1. Develop comprehensive understanding of personality
2. Know how to assess and enhance one's own personality
3. Comprehend leadership qualities and their importance
4. Understand how to develop leadership qualities

Syllabus:

Unit – I:(7 hrs)

Meaning of Personality – Explanations of Human Personality – Psychodynamic Explanations – Social Cognitive Explanation – Big Five traits of Personality

Unit – II: (8 hrs)

Assessment of Personality - Projective& Self Report Techniques - Building Self-Confidence – Enhancing Personality Skills

Unit – III:(10 hrs)

Leadership Characteristics – Types of Leaders – Importance of Leadership – Leadership Skills – Building and Leading Efficient Teams – Leadership Qualities of Abraham Lincoln, mahatma Gandhi, Prakasam Pantulu, Dr. B. R. Ambedkar & J.R.D.Tata

Co-curricular Activities Suggested: (05 hrs)

1. Assignments, Group discussions, Quiz etc
2. Invited Lecture by a local expert
3. Case Studies (ex., on students behavior, local leaders etc.)

Reference Books:

- Girish Batra, Experiments in Leadership, Chennai: Notion Press, 2018
- Mitesh Khatri, Awaken the Leader in You, Mumbai: Jaico Publishing House, 2013
- Carnegie Dale, Become an Effective Leader, New Delhi: Amaryllis, 2012
- Hall, C.S., Lindzey. G. & Campbell, J.B Theories of Personality. John Wiley & Sons, 1998

AP State Council of Higher Education

Revised Syllabus under CBCS Pattern
(w.e.f. 2020-'21 Academic Year)

A Mandatory Course for BA/BCom/BSc etc.

304LSD21 -ENVIRONMENTAL EDUCATION

(Total hours of Teaching – 30 Hrs. @ 02 Hrs. per Week)

Course objective: A Generic Course intended to create awareness that the life of human beings is an integral part of environment and to inculcate the skills required to protect environment from all sides.

Learning outcomes: On completion of this course the students will be able to …..

1. Understand the nature, components of an ecosystem and that humans are an integral part of nature.
2. Realize the importance of environment, the goods and services of a healthy biodiversity, dependence of humans on environment.
3. Evaluate the ways and ill effects of destruction of environment, population explosion on ecosystems and global problems consequent to anthropogenic activities.
4. Discuss the laws/ acts made by government to prevent pollution, to protect biodiversity and environment as a whole.
5. Acquaint with international agreements and national movements, and realize citizen's role in protecting environment and nature.

Unit 1: Environment andNatural Resources **06 Hrs.**

1. Multidisciplinary nature of environmental education; scope and importance.
2. Man as an integral product and part of the Nature.
3. A brief account of land, forest and waterresources in India and their importance.

4. Biodiversity : Definition; importance of Biodiversity - ecological,consumptive, productive, social, ethical and moral, aesthetic, and option value.
5. Levels of Biodiversity: genetic, species and ecosystem diversity.

Unit-2: Environmental degradation and impacts 10Hrs

1. Human population growth and its impacts on environment; land use change, land degradation, soil erosion and desertification.
2. Use and over-exploitation of surface and ground water, construction of dams, floods, conflicts over water (within India).
3. Deforestation: Causes and effects due to expansion of agriculture, firewood, mining, forest fires and building of new habitats.
4. Non-renewable energy resources, their utilization and influences.
5. A brief account of air, water, soil and noise pollutions; Biological, industrial and solid wastes in urban areas. Human health and economic risks.
6. Green house effect - global warming; ocean acidification, ozone layer depletion, acid rains and impacts on human communities and agriculture.
7. Threats to biodiversity: Natural calamities, habitat destruction and fragmentation, over exploitation, hunting and poaching, introduction of exotic species, pollution, predator and pest control.

Unit 3: Conservation of Environment 10 Hrs

1. Concept of sustainability and sustainable development with judicious use of land, water and forest resources; afforestation.
2. Control measures for various types of pollution; use of renewable and alternate sources of energy.
3. Solid waste management: Control measures of urban and industrial waste.
4. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
5. Environment Laws: Environment Protection Act; Act; Wildlife Protection Act; Forest Conservation Act.
6. International agreements: Montreal and Kyoto protocols; Environmental movements: Bishnois of Rajasthan, Chipko, Silent valley.

Suggested activities to learner: (4 hours)

1. Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc
2. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural site.
3. Study of common plants, insects, birds and basic principles of identification.
4. Study of simple ecosystems-forest, tank, pond, lake,mangroves etc.
5. Case study of a Forest ecosystem or a pond ecosystem.

Suggested text book :

- ErachBarucha (2004) *Text book of Environmental Studies for Undergraduate courses* (Prepared for University Grants Commmission) Universities Press.
- PurnimaSmarath (2018) *Environmental studies* Kalyani Publishers, Ludhiana

Reference books :

- Odum, E.P., Odum, H.T. & Andrews, J. (1971) *Fundamentals of Ecology*. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. &Brusseau, M.L. (2011). *Environmental and Pollution Science*. Academic Press.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. (2012) *Environment. 8th edition*. John Wiley & Sons.
- Singh, J.S., Singh, S.P. and Gupta, S.R. (2014) *Ecology, Environmental Science and Conservation.* S. Chand Publishing, New Delhi.
- Sengupta, R. (2003) Ecology and economics: An approach to sustainable development. OUP.
- Wilson, E. O. (2006) *The Creation: An appeal to save life on earth.* New York: Norton.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll (2006) *Principles of Conservation Biology.* Sunderland: Sinauer Associates,

I YEAR – 3 SEMESTER-SYLLABUS

305SDL24: SKILL DEVELOPMENT: ENVIRONMENT AUDIT

Learning Outcomes:
By successful completion of the course, students will be able to;

- *Understand the basic concepts Environmental health*
- *Learn and identify the industrial pollution*
- *Explain the highlights in the regulatory aspects of Environmental law and policy*
- *Understand the various phases of Environmental Audit*

UNIT – I
Industrial Pollution and its effects
Climate – Weather and Air Pollution – Classification of water and water bodies – Water Quality Parameters – Water Pollution – Sources – Classification, nature and Toxicology of water pollutants. - Soil parameters –Soil pollution and impacts – Soil conservation

UNIT - II
Environmental Law & Policy:
Highlights of the Acts, Institutional arrangements for: (1) The Water (Prevention & Control of Pollution) Act, 1974 amended in 1988; (2) The Air (Prevention and Control of Pollution) Act, 1981 amended in 1987; (3) The Water (Prevention and Control of Pollution) Cess Act, 1977 amended in 1991; (4) The Environment (Protection) Act, 1986; (5) The Public Liability Insurance Act, 1991; – Indian Policy Statement for abatement of Pollution, 1992.

UNIT - III
Environmental Audit - Scope & Requisites:
Environmental Audit: Definition; Objectives; Scope, Coverage - GOI Notification on Environmental Audit - Benefits to Industry. Reporting Environmental Audit Findings - Importance of Environmental Audit Report to industry, public and the governments.

Reference books and websites:

1. Environmental Education in India by K.R. Gupta
2. Environmental Legislation in India by K.R. Gupta
3. https://parivesh.nic.in/
4. https://www.cpcb.nic.in/
5. https://www.free-ebooks.net/environmental-studies-academic

B.SC- BOTANY SYLLABUS
I YEAR- 1 SEMESTER

101BOT24: Botany-1: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)

Learning Objectives: By the end of this course the learner has:

- To realize the characteristics and diversity of non-vascular plants.
- To recognize the ecological and economic value of algae, fungi, lichens and bryophytes.
- To inquire the habit, habitat, morphological features and life cycles of selected genera of non-vascular plants.

Syllabus of Theory:

Unit-1: Introduction to Algae

1. General Characteristics of algae: Occurrence and distribution, cell structure, pigments, flagella and reserve food material.
2. Classification of algae: F.E.Fritsch (1935) and Lee (2008)
3. Thallus organization and life cycles in algae.
4. Ecological and economic importance of algae.

Unit-2: Biology of selected Algae

1. Occurrence, structure, reproduction and life cycle of:

   (a) Chlorophyceae: *Spirogyra* (b) Phaeophyceae: *Ectocarpus*

   (c) Xanthophyceae: *Vaucheria* (d) Rhodophyceae:*Polysiphonia*

2. A brief account of Bacillariophyceae
3. Culture and cultivation of *Chlorella*

Unit-3: Introduction to Fungi

1. General characteristics of fungi and Ainsworth (1973) classification.
2. Thallus organization and nutrition in fungi.
3. Reproduction in fungi (asexual and sexual); Heterothallism and parasexuality.
4. Ecological and economic importance of fungi.

Unit-4: Biology of selected Fungi

1. Occurrence, structure, reproduction and life cycle of:

   (a) Mastigomycotina: *Phytophthora* (b) Zygomycotina: *Rhizopus*

(c) Ascomycotina: *Penicillium* (d) Basidiomycotina: *Puccinia*

2. Occurrence, structure and reproduction of lichens; ecological and economic importance of lichens.

Unit-5: Biology of Bryophytes

1. General characteristics of Bryophytes; Rothmaler (1951) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of

   (a) Hepaticopsida: *Marchantia* (b) Anthoceratopsida: *Anthoceros*

   (c) Bryopsida: *Funaria*

3. General account on evolution of sporophytes in Bryophyta.

Text Books:

5. Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi
6. Hait,G., K.Bhattacharya & A.K.Ghosh (2011) A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata

Reference Books:

7. Fritsch, F.E. (1945) The Structure¬& Reproduction of Algae (Vol. I & Vol. II) Cambridge University Press Cambridge, U.K.
8. Bold, H.C.& M. J. Wynne (1984) Introduction to the Algae, Prentice-Hall Inc., New Jersey
9. Robert Edward Lee (2008) Phycology. Cambridge University Press, New York
10. Van Den Hoek, C., D.G.Mann & H.M.Jahns (1996)Algae : An Introduction to Phycology. Cambridge University Press, New York.
11. Alexopoulos, C.J., C.W.Mims & M.Blackwell (2007) Introductory Mycology, Wiley& Sons, Inc., New York
12. Mehrotra, R.S.& K. R. Aneja (1990) An Introduction to Mycology. New Age International Publishers, New Delhi.
13. Kevin Kavanagh (2005) Fungi; Biology and Applications John Wiley& Sons, Ltd., West Sussex, England.
14. John Webster & R. W. S. Weber (2007) Introduction to Fungi, Cambridge University Press, New York.
15. Shaw, A.J.& B.Goffinet (2000) Bryophyte Biology .Cambridge University Press, New York.

102BOT24: Botany-1 Practical: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)

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

1. Identify some algal and fungal species based on the structure of thalli and reproductive organs.
2. Decipher the lichens and Bryophytes based on morphological, anatomical and reproductive features.

Laboratory/field exercises:

Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts:

3. **Algae:** *Spirogyra, Ectocarpus, Vaucheria and Polysiphonia;* a centric and a pennate diatom.
4. Demonstration of culture and cultivation of *Chlorella*
5. Identification of some algal products available in local market.
6. **Fungi:** *Phytophthora, Rhizopus, Penicillium* and *Puccinia*
7. Identification of some fungal products available in the local market.
8. **Lichens:** Crustose, foliose and fruiticose
9. **Bryophyta:** *Marchantia, Anthoceros* and *Funaria.*

B.SC- BOTANY SYLLABUS
I YEAR- 2 SEMESTER

201BOT24: Botany-2: Vascular Plants (Pteridophytes, Gymnosperms and Taxonomy of Angiosperms)

Learning Objectives: By the end of this course the learner has:

- To recognize the morphology, anatomy and reproduction in two groups of archegoniates.
- To acquire knowledge of the taxonomic aids and classification systems.
- To read the vegetative and floral characteristics of some forms of angiospermic families along with their economic value.
- To study the significance of other branches of botany in relation to plant taxonomy.

