Bachelor of Science

(Chemistry, Botany & Zoology)

Syllabus

School of Distance Education
Andhra University, Visakhapatnam, Andhra Pradesh

ANDHRA UNIVERSITY
B.Sc. (CBZ)

First Year Courses

Paper 1: English Language
Paper 2: Telugu/Hindi/Sanskrit
Paper 3: Foundation course
Paper 4: Computer Course : Introduction to Computers
Paper 5: Botany : MICROBIAL DIVERSITY, CRYPTOGAMS AND GYMNOSPERMS
Paper 6: Zoology : BIOLOGY OF INVERTIBRATES AND CELL BIOLOGY
Paper 7: Chemistry - Inorganic, Organic, Physical and General Chemistry

Second Year Courses

Paper 1: English Language
Paper 2: Telugu/Hindi/Sanskrit
Paper 3: Environmental Studies
Paper 4: Botany: Anatomy, Embryology, Taxonomy and Medicinal Botany
Paper 5: Zoology: Biology of Chordates, Embryology, Ecology and ZooGeography
Paper 6: Chemistry - Inorganic, Organic, Physical & General Chemistry – II
Paper 7: Computer Course : Office Automation Tools

Third Year Courses

Paper 1: Foundation Course II
Paper 2: Mathematics - Linear Algebra & Vector Calculus
Paper 3: Mathematics - Numerical Analysis
Paper 4 : Botany: Cell Biology, Genetics, Ecology and Biodiversity
Paper 5: Botany: Physiology, Tissue Culture, Biotechnology, Seed Technology & Horticulture
Paper 6 : Zoology: Animal Physiology, Genetics & Evolution
Paper 7 : Zoology: Applied Zoology Fisheries and Aquaculture, Clinical Science & Animal Biotechnology

SYLLABUS
BA/B.Com/B.Sc Common Paper

ENGLISH TRACKS
A COURSE IN POETRY, PROSE AND GRAMMAR

POETRY :

John Keats : Ode to Autumn
Matthew Arnold : Dover Beach
W.H.Auden : The Unknown Citizen
Wilfred Owen :Insensibility
R. Rarthasarathy : From Homecoming
Aduri Satyavathi Devi - Myraid - Winged Bird
Telephone Conversation

PROSE :

Bernard Shaw : Spoken English and Broken English
Will and Ariel Durant : Is Progress Real
Stephen Leacock : The Conjurer's Revenge
A.J. Cronin : The best investment I ever made
Dr. B.R. Ambedkar : Prospects of Democracy in India
Martin Luther King Jr. : I have a Dream
Students of Barbiana : Letter to a teacher
J.B.D'Souza : Taking the law into their hands

GRAMMAR :

Idioms
Tenses
Detection of Errors

BUILDING COMPETENCY
A Course in Reading and Writing English

SHORT STORIES

Leo Tolstoy :Little Girls are Wiser Than Men
Ruskin Bond : How Far Is the River
William Shakespeakare : The Merchant of Venice
Rabindranath Tagore : Sacrifice

A Course in Listening and Speaking I

SCHOOL OF DISTANCE EDUCATION

ANDHRA UNIVESITY

(B.A/B.Com/B.Sc. Degree First Year)

పేపర్ - 1 ద్వితీయ భాష - జనరల్ తెలుగు

అభ్యసన ఫలితాలు (Course Objectives)

ఈ పాఠాన్ని ఒక క్రమబద్ధమైన పద్ధతిలో రూపొందించి అందిసున్నాం.

1.పాఠాల్లో పరిచయం, ఉద్దేశం, పాఠ్యం అర్థతాత్పర్యాలు, విషయ విభాగం పాఠ్యభాగ సారాంశం, సందర్భ సహిత వాఖ్యలు మాదిరి ప్రశ్నలు అభ్యాసాలు గుర్తించుకోవలసిన ముఖ్యాంశాలు

2. పరీక్ష దృష్ట్యా ప్రశ్నలు సమాధానాలు, ఆధారగ్రంథాలు చదవదగిన పుస్తకాలు అనే విభజన పాటించడమైంది.

3. పరిచయంలో ప్రక్రియ గురించి, రచయిత గురించి, పాఠ్యం గురించి పరిచయం ఉంటుంది.

4. ఉద్దేశంలో పాఠ్యం స్థూలపరిచయం ఉంటుంది. పాఠ్యంలో చదవలసిన అంశం ఉంటుంది

5. విషయ విభాగంలో పాఠ్యభాగ సారాంశంలోని ముఖ్యాంశాల విభజన ఉంటుంది. తద్వార పాఠ్యభాగ సారాంశం ఉంటుంది.

6. పద్యాలకు అర్థతాత్పర్యాలు, కొన్ని వాక్యాలకు సందర్భ సహిత వ్యాఖ్యలు ఉంటాయి

7. పాఠం చివర అదనపు సమాచారం చదవగిన పుస్తకాలు సమకూర్చారు

8. సాహిత్య పఠనాభిలాషను, అధ్యయపన కౌశలాన్ని, విమర్శనా దృష్టినీ రచనా శక్తిని పెంపొందిస్తాయనీ ప్రత్యేకించి పరీక్షల్లో మీకు కృతార్థతను చేకూర్చి పెడతాయని మేం ఆశిస్తున్నాము.

SCHOOL OF DISTANCE EDUCATION

ANDHRA UNIVESITY

(B.A/B.Com/B.Sc. Degree First Year)

పేపర్ - 1 ద్వితీయ భాష - జనరల్ తెలుగు పాఠ్యప్రణాళిక

ప్రాచీన కవిత్వం (Syllabus)

1. గంగాశంతనుల కథ - నన్నయ
2. మూషిక మార్జాల వృత్తాంతం - తిక్కన
3. హాంసీచక్రవాక సంవాదం - అల్లసాని పెద్దన
4. ఎఱుకత - తరిగొండ వెంగమాంబ

ఆధునిక కవిత్వం

5. మా కొద్దీ తెల్లదొరతనము - గరిమెళ్ళ సత్యనారాయణ
6. మహాప్రస్థానం - శ్రీశ్రీ
7. ముసాపరులు - జాషువ
8. మేఘదూతము - పుట్టపర్తి నారాయణాచార్యులు కథానికలు
9. గాలివాన - పాలగుమ్మి పద్మరాజు
10. ఆకలి - కొలకలూరి ఇనాక్
11. నమ్ముకున్న నేల - కేతు విశ్వనాథ రెడ్డి
12. జైలు - పొట్లపల్లి రామారావు

వ్యాకరణం:

1. సవర్ణదీర్ఘ, గుణ, యణాదేశ, వృద్ధి, త్రిక, గసడదవాదేశ, రుగాగమ, టుగాగమ, ఆమ్రేడిత, అత్వసంధి మొదలైనవి. సంధులు.

2. తత్పురుష, కర్మధారయు, ద్వంద్వ, ద్విగు, బహువ్రీహి మొదలైనవి. సమాసాలు ఉపవాచకము: నవల:

ప్రజల మనిషి - వట్టి కోట ఆశ్వారుస్వామి

I B.A. B.COM B.SC DEGREE

SANSKRIT Paper - 1

Course Objectives

1. To develop basic skills in reading, writing, and speakingSanskrit, including mastery of the Devanagari script, pronunciation, and basic sentence construction.
2. To acquire foundational knowledge of Sanskrit grammar, including noun declensions, verb conjugations, and sentencestructure.
3. To build a basic Sanskrit vocabulary, including common nouns, verbs, adjectives, and adverbs.
4. To cultivate an appreciation for the literary and cultural richness of Sanskrit, including the study of major literarygenres like epic poetry, and lyric poetry.
5. To develop skills in translating simple Sanskrit sentences and passages into English or Telugu.
6. To deepen understanding of Indian culture and philosophy through the study of Sanskrit texts in these fields, including the Ramayana and Mahabharatha and Panchatantra tales.
7. To cultivate an awareness of the historical and cultural contexts in which Sanskrit was used, including the study ofmajor periods and movements in Indian history.
8. To prepare for intermediate-level study in Sanskrit, including the mastery of more complex grammaticalconcepts and the study of more challenging texts.
9. To develop a critical awareness of the limitations and biases of translations of Sanskrit texts, and to develop the ability to evaluate different translations for accuracy and readability.
10. To engage with the wider community of scholars and enthusiasts of Sanskrit Language and culture, including the use of online resources, attendance at public lectures and events, and participation in student-led activities.

Syllabus

POETRY :

Lesson No. 1	Saranagathi From Valmiki Ramayanam Yuddhakanda 17th Canto Slokas 11 – 68
Lesson No. 2	Ahimsa Paramodharmah From Srimadbharatam, Adiparva 8th chapter Sloka 10 – to the end of 11 Chapter
Lesson No. 3	Raghoh Audaryam From Raghuvamsa 5th Canto 1 – 35 Slokas

PROSE:

Lesson No. 4 Mitrasampraptih

From Pancatantra – Ist Story (Abridged)

Lesson No. 5 Modern prose Chikroda katha

Andhra Kavya Kathah

By Sannidhanam Suryanarayana Sastry

Lesson No. 6 Computer Yanthram
By Prof. K.V. Ramakrishnamacharyulu

GRAMMAR

DECLENSIONS:

Nouns ending in Vowels:

Deva, Kavi, Bhanu Dhatr, Pitr, Go, Rama, Mati, Nadee, Tanu,Vadhoo,

Matr, Phala, Vari & Madhu

SANDHI:

Swara Sandhi : Savarnadeergha, Ayavayava, Guna, Vrddhi,Yanadesa

Vyanjana Sandhi : Scutva, Stutva, Anunasikadvitva, Anunasika,Latva, Jastva

Visarga Sandhi : Visarga Utva Sandhi, Visargalopa Sandhi, Visarga Repha Sandhi, Ooshma Sandhi

SAMASA :

(1) Dwandwa (2) Tatpurusha (Common)

(2a) Karmadharaya (2b) Dwigu

(2c) Paradi Tatpurusha (2d) Gatitatpurusha

(2e) Upapada Tatpurusha (3) Bahuvrihi

(4) Avyayibhava

CONJUGATONS

Ist Conjugations – Bhoo, Gam, Shtha, Drhs Labh, Mud,

IInd Conjugation – As

IIIrd Conjugation – Yudh,

IV th Conjugation – Ish

VIII Conjugation – Likh, Kri

IXth Conjugation – Kree

Xth Conjugation – Kath, Bhash, Ram, Vand,

SYLLABUS

BA/B.Com/B.Sc Common Paper
Hindi

A. Prose - Gadya Sandesh,
Editor : Dr. V.L. Narasimham Shiva KotiLorven Publications, Hyderabad.

B. Non-Detailed - Katha LokEditor : Dr. Ghanshyam
Sudha Publications, Hyderabad

C. **GRAMMAR** Pertaining to the following topics

I. Rewriting of sentences as directed based on : Case, Gender, Number, Tense, Voice.

II. Correction of sentences

III. Usage of words into sentences

IV. Karyalaya Hindi; Administrative Terminology (Prashasanik shabdavali), officialdesignations (padnam)

a. Changing English terms to Hindi

b. Changing Hindi terms to English

V. Sandhi Vichchhed

VI. Antonyms (Vilom Shabd)

D. Letter Writing - Personal Letters, Official Letters, Letter of Complaints, Application forappointment.

SYLLABUS

FOUNDATION COURSE

Common to all 1st Year Degree Students (B.A. / B.Com. / B.Sc.,)

CONTEMPORARY INDIA : ECONOMY, POLITY AND SOCIETY

UNIT - I

Basic features of Indian Economy - Trends in National Income - Role of Agriculture Sector - Problems, Remedial Measures; Industry - Large Scale, Small scale - Problems and remedial measures; a brief review of Industrial policies in India. Role of Public Sector in the context of globalization.

UNIT - II

Population, Poverty, Unemployment and Income Inequalities - Causes and Consequences - Remedies - Inflation - Causes and Remedies - Indian Tax Structure Globalisation, Economic Reforms and their impact on Indian Economy.

UNIT - III

Indian National Movement - Various stages - Its legacy. Integration of Native States and Formation of Modern India. Formation of Andhra Pradesh.

UNIT - IV

Basic Characteristics of Indian Constitution - Indian Political System, Emergence of All India Parties - Regional Parties - Coalition Politics.

Centre - State Relations - Emerging trends - Various Commissions - Rajamannar Committee, Anandpur Sahib Resolutions, Sarcaria Commission. Indian Foreign Policy - Non - Aligned Movement

- Local Self Governments in the light of 73rd 74th Constitutional amendments. Right to Information Act
- Governance- factors influencing Governance - Civil Society.

UNIT - V

Salient features of Indian Social Structure, Social Groups : Primary and Secondary, Association - Institution. Status and Role - Norms, Values and Customs. Concept of Socialisation – Agencies of Socialization.
Gender Issues - Women Liberation Movements in India - Domestic Violence, Women empowerment - Entrepreneurship Programs - Child Labour.

Human Rights – Importance and violation of Human Rights.

ANDHRA UNIVERSITY

FOR ALL B.A/B.COM/B.Sc. Common Paper

I YEAR

THEORY PAPER-IV

INTRODUCTION TO COMPUTERS

Course Objectives

1. Demonstrate the basic principles of computer software and hardware, Input devices, output devices.
2. Apply skills and concepts of computer hardware and software.
3. Learning about storage devices and operating system basics
4. Learning how data communicates.
5. Understanding the basics of email and web based communication.
6. Understanding the basics of information security and privacy.
7. Create personal, academic and business documents using MS-word.
8. Create PowerPoint presentations

COURSE OUTCOMES:

1. Gaining practical experience in using office automation tools for professional and personal use.
2. Prepare for further study or careers in office administration, data entry or other related fields.
3. Able to use of office automation tools, including formatting documents, creating spreadsheets, and designing presentations.
4. Developing a foundational understanding of office automation tools and their applications.
5. Developing skills in file management and data backup.

Syllabus

Unit-1: Exploring Computers

Exploring Computers and their uses :

Overview: Computers in our world, The computer defined, Computers for individual users, Computers for organizations, Computers in society, Why are

computers so important.

Looking inside the computer system:

Overview: Detecting the ultimate machine, The parts of a computer system, The information processing cycle, Essential computer hardware: processing devices, memory devices, Input and output devices, Storage devices, System software, Application software, Computer data, Computer users.

Using the keyboard and mouse:

Overview: The keyboard and mouse, The keyboard, How the computer accepts input from the keyboard, The mouse, Variants of the mouse, Ergonomics and input devices.

