St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
(An Autonomous College Affiliated to Osmania University)
FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY
THEORY SYLLABUS CBCS-2024
SEMESTER -VI
ADVANCED CHEMISTRY

1. Course Description

Program: B.Sc.
Course Code: U24/CHE/DSE/601
Course: DSE 3
No. of Credits: 3

Max. Hours: 60 Hrs
Max. Marks: 100
Hours per week: 4 Hrs

2. Course Objectives

- To enable the students to understand the concepts of Coordination chemistry and its applications and Inorganic reaction mechanisms of metal complexes.
- The course aims at giving an overview on principles and types of pericyclic reactions, colloids and surface chemistry
- To understand the basic principles and to develop skills in interpretation of various spectra in elucidation of structure of simple molecules.

3. Course Outcomes

CO1: Understand the concepts of Coordination Chemistry in elucidating the structures of complexes and apply in isomerism.

CO2: Understand the reaction mechanisms in metal complexes with applications. Interpret the concepts and applications of HSAB.

CO3: Understand and apply the principles of spectroscopy in solving the problems related to structural analysis of simple organic molecules.

CO4: Elaborate on the concepts of synthetic organic chemistry. To help the students acquire knowledge on the basic principles of colloids and surface chemistry.

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

4. Course Content

MODULE I: COORDINATION CHEMISTRY 15 Hrs

Werner's theory – postulates, experimental evidence. Sidgwick's theory – Calculation of EAN, limitations. Nomenclature of inorganic complex compounds.
Valence bond theory – postulates, geometries of coordination number 4 & 6- tetrahedral $[Ni(NH_3)_4]^{2+}$, $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$, square planar $[Ni(CN)_4]^{2-}$, $[Cu(NH_3)_4]^{2+}$, $[PtCl_4]^{2-}$ Octahedral complexes $[Fe(CN)_6]^{4-}$, $[Fe(CN)_6]^{3-}$, $[FeF_6]^{4-}$, $[Co(NH3)_6]^{3+}$, $[CoF_6]^{3-}$. Limitations of VBT Crystal field theory – features, splitting of d-orbitals, in octahedral, tetrahedral and square planar complexes, Crystal field stabilization energy (calculation of CFSE for d^n configurations in octahedral complexes),
Magnetic properties of transition- metal complexes: Types of magnetic behaviour, spin only formula, calculation of magnetic moments using spin only formula.
Electronic spectra of metal complexes – d-d transitions, spectrochemical series, Electronic absorption spectrum of $[Ti(H_2O)_6]^{3+}$.Determination of composition of complexes - Job's method and mole ratio method.
Thermodynamic and kinetic stability of transition metal complexes. Stability of metal complexes –step wise and overall stability constant and their relationship and chelate effect.

Isomerism in coordination compounds: structural: ionization, hydrate, linkage, co- ordination, coordination- position and polymerisation isomerism. Stereo isomerism – (a) geometrical isomerism in (i) square planar metal complexes of the type $[MA_2B_2]$, $[MA_2BC]$, $[M(AB)_2]$, [MABCD]. (ii) Octahedral metal complexes of the type $[MA_4B_2]$, $[M(AA)_2B_2]$, $[MA_3B_3]$ using suitable examples, (b) Optical isomerism in (i) Tetrahedral complexes [MABCD], (ii) Octahedral complexes $[M(AA)_2B_2]$, $[M(AA)_3]$ using suitable examples.
Applications of coordination compound
Applications of coordination compounds a) in quantitative and qualitative analysis with suitable examples b) in medicine for removal of toxic metal ions and cancer therapy c) in industry as catalysts polymerization – Ziegler Natta catalyst d) water softening.

MODULE II: INORGANIC REACTION MECHANISM AND HSAB 15 Hrs

Inorganic Reaction Mechanism
Lability and inertness of complexes
Substitution Reactions – dissociation and association reactions, mechanism for SN^1 and SN^2 in octahedral and square planar complexes with one example each. Trans effect –theories and applications. Acid Hydrolysis (mechanism) and Base Hydrolysis (mechanism). Electron transfer reactions – outer sphere and inner sphere mechanism (brief account only) – two electron transfer reactions.
Hard and soft acids and bases
Classification, Pearson's concept of hardness and softness, application of HSAB principles, stability of complexes, predicting the feasibility of a reaction.

MODULE III: MOLECULAR SPECTROSCOPY -II 15 Hrs

NMR Spectroscopy 5 Hrs
Principles of nuclear magnetic resonance, number of signals, equivalent & non equivalent protons, position of signals-chemical shift. NMR splitting of signals, Spin-Spin coupling,

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

83

coupling constants. Application of NMR with suitable examples-Ethyl bromide, Ethanol, Acetaldehyde, 1,1,2-Tribromoethane, Ethylacetate, Toluene & Acetophenone.

Mass Spectrometry **5 Hrs**

Basic principles – Nitrogen rule, Types of ions: Molecular ion / parent ion, fragment ions / daughter ions. Theory – formation of parent ions. Representation of mass spectrum. Identification of parent ion, (M+1), (M+2), base peaks (relative abundance 100%) Determination of molecular formula – Mass spectra of ethyl benzene, ethyl bromide, acetophenone, n-butylamine and 1- propanol.