Syllabus of Theory:

Unit-1: Pteridophytes

1. General characteristics of Pteridophyta; Smith (1955) classification.
2. Occurrence, morphology,anatomy, reproduction (developmental details are notneeded) and life history of: (a) Lycopsida:*Lycopodium* and (b) Filicopsida: *Marsilea*
3. Stelar evolution in Pteridophytes; Heterospory and seed habit.
4. Ecological and economic importance of Pteridophytes.

Unit-2: Gymnosperms

1. General characteristics of Gymnosperms; Sporne (1965) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of:(a) Cycadopsida: *Cycas* and (b) Gnetopsida: *Gnetum*
3. Ecological and economic importance of Gymnosperms.

Unit-3: Principles of Plant Taxonomy

1. Aim and scope of taxonomy, species concept, taxonomic hierarchy-major and minor categories.
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. Phylogenetic systematics: primitive and advanced, homology and analogy, parallelism and convergence, monophyly, paraphyly, polyphyly, clades. synapomorphy, symplesiomorphy, apomorphy. APG-IV classification.

Unit-4: Descriptive Plant Taxonomy

Systematic description and economic importance of the following families:

1. Polypetalae: (a) Annonaceae (b) Curcurbitaceae
2. Gamopetalae: (a) Asteraceae (b) Asclepiadaceae
3. Monochlamydae: (a) Amaranthaceae (b) Euphorbiaceae
4. Monocotyledonae: (a) Arecaceae (b) Poaceae

Unit-5: Evidences for Plant systematics

1. Anatomy and embryology in relation to plant systematics.
2. Cytology and cytogenetics in relation to plant systematics.
3. Phytochemistry in relation to plant systematics.
4. Numerical taxonomy
5. Origin and evolution of angiosperms.

II. Text Books:

1. Acharya, B.C., (2019) Archchegoniates, Kalyani Publishers, New Delhi
2. Bhattacharya, K., G. Hait&Ghosh, A. K., (2011) A Text Book of Botany, VolumeII, New Central Book Agency Pvt. Ltd., Kolkata
3. Hait,G., K.Bhattacharya&A.K.Ghosh (2011) A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata
4. Pandey, B.P. (2013) College Botany, Volumes-I&II, S. Chand Publishing, New Delhi

III. Reference Books:

1. Smith, G.M. (1971) CryptogamicBotanyVol. II., Tata McGraw Hill, New Delhi
2. Sharma,O.P.(2012) Pteridophyta. Tata McGraw-Hill, New Delhi
3. Sporne, K.R. (1971) The Morphology of Gymnosperms.Hutchinsons Co. Ltd.,London
4. Coulter, J.M. & C.J.Chamberlain(1910) Morphology of Gymnosperms,The University of Chicago Press, Chicago, Illinois
5. Bhatnagar, S.P. &AlokMoitra (1996) Gymnosperms. New Age International, NewDelhi
6. Sambamurty, A.V.S.S. (2005) Taxonomy of Angiosperms I. K .InternationalPvt. Ltd., New Delhi
7. Singh, G. (2012). Plant Systematics: Theory and Practice.Oxford& IBH Pvt.Ltd., NewDelhi.
8. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA,U.S.A.

202BOT24: Botany-2 Practical: Vascular Plants (Pteridophytes, Gymnosperms and Taxonomy of Angiosperms)

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

1. Distinguish the Pteridophytes and Gymnosperms based on their morphological, anatomical and reproductive structures.
2. Make systematic classification of plant species using vegetative and floral characters.
3. Identify angiosperm plant species and make herbarium specimens.

Laboratory/field exercises:

I. Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/specimens/ mounts:

1. Pteridophyta: *Lycopodium* and *Marselia*
2. Gymnosperms: *Cycas* and *Gnetum*

II. Technical description of locally available plant species from the following angiosperm families:

1. Annonacae	2. Cucurbitaceae	3. Asteraceae	4. Asclepiadaceae
5. Amaranthaceae	6. Euphorbiaceae	7. Arecaceae	8. Poaceae

III. Demonstration of herbarium techniques.

IV. Field trip to a local floristic area/forest -Submission of 30 number of Herbarium sheets of wild plants with the standard system are mandatory.

B.SC- BOTANY SYLLABUS
II YEAR- 3 SEMESTER

301BOT24: Botany-3: Anatomy and Embryology of Angiosperms

Learning Objectives: By the end of this course the learner has:

- To know about various types of tissues in plants and their organization.
- To obtain awareness on anomalous secondary growth in plants and economic value of woods.
- To acquire knowledge on development of male and female gametophytes in plants.
- To probe into embryogenesis in angiosperms.

Syllabus of Theory:

Unit – 1: Tissues in plants

1. Meristematic tissues: Definition, classification, structure and functions.
2. Apical meristems: Generalised structure of shoot apex, theories on organization of Shoot Apical Meristem (SAM) - Apical cell theory, Tunica-Corpus theory and Histogen theory.
3. Permanent tissues (simple and complex).
4. A brief account of plant secretory tissues/cells.

Unit-2: Anomalous growth in plants

1. Tissue systems–Epidermal, ground and vascular.
2. Anomalous secondary growth in root of *Beta vulgaris*
3. Anomalous secondary growth in stems of *Boerhaavia* and *Dracaena*
4. Study of timbers of economic importance - Teak, Red-sanders and Rosewood.
5. Applications of anatomy in plant systematics, forensics and pharmacognosy.

Unit-3: Anther and pollen

1. Anther: Structure and functions of anther wall, micro-sporogenesis, callose deposition and its significance.
2. Pollen wall structure, MGU (male germ unit) structure, NPC system; a brief account of Palynology and its scope; development of male gametophyte.
3. Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: pseudomonads, polyads, massulae, pollinia.

Unit-4: Ovules, fertilization and endosperm

1. Structure and types of ovules, megasporogenesis; monosporic (*Polygonum*), bisporic

(*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.

2. Outlines of pollination; self-incompatibility- basic concepts; methods to overcome self-incompatibility (mixed pollination, bud pollination, stub pollination).
3. Double fertilization in angiosperms – process and consequences.
4. Perisperm; endosperm – types (free nuclear, cellular, helobial and ruminate) and biological importance.

Unit-5: Embryogeny and seeds

1. Embryogeny in dicot (*Capsella bursa-pastoris*)
2. Embryogeny in monocot (*Sagittariasagittifolia*).
3. Seed structure in monocot and dicot.
4. Importance of seed and seed dispersal mechanisms.
5. Polyembryony and apomixes: Introduction, classification, causes and applications.

Text Books:

- Pandey, B.P. (2013) College Botany, Volumes-II& III, S. Chand Publishing, New Delhi
- Bhattacharya, K., G. Hait & Ghosh, A. K., (2011) A Text Book of Botany, Volume-II, New Central Book Agency Pvt. Ltd., Kolkata

Reference Books:

- Esau, K. (1971) Anatomy of Seed Plants. John Wiley and Son, USA.
- Fahn, A. (1990) Plant Anatomy, Pergamon Press, Oxford.
- Cutler, D.F., T. Botha & D. Wm. Stevenson (2008)Plant Anatomy: An Applied Approach, Wiley, USA
- Paula Rudall (1987) Anatomy of Flowering Plants: An Introduction to Structure and Development. Cambridge University Press, London
- Bhojwani, S. S. and S. P. Bhatnagar (2000) The Embryology of Angiosperms (4th Ed.),Vikas Publishing House, Delhi.
- Pandey, A. K. (2000) Introduction to Embryology of Angiosperms. CBS Publishers & Distributors Pvt. Ltd., New Delhi
- Maheswari, P. (1971) An Introduction to Embryology of Angiosperms. McGraw Hill Book Co., London.
- Johri, B.M. (2011) Embryology of Angiosperms. Springer-Verlag, Berlin

302BOT24: Botany-3 Practical: Anatomy and Embryology of Angiosperms

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

5. Conduct dissections of various plant organs and study the internal structures by staining.
6. Look into the embryological characteristics from sex organs to seeds in angiosperms.

Laboratory/field exercises:

1. Observation of meristems in dicot and monocot plants.
2. Tissue organization in shoot apices using permanent slides.
3. Anomalous secondary growth in root of *Beta vulgaris*
4. Anomalous secondary growth in stems of *Boerhaavia* and *Dracaena.*
5. Study of anther and ovule s using permanent slides/photographs.
6. Study of pollen germination and pollen viability.
7. Dissection and observation of embryo sac haustoria in *Santalum* or *Argemone*.
8. Structure of endosperm (nuclear and cellular) using permanent slides/photographs.
9. Dissection and observation of Endosperm haustoria in *Crotalaria* or *Coccinia.*
10. Developmental stages of dicot and monocot embryos using permanent slides /photographs.

B.SC- BOTANY SYLLABUS
II YEAR- 4 SEMESTER

401BOT24: Botany-4: Plant Ecology, Biodiversity and Phytogeography

Learning Objectives: By the end of this course the learner has:

- To figure-out the components of ecosystem and energy flow among different trophic levels.
- To apprise the characteristics of autecology and synecology.
- To understand the climatic change and associated impacts on biotic components.
- To discern the value of biodiversity, threats and conservation strategies.
- To know the distribution of various plant groups in different geographical areas.

Syllabus of Theory:

Unit-1: Basic concepts in ecology

1. Ecology: definition, branches and significance; relation with other sciences.
2. Structure and functions of ecosystems- abiotic and biotic components; flow of energy.
3. Cycling of materials: water, carbon, nitrogen and phosphorus; trophic pyramids, food chains and food webs.
4. Plants and environment: Climatic (light and temperature) and edaphic.
5. Interactions among plants; interactions between plants and animals.

Unit-2: Population and community ecology

1. Population ecology: definition, characteristics -natality, mortality, growth curves, ecotypes, ecads.
2. Community ecology: characteristics -frequency, density, cover, life forms, competition, biological spectrum. Ecological succession: Hydrosere and Xerosere.
3. Concepts of productivity: GPP, NPP and Community Respiration
4. Secondary production, P/R ratio and Ecosystems.

Unit-3: Climate change-impacts

1. Soil degradation – causes, consequences and management strategies.
2. Deforestation, forest fires – causes, consequences and management strategies.
3. Global warming, ozone layer depletion, acid rains, ocean acidification – causes and effects.
4. Carbon foot prints and carbon credits; The Montreal and the Kyoto protocol.
5. Plant indicators and their role in environmental monitoring.

Unit-4: Concepts of Biodiversity

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: 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.

Unit-5: Phytogeography

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:

- Pandey, B.P. (2013) College Botany, Volumes- II & III, S. Chand Publishing, New Delhi
- Bhattacharya, K., G. Hait & Ghosh, A. K., (2011) A Text Book of Botany, VolumeII, New Central Book Agency Pvt. Ltd., Kolkata
- N.S.Subrahmanyam& A.V.S.S. Sambamurty (2008) Ecology Narosa Publishing House, New Delhi
- Sharma, P.D. (2012) Ecology and Environment. Rastogi Publications, Meerut, India.
- Mani, M.S (1974) Ecology & Biogeography of India Dr. W. Junk Publishers, The Hague

Reference Books:

- Kormondy, Edward J. (1996) Concepts of Ecology,Prentice-Hall of India Private Limited, New Delhi
- Begon, M., J.L. Harper & C.R. Townsend (2003) Ecology, Blackwell Science Ltd., U.S.A.
- Eugene P. Odum (1996) Fundamentals of Ecology, Natraj Publishers, Dehradun
- Kumar, H.D. (1992) Modern Concepts of Ecology (7th Edn.,)Vikas

Publishing Co.,New Delhi.