Inputting data in other ways:

Overview: Options for every need and preference, Devices for hand, optical input devices, Audio-visual input devices.

Video and Sound:

Overview: Reaching our senses with sight and sound, Monitors, Ergonomics and monitors, Data projectors, Sound systems.

Unit-2:Storage Devices and Operating System Basics

Printing: Overview: putting digital content in your hands, Commonly used printers, High-quality printers, Thermal – wax printers, Dye-sublimation printers, Plotters.

Transforming data into information:

Overview: The difference between data and information, How computers represent data, How computers process data, Machine cycles, Memory, Factors effecting processing speed, The computer's internal clock, The Bus, Cache memory.

Types of storage devices:

Overview: An ever-growing need, Categorizing storage devices, Magnetic storage devices—How data is stored on a disk, How data is organized on a magnetic disk,

How the operating system finds data on a disk, Diskettes, hard disks ,Removable high-capacity magnetic disks, Tape drivers, Optical storage devices, Solid-state storage devices, Smart cards, Solid-state disks.

Operating system basics:

Overview: The purpose of operating systems, Types of operating systems, Providing a user interface, Running programs, Managing hardware, Enhancing an OS utility software.

Networking Basics:

Overview: Sharing data anywhere, anytime, The uses of a network, Common types of networks, Hybrid networks, How networks are structured, Network topologies and protocols, Network media, Network hardware.

Unit-3:Data Communications and Computer Programs

Data Communications:

Overview: The local and global reach of networks, Data communications with standard telephone lines and modems, Modems, uses for a modem, Using digital data connections, Broadband connections, Wireless networks.

Productivity Software:

Overview: Software to accomplish the work of life, Acquiring software, Commercial software, Freeware and public domain software, Open-source software, Word processing programs, Spreadsheet programs, Presentation programs, Presenting information managers.

Database management Systems:

Overview: The mother of all computer applications, Databases and Database Management Systems, Working with a database.

Creating Computer programs:

Overview: What is a computer program, Hardware/Software interaction, Code, machine code, programming languages, Compilers and interpreters, Planning a computer program, How programs solve problems. Programming languages and the programming process:

Overview: The keys to successful programming, The evolution of programming languages, Worldwide web development languages, The Systems development lifecycle for programming.

Unit-4:MS-Word

Word Basics: Starting word, Creating a new document, Opening pre existing document, The parts of a word window, Typing text, Selecting text, Deleting text, Undo, Redo, Repeat, Inserting text, Replacing text, Formatting text, Cut, Copy, Paste – Formatting Text and Documents: Auto format, Line spacing, Margins, Borders and Shading.

Headers and Footers : Definition of headers and footers, creating basic headers and footers, creating different headers and footers for odd and even pages.

Tables : Creating a simple table, Creating a table using the table menu, Entering and editing text in a table, selecting in table, adding rows, changing row heights, Deleting rows, Inserting columns, Deleting columns, changing column width.

Graphics: Importing graphics, Clipart, Insert picture, Clip Art Gallery, using word's drawing features, drawing objects, text in drawing.

Templates: Template types, using templates, exploring templates, modifying templates.

Macros: Macro, Recording macros, editing macros, running a macro.

Mail Merge: Mail Merge concept, Main document, data sources, merging data source and main document, Overview of word menu options word basic toolbar.

Unit-5:Ms-Power Point

Power Point: Basics, Terminology, Getting started, Views

Creating Presentations : Using auto content wizard, Using blank presentation option, Using design template option, Adding slides, Deleting a slide, Importing Images from the outside world, Drawing in power point, Transition and build effects, Deleting a slide, Numbering aslide, Saving presentation, Closing presentation, Printing presentation elements.

BA/B.Com./B.Sc. Common Paper
PAPER I : General English
SYLLABUS

POETRY :

1. John Donne: THE SUN RISING
2. Wordsworth: THE SOLITARY REAPER
3. Robert Frost: THE ROAD NOT TAKEN
4. Chinua Achebe: REFUGEE MOTHER AND CHILD
5. Nissim Ezekiel: GOODBYE PARTY FOR MISS PUSHPA
6. Tripuraneni Srinivas: I WILL EMBRACE ONLY THE SUN

PROSE :

7. Satyajit Ray: FILM MAKING
8. Isai Tobolsky: NOT JUST ORANGES
9. Herman Wouk: A TALK ON ADVERTISING
10. AG Gardiner: ON SHAKING HANDS
11. Arnold Joseph Toynbee: INDIA'S CONTRIBUTION TO WORLD UNITY
12. Ngugi wa Thiongó: DECOLOISING MIND

SHORT STORIES FOR READING COMPETENCE :

13. Gita Hariharan: GAJAR HALWA
14. Norah Burke: MY BROTHER, MY BROTHER

ONE-ACT PLAYS FOR READING COMPETENCE :

15. Fritz Karinthy: REFUND (One Act Play)
16. William Shakespeare: JULIUS CAESAR (CAESAR'S MURDER SCENE)

WRITTEN COMMUNICATION:

17. WRITING CURRICULA VITAE
18. E-CORRESPONDENCE

EXERCISES FOR WRITING COMPETENCE:

19. JUMBLED PASSAGES
20. PARAGRAPH-WRITING

A COURSE IN LISTENING AND SPEAKING II:

Part- I: Listening Skills
Part- II: Speaking Skills
Part- III: communication Skills
Part- IV: Telephone Skills

SCHOOL OF DISTANCE EDUCATION

ANDHRA UNIVESITY

(B.A/B.Com/B.Sc, Degree Second Year

పేపర్ – 2 ద్వితీయ భాష – జనరల్ తెలుగు

అభ్యసన ఫలితాలు (Course Objectives)

ఈ పాఠాన్ని ఒక క్రమబద్ధమైన పద్ధతిలో రూపొందించి అందిసున్నాం.

1.పాఠాల్లో పరిచయం, ఉద్యేశం, పాఠ్యం అర్థతాత్పర్యాలు విషయ విభాగం, పాఠ్యభాగ సారాంశం, సందర్భసహిత వ్యాఖ్యలు మాదిరి ప్రశ్నలు అభ్యాసాలు గుర్తించుకోవలసిన ముఖ్యాంశాలు

2. పరీక్ష దృష్ట్య ప్రశ్నలు సమాధానాలు, ఆధారగ్రంథాలు చదవదిగిన పుస్తకాలు అనే విభజన పాటించడమైంది.

3. పరిచయంలో ప్రక్రియ గురించి, రచయిత గురించి, పాఠ్యం గురించి పరిచయం ఉంటుంది

4. ఉద్దేశంలో పాఠ్యం స్థూల పరిచయం ఉంటుంది. పాఠ్యంలో చదవలసిన అంశం ఉంటుంది.

5. విషయ విభాగంలో పాఠ్యభాగ సారాంశంలోని ముఖ్యాంశాల విభజన ఉంటుంది తద్వార పాఠ్యభాగ సారాంశం ఉంటుంది

6. పద్యాలకు అర్థతాత్పర్యాలు, కొన్ని వాక్యాలకు సందర్భ సహిత వ్యాఖ్యలుంటాయి

7. పాఠం చివర అదనపు సమాచారం చదవగిన పుస్తకాలు సమకూర్చారు

8. సాహిత్య పఠనాభిలాషను, అధ్యయన కౌశలాన్ని, విమర్శనా దృష్టినీ, రచనా శక్తిని పెంపొందిస్తాయనీ ప్రత్యేకించి పరీక్షల్లో మీకు కృతార్థతను చేకూర్చి పెడతాయని మేం ఆశిస్తున్నాము.

SCHOOL OF DISTANCE EDUCATION

ANDHRA UNIVESITY

(B.A/B.Com/B.Sc, Degree Second Year

పేపర్ – 2 ద్వితీయ భాష – జనరల్ తెలుగు

ప్రాచీన కవిత్వం (Syllabus)

1. వామనావతారము – పోతన
2. శాలివాహన విజయము – కొఱవి గోపరాజు
3. గ్రీష్మర్తువు – రఘునాథ నాయకుడు

ఆధునిక కవిత్వం

4. హరిజన శతకము – కుసుమ ధర్మన్న
5. ధర్మసంవాదము – పింగళి, కాటూరి
6. బతకమ్మా! బ్రతుకు – కాళోజీ నారాయణరావు
7. మనిషి – డా॥అందెశ్రీ
8. రాయలసీమ – గంజి కేంద్రము – బెళ్లూరి శ్రీనివాసమూర్తి
9. వంటిల్లు – విమల

గద్యభాగం

1.తెలుగుభాష – ఆచార్య గుజ్జర్లమూడి కృపాచారి
2. వ్యక్తిత్వ వికాసం – ఆచార్య రాచపాళెం చంద్రశేఖరరెడ్డి
3.మాధ్యమాలకు రాయడం – ఆచార్య యస్.జి.డి. చంద్రశేఖర్
4. అభివ్యక్తి నైపుణ్యాలు – డా॥ పి.వి. సుబ్బారావు

ఉపవాచకం:

1. పాలేరు – బోయిభీమన్న

వ్యాసాలు, వ్యాకరణం

అలంకారములు –ఉపమ, రూపక, ఉత్ప్రేక్ష, స్వభావోక్తి, అతిశయోక్తి – అర్థాంతరన్యాస, దృష్టాంతము

ఛందస్సు – ఉత్పలమాల, చంపకమాల, శార్దూలం, మత్తేభం, కందం, తేటగిత్రి ఆటవెలది.

School of Distance Education

Andhra University - Visakhapatnam

II B.A. B.COM B.SC DEGREE

SANSKRIT Paper – 2

Course Objectives

1. To continue building a strong foundation in Sanskrit grammar, including the mastery of Alankaaras, Pratyaas, andsandhi rules.
2. To develop the ability to read and comprehend simple Sanskrit texts, including prose and poetry, with the help of adictionary and basic vocabulary.
3. To deepen understanding of Sanskrit vocabulary, including the ability to recognize and use common words, idioms, andexpressions.
4. To develop skills in translating Sanskrit texts into English orTelugu, with attention to accuracy, clarity, and style.
5. To cultivate an appreciation for the literary and cultural richness of Sanskrit texts, including the study of major genreslike moral prose, drama, and lyric poetry.
6. To deepen understanding of Indian philosophy and religion through the study of Sanskrit texts in these fields, includingthe Mahabharatha and Upanishads.
7. To develop skills in analysis and interpretation of Sanskrittexts, including the ability to identify themes, motifs, and rhetorical devices.
8. To cultivate an awareness of the historical and cultural contexts in which Sanskrit texts were produced, including thestudy of major periods and movements in Indian history.
9. To prepare for advanced study in Sanskrit or related fields, including the pursuit of graduate degrees or careers in academia, publishing, translation, or cultural preservation.
10. To develop independent research skills through the completion of a assignments on a topic related to Sanskritlanguage, literature, or culture.

Syllabus

(1)	Drama	(2)	Drama (Modern)
(3)	Upanishad	(4)	Prose
(5)	Bhoja Prabandha story	(6)	History of Literature
(7)	Alankaras ,	(8)	Grammar

Drama

1) Pratima Gruham

Pratima of Bhasa III act only

2) Modern Drama

Bharata Samskruteh mulam

P. Sreeramachandrudu from (Susamhata Bharatam VI act)

Prose

4) Sukanasopadesah

From Kadambari Sangraha

5) Bhojasya Saraswati Sushama

From Bhojaprabandha Page No. 74 (Abridged form)

6) Poets and Books from History of literature

1) Panani	(2) Kautilya
3) Bharatamuni	(4) Bharavi
5) Magha	(6) Sri Harsha
7) Bhavabhuti	(8) Sankaracharya
9) Dandin	(10) Jagannadha

7) Alankaras from Kuvalayananda

(1)	Upama	(2)	Ananvayaa
(3)	Utpreksha	(4)	Deepakam
(5)	Aprastutaprasamsa	(6)	Drstantam
(7)	Arthantaranyasa	(8)	Virodha Bhasa
(9)	Ullekha	(10)	Vyajasthuti

8) Grammar

Declensions :

Halanta Nouns

(1)	Jalamuc	(2)	Vac
(3)	Marut	(4)	Bhagavat
(5)	Pachat	(6)	Rajan
(7)	Gunin	(8)	Naman
(9)	Vidwas	(10)	Manas

Pronouns :

Asmad, Yushmad, Idam, Tat, Etat, Yat, KimParticiples :

Ktva, Lyap, tumun, Kta. Ktavat, Shatr, Shanac, Tavya

BA/B.Com/B.Sc Common Core
SECOND LANGUAGE

HINDI

PAPER-II

A. Poetry Text - Kavya Deep

Editor : Sri B.Radha Krishna Murthy, Maruthi Publications, Guntur.

B. History of Hindi Literature:

Main tendencies of all the four ages with special references to the following authors and poets:

(1) Chand Vardai (2) Kabir das (3) Surdas (4) Tulasidas (5) Mirabai (6) Raheem (7) Biharila (8) Bharatendu Harisdhandra (9) Mahaveer Prasad Dwivedi (10) Maithilisharan Gupt (11) Premchand (12) Jayashankar Prasad (13) Pant (14) Nirala (15) Maha Devi Verma (16) Agyeya (17) Dinkar.

C. General Essay:

(1) Sahitya Aur Samaj (2) Vidyarthi Rajiniti (3) Vidyarthi Aur Anushasan (4) Aaj Ki Shikasha Niti (5) Vigyan: Abhishap Ya Vardan (6) Nari Shikasha (7) Samaj Main Nari ka Sthan (8) Adhunik Shiksha Aur Nari (9) Bharat Main Berojgari Ki Samasya (10) Bharat Par Bhoomdalikaran Ka Prabhav (11) H.I.V./Aids (12) Paryavaran Aur Prabooshan (13) Bharat Main Badhati Hui Janasankhya Ki Samasya

D. Translation from English to Hindi

E. Prayojan Moolak Hindi: (1) Prayojanmooka Hindi: Arth Evam Swarop (2) Raj Bhasha, Rastra Bhasha aur Sampark Bhasha.

SYLLABUS
(BA/B.Sc/ B.COM COMMON PAPER)
Paper-III ENVIRONMENTALSTUDIES

Course Objectives:

1. To make the students realize the importance and their role in the protection and maintenance of a healthy Environment for sustainable development
2. To enable students to grasp the significance and issues related to ecosystems, biodiversity and natural resources, ways of managing/ protecting the environment
3. To enable students to have minimal understanding of environmental pollution, solid waste management and climate change and act with concern environmental issues.
4. To make students aware of the environmental policies and movements, and the role of individuals and communities in environmental protection for educating and inspiring the young minds.

At the end of the course, students will—

1. Understand the importance and dimension of a healthy environment, become environmentally conscious, skilled and responsible in all their action with a concern for sustainable development.
2. Comprehend the significance and issues related to ecosystems, natural resources and biodiversity and become aware of the need and ways to protect/preserve them.
3. Grasp the issues related to environmental pollution, solid waste management and climate change and become conscious and proactive in the discharge of their responsibilities towards the environment
4. Become aware and appreciate the value and concern of environmental movement and policies and the role of communities, and act responsibly on environment related issues.

Unit – 1: Environmental studies - Introduction

1. Definition of Environment-Its scope and importance.
2. Measuringand defining Environmentaldevelopment; indicators

Unit – 2: Basic principles of Ecosystem functioning

1. Concept of an ecosystem
2. Structureand function of an ecosystem.

3. Producers, Consumers and decomposers,
4. Energy flow in the ecosystem.
5. Food chains, food webs and ecological pyramids
6. Introduction, types, characteristic features, structure and functions
    - Forest ecosystem
    - Grassland ecosystem
    - Desert ecosystem
    - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit – 3:Environmental and Natural Resources

1. Forest resources
    - Use and over-exploitation
    - Deforestation
    - Timber extraction
    - Mining and dams- their effects on forest tribal people
    - Case studies
2. Water resources
    - Use and over—utilization of surf ace and ground water
    - Floods, droughts
    - Conflicts over water
    - Dams –benefits and costs
    - Mineral resources
    - Use and exploitations
    - Effects of extracting and using mineral resources
    - Case studies
3. Food resources
    - World food problem
    - Changes caused by agricultural and overgrazing
    - Effects of modern agriculture, fertilizer, pesticide problems, water logging and salinity.
    - Case studies
4. Energy resource
    - Growing energy needs
    - Renewal and non renewable energy sources
    - Use of alternate energy sources
    - Case studies

5. Land resources
    - Land resource
    - Common property resources
    - Land degradation
    - Soil erosion and desertification

Unit – 4:Biodiversity and its conservation

1. Introduction – Genetic, species and ecosystem diversity
2. Bio-geographical classification of India
3. Value of biodiversity – consumptive and productive use, social ethical, and option values
4. Biodiversity – global, national and local levels
5. Hot spots of biodiversity – habitat loss, poaching of wildlife, man-wildlife conflicts
6. India as mega diversity nation.
7. Endangered and endemic species of India.
8. Conservation of biodiversity -in-situ and ex-situ conservation

II YEAR B.A./B.Com., /B.Sc.,
PAPER-2 OFFICE AUTOMATION TOOLS

OBJECTIVES:

1. Understanding the features and functionality of office automation tools, including word processing software, spreadsheet software and presentation software.
2. Learning how to create and manage databases.
3. Understanding the basics of email and web based communication.
4. Understanding the basics of information security and privacy.

COURSE LEARNING OUTCOMES:

1. Gaining practical experience in using office automation tools for professional and personal use.
2. Prepare for further study or careers in office administration, data entry or other related fields.
3. Able to use of office automation tools, including formatting documents, creating spreadsheets, and designing presentations.
4. Developing a foundational understanding of office automation tools and their applications.
5. Developing skills in file management and data backup.

Unit-1: MS EXCEL BASICS

Excel basics: The usual spread sheet features, overview of excel features, Getting Started, creating a new work sheet, selecting cells, navigating with the undoing and repeating actions, entering and formatting numbers, entering and editing formulas, repeating cells, order of evaluation in formulas, look up tables, copying entries and equations to minimize typing, more auto fill examples, creating custom fill lists, protecting and an protecting documents and cells.

Rearranging worksheets: Moving cells, copying cells, sorting cell data, inserting rows, inserting columns, inserting cells, inserting as you paste, deleting parts of a worksheet, clearing parts of a worksheet, how formulas react to worksheet design changes, auditing tools help spot potential problems.

Excel formatting tips and techniques: Excel page setup, changing column widths and row heights, auto format, manual formatting, using styles, forma codes alter a number's appearance, format printer speeds up format copying, changing font sizes and attributes, adjusting alignments, centering text across columns, using border

buttons and commands, changing colors and shading, inserting and removing page breaks, hiding rows and columns.

Organizing large projects: Using names, splitting windows and fixing titles, outlining your worksheets, working with multiple worksheets, using multiple worksheets in a workbook, viewing multiple windows, summarizing information from multiple worksheets.

An introduction to functions: Parts of a function, functions requiring add-ins, online functions help, the function wizard, examples of functions by category, error messages from functions.

Unit-2: EXCEL CHARTS, GRAPHICS AND FUNCTIONS Excel's chart features: chart parts and terminology, instant charts with the chart wizard, creating charts on separate worksheets, resizing and moving charts, adding chart notes and arrows, editing charts, rotating 3-D charts, changing worksheet values by drawing chart parts, printing charts, deleting charts, setting the default chart type, controlling which series on which axis, adding overlay charts, creating trend lines, data map.

Working with graphics in Excel: Creating and placing graphic objects, resizing graphics, positioning graphics on worksheets, drawing lines and shapes, examples of graphics, possible sources of excel graphics, excel slide shows.

Introduction to Excel's command macros: Recording your own macros, running macros, assigning macros to buttons.

Using worksheets as databases: Database concepts and terms, creating an excel database, working with data forms, filtering-a better way to find, sorting excel databases, cross-tabulating databases, adding subtotals to databases.

Automating what-if projects: General organizational tips, scenario manager, finding the right number with solver.

Auditing and troubleshooting worksheets: Using error values to locate problems, using iteration to solve circular references, using the info window to find errors, using the auditing command to trouble shoot.

Unit-3: MS ACCESS BASICS

Introduction to Access : Access concepts and terms, starting and quitting access, the access workspace and tools, the views.

Creating a simple database and tables: The access table wizard, creating databases without the wizard, field names, data types and properties, adding or deleting fields in tables, resizing fields, changing the appearance of text in tables, freezing columns, primary key fields, indexing fields, viewing a list of database properties.

Forms: The form wizard, saving forms, modifying forms.

Entering and editing data: Typing, adding records, duplicate previous entries without retyping, switching out of data entry mode, when do entries get saved?, undo, correcting entries, global replacements, moving from record to record in a table, entry and navigational shortcuts.

Finding, sorting and displaying data: Queries and dynasets, creating and using queries, returning to the query design, multiple search criteria, finding incomplete matches, using wildcards in queries, requesting range of records, hiding columns, reformatting dynasets, multilevel sorts, showing all records after a query, saving queries for latter use, cross tab queries, find and replace.

Unit-4: ACCESS REPORTS, FORMS AND GRAPHICS

Printing reports, forms, letters and labels: Simple table, forms, and database printing, defining advanced reports, manual reporting and modifying, modifying section contents, properties in reports, saving formula for reuse, printing mailing labels, changing label designs.

Relational databases: Flat versus relational, how relationships work, exercise: creating a simple relationship, types of relationships, defining and redefining relationships, deleting relationships, creating relationships.

Expressions, macros and other automation: Expressions, using expressions in reports, using expressions in queries, using expressions in forms, expression builders.

Graphics in databases: Objects: linked, embedded, bound and unbound, graphics as form and report embellishments, bound graphics in records, adding graphics to buttons, chart wizard: charting your data.

Linking, importing and exporting records: Importing versus linking, linking other databases as tables, importing data from spread sheet files, importing data from word files, exporting access data.

Unit-5: FUNDAMENTALS OF INTERNET

The Internet and the world wide web: Overview: What is Internet, the Internet's history, The Internets major services, Understanding the world wide web, using your browser and the world wide web, navigating the web, closing your browser, getting help with your browser, searching the web, search results and web sites.

E-mail and other Internet Services: Overview: Communicating through the Internet, using e-mail, using an e-mail program, stomping out spam, using web-based e-mail services, more features of the Internet.

Connecting to the Internet: Overview: Joining the Internet phenomenon, connecting to the Internet through wires, how PC applications access the Internet, connecting to the Internet wireless.

Doing business in the online world: Overview: commerce on the world wide web, E-commerce at the consumer level, E-commerce at the business level, Business, the Internet and everything, telecommuters.

III BA/B.Com./B.Sc. Common Paper

Paper I :

Science, Technology & Development(Foundation Course - II)

Course Objectives :

CO1 : Learner will get the knowledge on Earth system
CO2 : Able to develop the concept on Evolution
CO3 : Gets general awareness about drugs
CO4 : Telecommunication types familiarity

Unit - I : Science :

1. Earth System : Characteristics features - Lithosphere, Hydrosphere - Atmosphere, Lithosphere- Soil Characteristics, texture, fertility and its control. Hydrosphere - Hydrological cycle - water bodies - ponds, lakes, rivers and their characteristics - Water consumption at global level and regional level - Management of water bodies. Atmosphere - Troposphere, Stratosphere, Ionosphere - Composition of air - Ozone - Ozone layer - its importance.
2. Life Sciences - Concepts of origin life - Evolution and diversity of life - Cell - Molecular basis of life and living forms - Mendelian concepts on inheritance - its impact on society - Blood - Blood groups - transfusion - Wild life and its conservation.
3. Chemical Science - The definitions, general awareness and importance of

   i) Drugs - Antibiotics, Penicillin, Tetracycline, Sulpha Drugs, Anti - Malarials, Anti pyretics, Analgesics.

   ii) Soaps and Detergents - Sources - mechanism of soap action - development of detergents
   - applications - disadvantages of detergents.

   iii) Plastics and polymers - Polyethylene, polyvinlychloride (PVC), nylon 66 - rubber and synthetic rubber.

   iv) Agrochemical and Fertilizers - Pesticides - Introduction - DDT, BHC, Malathion, Parathion - Fungicides - Rodenticides, Weedicides, Nitrogen and Phosphorus fertilizers - Microfertilizers, Bio - pesticides, neem and bacillus thuringensis.

   v) Bio fertilizers - Applications and their affects on nature.

   vi) Vitamins - Natural sources - importance - deficiencies (Structure and preparation methodsfor the syllabus mentioned in (i) to (iv) are excluded).

Unit - II : Technology and Development :

1. Communication - Definition, nature and concept of communication role of communication in society. Types of Communication - Intrapersonal, Interpersonal, group and mass communication. Traditional and folk forms of communication in India. New Media technologies - Satellite, Cable and Internet. Process of Communication : Functions of communication, elements and barriers of communication. Mass Media - Press, Radio, TV and Films. Functions of mass communication. Transport - Wheel, Steam, Engine, Automobile, Ship, Airplane. Comparison of Road, Rail, Water and Air transports in terms of infrastructure, speed, costs etc.
2. Energy - Sources - Renewable sources of energy - Non - renewable sources of energy - Conventional energy sources - non conventional energy- wind, water, tidal, Solar, geothermal, atomic energy, bio - fuels - sources and their applications - Energy Management - Energy Conservation - Future needs of energy.
3. Health - Problems - Sex education - Venereal diseases, AIDS, General Protozoan, Bacterial & Viral diseases.
4. Bio - Technology - Introduction - Applications - health and Human welfare - Agriculture - Mush- room culture - Medical Plants.
5. Green Revolution - Introduction - Types of crops developed in green revolution.
6. Food Technology - Introduction - Food processing - Methods of processing - Food preservation and methods of preservation.
7. National institutions (Science) - Institutions imparting education - Institutions performing research and development - Role of Scientific institutions in Research, Technology and Development.

B.Sc CHEMISTRY

PROGRAMME OUTCOMES

PO-1: B.Sc. Chemistry curriculum is so designed to provide the students a comprehensive understanding about the fundamentals of chemistry covering all the principles and perspectives.

PO-2: The branches of Chemistry such as Organic Chemistry, Inorganic Chemistry, Physical Chemistry and Analytical Chemistry expose the diversified aspects of chemistry where the students experience a broader outlook of the subject.

PO-3: The syllabi of the B.Sc. Chemistry course are discretely classified to give stepwise advancement of the subject knowledge right through the three years of the term.

PO-4: The practical exercises done in the laboratories impart the students the knowledge about various chemical reagents and reactions. Thereby, hone their skills of handling the corrosive, poisonous, explosive and carcinogenic chemicals making themselves employable in any kind of chemical industries. They are also trained about the adverse effects of the obnoxious chemicals and the first aid treatment.

PROGRAMME SPECIFIC OUTCOMES

PSO-1: The students will understand the existence of matter in the universe as solids, liquids, and gases which are composed of molecules, atoms and sub atomic particles.

PSO-2: Students will learn to estimate inorganic salt mixtures and organic compounds both qualitatively and quantitatively using the classical methods of analysis in practical classes.

PSO-3: Students will grasp the mechanisms of different types of reactions both organic and inorganic and will try to predict the products of unknown reactions.

PSO-4: Students will learn to synthesize the chemical compounds by maneuvering the addition of reagents under optimum reaction conditions.

Andhra University B.Sc., Chemistry Syllabus

1st Year Paper – I

Course outcomes:

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

CO1: Understand the basic concepts of p-block elements

CO2: Explainthe difference between solid, liquid and gases in terms of inter molecular interactions.

CO3: .Apply the concepts of gas equations, Ph and electrolyte swhile studying other chemistry courses.

CO4: Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.

CO5: formulate the mechanism of organic reactions by recallingand correlating the fundamental properties of the reactants involved.

CO6:Learn and identify many organicr eaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.

CO7: Correlate and describe the stereochemical properties of organic compounds and reactions.

UNIT -1 (Inorganic Chemistry-I)

1. s-block elements: General characteristics of groups I & II elements, diagonal relationship between Li & Mg, Be & Al.

2. p-block elements: General characteristics of elements of groups 13,14,15,16and 17 Group -13 : Synthesis and structure of diborance and higher borances (B4H10 and B5H9),

boron-nitrogen compounds (B3N3H6 and BN)

Group-14 : Preparation and applications of silences and silicones, graphitic compounds. Group-15 : Preparation and reactions of hydrazine, hydroxylamine, phosphazenes.

Group -16 : Classifications of oxides based on (i) Chemical behavior and (ii) Oxygen content.

Group -17 : Inter halogen compounds and pseudo halogens

3. Organometallic Chemistry

Definition and classification of organometallic compounds, nomenclature, preparation, properties and applications of alkyls of 1,2 and 13 group elements.

UNIT - II (Organic Chemistry -1)

1. Structural theory in Organic Chemistry

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H2O, NH3 & AlC13)

Bond polarization : Factors influencing the polarization of covalent bonds, electro negativity- 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, carbanions, carbenes and nitrenes.