- Newman, E.I. (2000): Applied Ecology Blackwell Scientific Publisher, U.K.
- Chapman, J.L&M.J. Reiss (1992): Ecology - Principles & Applications. Cambridge University Press, U.K.
- Kumar H.D. (2000) Biodiversity & Sustainable Conservation Oxford & IBH Publishing Co Ltd. New Delhi.
- Cain, S.A . (1944) Foundations of Plant Geography Harper & Brothers, N.Y.
- Good, R. (1997) The Geography of flowering Plants (2nd Edn.) Longmans, Green & Co., Inc., London & Allied Science Publishers, New Delhi

402BOT24: Botany-4 Practical: Plant Ecology, Biodiversity and Phytogeography

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

- Handle instruments used in ecological studies.
- Perform experiments and collect data on autecology and synecology.
- Identify various plant groups based on their morphological and anatomical adaptations.
- Collect data on biodiversity and phytogeography.

Laboratory/field exercises:

1. Study of instruments used to measure microclimatic variables;
    a. Soil thermometer,
    b. Maximum and minimum thermometer,
    c. Anemometer,
    d. Rain gauze
    e. Lux meter.
2. 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.
3. Study of morphological and anatomical adaptations of any two hydrophytes.
4. Study of morphological and anatomical adaptations of any two xerophytes.
5. Quantitative analysis of herbaceous vegetation in the college campus for frequency, density and abundance
6. Identification of vegetation/various plants in college campus and comparison with Raunkiaer's frequency distribution law.
7. Find out the alpha-diversity of plants in an area
8. Mapping of biodiversity hotspots of the world and India.
9. Mapping of phytogeographical regions of the globe and India.

B.SC- BOTANY SYLLABUS
II YEAR- 4 SEMESTER

403BOT24: Botany-5: Cell Biology and Genetics

Learning Objectives:

By the end of this course the learner has:

- To look into the ultra-structure of plant cell and its organelle
- To know the morphology and functions of chromosomes
- To understand the principles of genetics, structure and functions of gene

Syllabus of Theory:

Unit-1: Cell and its organelle

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); ultra structure of chloroplast, plastid DNA.
5. Ultrastructure of mitochondria, mitochondrial DNA.

Unit-2: Chromosomes

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 (nucleosome and solenoid models).

Unit-3: Mendelian and non-Mendelian Genetics

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*).

Unit-4: Structure and function of DNA

1. Watson and Crick model of DNA. Brief account on DNA Replication (Semiconservative method).
2. Brief account on transcription, types and functions of RNA.
3. Genetic code and a brief account of translation.
4. Regulation of gene expression in prokaryotes - Lac Operon.

Unit-5: Gene concept and Sex determination

1. Evolution of gene concept: classical vs molecular concepts of gene.
2. Cis–Trans complementation test for functional allelism, gene as unit of function, mutation and recombination.
3. Pattern of sex determination in plants.
4. Allele and genotype frequencies, Hardy-Weinberg law.

II. Text Books:

1. Pandey, B.P. (2013) College Botany, Volume-III, S. Chand Publishing, New Delhi
2. Ghosh, A.K., K.Bhattacharya&G. Hait (2011) A Text Book of Botany, Volume-III, New Central Book Agency Pvt. Ltd., Kolkata
3. A.V.S.S. Sambamurty (2007) Molecular Genetics,Narosa Publishing House,New Delhi
4. S. C. Rastogi (2008) Cell Biology,New Age International (P) Ltd. Publishers, New Delhi

III. Reference Books:

1. P. K. Gupta (2002) Cell and Molecular biology, Rastogi Publications, New Delhi

2. B. D. Singh (2008) Genetics,Kalyani Publishers, Ludhiana
3. Cooper, G.M. & R.E. Hausman (2009) The Cell – A Molecular Approach, A.S.M. Press, Washington
4. Becker, W.M., L.J. Kleinsmith& J. Hardin (2007) The World of Cell, Pearson, Education, Inc., New York
5. De Robertis, E.D.P. & E.M.F. De Robertis Jr. (2002) Cell and Molecular Biology, Lippincott Williams & Wilkins Publ., Philadelphia
6. Robert H. Tamarin (2002) Principles of Genetics, Tata McGraw –Hill Publishing Company Limited, New Delhi.
7. Gardner, E.J., M. J. Simmons & D.P. Snustad (2004) Principles of Genetics, John Wiley & Sons Inc., New York
8. Micklos, D.A., G.A. Freyer & D.A. Cotty (2005) DNA Science: A First Course, I.K.International Pvt. Ltd., New Delhi

404BOT24: Botany-5 Practical: Cell Biology and Genetics

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

1. Identify the stages of mitotic and meiotic cell divisions.
2. Infer the structure and functions of nucleic acids.
3. Predict the consequences of a particular genetic condition.

Laboratory/field exercises:

4. Study of ultra structure of plant cell and its organelles using electron microscopic photographs /models.
5. Demonstration of mitosis in *Allium cepa/Aloe vera* roots using squash technique.
6. Observation of various stages of mitosis in permanent slides.
7. Demonstration of meiosis in P.M.C.s of *Allium cepa* flower buds using squash technique.
8. Observation of various stages of meiosis in permanent slides.
9. Study of structure of DNA and RNA molecules using models.
10. Solving problems on monohybrid, dihybrid, back and test crosses.
11. Solving problems on gene interactions (at least one problem for each of the gene interactions in the syllabus).
12. Chromosomes mapping using problems of 3- point test cross data.

B.SC- BOTANY SYLLABUS
III YEAR- 5 SEMESTER

501BOT24: Botany-6: Plant Physiology and Metabolism

Learning Objectives: By the end of this course the learner has:

1. To understand the concept of Soil-Plant-Atmosphere continuum based on plant-water relations.
2. To study the anabolic and catabolic processes in plants.
3. To understand the role of plant growth regulators on growth, development and flowering.

Syllabus of Theory:

Unit – 1: Plant-Water relations

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

Unit – 2: Mineral nutrition, Enzymes and Respiration

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

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 (C3, C4 and CAM).
4. Photorespiration - C2 pathway

Unit – 4: Nitrogen and lipid metabolism

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, β-oxidation of fatty acids, Glyoxylate cycle.

Unit – 5: Plant growth - development

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 during seed germination.

Text Books:

- 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, VolumeIII, New Central Book Agency Pvt. Ltd., Kolkata

Reference Books:

- Aravind Kumar & S.S. Purohit (1998) Plant Physiology – Fundamentals and Applications, Agro Botanica, 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, Austalia&U.S.A
- Sinha, R.K. (2014) Modern Plant Physiology, Narosa Publishing House,New Delhi
- Taiz, L.&E. Zeiger (2003) Plant Physiology, Panima Publishers, New Delhi.
- Verma, V. (2007) Text Book of Plant Physiology,Ane Books India, New Delhi.

502BOT24: Botany-6 Practical: Plant Physiology and Metabolism

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

- Conduct lab and field experiments pertaining to plant physiology.
- Estimate the quantities and qualitative expressions using experimental results and calculations
- Interpret the factors responsible for growth and development in plants.

Laboratory/field exercises:

1. Determination of osmotic potential of plant cell sap by plasmolytic method using *Rhoeo*/ *Tradescantia* leaves.
3. Calculation of stomatal index and stomatal frequency of a mesophyte, a hydrophyte 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 C3, C4 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

B.SC- BOTANY SYLLABUS
III YEAR- 5 SEMESTER

503BOT24: Botany-7: Seed Technology

Learning Objectives: By the end of this course the learner has:

- To understand the factors responsible for seed dormancy and procedures for break-down.
- To learn the aspects of seed processing and storage.
- To acquaint with various practices in seed testing and diagnosis of seed borne diseases.

Syllabus of Theory:

Unit - 1: Seed dormancy

1. Seed and grain: Definitions, importance of seed; structure of Dicot and Monocot seed.
2. Role and goals of seed technology; characteristics of quality seed material.
3. Dormancy: Definition, causes for seed dormancy; methods to break seed dormancy.

Unit – 2: Seed processing and storage

1. Principles of seed processing: seed pre-cleaning, precuring, drying, seed extraction; cleaning, grading, pre-storage treatments; bagging and labelling, safety precautions during processing.
2. Seed storage; orthodox and recalcitrant seeds, natural longevity of seeds.
3. Factors affecting longevity in storage; storage conditions, methods and containers.

Unit – 3: Seed testing

1. Definition of seed vigour, viability and longevity; seed sampling and equipment; physical purity analysis.
2. Seed moisture – importance – methods of moisture determination.
3. Seed germination tests using paper, sand or soil – standard germination test; TZ test to determine seed viability; seed health testing.

Unit – 4: Seed borne diseases

1. A brief account of different seed borne diseases and their transmission.
2. Different seed health testing methods for detecting microorganisms.
3. Management of seed borne diseases; seed treatment methods: spraying and dusting.

Unit – 5: Seed certification

1. Objectives - Indian seed Act; seed rules and seed order; new seed policy (1988).
2. Seed Inspector: Duties and responsibilities; classes of seeds, phases of certification

standards (i.e., Land requirement, isolation distance) etc.

2. Issue of certificates, tags and sealing; pre and post control check: Genetic purity verification, certification, records and reporting.

Text Books:

- Sharma G. K. (2012) Seed Science and Technology, Daya Publishing House, New Delhi, India
- Reddy, M. V. and K. V. Krishna Reddy (2009) Seed Science and Technology: A Comprehensive Manual, BS Publications, Hyderabad, India
- Lawrence O. Copeland and Miller B. McDonald (2014) Principles of Seed Science and Technology, Springer, New York, USA
- Agrawal, (2005) Seed Technology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi

Reference Books:

- Umarani R, Jerlin R, Natarajan N, Masilamani P, Ponnuswamy AS (2006) Experimental Seed Science and Technology, Agrobios, Jodhpur
- Desai B D 2004. Seeds Hand Book: Processing and Storage, CRC Press
- Agarwal V K and J B Sinclair 1996, Principles of Seed Pathology, CRC Press
- Tunwar NS and Singh SN. 1988. Indian Minimum Seed Certification Standards. CSCB, Ministry of Agriculture, New Delhi.
- McDonald, M.B. and L.O. Copland. 1999. Seed Science and Technology Laboratory Manual, Scientific Publishers, Jodhpur
- Jagdish Lal and R. C. Saxena (2011) Seed Technology and Seed Pathology, Agrobios (India), Jodhpur, India

504BOT24: Botany-7 Practical: Seed Technology

Course Outcomes:

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

- Break the seed dormancy using various techniques.
- Determine seed moisture, seed germination percentage, seed viability and vigour.
- Identify the seed borne pathogens and prescribe methods to prevent or control them.

Laboratory/field exercises:

1. Determination of physical properties of seeds of 3 select local crops (1each from cereals, millets, pulses and oil seeds).
2. Breaking seed dormancy in 3 select local crops.
3. Measurement of seed moisture content by O S W A or moisture meter or oven drying method.
4. Seed germination tests and evaluation.
5. Seed vigour - conductivity test.
6. Accelerated ageing tests.
7. Tetrazolium test.
8. Priming and invigoration treatments for improving germination and vigour.

Acharya Nagarjuna University
Centre for Distance Education

Nagarjuna Nagar, Guntur-522510

Bachelor of Science (Botany, Zoology, Chemistry)
Programme Code: 59

PROGRAMME SYLLABUS

I YEAR–1 SEMESTER SYLLABUS: BSC- ZOOLOGY

101ZOO24: Zoology-1: Animal Diversity-I Biology of Non-Chordates

LEARNING OBJECTIVES:

- **To understand the taxonomic position of protozoa to helminthes.**
- **To understand the general characteristics of animals belonging to protozoa to hemichordata.**
- **To understand the structural organization of animals phylum from protozoa to hemi chordata.**
- **To understand the origin and evolutionary relationship of different phyla from protozoa to hemichordata.**
- **To understand the origin and evolutionary relationship of different phylum from annelids tohemichordates.**

UNIT-I

1.1 Whittakers five kingdom concept and classification of Animal Kingdom.
1.2 Protozoa General Characters and classification up to classes with suitable examples
1.3 Protozoa Locomotion & nutrition
1.4 Protozoa reproduction

UNIT –II

2.1 Porifera General characters and classification up to classes with suitable examples
2.2 Canal system in sponges
2.3 Coelenterata General characters and classification up to classes with suitable examples
2.4 Polymorphism in coelenterates & Corals and coral reefs

UNIT – III

3.1 Platyhelminthes General characters and classification up to classes with suitable examples
3.2 Parasitic Adaptations in helminthes
3.3 Nemathelminthes General characters and classification up to classes with suitable examples
3.4 **Life cycle and pathogenicity of *Ascaris lumbricoides***

UNIT – IV

4.1 Annelida General characters and classification up to classes with suitable examples
4.2 Vermiculture - Scope, significance, earthworm species, processing,Vermicompost, economicimportance of vermicompost
4.3 Arthropoda General characters and classification up to classes with suitable examples
4.4 *Peripatus* - Structure and affinities

UNIT – V

5.1 Mollusca General characters and classification up to classes with suitable examples

5.2 Pearl formation in Pelecypoda

5.3 Echinodermata General characters and classification up to classes with suitable examples Water vascular system in star fish

5.4 Hemichordata General characters and classification up to classes with suitable examples *Balanoglossus* - Structure and affinities

REFERENCE BOOKS:

1. **L.H. Hyman „*The Invertebrates' Vol I, II and V*. – M.C. Graw Hill Company Ltd.**
2. **otpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca,Echinodermata. Rastogi Publications, Meerut.**
3. **E.L. Jordan and P.S. Verma „*Invertebrate Zoology'* S. Chand and Company.**
4. **R.D. Barnes „*Invertebrate Zoology'* by: W.B. Saunders CO., 1986.**
5. **Barrington. E.J.W., „*Invertebrate structure and Function'* by ELBS.**
6. **P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.**
7. **Parker, T.J. and Haswell„*A text book of Zoology'* by, W.A., Mac Millan Co.London.**
8. **Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition"**

102ZOO24: ZOOLOGY-1 PRACTICAL: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES

LEARNING OBJECTIVES

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labelled record of identified museum specimens

SYLLABUS:

Study of museum slides / specimens / models (Classification of animals up to orders)

- Protozoa: Amoeba*, Paramoecium, Paramoecium Binary fission and Conjugation,Vorticella, Entamoeba histolytica, Plasmodium vivax*
- Porifera: *Sycon, Spongilla, Euspongia, Sycon*- T.S & L.S, Spicules, Gemmule
- Coelenterata: *Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium,Gorgonia,Pennatula*
- Platyhelminthes: *Planaria, Fasciola hepatica, Fasciola* larval forms – Miracidium,Redia,Cercaria, *Echinococcus granulosus, Taenia solium, Schistosoma haematobium*
- Nemathelminths: *Ascaris (Male & Female), Drancunculus, Ancylostoma,Wuchereria*
- Annelida: *Nereis, Aphrodite, Chaetopteurs, Hirudinaria,* Trochophore larva
- Arthropoda: Cancer, *Palaemon*, Scorpion, *Scolopendra, Sacculina, Limulus, Peripatus,* Larvae - Nauplius, Mysis, Zoea, Mouth parts of male &female *Anopheles*and *Culex,* Mouthparts of Housefly and Butterfly.
- Mollusca:*Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus,* Glochidium larva
- Echinodermata: *Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon,* Bipinnaria larva
- Hemichordata: *Balanoglossus,* Tornaria larva

Dissections:

Computer - aided techniques should be adopted or show virtual dissections Dissection of edible (Prawn/Pila) invertebrate as per UGC guidelines

An “Animal album” containing photographs, cut outs, with appropriate write up about the above-mentioned taxa. Different taxa/ topics may be given to different setsof students for this purpose

RFERENCE WEB LINKS:

- https://virtualmicroscopy.peabody.yale.edu/
- https://tnhm.in/category/assorted-gallery-for-vertebrates-and-invetebrates/invertebrates/
- http://www.nhc.ed.ac.uk/index.php?page=24.25.312
- https://biologyjunction.com/invertebrate-notes/
- https://lanwebs.lander.edu/faculty/rsfox/invertebrates/
- http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf

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201ZOO24: Zoology-2: Cell and Molecular Biology

LEARNING OBJECTIVES

- To understand the cell and distinguish between prokaryotic andeukaryotic cell
- To understand the role of different cell organelles in maintenance of lifeactivities
- To acquaint the students with the concept s of cell division and cell cycle
- To acquaint student with basic concepts of molecular biology as to how characters are expressed with a coordinated functioning of replication, transcription and translation in all living beings
- To acquaint the students on the biological importance of biomolecules.

UNIT – I Cell Biology-I

1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
1.2 Electron microscopic structure of animal cell.
1.3 Plasma membrane –Models and Fluid mosaic model
1.4 Transport functions of plasma membrane-Active – passive- facilitated.

UNIT – II Cell Biology-II

2.1 Structure and functions of Golgi complex & Endoplasmic Reticulum
2.2 Structure and functions of Lysosomes & Ribosomes
2.3 Structure and functions of Mitochondria & Centriole
2.4 Structure and functions of Nucleus & Chromosomes

UNIT – III Cell Biology-III

3.1 Cell Division- mitosis, meiosis
3.2 Cell cycle – stages- check points- regulation
3.3 Abnormal cell growth- cancer- apoptosis
3.4 Bio energetics- Glycolysis-Krebs cycle-ETS

UNIT IV: Molecular Biology-I

4.1 Central Dogma of Molecular Biology
4.2 Basic concepts of - DNA replication – Overview (Semi-conservative mechanism, Semi-discontinuous mode, Origin & Propagation of replication fork)
4.3 Transcription in prokaryotes – Initiation, Elongation and Termination, Post- transcriptional modifications (basics)
4.4 Translation – Initiation, Elongation and Termination

UNIT V: Molecular Biology-II

5.1 Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes
5.2 Biomolecules- Carbohydrates (Glucose- structure-properties- biological importance only)
5.3 Biomolecules- Protein (Amino acid- structure- properties- biological importance only)
5.4 Biomolecules- Lipids (Fatty acid- structure - properties- biological importance only)

REFERENCES:

1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell „Molecular Cell Biology"W.H. Freemanand company New York.
2. Cell Biology by De Robertis
3. Bruce Alberts, Molecular Biology of the Cell
4. Rastogi, Cytology
5. Varma & Aggarwal, Cell Biology
6. C.B. Pawar, Cell Biology
7. Molecular Biology by Frei fielder
8. Instant Notes in Molecular Biology by Bios scientific publishers and Viva BooksPrivate Limited
9. James D. Watson, Nancy H. Hopkins „Molecular Biology of the Gene"

202ZOO24: ZOOLOGY-2 PRACTICAL: CELL AND MOLECULAR BIOLOGY

LEARNING OBJECTIVES

- Acquainting and skill enhancement in the usage of laboratory microscope
- Hands-on experience of different phases of cell division by experimentation
- Develop skills on human karyotyping and identification of chromosomaldisorders
- To apply the basic concept of inheritance for applied research
- To get familiar with phylogeny ad geological history of origin & evolution ofanimals

SYLLABUS:

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis with prepared slides
3. Observation of various stages of Meiosis with prepared slides
4. Mounting of salivary gland chromosomes of Chironomus
5. Test for carbohydrate in given biological sample (Benedicts test)
6. Test for Protein in given biological sample (Nitric acid test -white ring)
7. Test for lipid in the given biological sample (Saponification test)

RFERENCE WEB LINKS:

- https://cbi-au.vlabs.ac.in/
- https://www.youtube.com/watch?v=xhnUZAyNdQk
- https://www.youtube.com/watch?v=l8LXQq5_VL0
- https://www.labster.com/simulations
- https://www.sciencecourseware.org/BiologyLabsOnline/protected/TranslationLab/index.php
- https://virtual-labs.github.io/exp-analysis-of-carbohydrates-au/procedure.html
- https://www.labxchange.org/library/items/lb:LabXchange:f10fd7ad:lx_simulation:1
- http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf

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301ZOO24: Zoology-3: Animal Diversity-II Biology of Chordates

LEARNING OBJECTIVES

- **To understand the animal kingdom.**
- **To understand the taxonomic position of Protochordata to Mammalia.**
- **To understand the general characteristics of animals belonging to Fishes to Reptilians.**
- **To understand the body organization of Chordata.**
- **To understand the taxonomic position of Protherian mammals.**

UNIT - I

1.1 General characters and classification of Chordata up to classes
1.2 Salient features of Cephalochordata, Salient features of Urochordata
1.3 Structure and life history of *Herdmania*, Retrogressive metamorphosis –Process and Significance
1.4 Cyclostomata, General characters, Comparison of Petromyzon and Myxine

UNIT - II

2.1 General characters of Fishes, Salient features Dipnoi
2.2 *Scoliodon*: External features, Digestive system, Respiratory system
2.3 *Scoliodon* Structure and function of Heart, Structure and functions of the Brain.
2.4 Migration in Fishes, Types of Scales

UNIT - III

3.1 General characters of Amphibia, General characters of Reptilia
3.2 *Rana hexadactyla*: External features, Respiratory system, Structure and function of Heart
3.3 *Rana hexadactyla* structure and functions of the Brain
3.4 *Calotes*: External features, Digestive system, structure and function of Brain
3.5 Identification of Poisonous snakes

UNIT - IV

4.1 General characters of Aves
4.2 *Columba livia*: External features, Digestive system, Respiratory system
4.3 *Columba livia*: Structure and function of Heart, structure and function of Brain
4.4 Migration in Birds, Flight adaptation in birds

UNIT - V

5.1 General characters of Mammalia
5.2 Classification of Mammalia up to sub - classes with examples
5.3 Comparison of Prototherians, Metatherians and Eutherians
5.4 Dentition in mammals, Aquatic mammals Adaptations

REFERENCE BOOKS

1. **J.Z. Young, 2006. The life of vertebrates. (The Oxford University Press, New Delhi). 646 pages.Reprinted**
2. **Arumugam, N. Chordate Zoology, Vol. 2. Saras Publication. 278 pages. 200 figs.**
3. **A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan Press Ltd., UK). 852 pages. (Revised edition of Parker &Haswell, 1961).**
4. **M. Ekambaranatha Ayyar, 1973. A manual of zoology. Part II. (S. Viswanathan Pvt. Ltd., Madras).**
5. **P.S. Dhami & J.K. Dhami, 1981. Chordate zoology. (R. Chand & Co.). 550 pages.**
6. **Gurdarshan Singh & H. Bhaskar, 2002. Advanced Chordate Zoology. Campus Books, 6 Vols.,1573 pp., tables, figs.**
7. **A.K. Sinha, S. Adhikari& B.B. Ganguly, 1978. Biology of animals. Vol. II. Chordates. (New**

Central Book Agency, Calcutta). 560 pages.