Types of Organic reactions: Addition - electrophilic, nucleophilic and free radical. Substitution - electrophilic, nucleophilic and free radical. Elimination - Examples (mechanism not required).

2. Acyclic Hydrocarbons

Alkanes - IUPAC Nomenclature of Hydrocarbons. Methods of preparation: Hydrogenation of alkynes and alkenes, Wurtz reaction, Kolbe's electrolysis, Corey - House reaction. Chemical reactivity- inert nature, free radical substitution mechanism. Halogenation example - reactivity, selectivity and orientation.

Alkenes - Preparation of alkenes (a) by dehydration of alcohols (b) by dehydrochlorination of alky halides (c) by dehalogenation of 1,2 dihalides (brief mechaniaasm), Saytzev's rule.

Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markonikow's rule, addition of H2O, HOX, H2,SC4 with mechanism and addition of HBr in the presence of peroxide (anti - Markonikov's addition).

Oxidation - hydroxylation by KMnO4, OsO4, peracids (via epoxidation) hydroboration, Dienes

- Types of dienes, reactions of conjugated dines -1,2 and 1,4 addition of HBr to 1,3 - butadiene

and Diel's - Alder reaction.

Alkynes - Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties; Acidity of acetylenic hydrogen (formation of Metal acedtylides).

Preparation of higher acetylenes, Metal ammonia reductions physical properties. Chemical reactivity-electrophilic

addition of X2, HX, H2O (Tautomerism), Oxidation with KMnO4, OsO4, reduction - and Polymerization reaction of acetylene.

3. Alicyclic hydrocarbons (Cyeloalkanes)aa

Nomenclature, Preparation by Freunds methods, hewing dicarboxylic metal salts. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloakanes-Baeyer's strain theory, Sachse and Mohr predictions and Pidtzer's strain theory. Conformational structures of cyclobutance, cyclopentane, cyclonehexane.

4. Benzene and its reactivity

Concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene.

Concept of aromaticity - aromaticity (definition), Huckels rule - application to Benzenoid (Benzene, Napthalene) and Non -Benzenoid compounds (cyclopropenyl cation, cyclopentadieny 1 anion and tropylium cation)

Reactions - General mechanism of electrophilic substitution, mechanism of nitration. Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of ortho,

para and meta directing groups. Ring activating and deactivating groups with examples

(Electronic interpretation of various groups like NO2 and Phenolic). Orientation of (i). Amino, methoxy and methyl groups (ii). Carboxy, nitro, nitrile, carbony 1 and Sulfonic acid groups, (iii)

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

5. Polynuclear Hydrocarbons -

Structure of naphthalene and anthracene (Molecular Orbital diagram and resonance energy) Any two methods of preparation of naphthalene and reactivity. Reactivity towards electrophilic substitution. Nitration and Sulfonation as examples.

UNIT -III - Physical Chemistry (1)

I) Gaseous state

Compression factors, deviation of real gases from ideal behaviour. Vander Waal's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. The vander Waal's equation and the critical state. Relationship between critical constants and van Waal's constants. The law of

corresponding states reduced equation of states. Joule Thomson effect. Liquefaction of gases : i) Lindensmethod and ii) Claude's method.

II) Liquid state

Intermolecular forces, structure of liquids (qualitative). Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into Smectic and Nematic. Differences between liquid crystal and solid/ liquid. Application of liquid crystals as LCD devices.

Ill Solid state

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Definition of lattice point, space lattice, unit cell. Bravis lattices and crystal systems. X-ray differaction and crystal structure. Bragg's law. Determination of crystal structure by Bragg's method and the powder method. Indexing of planes and structure of NaCl and KC1 crystals.

Defects in crystals. Stoichiometric and non-stoichiometric defects. Band theory of semiconductors. Extrinsic and intrisic semiconductors, n-type and p-type semiconductors and their applications in photo electrochemical cells.

IV Solutions

Liquid-liquid-ideal solution, Raoult's law. Ideally dilute solutions, Henry's law. Non-ideal

solutions, Vapour pressure-composition and vapour pressure-temperature curves.

Azeotropes-HCI-H2O, ethanol - water systems and fractional distillation. Partially miscible liquids-phenol-water; trimethylamine-water, nicotine - water systems. Effect of impurity

on consulate temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

V Colloids and surface chemistry

Definition of colloids. Solids in liquids (sols), preparation, purification, properties-kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid Liquids in Liquids (emulsions) preparation, properties, uses. Liquid in solids (gels) preparation, uses,

Adsorption : Physical adsorption, chemisorption, Freybdkuch, Langmuir adsorption isotherms. Applications of adsorption.

UNIT -IV

(General Chemistry -I)

1. Atomic structure elementary quantum mechanics

Blackbody radiation, Planck's radiation law, photoelectric effect, Compton effect, de Broglie's hypothesis, Heisenberg's uncertainty principle, Postulates of quantum mechanics. Schrodinger wave equation and a particle in a box, energy levels, wave functions and probability densities. Schrodinger wave equation for H-atom. Separation of variables, Radial and angular functions, hydrogen like wave functions, quantum numbers and their importance.

2. Chemical Bonding

Valence bond theory, hybridization, VB theory as applied to CIF3 BrF5, Ni(CO)4, XeF2 Dipole moment - orientation of dipoles in an electric field, dipole moment, induced dipole moment, dipole moment and structure of molecules. Molecular orbital theory - LCAO method, construction of MO. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N2,O2,HC1, CO and NO). Compression of VB and MO theories.

3. Stereochemistry of carbon compounds Molecular representations - Wedge, Fischer, Newman and Saw-Horse formulae.

Stereoisomerism, Stereoisomers: enantiomers diastereomers-definition and examples. Conformational and configurational isomerism-definition. Conformational isomerism of ethane and n-butane.

Enantiomers: Optical activity - wave nature of light, plane polarized light, interaction with molecules, optical rotation and specific rotation. Chiral molecules-definition and citeria absence of plane, center, and Sn axis of symmetry - asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and disymmetric molecules (trans-1,2 - dichloro cyclopropane).

Chiral centers: definition - molecules with similar chiral carbon (Tartaric acid), definition of mesomers - molecules with dissimilar chiral carbons (2,3-dibromopentane). Number of enantiomers and mesomers-calculation.

D.L and R,S configuration for asymmetric and disymmetric molecules. Cahn-Ingold-Prelog rules. Racemic mixture -racemization and resolution techniques.

Diastereomers: definition-geometrical isomerism with reference to alkenes-cis, trans and E,Z-configuration.

4. General Principles of Inorganic qualitative analysis

Solubility product, common ion effect, characteristic reactions of anions, elimination of interfering anions, separation of cations into groups, group reagents, testing of cations.

II B.Sc. Chemistry (THEORY)

Paper-II: INORGANIC, ORGANIC, CHEMICAL, PHYSICAL, GENERAL

Course outcomes:

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

CO1. To learn about the laws of absorption of light energy by molecules and the subsequent photochemical reactions.

CO2. To understand the concept of quantum efficiency and mechanisms of photo chemical reaction

CO3. Understand and explain the differential behaviour of Organic compounds based on fundamental concepts learnt.

CO4. Formulate the mechanism of organic reactions by Recalling and correlating the fundamental properties of the reactants involved.

CO5. Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.

CO6. Correlateanddescribethestereochemicalpropertiesoforganiccompoundsandreactions.

UNIT-1 (Inorganic chemistry-II)

1. Chemistry of d-block elements: characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states and e.m.f. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu traids in respext of electronic configuration and reactivity of different oxidation states.

II. Chemistry of f-block elements :Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contaction, consequences of lanthanide contraction, magnetic properties, spectral properties and separation of lanthanides by ion exchange and solvent extraction methods. Chemistry of actinides - electronic configutation, oxidation states, actinide contraction, position of actinides in the periodic table, comparision with lanthandies terms of magnetic properties, spectral properties and complex formation.

III. Theories of bonding in metals: Valence bond theory, explanation of metallic prpoerties and its limitations, Free electron theory, thermal and electrical conductivity or

metals, limitations, Band theory, formation of bands, explanation of conductors semiconductors and insulators.

IV. Metal carbonyls and related compunds-EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni. Metal nitrosyls and metallocenes (only ferrocence).

UNIT-II (Organic chemistry-II)

1. Halogen compounds Nomenclature and classification of alkyl (into primary, secondary, tertiary, aryl, aralkyl, allyl, vinyl, benzyl halies.

Chemical reactivity, formation of RMgX Nucleophilic aliphatic substitution reactiohn, - classification into S 1 and S2 energy profile diagram of S1 and S2 reactions. Stereochemistry of S 2 (Walden Inversion) S 1 (Racemisation). Explanation of both by taking the wxample of optically active alkyl halde-2bromobutane. Ease of hydrolysis-comparision of alkyl, benzyl, alkyl, vinyl and arly halides

2. Hydroxy compounds Nomenclature and classification of hydroxy compunds.

alcohols: Preparation with hydroboration reaction, Grignard synthesis of alcohols. Phenols: Preparation i) from diazonium salt, ii) from aryl sulphonates, iii) from cumene. Physicia properties - Hydrogen bonding (intermolecular and intramolecular). Effect of hydrogen bonding on boiling point and solubility in water.

Chemical properties:

a. acidic nature of phenols

b. formation of alkoxides/ Phenoxides and their reaction with RX.

c. replacement of OH by X using PCI, PCI, PB, SOCI and with HX/ZnCI

d. esterification by acids (Mechanism).

e. dehydration of alcohols.

f. oxidation of alcohols by CrO, KMnO

g. special reaction of phenols: Bromination, Kolb-Schmidt reaction, Riemer

Tiemann reaction, Fries rearrangment, Azocoupling.

Identification of alcohols by oxidation with KMnO, ceric ammonium nitrate, lucas reagent and phenols by reaction with FeCI.

Po9lyhydroxy compunds: Pinacol-Pinacolone rearrangment.

3. Carbonyl compounds

Nomenclature of aliphatic and aromatic carbonyl compunds, structure of the carbonyl group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using1,3-dithianes, synthesis of ketones fromnitriles and from carboxylic acids.

Physicia properties: absence of hydrogen bonding, keto-enol tautomerism, reactivity of

carbonyl group in aldehydes and ketones.

Nucleophilic addition reaction with a) NaHSO, b) HCN, c) RMgX, d) NH OH,

e) PhNHNH, 1)2,4 DNPH, g) Alcohols-formation of hemiacetal and acetal. Halogenation using PCI with mechanism.

Base catalysed reactions: a) aldol, b) Cannizzaro reaction, c) Perkin reaction, d) Benzoin

condensation, e) haloform reaction, f) Knoevenagel reaction.

Oxidationof aldehydes-Baeyer-Villager Oxidation of Ketones.

Reduction: Clemmensen reduction, Wolf-Kishner reduction, MPV reduction, reduction with LIAIH and NaBH.

Analysis of aldehydes and ketones with a) 2,4-DNT test, b) Tollen's test, c) Fehling text, d) Schiff test,

e) Haloform test (with equation).

4. Carboxylic acids and derivatives

Nomenclature, classificationand structure of carboxylic acids.

Methods of preparation by

a) hydrolysis of nitriles, amides and esters,

b) carbonation of Grignard reagents.

Special methods of preparation of aromatic acids by

a) oxidation of side chain.

b) hydrolysis by benzotrichlorides.

c) Kolbe reaction.

Physical properties: Hydrogen bonding, dimeric association, acidity- strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids.

Chemical properties: Reactions involving H, OH and COOH groups- salt formation,

anhydride formation, acid chloride formation, amide formation and esterification (mechanism), Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt-Eistert synthesis, halogenation by Hell-Volhard- Zelinsky reaction.

Derivatives of carboxylic acids: Reaction of acid chlorides, acid anhydrides, acid amides,

esters (mechanism of the hydrolysis of esters by acids and bases).

5. Active methylene compounds

Acetoacetic esters: preparation by Claisen condensation, keto-enol tauton Tensm. Acid

hydrolysis and ketonic hydrolysis. Preparation of a) monocarboxylic acids.

b) dicarboxylic acids. Reaction with urea

Malonic ester: preparation from acetic acid. Synthetic applications; Preparation of a)

monocarboxylic acids (propionic acid and n-butyric acid).

b) dicarboxylic acids (succinic acid and adipic acid).

c) a,U-unsaturated carboxylic acids (crotonic acid).

Reaction with urea.

Exercises in interc,onversion

Unit-III (Physical chemistry-II)

1.Phase rule

Concept of phase, components, degree of freedom. Derivation of Gibbs phase rule. Phase equilibrium of one component-water system. Phase equilibrium of two-component system, solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag system, desilverisation of lead. Solid solutions-compound with congruent melting point-(Mg-Zn) system, compound with incongruent melting point-NaCl-water system. Freezing mixtures.

2. Dilute solutions

Colligative properties. Raoult's law, relative lowering of vapour pressure, iTs relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties. Van't Hoff factor, degree of dissociation and association.

Electrochemistry

Specific conductance, equivalent conductance, measurement of equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law. Debye- Huckel-Onsagar's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorf s method. Application of conductivity measurements-determination of dissociation constant (K) of an acid, determination of solubility product of sparingly soluble salt, conductometric titrations. Types of reversible electrodes-the gas electrode, metal-metal ion, metal-insoluble salt and redox electrodes. Electrode reactions, Nernst equation, single electrode potential, standard Hydrogen

electrode, reference electrodes, standard electrode potential, sign convention, electrochemical series and its significance. Reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements. Computation of cell EMF. Applications of EMF measurements, Calculation of thermodynamic quantities of cell reactions (AG, AH and K). Determination of pH using quinhydrone electrode, Solubility product of AgCl. Potentiometric titrations.

Unit IV (General chemistry-II)

1.Molecular symmetry

Concept of symmetry in chemistry-symmetry operations, symmetry elements. Rotational axis of symmetry and types of rotational axes. Planes of symmetry and types of planes. Improper rotational axis of symmetry. Inversion centre. Identity element. The symmetry operations of a molecule form a group. Flow chart for the identification of molecular point group.

2.Theory of quantitative analysis

a) Principles of volumetric analysis. Theories of acid-base, redox, complexometric, Todometric and precipitation titrations, choice of indicators for these titrations.

b) Principles of gravimetric analysis: precipitation, coagulation, peptization. coprecipitation,

post precipitation, digestion, filtration and washing of precipitate, drying and ignition! precipitation from homogenous solutions, requirements of gravimetric analysis.