8. **R.L. Kotpal, 2022. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut). 632 pages.**
9. **E.L. Jordan & P.S. Verma, 1998. Chordate zoology. (S. Chand & Co.). 1092 pages.**
10. **G.S. Sandhu, 2005. Objective Chordate Zoology. Campus Books, vii, 169 pp.**
11. **Sandhu, G.S. & H. Bhaskar, H. 2004. Textbook of Chordate Zoology. Campus Books, 2 vols., xx,964 p., figs.**
12. **Veena, 2008. Lower Chordata. (Sonali Publ.), 374 p., tables, 117 figs.**

302ZOO24: ZOOLOGY-3 PRACTICAL: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES

LEARNING OBJECTIVES

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labeled record of identified museum specimens

SYLLABUS:

1. Protochordata: *Herdmania, Amphioxus, Amphioxus* T.S through pharynx.
2. Cyclostomes: *Petromyzon and Myxine.*
3. Pisces: *Pristis, Torpedo, Hippocampus, Exocoetus, Echeneis, Labeo, Catla,Clarius, Channa, Anguilla*.
4. Amphibia: *Ichthyophis, Amblystoma, Axolotl larva, Hyla,*
5. Reptilia: *Draco, Chamaeleon, Uromastix, Testudo, Trionyx, Russels viper, Naja,* Krait, *Hydrophis, Crocodile.*
6. Aves: *Psittacula, Eudynamis, Bubo, Alcedo.*
7. Mammalia: *Ornithorhynchus*, *Pteropus, Funambulus.*
8. **Dissections**-As per UGC guidelines
   Scoliodon IX and X, Cranial nerves
   Scoliodon Brain
   Mounting of fish scales

Note: 1. Dissections are to be demonstrated only by the faculty or virtual.
2.Laboratory Record work shall be submitted at the time of practical examination.

RFERENCE WEB LINKS:

- https://nt7-mhe-complex-assets.mheducation.com/nt7-mhe-complex-assets/Upload-20190715/InspireScience6-8CA/LS15/index.html
- https://themammallab.com/
- http://abacus.bates.edu/acad/depts/biobook/LabConCh.htm
- https://virtualzoology.wordpress.com/scoliodon/
- http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf

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401ZOO24: Zoology-4: Principles of Genetics

LEARNING OBJECTIVES

- To provide the background knowledge on the history of genetics and the importance of Mendelian principles.
- To provide the required knowledge on the gene interactions
- To acquaint the students, distinguish between polygenic, sex-linked, and multipleallelic modes of inheritance and extrachromosomal inheritance.
- To understand the principles of sex determination in animals with a reference to human being, and sex-linked inheritance
- To understand the human karyotyping and the concept of pedigree analysis basics.

UNIT-I:

1.1 History of Genetics- Concepts of Phenotype, Genotype, Heredity, Variation, Pure lines and Inbreed Lines

1.2 Mendelian Principles on Monohybrid cross, back cross and Test cross

1.3 Mendelian Principles on Dihybrid cross

UNIT-II:

2.1 Linkage - Definition, Types of linkage-complete linkage and incomplete linkage, Significance of linkage.

2.2 Crossing over - definition; Mechanism of crossing over: Chiasma Interference andcoincidence

2.4 Gene Interactions: Incomplete dominance, codominance, Pleiotropy

2.5 Gene Interactions: Lethal alleles, Epistasis, Non- Epistasis

UNIT-III:

3.1 Polygenes (General Characteristics & examples)

3.2 Multiple Alleles (General Characteristics and Blood group inheritance)

3.3 Rh inheritance erythroblastosis foetalis

3.4 Extra chromosomal inheritance- Kappa particles in Paramecium and Shell coiling in snails

UNIT-IV:

4.1 Sex determination- Chromosomal theory and Genic Balance theory

4.2 Sex determination- Hormonal, Environmental and Haplo-diploidy types4..3 Sex linked inheritance: X-linked inheritance

4.4 Sex linked inheritance: Y-linked & XY-linked inheritance

UNIT-V:

5.1 Human karyotyping, Pedigree Analysis(basics)

5.2 Autosomal Recessive disorder-Sickle cell anaemia – causes, treatment, inheritance pattern, modes of testing and prevention

5.3 Autosomal Dominant disorder- Huntington disease

5.4 Basics on Genomics and Proteomic

REFERENCE BOOKS:

1. Harper, P. (2010). Practical genetic counselling. CRC Press.

2. Kessler, S. (Ed.). (2013). Genetic counselling: psychological dimensions. Academic Press. 3. Stevenson, A. C., & Davison, B. C. (2016). Genetic counselling. Elsevier.
3. Evans, C. (2006). Genetic counselling: a psychological approach. Cambridge University Press.
4. References:
5. Atlas of Inherited Metabolic Diseases□
6. Mendelian Inheritance in Man: A Catalog of Human Genes and Genetic Disorders, Victor A. McKusick,□□ Vol I & II
7. Stacy L Blachford (Editor) 2001. The Gale Encyclopedia of Genetic Disorders. Gale Group Publishers, Vol.1 (A-L), Vol.II (M-Z).
8. Limoine, W.R. and Cooper, D.NB. 1996: Gene Trophy, Bios Scientific Pub.Oxford.
9. REFERENCES:
10. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. WileyIndia
11. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wileyand Sons Inc.
12. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition.Benjamin Cummings.
13. Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. BenjaminCummings.
14. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction toGenetic Analysis. IX Edition. W. H. Freeman and Co.
15. James D. Watson, Nancy H. Hopkins 'Molecular Biology of the Gene'
16. Gupta P.K., 'Genetics

402ZOO24: ZOOLOGY-4 PRACTICAL: PRINCIPLES OF GENETICS

LEARNING OBJECTIVES

- To acquire practical knowledge on the importance of Mendelian principles by solving the problems.
- To provide the required knowledge on the gene interactions
- To acquaint the students on Human karyotype & pedigree analysis basics
- To understand the various genetic concepts through Virtual labs

SYLLABUS:

1. Study of Mendelian inheritance using suitable examples/Problems
2. Study of linkage recombination, gene mapping using the data
3. Study of human karyotypes
4. Blood grouping and Rh in humans
5. Demonstration of prenatal diagnosis (Virtual lab).
6. Amniocentesis demo or virtual lab
7. Demonstration of Ultrasonography (Virtual lab).
8. Scoring dysmorphic features in syndromic patients
9. Genetic Counselling methods based on case history
10. Construction and analysis of Pedigree

RFERENCE WEB LINKS:

- https://www.iitg.ac.in/cseweb/vlab/anthropology/Experiments/Mendels%20law/index.html
- https://learn.genetics.utah.edu/content/labs/
- https://virtuallabs.merlot.org/vl_biology.html
- https://blog.praxilabs.com/2020/06/30/dna-extraction-virtual-lab/
- https://jru.edu.in/studentcorner/lab-manual/agriculture/Fundamentals%20of%20Genetics.pdf
- https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=1008&context=ny_oers
- https://sjce.ac.in/wp-content/uploads/2018/04/Cell-Biology-Genetics-Laboratory-Manual-17-18.pdf
- https://www.rlbcau.ac.in/pdf/Agriculture/AGP%20113%20%20Fundamentals%20of%20Genetics.pdf
- https://coabnau.in/uploads/1610707528_GPB3.2PracticalManual-Final.pdf

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403ZOO24: Zoology-5: Animal Physiology: Life Sustaining Systems

LEARNING OBJECTIVES

- To acquire knowledge of organ systems function.
- To develop the ability to integrate physiology from the cellular and molecular level to the organ system and organismic level of organization.
- To Effectively read, evaluate and communicate scientific information related to physiological processes in the body.
- To gain a deep knowledge of current topics in physiology.

UNIT-I: Physiology of Digestion

1.1 Structural organization and functions of gastrointestinal tract and associated glands;
1.2 Vitamins & Mineral composition of food & Mechanical and chemical digestion of food;
1.3 Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins;
1.4 Hormonal control of secretion of enzymes in Gastrointestinal tract.

UNIT-II: Physiology of Respiration

2.1 Structural organization of Respiratory system, Mechanism of respiration, Control of respiration
2.2 Pulmonary ventilation; Respiratory volumes and capacities;
2.3 Transport of oxygen in blood and dissociation curves and the factors influencing it
2.4 Transport of Carbon dioxide in blood; dissociation curves and the factors influencing it, Carbon monoxide poisoning

UNIT-III: Renal Physiology

3.1 Structure of kidney and its functional unit
3.2 Mechanism of urine formation
3.3 Regulation of water balance
3.4 Regulation of acid-base balance

UNIT-IV: Physiology of exciting tissues

4.1 Neuron structure and types
4.2 Nerve impulse transmission-(Myelinated, Non-myelinated, synaptic)
4.3 Ultra structure of muscle
4.4 Molecular and chemical basis of muscle contraction

UNIT- V: Physiology of Heart

5.1 Structure of mammalian heart, Coronary circulation;
5.2 Structure and working of conducting myocardial fibers. Origin and conduction of cardiacimpulses
5.3 Cardiac Cycle-Cardiac output and its regulation
5.4 Nervous and chemical regulation of heart rate. Blood pressure and its regulation

REFERENCES BOOKS:

1. Eckert H. *Animal Physiology: Mechanisms and Adaptation.* W.H. Freeman &Company.
2. Floray E. *An Introduction to General and Comparative Animal Physiology.* W.B.Saunders Co., Philadelphia.
3. Goel KA and Satish KV. 1989. *A Text Book of Animal Physiology*, RastogiPublications, Meerut, U.P.
4. Hoar WS. *General and Comparative Physiology.* Prentice Hall of India, New Delhi.
5. Lehninger AL. Nelson and Cox. *Principles of Biochemistry.* Lange MedicalPublications, New Delhi.
6. Prosser CL and Brown FA. *Comparative Animal Physiology.* W.B. SaundersCompany, Philadelphia.