3. Evaluation of analytical data.

Theory of errors, idea of significant figures and its importance, accuracy - methods of

expressing accuracy, error analysis and minimization of errors, precision-methods of expressing precision, standard deviation and confidence limit.

4. Introductory treatment to:

a) Pericyclic Reactions

Concerted reactions, Molecular orbitals, Symmetry properties HOMO, LUMO, Thermal and photochemical pericyclic reactions. Types of pericyclic reactions - electrocyclic, cycloaddition and sigmatropic reactions- one example each.

b) Synthetic strategies

Terminology-Disconnection (dix), Symbol(), synthon, synthetic equivalent (SE), Functional group interconversion (FGI), Linear, Convergent and Combinatorial syntheses, Target molecule (TM). Retrosynthesis of the following molecules 1) acetophenone 2) cydohexene

3) phenylethylbromide

c) Asymmetric (Chiral) synthesis

Definitions-Asymmetric synthesis, enantiomeric excess, diastereomeric excess. stereospecific reaction, definition, example, dehalogenation of 1,2-dibromides by I". stereo selective reaction, definition, example, acid catalysed dehydration of 1-phenylpropanol

SYLLABUS

B.Sc. Ill Year 2011-2012

Part II - Paper-III

Course outcomes:

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

CO1. Understand the basic concepts of p-block elements

CO2. Explain the difference between solid, liquid and gases in terms of Inter molecular interactions.

CO3. Apply the concepts of gas equations, Ph and electrolytes while studying other chemistry courses.

CO4. Understand concepts Of boundary conditions and quantization, probability distribution, most probable values, uncertainty and expectation values

CO5. Application of quantization to spectroscopy.

CO6. Various types of spectra and their use in structure determination.

UNIT-1 (INORGANIC CHEMISTRY-III)

1. Coordination Chemistry: IUPAC nomenclature, bonding theories-review of Wemer's theory and Sidgwick's concept of coordination, Valence bond theory, geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, crystal filed theory, splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes-low spin and high spin complexes-factors affecting crystal-field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds -structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

2. Spectral and magnetic properties of metal complexes: Electronic absorption spectrum of [Ti(HO), ion. Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility - Gouy method

3. Reactivity of metal complexes: Labile and inert complexes, ligand substitution reactions -S1 and S2, substitution reactions of square planar complexes - Trans effect and applications of trans effect.

4. Stability of metal complexes: Thermodynamic stability and kinetic stability, factors

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

5. Hard and soft acids bases (HSAB): Classification, Pearson's concept of hardness and softness, application of HSAB principles-Stability of compounds/complexes, predicting the feasibility of a reaction.

6. Bioinorganic chemistry: Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Ct). Metalloporphyrins - hemoglobin, structure and function, Chlorophyll, structure and role in photosynthesis.

UNIT-II (ORGANIC CHEMISTRY-111)

1. Nitrogen compounds

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

Amines (Aliphatic and Aromatic): Nomenclature, Classification into 29,3° Amines and Quarternary ammonium compounds. Preparative methods-1. Ammonolysis of alkyl halide 2. Gabriel synthesis 3, Hoffman's bromamide reaction (mechanism). 4, Reduction of Amides and Schmidt reaction. Physical properties and basic character-Comparative basic strength of Ammonia, methylamine, dimethyl amine, trimethyl amine and an line-comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects. Use of amine salts as phase transfer catalysts, Chemical properties: a) Alkylation b) Acylation e) Carbylamino reaction d) Hinsberg separation e) Reaction with Nitrous acid of 19,2º, 3º (Aliphatic and aromatic amines), Electrophilic substitutions of Aromatic amines-Bromination and Nitrition, oxidation of aryl and 3° Amines. Diazotization Cyanides and isocyanides: Nomenclature (aliphatic and aromatic) structure, Preparation of cyanides from a) Alkyl halides b) from amides c) from aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides and isocyanides, a) hydrolysis b) addition of Grignard reagent iii) reduction iv) oxidation.

2. Heterocyclic Compounds

Introduction and definition: Simple 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole, Importance of ring system-presence in important natural products like hemoglobin and chlorophyll, Numbering the ring systems as per Greek letter and Numbers. Aromatic character-6-electron system (four-electrons from two double bonds and a pair of non-bonded electrons from the hetero atom). Tendency to undergo substitution reactions.

Resonance structures: Indicating electron surplus carbons and electron deficient hetero atom. Explanation of feebly acidic character of pyrrole, electrophilic substitution at 2 or 5 position

Halogenation, Nitration and Sulphonation under mild conditions. Reactivity of furan as 1,3- diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene from 1,4-dicarbonyl compounds only, Paul-Knorr synthesis, structure of pyridine, Basicity - Aromaticity. Comparison with pyrrole-one method of preparation and properties - Reactivity towards Nucleophilic substitution reactions-chichibabin reaction.

3. Carbohydrates

Monosa charides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as example of ketohexoses. Chemical properties and structureal elucidation: Evidences for straight chain pentahydroxy aldehyde structure (Acetylation, reduction to n- hexane, cyanohydrin formation, reduction of Tollen's and Fehling's reagent and oxidation to gluconic and saccharic acid). Number of optically active isomers possible for the structure, configuration of glucose based on D-glyceraldehyde as primary standard (no proof for configuration is required). Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation). Cyclic structure of glucose. Decomposition of cyclic structure (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). Different ways of writing pyranose structure (Haworth formula and chair conformationa formula). Structure of fructose: Evidence of 2-ketohexose structure (formation of penta acetate, formation of cyanohydrin its hydrolysis and reduction by HI to give 2-Carboxy-n-hexane). Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure and Haworth formula). Intere inversion of Monosaccharides: Aldopentose to aldo hexose-eg: Ambinose to D-Glucose, D-Mannose (Kiliani - Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose eg: D-glucose to D-arabinose by Ruff degradation. Aldohexose (+) (glucose) to ketohexose (-) (Fructose) and Ketohexose (fructose) to aldohexose (Glucose)

4. Amino acids and proteins

Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gama amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples.

Methods of synthesis General methods of synthesis of alpha amino acids (specoc examples -Glycine, Alanine, valine and leucene) by following methods. a) from alogenated carboxylic acid b) Malonic ester synthesis c) strecker's synthesis. Physical properties: Optical activity of naturally occurring amino acids; L-configuration, respective of sign of rotation, Zwitterion structure-salt like character-solubility, meling points, amphoteric character, definition of isoelectric point.

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

5. Mass Spectrometry:

Basic principles-Molecular ion/parent ion, fragment ions/daughter ions. Theory-formation of parent ions. Representation of mass spectrum. Identification of parent ion,(M+I), (M+2), base peaks (relative abundance 100%) Determination of molecular formula-Mass spectra of ethylbenzene, acetophenone, n-butylamine and 1-proponol.

UNIT-III (PHYSICAL CHEMISTRY-III)

1. Chemical kinetics

Rate of reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst. Experimental methods to determine the rate of reaction. Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Kinetics of complex reactions (first order only): opposing reactions, parallel reactions, consecutive reactions and chain reactions Effect of temperature on rate of reaction, "Arrhenius equation, concept of activation energy. Theories of reaction rates-collision theory-derivation of rate constant for bimolecular read ion, The transition state theory (elementary treatment).

2. Photochemistry

Difference between thermal and photochemical processes Laws of photochemistry-Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield. Ferrioxalate actinometry. Photochemical hydrogen chlorine, hydrogen-bromine read ion, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing). Photosensitized reactions-energy transfer-processes

3. Thermodynamics

The first law of thermodynamics-statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule's law-Joule-Thomson coefficient. Calculation of w, q, dU and dH for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. State function. Temperature dependence of enthalpy of formation-Kirchoffs equation. Second law of thermodynamics. Different Statements of the law. Camot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. Concept of entropy, entropy as a state function, entropy changes in cyclic, reversible, and irreversible processes and reversible phase change. Calculation of entropy

changes with changes in V & T and P&T, Entropy of mixing inert perfect gases. Entropy changes in spontaneous and equilibrium processes.

The Gibbs (G) and Helmholtz (A) energies. A & Gas criteria for thermodynamic equilibrium and spontaneity-advantage over entropy change. Gibbs equations and the Maxwell relations. Variation of G with P, V and T.

B.Sc. III Year Chemistry

Paper-IV Chemistry and Industry

Course outcomes:

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

CO1. Understand preparation, properties and reactions of haloalkanes, haloarenes and

Oxygen containing functional groups.

CO2. Use the synthetic chemistry learnt in this course to do functional group

transformations.

CO3. To propose possible mechanisms for any relevant reaction.

Unit-I (Physico Chemical methods of analysis)

1.Separation techniques

1. Solvent extraction: Principle and process, Batch extraction, continuous extraction and counter current extraction. Application-Determination of Iron (III)

2. Chromatography: Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, Rf values, factors effecting Rf values.

a. Paper Chromatography: Principles, Rf values, experimental procedures, choice of paper and solvent systems, developments of chromatogram ascending. descending and radial. Two dimensional chromatography, applications.

b. Thin layer Chromatography (TLC): Advantages. Principles, factors effecting Rf values. Experimental procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.

c. Colum Chromatography: Principles, experimental procedures, Stationary and mobile Phases, Separation technique. Applications.

d. High Performance Liquid Chromatography (HPLC): Principles and Applications.

e. Gas Liquid Chromatography (GLC): Principles and Applications.

II. Spectro photometry

General features of absorption spectrosocopy, Beer - Lambert's law and its limitations, transmittance, absorbance, and molar absorptivity. Single and double beam spectrophotometers Application of Beer - Lambert law for quantitative analysis of

1.Chromium in K,Cr,O,

2. Manganese in manganous sulphate

3. Iron (III) with thiocyanate.

III. Molecular sectorscopy

i) Electronic spectroscopy:

Interaction of electromagnetic radiation with molecules and types of molecular spectra. Potential energy curves for bonding and antibonding molecular orbitals. Energy levels of molecules (s.p.n) selection rules for electronic spectra. Types of electronic transitions in molecules effect of conjugation. Concept of chromophore.

ii) Infra red spectrosocopy

Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant. Qualitative relation of force constant to bond energies. Anharmonic motion of real molecules and energy levels. Modes of vibrations in polyatomic molecules. Characteristic absorption bands of various functional groups. Finger print nature of infrared spectrum.

iii) Raman spectroscopy

Concept of polarizavility, selection rules, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

iv) proton magnetic resonance spectroscopy (H-NMR)

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons,

position of signals. Chemical shift, NMR splitting of signals-spin-spin coupling.

coupling constants. Applications of NMR with suitable examples-ethyl bromide, ethanol, acetaldehyde, 1,1,2 tribromo ethane, ethyl acetate, toluene and acetophenone.

v) Spectral interpretation

Interpretation of IR, UV-Visible. 'H-NMR and mass spectral data of the following

compounds 1. Phenyl acetylene 2. Acetophenone 3. Cinnamic Acid 4. Para-nitro aniline.

Unit-II (Drugs, formulations, pesticides and green chemistry)

1. Drugs

1. Introduction: Drug, disease (definition), Historical evolution, Sources - Plant, Animal synthetic, Biotechniology and human gene therapy.

2. Terminology: Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetic (ADME, Receptors - brief teartment) Metabolites and Anti metabolites.

3. Nomenclature: Chemical name, Generic name and trade names with examples.

4. Classification: Classification based on structures and therapeutic activity with one example each.

5. Synthesis: Synthesis and therapeutic activity of the following drugs., L- Dopa, Chloroquin, Omeprazole, Albuterol and ciprofloxacin.

6. Drug Development: Pencillin, Separation and isolation, structures of different pencillins

7. HIV-AIDS: Immunity-CD-4 Cells, CD-8 cells Retrovirus, replication in human body. Investigation available, prevention of AIDS. Drugs available-examples with structures: PIS: Indinavir (Crixivan), Nelfinavir (Viracept), NNRTIS: Efavirenz (Susrtiva), Nevirapine (Viranune) NRTIs: Abacavir (Ziagen), Lamivudine (Epivir, 3TC) Zidovudine (Retravir, AZT, ZDV)

8. Monographs of drugs: Eg Paracetamol, Sulpha methoxazole (Tablets)

2. Formulaltions

1. Need f conversion of drugs into medicine. Additives and their role (brief account only)

2. Different types of formulations

3. Pesticides

1. Introduction to pesticides-types- Insecticides, Fungicides, Herbicides, Weedicides, Rodenticides plant growth regulators, Pheremones and Hormones. Brief discussion with examples, structure and uses.

2. Synthesis and present status of the following. DDT, BHC, Malathion, Parathion, Endrin, Baygon, 2,4-D and Endo-Sulphon

4. Green Chemistry

Introduction : Definition of green Chemistry, need of green chemistry, basic principles of green chemistry

Green synthesis: Evalution of the type of the reaction 1) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic), Pericyclic reactions (no by-product). Selection of solvent:

i) Aqueous phase reactions ii) Reactions in ionic liquids iii) Solid supported synthesis iv) Solvent free reactions (solid phase reactions)

Gree catalysts: 1) Phase transfer catalysts (PTC) ii) Biocatalysts

Microwave and ultrasound assisted green synthesis:

1. Aldol condensation
2. Cannizzaro reaction
3. Diels-Alder reactions
4. Strecker synthesis
5. Willaimson synthesis
6. Dieckmann condensation

Unit-III: (Macromolecules,Meterial Science and Catalysis)

1. Macromolecules

Classification of polymers, chemistry of polymerization, chain polymerization, step polymerization, coordination polymerization - tacticity. Molecular weight of polymersnumber average and weight average molecular weight, degree of polymerization, determination of molecular weight of polymers by viscometry. Osmometry and light scattering methods. Kinetics of free radical polymerization. derivation of rate law. Preparation and industrial application of polyethylene. PVC, Teflon, polyacrylonitrile, terelence and Nylon66. Introduction to biodegradability.

2. Materials science

Superconductivity, characteristics of superconductors, Meissner effect types of and applications. Nanomaterials - synthetic techniques, bottom- up-sol-gel method, top-down-electro deposition method. Properties and applications of nano-materials. Composites-definition, general characteristics, particle reinforce and fiber reinforce composites and their applications.

3. Catalysis

Homogeneous and heterogeneous catalysis, comparision with examples. Kinetic of specific acid catalyzed reactions, inversion of cane sugar, Kinetics of specific base catalyzed reactions, base catalyzed conversion of acetone to diacetone alcohol. Acid and base catalyzed reactions-hydrolysis of esters, mutarotation of glucose, Catalytic activity at surfaces. Mechanisms of heterogeneous catalysis. Langmuir-Hinshelwood mechanism. Enzyme catalysis: Classification, characteristics of enzyme catalysis. Kinetic of enzyme catalyzed reactions-Michaelis Menton law, significance of Michaelis constant (K) and maximum velocity (V). Factors affecting enzyme catalysis - effect of temperature, pH, concentration cand inhibitor. Catalytic efficiency. Mechanism of oxidation of ethanol by alcohol dehydrogenase.

B.Sc. Botany

Three Year Program Structure

The Program Objectives (POs) of B.Sc. Botany are:

- Students acquire fundamental knowledge on plants through theory and practicals.
- Students will able to explain microbial life, plant life, reproduction and their survival in nature. Help the students to understand role of living and fossil plants in our life.
- Help the students to understand role of living and fossil plants in our life.
- Learn advance techniques in plant sciences, viruses and bacteria using electron photon micrographs, phytoremediation, plant disease management, formulation of new herbal drugs etc.
- Students able to start nursery, mushroom cultivation, biofertilizer production, fruit preservation and horticultural practices
- Create awareness about cultivation, conservation and sustainable utilization of biodiversity

Theory and Practical Papers:

Paper - I: Microbial Diversity, Cryptogams and Gymnosperms

Practicals - Microbial Diversity, Cryptogams and Gymnosperms

Paper-II: Anatomy, Embryology, Taxonomy and Medicinal Botany

Practicals-Anatomy, Embryology, Taxonomy and Medicinal Botany

Paper-III:Cell Biology, Genetics, Ecology and Biodiversity

Practicals-Cell Biology, Genetics, Ecology and Biodiversity

Paper-IV: Physiology, Tissue culture, Biotechnology, Seed Technology & Horticulture

Practicals-Physiology, Tissue culture, Biotechnology, Seed Technology & Horticulture

B.Sc. Botany first year theory paper

Part II : Paper - I: Microbial Diversity, Cryptogams and Gymnosperms

Course Objectives:

CO1: Develop skills and knowledge in microbial diversity and microscopic methods.
CO2: Be able to understand the microbial world and identify microbial diversity.
CO3: Gain knowledge about classification of microorganisms and special groups of bacteria.
CO4: Study, discovery and structure of different viruses and different plant diseases caused by viruses.
CO5: Learn about the discovery, general characteristics, nutrition and economic importance of bacteria.
CO6: Study and import knowledge about the occurrence, distribution, structure and life history of lower plants such as Algae, Fungi and Lichens.
CO7: Study the structure, reproduction and life history and economic importance of different algae in the local ecosystems.
CO8: Familiarise with the general characteristics of fungi.
CO9: Gain knowledge about the structure, reproduction and life history of different types of fungi.
CO10: Know about lichens-structure, reproduction and ecological & economic importance.
CO11: Gain knowledge about equipment used in microbiology and safe laboratory practices like safe chemical handling, hazardous waste management and proper use of lab equipment.
CO12: Learn about the study of viruses and bacteria using electron photon micrographs.
CO13: Gain knowledge about the plant disease symptoms caused by bacteria under microscope and hands on experience.

CO14: Understand the vegetative and reproductive structures of bacteria, algae and fungi and familiarise with microscopic technique and cellular drawing.

CO15: Advanced study of plant material infected by fungi and learning of morphology and anatomy of different thalli.

CO16: Field visits to gain more hands-on experience.

CO17: Gain knowledge on bacterial identification using gram staining methods of analysis

Syllabus

Part II : Paper - I: Microbial Diversity, Cryptogams and Gymnosperms

Unit-I : Evolution of Life and Diversity of Microbes

1. Origin and evolution of Life - an outline.

2. Viruses: Structure, replication and transmission; plant diseases caused by viruses and their control.

3. Bacteria: Structure, nutrition, reproduction and economic importance. An outline of Plant diseases of important crop plants caused by bacteria and their control.

4. Cyanobacteria: General Account of Cell Structure, thallus organisation and their prospecting (uses), Biofertilizers

Unit – II : Algae and Fungi

5. Algae: General account, thallus organisation, structure, reproduction, classification and economic importance.

6. Structure, reproduction, life history and systematic position of Oedogonium, Coleochaete, Chara, Ectocarpus and Polysiphonia.

7. Fungi: General characters, classification and economic importance.

8. Structure, reproduction and life history of Albugo, Saccharomyces, Penicillium, Puccinia, Alternaria..General account of plant diseases caused by Fungi and their control.

9. Lichens: Structure and reproduction; ecological and economic importance.

Unit - Ill: Bryophyta and Pteridophyta

10. Bryophytes: General characters, classification and alternation of generations.

11. Structure, reproduction, life history and systematic position of Marchantia, Anthoceros and Polytrichum. Evolution of Sporophyte in Bryophytes.

12. Pteridophytes: General characters, classification, alternation of generations and evolution of sporophtyte.

13. Structure, reproduction, life history and systematic position of Rhynia, Lycopodium, Equisetum and Marsilea.

14. Evolution of stele, heterospory and seed habit in Pteridophytes. Unit - IV: Gymnosperms and Palaeobotany

15. Gymnosperms: General characters, structure, reproduction and classification.

16. Morphology of vegetative and reproductive parts, systemic position, life history of Pinus and Gnetum

17. Palaeobotany: Introduction, Fossils and fossilization; Geological time scale; Importance of fossils. 18. Bennettitales: General account

B.Sc. Botany first year Practical paper

Paper - I: Microbial Diversity, Cryptogams and Gymnosperms

Course Objectives:

CO1: Develop skills and knowledge in microbial diversity and microscopic methods.
CO2: Gain knowledge about classification of microorganisms and special groups of bacteria.
CO3: Study, discovery and structure of different viruses and different plant diseases caused by viruses.
CO4: Study and import knowledge about the occurrence, distribution, structure and life history of lower plants such as Algae, Fungi and Lichens.
CO5: Study the structure, reproduction and life history and economic importance of different algae in the local ecosystems.
CO6: Gain knowledge about the structure, reproduction and life history of different types of fungi.

CO7: Know about lichens-structure, reproduction and ecological & economic importance.

CO8: Gain knowledge about equipment used in microbiology and safe laboratory practices like safe chemical handling, hazardous waste management and proper use of lab equipment.

CO9: Learn about the study of viruses and bacteria using electron photon micrographs.

CO10: Gain knowledge about the plant disease symptoms caused by bacteria under microscope and hands on experience.

CO11: Understand the vegetative and reproductive structures of bacteria, algae and fungi and familiarise with microscopic technique and cellular drawing.

CO12; Advanced study of plant material infected by fungi and learning of morphology and anatomy of different thalli.

CO13: Field visits to gain more hands-on experience.

CO14: Gain knowledge on bacterial identification using gram staining methods of analysis

Syllabus for B.Sc. Botany first year Practical paper:

1. Knowledge of equipment used in Microbiology:Spirit lamp, Inoculation loop, Hot air oven, Autoclave,Pressure cooker, Laminar air flow, Inoculation chamber, Incubator etc.

2. Preparation of solid and liquid media for culturing of microbes(Demonstration)

3. Study of viruses and bacteria using electron micrographs (photographs).

4. Gram staining of Bacteria

5. Study of symptoms of plant diseases caused by viruses and bacteriaViruses: Tobacco mosaic virus, Bunchy top of banana, Yellow veinclearing of bhendi, Leaf curl of papayaBacteria: Citrus canker, Leafblight of Rice, Angular leaf spot of cotton.

6. Vegetative and reproductive structures of the following taxa Algae: Oscillatoria, Nostoc.Scytovene, Oedogonium,Coleochaete, Chara, Ectocarpus and Polysiphonia.Fungi: Albugo, Saccharomyces Penicillium, Puccinia andAlternaria.

7. Section cutting of diseased material infected by Fungi and identification of pathogens as per theory syllabus.

8. Lichens: Different types of thalliand their external morphology

9. Morphology (vegetative and reproductive structures) and anatomy of the following taxa: Bryophytes: Marchantia, Anthoceros and Polytrichum.Pteridophytes: Lycopodium, Equisetum and Marsilea. Gymnosperms: Pinus and Gnetum.

10. Fossil forms using permanent slides! photographs: Rhynia andCycadeoidea

11. Symptoms of plant diseases caused by Fungi and mycoplasma: Tikka disease of Groundnut, Late blight of Potato, Ergot of Bajra, Whip smut of Sugarcane, Wheat rust, Brown spot of Rice, Rice(Paddy) blast, Head smut of Sorghum, Little leaf disease of Brinjal.

12. Enumeration and examination of important microbial, fungal and algal products: Biofertilizers, protein capsules, antibiotics, mushrooms, SCP, Agar-agar etc.13. Field visits to places of algal, microbial, fungal interest. (e.g. Mushroom cultivation, water bodies)

B.Sc. Botany Second year Theory paper

Part II : Paper - II: Anatomy, Embryology, Taxonomy & Medicinal Botany

Course Objectives:

CO1: Learn about the principles of basic and advanced microscopy.
CO2: Advanced learning of Bryophytes, Pteridophytes and anatomy slides and specimens under microscope and gain hands-on experience.
CO3: Familiarize with the external and internal structure of Bryophytes, Pteridophytes and Wood yielding plants.
CO4: Understand how to survey techniques and to identify and evaluate the values of different timbers available locally.
CO5: Understanding of principles of taxonomy and the modern trends in plant taxonomy.
CO6: Gain knowledge about identification and naming of plants as per ICBN regulations.
CO7: Acquiring knowledge about the classification of Phanerogams according to the standard system of classification.
CO8: Understanding different types of systems of classification based on natural and evolutionary tendencies.
CO9: Gain knowledge on the diversity of families of angiosperms.
CO10: Understand the various aspects of embryology of plants.
CO11: Understand and identify the different stages in reproduction leading to seed formation in angiosperms.
CO12: Enable to understand the process of pollination and fertilisation leading to the formation of fruit, seed and embryo.

CO13: Gaining knowledge about the diversity in embryogeny of dicots and monocots and also about polyembryony as an abnormal characteristic.

Syllabus of B.Sc. Botany Second year Theory paper

Unit - I: Anatomy

1. Meristems: Types, histological organisation of shoot and root apices and theories.

2. Tissues and Tissue Systems: Simple and complex.

3. Leaf: Ontogeny, diversity of internal structure; stomata and epidermal outgrowths.

4. Stem and root : Vascular cambium - Formation and function. Anamalous secondary growth General account. Stem - Achyranthes, Boerhavia, Bignonia, Dracaena; Root-Beta

5. Wood structure : General account. Study oflocal timbers - Teak (Tectonagrandis), Rosewood, (Albergialatefoliai, Red sanders, (Pterocarpussantalinus) Nallamaddi (Terminaliatomentosa (T. alata)), Yegisa (Pterocarpusmarsupiun) and Neem (Azadirachtaindica).

Unit - 11: Embryology

6. Introduction: History and importance of Embryology. Anther structure, Microsporogenesis and development of male gametophyte.

7. Ovule structure and types; Megasporogenesis; types and development of female gametophyte.

8. Pollination - Types; Pollen - pistil interaction. Fertilization.

9. Endosperm - Development and types. Embryo - development and types; Polyembryony and Apomixis - an outline.

10. Palynology: Principles and applications.

Unit - Ill: Taxonomy

11. Introduction: Principles of plant systematics, Systematics vs Taxonomy, Types of classification: Artificial, Natural and Phylogenetic.

12. Systems of classification: Salient features and comparative account of Bentham & Hooker and Engler&Prantle. An introduction to Angiosperm Phylogeny Group (APG).

13. Current concepts in Angiosperm Taxonomy: Embryology in relation to taxonomy, Cytotaxonomy, Chemotaxonomy and Numerical Taxonomy.

14. Nomenclature and Taxonomic resources: An introduction to ICBN, Vienna code - a brief vi account. Herbarium: Concept, techniques and applications.

15. Systematic study and economic importance of plants belong to the following families: Annonaceae, Capparaceae, Rutaceae, Fabaceae(aboideae/papilionoideae, Caesalpinioideae, Mimosoideae), Cucurbitaceae, Apiaceae, Asteraceae, Asclepiadaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Orchidaceae and Poaceae.

Unit –IV Medicinal Botany

16. Ethnomedicine: Scope, interdisciplinary nature, distinction of Ethnomedicine from Folklore medicine. Outlines of Ayurveda, Sidda, Unani and Homeopathic systems of traditional medicine.Role of A YUSH, NMPB, CIMAP and CDRI.

17. Plants in primary health care: Common medicinal plants - Tippateega (Tinosporacordifolia), tulasi (Oscimum sanctum), pippallu (Piper longum), Karaka (Terminaliachebula), Kalabanda (Aloe vera), Turmeric (Curcuma longa).

18. Traditional medicine vs Modern medicine: Study of select plant examples used in traditional medicine as resource (active principles, structure, usage and pharmacological action) of modern medicine: Aswagandha (Withaniasomnifera), Sarpagandha (Rauvolfiaserpentina), Nelausiri (Phyllanthusamarus), Amla (Phyllanthusemblica) andBrahmi (Bacopamonnieri) Monera.

19. Pharmacognosy: Introduction and scope. Adulteration of plant crude drugs and methods of identification - some examples. Indian Pharmacopoeia.Evaluation of crude drugs

B.Sc. Botany Second year Practical paper

Paper - II: Anatomy, Embryology, Taxonomy & Medicinal Botany

Course Objectives:

CO1: Gain knowledge on the double staining technique.
CO2: Understand how to survey techniques and to identify and evaluate the values of different timbers available locally.
CO3: Gain knowledge about identification and naming of plants as per ICBN regulations.
CO4: Understanding different types of systems of classification based on natural and evolutionary tendencies.
CO5: Gain knowledge on the diversity of families of angiosperms.
CO6: Understand and identify the different stages in reproduction leading to seed formation in angiosperms.
CO7: Enable to understand the process of pollination and fertilisation leading to the formation of fruit, seed and embryo.
CO8 :Understand the angiospermic plant diversity and identify the members of the representative families through taxonomic observations.
CO9: Acquiring the skill of Herbarium technique.
CO10: Isolating the embryos and testing the viability of pollen grains.