404ZOO24: ZOOLOGY-5 PRACTICAL: ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

LEARNING OBJECTIVES

- To acquire knowledge of anatomy of certain important organs.
- To develop the ability to test the biological sample like saliva and urine.
- To Effectively estimate the blood haemoglobin.
- To Acquire skill to use the sphygmomanometer in recording blood pressure.
- To observe the ECG

SYLLABUS:

1. Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum liver, trachea, lung, kidney
2. Study of activity of Salivary amylase under optimum condition
3. Qualitative tests for identification of Carbohydrates
4. Qualitative tests for identification of Proteins
5. Qualitative tests for identification of Fats
6. Urine test for sugar, albumin
7. Estimation of haemoglobin using Sahli's haemoglobinometer
8. Recording of blood pressure using a sphygmomanometer
9. Recording of frog's heart beat under in situ and perfused conditions
10. ECG observation- Spotting/identification of curves from the given ECG

RFERENCE WEB LINKS:

- https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
- https://library.csi.cuny.edu/oer/virtuallabs-simulations#anatomy
- https://www.labster.com/simulations?course-packages=animal-physiology
- http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf
- https://physiology.elte.hu/gyakorlat/jegyzet/Physiology_Pactical_(2013).pdf

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501ZOO24: Zoology-6: Sustainable Aquaculture Management

LEARNING OUTCOMES:

Students at the successful completion of this course will be able to

- Evaluate the present status of aquaculture at the Global level and National level
- Classify different types of ponds used in aquaculture
- Demonstrate induced breeding of carps
- Acquire critical knowledge on commercial importance of shrimps
- Identify fin and shell fish diseases

Unit: 1

1.1 Present status of Aquaculture – Global and National scenario
1.2 Major cultivable species for aquaculture: freshwater, brackish water and marine.
1.3 Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.
1.4 Design and construction of fish and shrimp farms

Unit: 2

2.1 Functional classification of ponds – head pond, hatchery, nursery ponds
2.2 Functional classification of ponds -rearing, production, stocking and quarantine ponds
2.3 Need of fertilizer and manure application in culture ponds
2.4 Physio-chemical conditions of soil and water optimum for culture (Temperature, depth, turbidity,light, water, PH, BOD, CO_2 and nutrients)

Unit: 3

1.1. Induced breeding in fishes
1.2. Culture of Indian major carps: Pre-stocking management (Dewatering, drying, ploughing / desilting; Predators, weeds and algal blooms and their control, Liming and fertilization)
1.3. Culture of Indian major carps - Stocking management
1.4. Culture of Indian major carps - post-stocking management

Unit: 4

4.1 Commercial importance of shrimp & prawn
4.2 *Macrobrachium rosenbergii*- biology, seed production.
4.3 Culture of *L. vannamei* – hatchery technology and culture practices
4.4 Mixed culture of fish and prawns

Unit: 5

5.1 Viral diseases of Fin Fish & shell fish
5.2 Fungal diseases of Fin & Shell fish
5.3 Bacterial diseases of Finfish & Shell fish
5.4 Prophylaxis in aquaculture

REFERENCES:

1. Pillay TVR & M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc.1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsivier ScientificPublishingCompany.
4. Bose AN et.al. 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing CompanyPvt.Ltd.

Web resources:

5. http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm
6. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf
7. https://www.notesonzoology.com/india/fishery/fish-diseases-symptoms-and-control-fishery/871

502ZOO24: ZOOLOGY-6 PRACTICAL: SUSTAINABLE AQUACULTURE MANAGEMENT

LEARNING OUTCOMES:

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

- Identify the characters of Fresh water cultivable species
- Estimate physico chemical characteristics of water used for aquaculture
- Examine the diseases of fin and shell fish
- Suggest measures to prevent diseases in aquaculture

SYLLABUS:

a. Fresh water Cultivable species any (Fin & Shell Fish Specimens – Observation of morphological characters by observation and drawings)-5
b. Brackish water cultivable species (Fin &Shell fish- Specimens- Observation of Morphological Character by observing drawing) -5
c. Hands on training on the use of kits for determination of water quality in aquaculture (DO, Salinity, pH, Turbidity- Testing kits to be used for the estimation of various parameters/ Standard procedure can be demonstrated for the same)
d. Demonstration of Hypophysation(Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)
e. Viral diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of viral pathogens in fin/ shell fish – one edible specimen can be used for observation of same in the laboratory)
f. Bacterial diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)
g. Fungal diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)

REFERENCES:

- Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier ScientificPublishingCompany
- http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm
- http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf
- https://www.notesonzoology.com/india/fishery/fish-diseases-symptoms-and-control-

503ZOO24: Zoology-7: Live Stock Management (Dairy Production and Management)

LEARNING OUTCOMES:
Students at the successful completion of the course will be able to

- Identify and suggest the suitable housing system for the dairy farming
- Understand management practices for the dairy farming
- Learn the process of milk pasteurization
- Prepare cream from milk

Unit-1: Housing of Dairy cattle- Loose Housing and Conventional Dairy Barns. Drawing of layouts for dairy cattle dwellings; Criteria for selecting site for establishing Dairy farm buildings; Water requirement of dairy animals. Systems

Unit-2:
Management of different classes of Dairy animals- Milk producing animals, pregnant animals dry animals, heifers and calves. Management practices for Dairy farm; Identification, Dehorning, Castration, Deworming, Vaccination, Disinfection, and Milking.

Unit-3:
(a) Pasteurization of milk: Definition, objects of pasteurization, objections to pasteurization, Principles of heat exchange. Methods of pasteurization: LTLT, HTST and Uperization. (b)Sterilization of milk. Homogenization: Factors influencing homogenization

Unit- 4:
Market milk: Toned milk, double toned milk, Reconstituted milk, Standardized milk and fullcream milk– Standards and methods of manufacture.

Unit- 5:
Cream: Types of cream, composition, methods of cream separation, gravity and centrifugal methods,types of cream separators, factors affecting fat losses in skim milk and fat percentage in cream.

REFERENCES:
1. Textbook of Animal Husbandry-G C Benarjee
2. Handbook of Animal Husbandry –ICAR Edition
3. Principles and practices of Dairy Farm–Jagdish Prasad

web resources:
4. http://ecoursesonline.iasri.res.in/course/index.php?categoryid=42
5. https://vetsebooks.blogspot.com/p/e-books.html
6. https://www.basu.org.in/study-materials/veterinary-science/
7. https://vikaspedia.in/agriculture/livestock/cattle-buffalo/breeds-of-cattle-buffalo

504ZOO24: ZOOLOGY-7 PRACTICAL: LIVE STOCK MANAGEMENT (DAIRY PRODUCTION AND MANAGEMENT)

LEARNING OUTCOMES:

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

- Design a model dairy farm layout
- Understand procedure of milk pasteurization at milk processing centers
- Identify various important management practices in dairy farming

SYLLABUS:

1. Dairy Farm layout (In the laboratory student has to sketch a dairy farm with all itscomponents)
2. Identification of cows (students have to identify the breeds of cows form the images/charts – haveto identify any two breeds in the vicinity of the college/ their locality).
3. Dehorning of calves : (Method - protocol- precautions)
4. Castration of bulls (Method – Apparatus- Time-importance)
5. Deworming of dairy cattle: (Schedule – method- benefits)
6. Pasteurization of milk (Batch Method- procedure- Observation)
7. Sterilization of milk (In bottle sterilization- procedure – protocol)
8. Cream separation (By gravity method- procedure- hands on experiment)

REFERENCES:

1. Handbook of Animal Husbandry –ICAR Edition
2. Dairy farm layout : https://www.youtube.com/watch?v=dmukHUEUvKc
3. Dehorning procedure : http://www.omafra.gov.on.ca/english/livestock/dairy/facts/09-003.htm
4. Castration of bulls: https://vikaspedia.in/agriculture/livestock/general-management-practices-of-livestock/castration-of-ruminants
5. Deworming: https://kvk.icar.gov.in/API/Content/PPupload/k0347_10.pdf
6. Pasteurization of milk : http://www.jnkvv.org/PDF/08042020170652part%203.pdf
7. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1690
8. Cream separation: http://ecoursesonline.iasri.res.in/mod/page/view.php?id=147910

B.SC- CHEMISTRY SYLLABUS

I YEAR- 1 SEMESTER

101CHE24: CHEMISTRY-1: GENERAL AND INORGANIC CHEMISTRY

Course Outcomes:

At the end of the course the student will be able to-

- Understand the structure of atom and the arrangement of elements in the periodic table.
- Understand the nature and properties of ionic compounds.
- Identify the structure of a given inorganic compound.
- Explain the existence of special types of compounds through weak chemical forces.
- Define acids and bases and predict the nature of salts.

Unit I: Atomic Structure and Periodic table (9 h)

Electronic configuration: Bohr theory, duel nature of electrons, Heisenberg uncertainty principle, the Schrodinger equation, significance of wave functions, normalization of wave function, radial and angular wave functions, Pauli's exclusion principle, Hund's rule, sequence of energy levels (Aufbau principle).

Periodicity: periodic law and arrangement of elements in the periodic table, IUPAC nomenclature and group number, horizontal, vertical, and diagonal relationships in the periodic table. 1.3 General properties of atoms: size of atoms and ions-atomic radii, ionic radii, covalent radii; trend in ionic radii, ionization potential, electron affinity; electronegativity - Pauling, Mulliken-Jaffe, Allred-Rochow definitions; oxidation states and variable valency; isoelectronic relationship; inert-pair effect;

UNIT 2: Ionic bond (9 h)

Properties of ionic compounds, factors favouring the formation of ionic compounds- ionization potential, electron affinity, and electronegativity. Lattice energy: definition, factors affecting lattice energy, Born-Haber cycle-enthalpy of formation of ionic compound and stability. Stability of ionic compounds in terms of $\Delta H_f$and U_o. Solubility and thermal stability of ionic compounds. Covalent character in ionic compounds- polarization and Fajan's rules; effects of polarization-solubility, melting points, and thermal stability of typical ionic compounds.

UNIT 3: The Covalent Bond (9 h)

Valance Bond theory-arrangement of electrons in molecules, hybridization of atomic orbitals and geometry of molecules-$BeCl_2$, BF_3, CH_4, PCl_5, SF_6– VSEPR model-effect of bonding and nonbonding electrons on the structure of molecules, effect of electronegativity, isoelectronic principle, illustration of structures by VESPR model-NH_3, H_2O, SF_4, ICl^-,4

ICl^-,2 XeF_4, XeF_6

Molecular orbital theory -LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2, O_2, CO and NO)

UNIT 4: Metallic and Weak Bonds (9 h)

The Metallic bond: metallic properties, free electron theory, Valence Bond Theory, band theory of metals. Explanation of conductors, semiconductors and insulators.

Weak bonds: hydrogen bonding-intra- and intermolecular hydrogen bonding, influence on the physical properties of molecules, comparison of hydrogen bond strength and properties of hydrogen bonded N, O and F compounds; associated molecules-ethanol and acetic acid; Vanderwaals forces, ion dipole-dipole interactions.

UNIT 5: Acids and Bases (9 h)

Theories of acids and bases: Arrhenius theory, Bronsted-Lowry theory, Lewis theory, the solvent system, Nonaqueous solvents: classification-protonic and aprotic solvents, liquid ammonia as solvent-solutions of alkali and alkaline earth metals in ammonia.

Types of chemical reactions: acid-base, oxidation-reduction, calculation of oxidation number. Definition of pH, pK_a, pK_b. Types of salts, Salt hydrolysis. Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard andSoft-Soft combinations.

List of Reference Books:

1. J. D. Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
2. . B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., 1996.
3. D. F. Shriver and P. W. Atkins, Inorganic Chemistry, 3rd ed., W. H. Freeman and Co, London,

102CHE24: CHEMISTRY-1 PRACTICAL: GENERAL AND INORGANIC CHEMISTRY

Practical- I Qualitative Analysis of SIMPLE SALT

Qualitative inorganic analysis (Minimum of Six simple salts should be analysed) 50 M

Course outcomes:

- At the end of the course, the student will be able to;
- Understand the basic concepts of qualitative analysis of inorganic simple salt.
- Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
- Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis

Laboratory course syllabus: Analysis of SIMPLE SALT

Analysis of simple salt containing ONE anion and ONE cation from the following:
Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate.
Cations: Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Magnesium and Ammonium.

Co-curricular activities and Assessment Methods

- Continuous Evaluation: Monitoring the progress of student's learning.
- Class Tests, Work sheets and Quizzes
- Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
- SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

Reference books:

I. Vogel's Qualitative Inorganic Analysis, Seventh edition, Pearson.

B.SC- CHEMISTRY SYLLABUS

I YEAR- 2 SEMESTER

201CHE24: CHEMISTRY-2: FUNDAMENTALS IN ORGANIC CHEMISTRY

Course outcomes:

At the end of SEMESTER the student will be able to

- Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.
- Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
- Learn and identify many organic reaction mechanisms .
- Correlate and describe the stereo-chemical properties of organic compounds and reactions.