Syllabus of B.Sc. Botany Second year Practical paper

1. Double staining technique

2. Tissue organization in root and shoot apices (tips)

3. Primary, secondary and anomalous secondary structures of root and stem

4. Stomatal types

5. Wood TS, TLS and RLS

6. Structure of anther and microsporogenesis

7. Structure of pollen grains

8. Pollen viability test

9. Types of ovules and developmental stages of embryo sac

10. Structure of endosperm and structure of monocot and dicot embryos

11. Isolation and mounting of embryo

12. Systematic study of locally available plants

13. Demonstration of herbarium techniques

14. Local field visits to study the vegetation and flora

15. Study of morphological and anatomical characters of some medicinal plants

16. Field visits to identify and collect ethno medicinal plants and preparation of herbarium sheets of medicinal plants

17. Preparation and submission of herbarium specimens for evaluating during the practical examination

B.Sc. Botany Third year Theory paper

Part II : Paper - III: Cell Biology, Genetics, Ecology and Biodiversity

Course Objectives:

CO1: Gain basic knowledge to understand the ultrastructure of envelopes of plant cell, nucleus, chromosomes and cell division.
CO2: Acquire an insight of molecular biology.
CO3: Enable the student to understand and comprehend the basic principles of heredity.
CO4: Gain basic and better knowledge about the mutations and polyploidy.
CO5: Solve problems in genetics on the basis of Mendel's laws of inheritance.
CO6: Acquire practical knowledge in cytochemical methods of fixation and nuclear staining.
CO7: Acquire knowledge about the basic concepts of ecology and environment.
CO8: Understand the morphological, anatomical and physiological response of plants to the environmental factors.
CO9: Learn the role and impact of climatic factors on plant communities and general vegetation.
CO10: Understand population characteristics.
CO11: Gain knowledge about the importance of community ecology and ecological succession.

CO12: Know the significance of phytogeography and understand the phytogeographical regions of India and the world.

CO13: Acquire knowledge to identify causes of biodiversity loss and learn ex-situ and in-situ conservation methods of biodiversity.

CO14: Be able to locate biodiversity hotspots on a map.

CO15: Understand the role of seed banks and international organisations in the conservation of biodiversity.

CO16: Acquire knowledge about the basic concepts of ecology and environment.

CO17: Understand the morphological, anatomical and physiological response of plants to the environmental factors.

CO18: Learn the role and impact of climatic factors on plant communities and general vegetation.

CO19: Understand population characteristics.

CO20: Learn methods to study plant communities.

CO21: Gain knowledge about the importance of community ecology and ecological succession.

CO22: Know the significance of phytogeography and understand the phytogeographical regions of India and the world.

CO23: Acquire knowledge to identify causes of biodiversity loss and learn ex-situ and in-situ conservation methods of biodiversity.

CO24: Understand the role of seed banks and international organisations in the conservation of biodiversity.

Syllabus

Unit - I: Cell Biology

1. Plant cell envelops: Ultra structure of cell wall, molecular organisation of cell membranes.

2. Nucleus: Ultrastructure, Nucleic acids - Structure and replication of DNA; types and functions of RNA.

3. Chromosomes: Morphology, organisation of DNA in a chromosome, Euchromatin and Heterochromatin. Karyotype.

4. Cell division: Cell cycle and its regulation; mitosis, meiosis and their significance.

Unit - II: Genetics

6. Mendelism: Laws of inheritance. Genetic interactions – Epistasis, complementary, supplementary and inhibitory genes.

7. Linkage and crossing over: A brief account, construction of genetic maps - 2 point and 3 point test cross data.

8. Mutations: Chromosomal aberrations - structural and numerical changes; Gene mutations, transposable elements

9. Gene Expression: Organisation of gene, transcription, translation, mechanism and regulation of gene expression in prokaryotes (Lac. and Trp Operons).

10. Extra nuclear genome: Mitochondrial and plastid DNA, plasmids.

Unit - Ill: Ecology

11. Concept and components of Ecosystem. Energy flow, food chains, food webs, ecological pyramids, biogeochemical cycles - Carbon, Nitrogen, Phosphorus

12. Plants and environment: Ecological factors - Climatic (light and temperature), edaphic and biotic. Ecological adaptations of plants.

13. Population ecology: Natality, mortality, growth curves, ecotypes, ecads.

14. Community ecology: Frequency, density, cover, life forms, biological spectrum, ecological succession (Hydrosere, Xerosere).

15. Production ecology: Concepts of productivity, GPP, NPP, CR (Community Respiration) and Secondary production, P/R ratio and Ecosystems.

Unit - IV: Biodiversity and Conservation

16. Biodiversity: Concepts, Convention on Biodiversity - Earth Summit. Types of biodiversity.

17. Levels, threats and value of Biodiversity.

18. Hot spots of India - Endemism, North Eastern Himalayas, Western Ghats.

19. Agro-biodiversity: Vavilov centres of crop plants.

20. Principles of conservation: IUCN threat-categories, RED data book - threatened & endangered plants of India. Role of organisations in the conservation of Biodiversity - IUCN, UNEP, WWF, NBPGR, NBD.

B.Sc. Botany Third year Practical paper-III

Paper - III: Cell Biology, Genetics, Ecology and Biodiversity

Course Objectives:

CO1: Gain detailed knowledge about the various stages of cell division and chromosomal analysis or karyotyping.
CO2: Solve problems in genetics on the basis of Mendel's laws of inheritance.
CO3: Acquire practical knowledge in cytochemical methods of fixation and nuclear staining.
CO4: Able to do calorimetric estimation of DNA by diphenylamine method.
CO5: Develop analytical skills to solve numerical problems in genetics and field skills to perform emasculation and hybridization methods in plant breeding.
CO6: Learn methods to study plant communities.
CO7: Gain knowledge about the importance of community ecology and ecological succession.

Syllabus of B.Sc. Botany Third year Practical paper

1. Demonstration of Cytochemical methods

2 Study of various stages of mitosis using cytological preparation of Onion root tips

3 Study of various stages of meiosis using cytological preparation of Onion flower buds.

4 Karyotype study using cytological preparation of dividing root tip cells of Onion.

5 Solving genetic problems related to monohybrid, dihybrid and interaction of genes.

6 Construction of linkage maps

7 Knowledge of ecological instruments

8 Determination of soil texture and PH

9 Study of morphological and anatomical characteristics of plant species

10 Detailed study on flora of a local fresh water or aquaculture pond.

11 Geographical spotting of certain endemic and endangered plant species of A.P. state

12 Minimum of two field visits to local areas of ecological/ conservation of biodiversity importance

B.Sc. Botany Third year Theory paper-IV

Par II : Paper - IV: Physiology, Tissue Culture, Biotechnology, Seed Technology & Horticulture

Course Objectives:

CO1: Understanding the requirement of mineral nutrition for plant growth.
CO2: Acquiring knowledge about sensory photobiology.
CO3: Understanding the process of photosynthesis, respiration and nitrogen metabolism.
CO4: Knowing about the plant growth nutrients and understanding the biosynthesis of nitrogenous compounds and their role in plants.
CO5: Understanding physiology of flowering – photoperiodism; role of phytochrome in flowering and vernalization.
CO6: A pervasive understanding on the kingdoms of bimoleculas, metabolites and pathways that are the prerequisites and consequences of physiological phenomenon for further manipulations.

Syllabus

Unit - I: Cell Biology (Part A)

1. Water Relations: Importance of water to plant life, physical properties of water, diffusion,imbibition, osmosis; water, osmotic and pressure potentials; absorption, transport of water, ascentof sap; transpiration; Stomatal structure and movements.

2. Mineral Nutrition: Essential macro and micro mineral nutrients and their role; symptoms ofmineral deficiency; absorption of mineral ions; passive and active processes.

3. Enzymes: Nomenclature, characteristics, mechanism and regulation of enzyme action, enzymekinetics, factors regulating enzyme action.

4. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emersonenhancement effect; concept of two photosystems; mechanism of

photosynthetic electron transportand evolution of oxygen; photophosphorylation; Carbon assimilation pathways: C 3, C4and CAM;photorespiration.

5. Translocation of organic substances: Mechanism of phloem transport; source-sink relationships.

Unit II: Physiology

6. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system,mechanism of oxidative phosphorylation, pentose phosphate pathway.

7. Nitrogen Metabolism: Biological nitrogen fixation, nitrate reduction, ammonia assimilation, aminoacid synthesis and protein

8. Lipid Metabolism: Structure and functions of lipids; conversion of lipids to carbohydrates, β-oxidation.

9. Growth and Development: Definition, phases and kinetics of growth. Physiological effects of phytohormon- auxins, gibberellins, cytokinins, ABA, ethylene and brassinosteroids; Physiology of flowering and photo periodism, role of phytochrome in flowering.

10. Stress Physiology: Concept and plant responses to water, salt and temperature stresses.

Unit - Ill: Tissue Culture and Biotechnology

11. Tissue culture: Introduction, sterilization procedures, culture media - composition and preparation; explants.

12. Callus culture; cell and protoplast culture, Somatic hybrids and cybrids.

13. Applications of tissue culture: Production of pathogen free plants and somaclonal variants, production of stress resistance plants, secondary metabolites and synthetic seeds.

14. Biotechnology: Introduction, history and scope.

15. DNA technology: Vectors and gene cloning and transgenic plants.

Unit - IV: Seed Technology and Horticulture

16. Seed: Structure and types. Seed dormancy; causes and methods of breaking dormancy.

17. Seed storage: Seed banks, factors affecting seed viability, genetic erosion. Seed productiontechnology; seed testing and certification.

18. Horticulture techniques: Introduction, Cultivation of ornamental and vegetable crops, Bonsai andlandscaping

19. Floriculture: Introduction. Importance of green house, polyhouse, mist chamber, shade nets;Micro irrigation systems. Floriculture potential and its trade in India

20. Vegetative Propagation of plants: Stem, root and leaf cuttings. Layering and bud grafting.Role ofplant growth regulators in horticulture.

B.Sc. Botany Third year Practical paper-IV

Paper - IV: Physiology, Tissue Culture, Biotechnology, Seed Technology & Horticulture

Course Objectives:

CO1: Acquiring knowledge about sensory photobiology.
CO2: Understanding physiology of flowering – photoperiodism; role of phytochrome in flowering and vernalization.
CO3: Acquaintance with mechanistic view on the plant environment interactions.
CO4: Development of an integrative approach for visions in biological problems.
CO5: Understanding the stress tolerance mechanism adopted by plants.
CO6: Knowing about the plant growth hormones (Auxins, Gibberellins, Cytokinens, Ethylene, Brassinosteroids) and assessing their role in plants.

Syllabus of B.Sc. Botany Third year Practical paper-IV

1. Measurement of Osmotic Potential
2. Study of differential transpiration
3. Determination of Stomatal frequency using leaf epidermal peelings/impressions
4. Study of mineral deficiency symptom using plant materials
5. Determination of Catalase Activity Using Potato Tubers by Titration Method
6. Separation of Chloroplast Pigments
7. Estimation of protein by biuret method
8. Isolation and Estimation of DNA
9. Testing of seed viability using 2,3,5-Triphenyl Tetrazolium Chloride (TTC)

10. Study of non-dormant seed germination: Breaking of seed dormancy caused by hard seed coat using scarification technique
11. Demonstration of seed dressing using fungicide to control diseases
12. Demonstration of seed dressing using biofertilizer (RHIZOBIUM) to enrich nutrient supply
13. Horticulture Equipment or Tools
14. Demonstration of vegetative plant propagation: Rooting of cuttings – Leaf and Stem; Layering; Stem; Bud and Wedge Grafting
15. Study on the application of plant growth regulators (IBA) for Rooting of cuttings using ornamental plants
16. Instruments used in biotechnology
17. Demonstration of micropropagation using explants like axillary buds and shoot meristems
18. Isolation of nuclear and plasmid DNA: Separation of DNA by gel electrophoresis
19. Study of Biotechnology Products

Study visits to places of horticultural and Biotechnological interest – commercial nurseries or botanical gardens, Biotechnology R&D Laboratories Industries

B.Sc zoology

The overall objectives of the learning outcomes-based curriculum framework are to:

Help formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes that are expected to be demonstrated by the holder of a qualification; Enable prospective students, parents, employers and others to understand the nature and level of learning outcomes (knowledge, skills, attitudes and values) or attributes a graduate of a programme should be capable of demonstrating on successful completion of the programme of study.

Programme Specific Objectives (PSOs):

PSO1 : Higher Education: Empower students to pursue higher studies in various fields of Biology and Chemistry.

PSO2 : Career: Enable students to pursue careers in Chemical, Biological and related fields as demonstrated by professional success at positions within industry, government, or academia.

PEO3 :Social responsibility: Enable students to exhibit professionalism, ethical attitude, communication skills and team work in their profession.

Program Outcomes (POs):

PO1Critical thinking: Able to understand and utilize the principles of scientific enquiry, think analytically, clearly and evaluate critically while solving problems and making decisions during biological study.

PO2 Effective communication: Able to formally communicate Scientific ideas and investigations of the biology discipline to others using both oral and written communication skills.

PO3 Social interaction: Able to develop individual behaviour and influence society and social structure.

PO4 Effective citizenship: Able to work with a sense of responsibility towards social awareness and follow the ethical standards in the society.

PO5 Ethics: Ability to demonstrate and discuss ethical conduct in scientific activities.

PO6 Environment and Sustainability: Able to understand the impact of biological science in societal and environmental contexts and demonstrate the knowledge for sustainable development.

PO7 Self-directed and life-long learning: Able to recognize the need of life-long learning and engage in research and self-education

B.Sc, Zoology, First YearSYLLABUS

PAPER-I BIOLOGY OF INVERTEBRATES AND CELL BIOLOGY

Course Outcomes:

By the completion of the course the graduate should able to –

The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level.

This course will provide students with a deep knowledge in Cell Biology, Animal Biotechnology and Evolution and by the completion of the course the graduate shall able to –

CO1 Describe general taxonomic rules on animal classification

CO2 Classify Protozoa to Coelenterata with taxonomic keys

CO3 Classify Phylum Platy hemninthes to Annelida phylum using examples from parasitic adaptation and vermin composting

CO4 Describe Phylum Arthropoda to Mollusca using examples and importance of insects and Molluscans

CO5 Describe Echinodermata to Hemi Chordata with suitable examples and larval stages in relation to the phylogeny

CO1 To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure

CO5 Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins

CO 6 To impart knowledge on various biomolecules

CO 7. To learn about chemistry and bioenergetics of carbohydrates

CO 8 To have knowledge on biological importance of proteins

CO 9 To know about the role of lipids in biological functions

CO 10 To gain knowledge on Nucleic acids & Enzymes

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 origin and evolutionary relationship of different phyla from • protozoa to hemichordata.
- To understand the role of different cell organelles in maintenance of life Activities
- To demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry.
- To provide insightful knowledge on the structure and classification of carbohydrates, proteins, lipids and enzymes
- To demonstrate an understanding of fundamental biochemical principles such as the function of biomolecules, metabolic pathways and the regulation of biochemical processes
- To make students gain proficiency in laboratory techniques in biochemistry and orient them to apply the scientific method to the processes of experimentation and hypothesis testing.

UNIT-I

1.0 Le Protest Annelida

1.1. Phylum Proton General characters and outline clamification up to classes.

Type study Paramection.

12. Phylum Porifers General characters and cutline classification up to classes.

Type study. Sycon Canal system in Sponges.

13. PhylenCoelentersta: General characters and outline classification up to classes.

Type sady; Obelia : Polymorphism in Coelenterates, Corals and Coral reef formation.

1.4. Phylum Platyhelminthes: General characters and outline classification up to classes.

Type study: Fasciola hepatica.

15. Phylum Nemathelminthes: General chamcters and outline clarification up to classes.

Type study: Ascaris lumbricoides

1.6. Phylum Annelida: General characters and outline classification up to classes.

Type study: Leech; Cociom and coelomoducts in Annelids.

UNIT II

2.0. Arthropods to Hemichordata

21. Phylum Arthropoda: General charseters and outline classification of up to classes.

Type study. Prawn, Penouymonedon (Type Study) Chustacean larvae, Peripatus-Chancters and Significance.

2.2. Phylum Mollusca: General characters and outline classification of up to classes.

Type study: Pila; Pearl formation in Molluscs

23. Phylum Echinodermata: General characters and outline classification of up to classes.

Type study: Star fish.

2.4. General characters of Hemichordata: Structure and affinities of Balanoglossus.

UNIT- III

3.0. Cell Biology

3.1. Cell theor

3.2. Ultra structure of Animal cell

3.3 Structure of Plasmembrane-Fluid-mosaic model. Transport functions of Plasma membrane- Passive transport, active transport (Antiport, symport and uniport) and bulk tramport.

3.4. Structure and functions of Endoplasmic reticulum Golgi body, Ribosomes, lysosomes and

Mitochondrion.

3.5. Chromosomes - nomenclature types and structure. Giant chromosomes - Polylene and Lampbrush chromosomes.

3.6 Cell division-Cell-cycle stages (G,, S, G, and M phases), Cell-cycle check points and

regulation. Mitosis, Meiosis-and its significance.

UNIT IV

40. Biomolecules of the cell

4.1. Carbohydrates:

4.1.1. Classification of Carbohydrates

4.1.2. Structure of Monosaccharides (Glucose and Fructose)

4.1.3, Structure of Disaccharides (Lactose and Sucrose)

4.1.4. Structure of Polysaccharides (Starch, Glycogen and Chitin)

4.2. Proteins:

4.2.1. Amino acids: General properties, nomenclature, classification an structure.

4.2.2. Classification of proteins based on functions, chemical nature and nutrition.

peptide bond and structure (Primary, secondary, tertiary and quaternary structures)

4.3. Lipids:

4.3.1. Classification Structure of Fatty acids (Saturated and unsaturated).

4.3.2. Triacylglycerols, Phospolipids (Lecithin and cephalin) and Steroids(Cholesterol).

4.4. Nucleic acids:

4.4.1. Structure of purines, pyrimidines, ribose and deoxyribose sugars.

4.4.2. Watson and Crick model of DNA-Nucleoside, Nucleotide, Chargaff's rule.

Structure of RNA, Types of RNA-RNA, tRNA and mRNA.

Learning Outcomes:

LO1: To understand the importance of preservation of museum specimens

LO2: To identify animals based on special identifying characters

LO3: To understand different organ systems through demo or virtual dissections

LO4: To maintain a neat, labeled record of identified museum specimens Student Learning Outcomes:

LO 5: Understand the organic chemical principles in life processes.

LO 6: Understand the structure & function of important biological molecules such as

DNA, RNA & enzymes

B.Sc. Zoology Second YearSYLLABUS

PAPER-II BIOLOGY OF CHORDATES, EMBRYOLOGY, DATES, EMBRYOLOGY, ECOLOGY AND ZOOGEOGRAPHYECOLOGY AND ZOOGEOGRAPHY

Course Outcomes:

By the completion of the course the graduate should able to

CO1 Describe general taxonomic rules on animal classification of chordates

CO2 Classify Protochordate to Mammalia with taxonomic keys

CO3 Understand the significance of dentition and evolutionary significance

CO4 Describe the key events in early embryonic development starting from the formation of gametes upto gastrulation and formation of primary germ layers.

CO 5: Help students to understand the structure and function of an ecosystem, habitat ecology and Ecological niche.

CO 6: Develop awareness among the young students about the surrounding environment, the

impact of climate change and its mitigation, and biodiversity.

CO 7: Enhance the ability to apply this knowledge and proficiency to find solutions relating to environmental concerns of varied dimensions of present time

CO8- To understand methods of wildlife and conservation and endangered species

C09- To describe Innate and Acquired types of behavior

CO10- To identify Zoogeographical regions with their climatic and faunal peculiarities

UNIT 1

1.0 Protochordata to Arnphibia

1.1 Protochodates: Salient features of U rochordata and Cephalochordata Structure and life-

history of Herdmania,Significance of retrogressive Metamorphosis. hours

1.2 General organization of Chordates hour

1.3 General characters of Cyclostomes

1.4 General characters of fishes, classification up to sub-class level with examples hours

1.4.1 Type study-Scoliodon: Morphology, respiratory system, circulatory system, excretory system, nervous system and sense organs. hours

1.4.2. Migration in fishes and types of scales

1.5 General characters and classification of Amphibia up to order levelhours

1.5.1. Type study-Rana: Morphology, respiratory system, circulatory and reproductive System hours

1.5.2 parental care in amphibians hours

UNIT-II

2.0 Reptilia to Mammalia

2.1 General characters and classification of Reptilia up to order level.
2.1.1. Type study-calotes: Morphology, digestive system, respiratory system, circulatory
system, urinogenital system and nervous system.

2.2 General characters and classification of A ves up to order level with example.

2.2.1. Type study-Pigeon (Columbia livia): Exoskeleton, respiratory system, circulatory system and excretory system.

2.2.2. Significance of migration in birds

2.2.3 Flight adaptation in birds

2.3 General characters and classification of Mammalia up to order level with examples

2.3.1. Dentition in Mammals

UNIT-III

3.0 Embryology

3.1 Spermatogeneis, Oogenesis and Fertilization

3.2 Types of eggs

3.3 Type of cleavages

3.4 Development of frog up to gastrulation and formation of primary germ layers
3.5 Foetal membranes and their significance

3.6 Placenta: types and functions

3.7 Regeneration with reference to Turbellarians and Lizards

UNIT-IV

4.0 Ecology

4.1 Biogeochemical cycles or nutrient cycles-Gaseous cycles of Nitrogen and Carbon: Sedimentary cycle-phosphorus.

4.2 Definition of Community- Habitat and ecological niche

4.2.1 Community interactions: Breif account on Competition, Predation, mutualism,commensalism and parasitism.

4.2.2 Ecological succession: Primary and secondary, seral stages, climax community with examples.

4.3 Population ecology: Density and dispersions of animal populations

4.3.1. Growth curves and growth of animal populations-r-selected and k-selected species

4.3.2. Populations regulation mechanisms- both biotic and abiotic

4.3.3. Growth of human population and its control

4.4 Zoogeography (Addition)

1. Fauna of Oriental Realm 2. Fauna of Australian Realm

SYLLABUS

B.Sc. Zoology Third Year

ANIMAL PHYSIOLOGY, GENETICS & EVOLUTION

Course Objectives:

CO 1. To obtain knowledge on physiology & anatomy of digestive & respiratory systems

CO 2. To learn about physiology & anatomy of circulatory system

CO 3. To know about physiology & anatomy of excretory system

CO 4. To have knowledge on physiology & anatomy of nervous system & muscles

CO 5. To gain knowledge on physiology of homeostasis & stress

CO 6: In-depth knowledge into the area of genetics.

CO 7: let the students have an understanding of the implications and conditions under which gene and genotype frequencies change and/or remain the same

CO 8: help the students realize the principles underlying the Hardy-Weinberg law and its application

CO 9: the idea of construction of Phylogenetic trees using molecular data.

UNIT-I

1.0 Physiology of Digestion

1.1 Definition of digestion and types of digestion-extra and intracellular.

1.2 Digestion of Carbohydrates, proteins, lipids and cellulose digestion.

1.3 Absorption and assimilation of digested food materials.

1.4 Gastrointestinal hormones- control of digestion.

2.0 Physiology of respiration

2.1 Types of respiration-external and internal respiration.

2.2 Structure of mammalian lungs and gaseous exchange.

2.3 Transport of oxygen-formation of oxyhaemoglobin and affinity of haemoglobin for Oxygen dissociation curves.

2.4 Transport of CO2-Chloride shift, Bohr effect.

2.5 Cellular respiration- Main steps of glycolysis, Kreb's cycle, electron transport, Oxidative phosporylation and ATP production (Chemosmotic theory).

3.0 Physiology of Circulation

3.1 Open and closed circulation

3.2 Structure of mammalian heart and its working mechanism- Heartbeat and cardiac cycle Myogenic and neurogenic hearts.

3.3 Regulation of heart rate- Tachycardia and Bradycardia.

4.0 Physiology of Excretion

4.1 Definition of excretion

4.2 Forms of nitrogenous waste material and their formation: classification of animals on the basis of excretory products.

4.3 Gross organization of mammalian excretory system and structure of kidney.

4.4 Structure and function of Nephron-Counter current mechanism.

UNIT-II

1.0 Physiology of muscle contraction

1.1 General strcture and types of muscles.

1.2 Ultra structure of skeletal muscle.

1.3 Sliding filament mechanism of muscle contraction.

1.4 Chemical changes during muscle contraction-role of calcium, ATP utilization and its Replenishment.

2.0 Physiology of nerve impulsle 8 hours

2.1 Structure of nerve cell.

2.2 Nature of nerve impulse-resting potential and action potential.

2.3 Conduction of nerve impulse along an axon- local circuit theory and salutatory conduction theory.

2.4 Structure of synapse, mechanism of synaptic transmission-electrical and chemical transmissions.

3.0 Physiology of Endocrine system

3.1. Relationship between hypothalamus and pituitary gland.

3.2 Hormones of hypo thalamus.

3.3 Hormones of ademohypophysis and Neurohypophysis.

3.4 Hormones of pineal gland, thyroid gland, parathyroid, thymus, adrenal and pancreas.

3.5 Endocrine control of mammalian reproduction- Male and female hormones- Hormonal control of menstrual cycle in humans.

4.0 Physiology of Homeostasis

4.1 Concept of Homoostasis and its basic working mechanism.

4.2 Mechanism of Homeostasis-giving three illustrations viz., Hormonal control of glucose levels, Water and ionic regulation by freshwater and marine animals and temperature regulation in man.

UNIT-III

1.0 Gentics

1.1 Mendel's laws-Law of segregation and independent assortment; Genetic interactions- Incomplete dominance, condominanceand epistasis.

1.2 Identification of DNA as the genetic material-Griffith's experiment and Hershey-Chase experiment

1.3 Central dogma of molecular biology-Breif account of DNA replication(Semi-conservative method), Replication fork(Continous and discontinuous synthesis), Transcription- Breif account of initiation, elongation and termination in eukaryotes; Translation; Genetic code gane regulation as exemplified by lac operon.

1.4 Human karyotyping, barr bodies and Lyon hypothesis and Amniocentesis chromosomal disorders- Autosomal and sex chromosomes

2.0 Organic Evolution;

2.1 Genetic bnasis of Evolution, Gene pool and gene frequencies, Hardy-Weinberg's Law Force of destabilixation, natural selection, genetic drift, Mutation, Isolation and Migration.

2.2 Speciation-Allopatry and sympatry

SYLLABUS

B.Sc. Zoology Third Year

Fisheries and Aquaculture,Clinical Science & Animal Biotechnology

Course Objectives:

CO 1: To learn about construction & management of aquaculture ponds and knowledge on aquaculture of different shell fish & fin fish

CO 2: To know about the water quality & feed management and post harvest technology

CO 3: It includes host responses and parasite evasion of host defense mechanisms.

C O 4: It emphasizes on the evolutionary aspect of host-pathogen interactions leading to host specificity.

C O 5: The students learn about transmission, epidemiology, diagnosis, clinical manifestations, pathology, treatment and control of major parasites.

C O 6: The course has been structured in a way that the students assimilate the classroom knowledge for applied aspects of parasitology and public health.

CO 7: The student gets an insight into immune mechanisms exhibited by parasites present in various habitats and representing different groups.

CO 8: To acquaint the student with the application of recombinant technology

UNIT-I

1.0 Fisheries and Aquaculture

1.1 Capture fisheries- Introduction

1.2 Types of fisheries, Fisheryresouuces from Freshwater, Brackish water and habitats.

1.3 Freshwater, Brackish water and Mariculture.

1.4 Site selection criteria

1.5 Aquaculture systems

1.6 Induced breeding.

1.7 Hatchery design and Management

1.8 Larval rearing- Nursery ponds, rearing and grow out ponds

1.9 Shrimp and prawn culture

1.10 Preservation and processing- Freezing, solar drying, Canning, salting, smoking.

UNIT-II

2.0 Clinical Science

2.1. Hematology

2.1.1. Blood composition and functions

2.1.2. Blood groups and transfusion problems

2.1.3. Blood diseases- Anemia, Leukemia, Leucocytosis, Leucopaenia

2.1.4. Biopsy and autopsy-clinical importance

2.2. Immunology

2.2.1.Types of immunity-Innate and acquired

2.2.2. Antigens-Haptense and epitopes and their properties

2.2.3. Structure and biological properties of human immune globuling G(1gG)

2.2.4. Hypersenitivity-immediate and delayed

2.3. Important Human Parasites

2.3.1. Blood Parasites(Structure and Clinical significance of Plasmodium)
2.3.2. Intestinal parasites-Structure and clinical sinificane Entamoeba,

2.4 Addition

2.4.1 Cholestrol and ikts significance in Cardiovascular problems

2.4.2 Blood Sugar levels and Diabets

UNIT-III

3.0 Animal Biotechnology:

3.1 Animal Biotechnology: Scope of Biotechnology, Cloning vectors-Characteristics of vectors, Plasmids.

3.2 Gene Cloning –Enzymatic cleavage of DNA, Restictionenzymes (Endonucleases) and Ligation.

3.3 Transgenesis and Productionnof transgenic animals (Fish and Goat)

3.4 Application of Stem Cell technology in cell based therapy(Diabetes and Parkison's diseases)