Unit 1. Structural theory in Organic Chemistry (9 h)

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents). Reaction intermediates – Carbocations, carbanions & free radicals. Bond polarization: Factors influencing the polarization of covalent bonds, inductive effect - Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes.

Unit II Saturated Hydrocarbons (Alkanes and Cycloalkanes) 9 h

General methods of preparation of alkanes- Wurtz and Wurtz Fittig reaction, Corey House synthesis, physical and chemical properties of alkanes, 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-III Unsaturated Hydrocarbons (Alkenes and Alkynes) 9 h

General methods of preparation, physical and chemical properties, Saytzeff and Hoffmann eliminations (with mechanism), Electrophilic Additions, (H_2, HX) mechanism (Markownikoff/ Antimarkownikoff addition) with suitable examples-syn and anti-addition;

addition of X_2, HX. Oxymercuration demercuration, ozonolysis, hydroxylation, Diels Alder reaction, 1,2- and1,4-addition reactions in conjugated dienes. Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-IV Benzene and its reactivity (9 h)

Structure of Benzene – Preparation - polymerisation of acetylene and decarboxylation- Properties - mechanism of electrophilic aromatic substitution of Friedel- Craft's alkylation and acylation. halogenation and nitration,

UNIT-V Orientation of aromatic substitution (9 h)

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenylcation, cyclopentadienyl anion and tropylium cation) Orientation of aromatic substitution - ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens.

II. List of Reference Books

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (PearsonEducation).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Guide book to Mechanism in Organic Chemistry by Peter Sykes 6th edition,1985.

202CHE24: CHEMISTRY-2 PRACTICAL: FUNDAMENTALS IN ORGANIC CHEMISTRY

Course Outcomes:

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

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

Syllabus:

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.

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: Enhances critical thinking skills and personality
- SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

Reference books:

1. Vogel A.I .Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry, University press.

B.SC- CHEMISTRY SYLLABUS

II YEAR- 3 SEMESTER

301CHE24: CHEMISTRY-3: PHYSICAL CHEMISTRY- II (STATES OF MATTER, PHASE RULE & SURFACE CHEMISTRY)

Course outcomes:

At the end of the semester the student will be able to:

- Explain the difference between solids liquids and gases in terms of intermolecular interactions.
- Differentiate ideal and real gases.
- Discuss the basic concepts of two component systems
- Apply the concepts of adsorption.
- Understand the basic concepts of crystallography.

Unit I - Gaseous state (9 h)

Postulates of Kinetic theory of Gases (exclude derivation) – deduction of gas laws from kinetic gas equation-Vander 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.

Unit II – Liquid State (9 h)

Physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Temperature variation of viscosity of liquids and comparison with that of gases. Qualitative discussion of structure of water.

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-III - Solid state (9h)

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

Unit IV - Phase Rule (9 h)

The Concept of phase, components, degrees of freedom. 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 V Surface Chemistry (9 h)

Definition and classification of Colloids- Coagulation of colloids- Hardy-Schulze rule. Stability of colloids, Protection of Colloids, Gold number.

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

List of Reference Books:

1. **Solid State Chemistry and its applications by Anthony R. West**
2. **Text book of physical chemistry by K L Kapoor Vol.1**

3. **Text book of physical chemistry by S Glasstone**
4. **Advanced physical chemistry by Bahl and Tuli.**

302CHE24: CHEMISTRY-3 PRACTICAL: PHYSICAL CHEMISTRY- II (STATES OF MATTER, PHASE RULE & SURFACE CHEMISTRY)

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 surface chemistry in experiments.
3. Be familiar with the concepts & practical applications of Surface tension and viscosity of liquids.

Physical Chemistry Practical Syllabus:

1. Determination of surface tension of liquid by drop count method
2. Determination of surface tension of liquid by drop weight method
3. Determination of surface tension of mixture (liquid + detergent) using stalagmometer.
4. Determination of coefficient of viscosity of an organic liquid.
5. Determination of composition of a glycerol in glycerol + water mixture using viscometer.
6. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm.

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: Enhances

Critical thinking skills and personality

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

List of reference books:

1. A Text Book of Quantitative Inorganic Analysis(3rd Edition) –A.I.Vogel
2. Web related references suggested by teacher.

B.SC- CHEMISTRY SYLLABUS

II YEAR- 4 SEMESTER

401CHE24: CHEMISTRY-4: GENERAL AND PHYSICAL CHEMISTRY

Course outcomes:

At the end of the semester the student will be able to:

- Correlate and describe the stereochemical properties of organic compounds.
- Explain the biological significance of various elements present in the human body.
- Apply the concepts of ionic equilibrium for the qualitative and quantitative analysis.
- Determine the order of a chemical reaction.
- Describe the basic concepts of enzyme catalysis.

UNIT-I Stereo chemistry of carbon compounds

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.

Unit II Bioinorganic Chemistry

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals, Na / K- pump, carbonic anhydrase and carboxy peptidase. 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-transfer of oxygen, Myoglobin-Storage and transfer of iron

Unit III Ionic equilibrium

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, Buffer solutions-Henderson's equation. Indicators-theories of acid – base Indicators, selection of Indicators,

Common ion effect Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Unit IV Chemical Kinetics-I:

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 (similar and different reactants). Half–life of a reaction. General methods for determination of order of a reaction.

Unit V Chemical Kinetics-II:

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.

Reference books

1. Text book of physical chemistry by S Glasstone

2. Concise Inorganic Chemistry by J.D.Lee
3. Advanced physical chemistry by Gurudeep Raj
4. Advanced physical chemistry by Bahl and Tuli
5. Inorganic Chemistry by J.E.Huheey
6. Basic Inorganic Chemistry by Cotton and Wilkinson.

402CHE24: CHEMISTRY-4 PRACTICAL: GENERAL AND PHYSICAL CHEMISTRY

Course outcomes:

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

- Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
- Understand and explain the volumetric analysis based on fundamental concepts learnt in ionic equilibria
- Learn and identify the concepts of a standard solutions, primary and secondary standards
- Facilitate the learner to make solutions of various molar concentrations.

Syllabus:

Volumetric analysis:

1. Estimation of sodium hydroxide using standardised HCl solution.
2. Estimation of sodium carbonate and sodium hydroxide present in a mixture.
3. Determination of Fe (II) using $KMnO_4$ with oxalic acid as primary standard. (internal indicator method)
4. Determination of Fe (II) using $KmnO_4$ with oxalic acid as primary standard. (external indicator method)
5. Estimation of water of crystallization in Mohr's salt by titrating with $KmnO_4$

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 teachers throughout the semester .

List of reference books:

1. A Text Book of Quantitative Inorganic Analysis(3^{rd}Edition) –A.I.Vogel
2. Web related references suggested by teacher.

B.SC- CHEMISTRY SYLLABUS

II YEAR- 4 SEMESTER

403CHE24: CHEMISTRY-5: ANALYTICAL METHODS IN CHEMISTRY- QUANTITATIVE ANALYSIS

Learning Outcomes:

Students after successful completion of the course will be able to:

- Identify the importance of solvent extraction and ion exchange method.
- Acquire knowledge on the basic principles of volumetric analysis and gravimetric analysis.
- Demonstrate the usage of common laboratory apparatus used in quantitative analysis.
- Understand the theories of different types of titrations.
- Gain knowledge on different types of errors and the minimization methods.

Unit-1: Quantitative analysis-1

A brief introduction to analytical methods in chemistry. Principles of volumetric analysis, concentration terms- Molarity, Molality, Normality,v/v, w/v, ppm and ppb, preparing solutions- Standard solution, primary standards and secondary standards.. Description and use of common laboratory apparatus-volumetric flask, burette, pipette, beakers, measuring cylinders.

Unit-2: Quantitative analysis-2

Principles of volumetric analysis: Theories of acid-base (including study of acid-base titration curves), redox, complex metric, iodometric and precipitation titrations-choice of indicators for the saturations. Principles of gravimetric analysis: precipitation, coagulation, peptization, coprecipitation, post precipitation, digestion, filtration, and washing of precipitate, drying and ignition.

Unit-3: Treatment of analytical data

Types of errors- Relative and absolute, significant figures and its importance, accuracy - methods of expressing accuracy, errors- Determinate and indeterminate and minimization of errors, precision-methods of expressing precision, standard deviation and confidence interval.

Unit-4: Separation techniques

Solvent Extraction: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, Continuous extraction and counter current extraction. Synergism. Application-Determination of Iron(III). Ion Exchange method: Introduction, action of ion exchange resins, applications.

UNIT-5: Analysis of water

Determination of dissolved solids, total hardness of water, turbidity, alkalinity, Dissolved oxygen, COD, determination of chloride using Mohr's method.

Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Assignments, Seminars and Quiz(on related topics).
3. Visits to laboratories, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts.

List of Reference Books:

1. Fundamentals of Analytical Chemistry by F.James Holler, Stanley R Crouch, DonaldM.West and

Douglas A. Skoog, Ninth edition, Cengage.
2. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and KevinA. Schug, Seventh edition, Wiley.
3. Quantitative analysis by R.A.DayJr.and A.L.Underwood, Sixth edition, Pearson.
4. Text book of Vogel's Quantitative Chemical Analysis,Sixth edition, Pearson.
5. Text book of Environmental Chemistry and Pollution Control by S.S.Dara and D.D.Mishra, Revised edition, S Chand & Co Ltd.

404CHE24: CHEMISTRY-5 PRACTICAL: ANALYTICAL METHODS IN CHEMISTRY- QUANTITATIVE ANALYSIS

Learning Outcomes:

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

- Estimate Iron(II)using standard Potassium dichromate solution
- Learn the procedure for the estimation of total hardness of water
- Demonstrate the determination of chloride using Mohr's method
- Acquire skills in the operation and calibration of pH meter
- Perform the strong acid vs strong base titration using pH meter

Laboratory course Syllabus:

1. Estimation of Iron(II)using standard Potassium dichromate solution (using DPA indicator)
2. Estimation of total hardness of water using EDTA
3. Determination of chloride ion by Mohr's method
4. Study the effect on pH of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and their mixtures.
5. Preparation of buffer solutions of different pH (i) Sodium acetate-acetic acid, (ii) Ammonium chloride-ammonium hydroxide.
6. pH metric titration of (i) strong acid vs strong base,(ii)weak acid vs. Strong base.
7. Determination of dissociation constant of a weak acid.

Co-Curricular Activities:

Mandatory:*(Lab /field training of students by teacher:(lab:10+field:05):*

1. **For Teacher**: Training of students by the teacher in laboratory and field for not less than 15 hours on the field techniques / skills of calibration of pH meter, Strong acid vs strong base titration using pH meter, determination of chloride ion, estimation of water quality parameters and estimation of Iron(II).
2. **For Student**: Student shall visit a related industry / chemistry laboratory in universities / research organizations/private sector facility and observe various methods used for the analysis of water. Write their observations and submit a hand written fieldwork /project work report not exceeding10pages in the given format to the teacher.
3. Max marks for Field work / projectwork Report:05.
4. Suggested Format for Fieldwork/project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements.*
5. Unit tests (IE).

List of Reference books:

1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.

B.SC- CHEMISTRY SYLLABUS

III YEAR- 5 SEMESTER

501CHE24: Chemistry-6: CHROMATOGRAPHY AND INSTRUMENTAL METHODS OF ANALYSIS

Learning Outcomes:

- Students after successful completion of the course will be able to:
- Identify the importance of chromatography in the separation and identification of compounds in a mixture
- Acquire a critical knowledge on various chromatographic techniques.
- Demonstrate skills related to analysis of water using different techniques.
- Understand the principles of spectrochemistry in the determination of metal ions.
- Comprehend the applications of atomic spectroscopy.

Unit-1: Chromatography-Introduction and classification

Principle, Classification of chromatographic methods, Nature of adsorbents, eluents, Rfvalues, factors affecting Rfvalues.

UNIT-2: TLC and paper chromatography

Thin layer chromatography: Principle, Experimental procedure, preparation of plates, adsorbents and solvents, development of chromatogram, detection of spots, applications and advantages.

Paper Chromatography: Principle, Experimental procedure, choice of paper and solvents, various modes of development- ascending, descending, radial and two dimensional, applications.

UNIT-3: Column chromatography

Column chromatography: Principle, classification, Experimental procedure, stationary and mobile phases, development of the Chromatogram, applications.

HPLC: Basic principles, instrumentation–block diagram and applications.

UNIT-4: Spectrophotometry

Principle, Instrumentation : Single beam and double beam spectrometer, Beer-Lambert's law- Derivation and deviations from Beer-Lambert's law, applications of Beer-Lambert's law- Quantitative determination of Fe^{+2}, $Mn^{+2}$and Pb^{+2}.

UNIT-5: Polarimetry and Refractometry

Polarimetry and Refractometry: Polarimetry: Nature of polarized light, polarimeter, sample cells, operation of the polarimeter, optical purity. Refractometry; The refractive index, Refractometer.

Suggested Co-Curricular Activities:

- Training of students by related industrial experts.
- Assignments, Seminars and Quiz(on related topics).
- Visits to laboratories, firms, research organizations etc.
- Invited lectures and presentations on related topics by field/industrial experts

List of Reference books:

1. Fundamental so Analytical Chemistry by F.James Holler, Stanley R Crouch, Donald M.West and Douglas A.Skoog, Ninth edition, Cengage.

2. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and Kevin A.Schug, Seventh edition, Wiley.
3. Quantitative analysis byR.A.DayJr .and A.L.Underwood,Sixth edition,Pearson.
4. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition/Pearson.
5. Instrumental methods of Chemical Analysis by Dr.B.K.Sharma 1981

502CHE24: Chemistry-6 Practical: CHROMATOGRAPHY AND INSTRUMENTAL METHODS OF ANALYSIS

Learning Outcomes:

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

- Perform the separation of a given dye mixture using TLC
- Learn the preparation of TLC plates
- Demonstrate the separation of mixture of amino acids using paper chromatography
- Acquire skills in using column chromatography for the separation of dye mixture.

Laboratory course Syllabus:

1. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina as adsorbent).
2. Separation of mixture of methyl orange and methylene blue by column chromatography.
3. Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography.
4. Separation of food dyes using Column Chromatography
5. Separation of triglycerides using TLC
6. Verification of Beer lambert's law. (Using potassium permanganate solution) using colorimeter / spectrophotometer.

List of Reference books:

1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
2. VogelA.I .Practical Organic Chemistry, Longman Group Ltd.
3. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
4. Ahluwalia V. K. and Agarwal R. Comprehensive Practical Organic Chemistry, University press.

B.SC- CHEMISTRY SYLLABUS

III YEAR- 5 SEMESTER

503CHE24: CHEMISTRY-7: SYNTHETIC ORGANIC CHEMISTRY

Learning Outcomes:

Students after successful completion of the course will be able to:

- Identify the importance of reagents used in the synthesis of organic compounds.
- Acquire knowledge on basic concepts in different types of pericyclic reactions.
- Understand the importance of retro synthesis inorganic chemistry.
- Comprehend the applications of different reactions in synthetic organic chemistry.

Unit-1:Pericyclic reactions

Definition and classification of pericyclic reactions: Phases, nodes and symmetry propertiesof molecular orbital's in ethylene,1,3-butadiene,1,3,5-hexatriene,alkylationandallylradical. Thermal and photochemical reactions. Electro cyclic reactions: Definition and examples, definitions of con and disrotation,Woodward-Hoffmann selection rules.(Correlation diagrams excluded) Cyclo addition reactions: Definition and examples, definitions of supra facial and antar facial addition, Woodward-Hoffmann selection rules. (Correlation diagrams excluded)

Unit-2 : Organic photochemistry

Jablonski diagram-singlet and triplet States Photochemistry of Carbonyl compounds $n-\pi^*$ and $\pi-\pi^*$transitions, Norrish type-1and type-2reactions Paterno–Buchi reaction.

Unit-3 : Retrosynthesis

Important terms in Retro synthesis with examples-Disconnection, Target molecule, FGI, Synthon, Retrosynthetic analysis, chemo selectivity, region selectivity. Importance of Orderof events in organic synthesis. Retrosynthetic analysis of the compounds:a)cyclohexene b)4-Nitro toluene c) Paracetamol.

Unit-4 : Synthetic Reactions

Shapiro reaction, Stork - enamine reaction(only alkylation),Wittig reaction, Robinson annulation, Bailys-Hillman reaction, Heck reaction, Suzuki coupling. Synthesis of aldehydes and ketones using1, 3-Dithiane.

Unit-5 : Reagents in Organic Chemistry

Oxidizing agents:PCC,PDC,SeO_2 (Riley oxidation), NBS.

Reducing agents : $LiAlH_4$(with mechanism), LTBA, Metal-solvent reduction (Birchreduction), Catalytic reduction.

List of Reference books:

1. Pericyclic reactions by Ian Fleming, Second edition,Oxford University press.
2. Pericyclic Reactions- A Text book: Reactions, Applications and Theory byS.Sankararaman, WILEY-VCH.
3. Reaction Mechanism in Organic Chemistry by S.M. Mukherji and S.P.Singh, Revisededition, Trinity Press.

4. Pericyclic reactions – A Mechanistic study by S.M.Mukherji, Macmillan India.
5. Organic synthesis :The disconnection approach by Stuart Warren, John Wiley&Sons.
6. Organic chemistry by Jonathan Clayden, Nick Greeves and Stuart Warren, Secondedition, Oxford university press.
7. Reactions, Reagents and Rearrangements by S.N. Sanyal, Bharati Bhawan Publishers &Distributors

504CHE24: CHEMISTRY-7 PRACTICAL: SYNTHETIC ORGANIC CHEMISTRY

Learning Outcomes:

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

- Perform the organic qualitative analysis for the detection of N, S and halogens usingthe green procedure.
- Learn the procedure for the separation of mixture famine acids using paper Chromatography.
- Prepare the TLC plates for TL chromatography.
- Acquire skills in conducting column chromatography for the separation of dyes in thegiven mixture.

Laboratory course syllabus:

1. Green procedure for organic qualitative analysis: Detection of N,S and halogens
2. Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography.
3. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina as adsorbent).
4. Separation of mixture of methyl orange and methylene blue by columnchromatography
5. Separation of food dyes using Column Chromatography
6. Separation of triglycerides using TLC

List of Reference books :

1. VogelA.I.Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. MannF.G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

Duration of the Programme:

Minimum: Three Academic Years from the year of joining of the course (Six Semesters). **Maximum:** Seven Academic Years from year of joining of the course for securing First Class or Second Class.

INSTRUCTIONAL DESIGN :

Instructional delivery mechanism:

Senior faculty members from HEI (Conventional mode) act as resource person for will act as resource persons for this program. Our University has blended mode delivery mechanism i.e., ICT and Conventional modes.

Media of delivery mechanisms:

- **Printing:** The study material delivery media include Printing of books which are issued to the students who are enrolled for the programme.

- **Online:** On line PDF format content is also given access to the students who wish to study through online mode.

- **Interactive sessions, and Discussion boards:** In distance Education, face to face contact between the learners and their tutors is relatively less and therefore interactive sessions are conducted. The purpose of such interactive session is to answer some of the questions and clarify doubts that may not be possible in other means of communication. This programme provides an opportunity to meet other fellow students. The Counsellors at the study centres are expected to provide guidance to the students. The interactive sessions are conducted during week ends and vacations to enable the working students to attend.

- **Student support services:** Student support services include Internet enabled student support services like e-mails, SMS and even an app is planned. Student feed back mechanism is created and feed back is designed. Student Learning Managemnet Sysyem (LMS) is customized to every student. For every student customized examination management system (EMS) is also created facilitationg self evaluation, demo tests, model question papers and periodical Internal Assessments.

- **Credit System:** University has adopted Choice Based Credit System (CBSE) under semester mode from 2013. The same has been approved by relevant Statuatory boards in Distance mode also.

- **Admission procedure:** In Bachelor of Sciences Botany, Zoology, Chemistry programme candidates can take admission directly. For this purpose, CDE, ANU will advertise for admissions. Then candidates should apply in prescribed format of the CDE after publication of the advertisement.

- **Eligibility Criteria: The minimum eligibility for admission for this course is 10+2 stream**

- **Fee Structure:** The total course fee is Rs.34,030/-.

- **Policy of programme delivery:** Our University has blended mode delivery mechanism i.e., ICT and Conventional modes. In conventional mode printed material is given and also online mode of delivery with learning management system is adopted.

• **Activity planner:** There is an yearly academic plan and as per plan interactive sessions, assignments, examinations etc are conducted to the candidates.

• **Evaluation System:** Periodical progress of learning is evaluated by web based feed back mechanism in the Learning Management System. Evaluation of learner progress is conducted as follows:

(i) The examination has two components i.e., continuous evaluation by way os assignments (30 %) and term end University Examination (70 %).

(ii) Each student has to complete and submit assignment in each of the theory paper before appearing to the term end examination. The term end examination shall be of 3 hours duration.
(iii) Minimum qualifying marks in each paper is 40 % indivually in internal and term end examination. The candidates who get 60 % and above will be declared as passin First Division, 50 % to below 60 % as Second Division and 40 % to below 50 % as Third Division.

(iv) THe Centre for Distance Education, Acharya Nagarjuna University will conduct the examinations, evaluations and issue certificates to the successful candidates.

(v) All the term end examinations will be conducted at the examination centres fixed by the CDE.

(vi) Qualitatively the examinations conducted for the students of the Distance Education are on par with the examinations conducted for the regular University students.

LIBRARY SUPPORT AND LIBRARY RESOURCES :

The Bachelor of Sciences Botany, Zoology, Chemistry program is based on the theory and practical papers. Laboratory support is available to students. Further, entire University Library is accessble to all the students of distance education. Additionally every department in the University has a well equipped library which is accessable to all the students. CDE also provides a compendium of web resources to every student to support learning.

COST ESTIMATE :

The Programme fee for I year is Rs.10,300/-, II year is Rs. 12,100/- and III year is Rs.11,630/-. The university will pay the remuneration to Editors and lesson writers as per university norms. DTP charges, Printing of books and Examination fees will be paid by the ANUCDE as per prescribed norms. This institution is providing high quality programmes at low cost.

QUALITY ASSURANCE :

Quality assurance comprises the policies, procedures and mechanisms which that specified quality specifications and standards are maintained. These include continuous revision and monitoring activities to evaluate aspects such as suitability, efficiency, applicability and efficacy of all activities with a view to ensure continuous quality improvement and enhancement. The programme is designed with a focus on the proposed learning outcomes aimed at making the learner industry ready also for career advancement, enterprenureal development, and as wealth creators. There is a continuous evaluation of learning and of competence internally and also by ICT enabled feed back mechanism and Centre for Internal Quality Assurance (CIQA). The University ensures maintaining quality in education provided through open and diatance learning mode. As per the need of the information society and professional requirement, the University ensures to change the mechanism from time to time along with enhancement of standard in course curriculum and instructional design. Therefor, the outcomes of the programme can meet the challenges in the changing society.

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Acharya Nagarjuna University
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