Spectral interpretation **2 Hrs**

Interpretation of IR, UV-Visible, H^1 -NMR and mass spectral data of the following compounds 1. Phenylacetylene 2. Acetophenone 3. Cinnamic Acid 4. para-nitro aniline.

Electron Spin Resonance **3 Hrs**

Electron Spin Resonance (ESR) spectroscopy: Basic principle, hyperfine structure, ESR of simple radicals like $H^{\cdot}$, $CH_3^{\cdot}$ and CH_3CH_2.

MODULE IV: COLLOIDS, SURFACE CHEMISTRY & PERICYCLIC REACTIONS

15 Hrs

Colloids & Surface Chemistry **9 Hrs**

Definition of colloids. Classification of colloids. Solids in liquids (sols): preparations and properties – Kinetic, Optical and Electrical stability of colloids. Protective action. Hardy–Schultz law, Gold number. Liquids in liquids (emulsions): Types of emulsions, preparation and emulsifier. Liquids in solids(gels): Classification, preparations and properties, General applications of colloids. Adsorption: Types of adsorption. Factors influencing adsorption. Freundlich adsorption isotherm. Langmuir theory of unilayer adsorption isotherm. Applications.

Photochemistry **6 Hrs**

Interaction of radiation with matter, difference between thermal and photochemical process. Laws of photochemistry- Grothus Draper law, Stark Einstein law. Quantum yield,Problems based on quantum efficiency. photochemical combinations of Hydrogen- Chlorine & Hydrogen –Bromine. Jablonski diagram depicting various processes occurring in an excited state. Qualitative description of Fluorescence, phosphorescence, non-radiative process (internal conversion, intersystem crossing.

5. References

1. 30.Wahid.U.Malik, Tuli G.D and Madan R.D (1976) *Selected topics in Inorganic Chemistry*: S.Chand Publishers
2. Puri B.R, Sharma L.Rand Khalia K.C (2014) *Principles of Inorganic Chemistry*: Milestone publishers and Distributers.
3. Tuli G.D, Madan R.D, Basu S.K, Sathyaprakash. *Advanced Inorganic Chemistry Volume II* : S.Chand and company ltd (New Delhi ,India)
4. Sharma, Y.R. *Text Book of Complete Organic Chemistry*, 2nd Edn. Kalyani, 2007.
5. Jain, M.K. & Sharma, S.C. *Modern Organic Chemistry,* 4th Edn. Vishal, 2009.
6. Sharma Y.R (2005) *Elementary Organic Spectroscopy; Principles and Chemical applications* : S.Chand & Company Ltd
7. Puri, B.R., Sharma L.R., and Pathania, M.S. (2003). *Elements of Physical Chemistry.* Jalandhar, Delhi: Vishal Publishing Co.
8. Bahl, A., & Tuli. (2009). *Essentials of physical chemistry: A textbook for B. Sc. classes as per UGC model syllabus* (Rev. multicoloured.). New Delhi: S. Chand.

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

84

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
(An Autonomous College Affiliated To Osmania University)
FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY
PRACTICAL SYLLABUS CBCS-2024
SEMESTER -VI
EXPERIMENTS IN PHYSICAL CHEMISTRY II AND INSTRUMENTATION

Program: B.Sc.
Course Code: U20/CHE/DSE/601/P
Course: DSE-3&4
No. of Credits : 1

Max. Hours: 30 Hrs
Max. Marks: 50
Hours per week: 3 Hrs

Course Objectives

- To equip the students with skills to determine various physical parameters using instrumentation methods and to synthesize complexes.

Course Outcomes

CO1: Achieve the expertise in determining pH, conductivity, unknown concentration of solutions and rate constants of reactions.
CO2: Acquire the ability to synthesize metal complexes.

Chemical Kinetics:

1. Catalytic Decomposition of Hydrogen Peroxide.
2. Acid catalyzed hydrolysis of methyl acetate.
3. Kinetic study of oxidation of I^- by $K_2S_2O_8$.

Colorimetry:

4. Determination of Dichromate and Permanganate in a mixture using Beer Lambert's Law.
5. Job's Method for the determination of ferric thiocyanate complex.

pH metry:

6. Titration of strong acid Vs strong base.
7. Determination of ionization constant of acetic acid by pH metric method.

Preparation of Complexes:

8. To prepare a complex of tetraammine copper II sulphate complex.
9. To prepare a complex of chloropentaamminecobalt III chloride.
10. To prepare a complex of hexammine nickel II chloride.

References

1. Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
2. Svehla, G, *Vogel's Qualitative Inorganic Analysis:* Pearson Education, 2012.
3. Mendham, J, *Vogel's Quantitative Chemical Analysis:* Pearson, 2009.

Chairperson
Board of Studies in Che
Dept of Chemistry
Osmania University, Hyd

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

6. **Syllabus Focus**

a. Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Local	Knowledge of chemistry of complexes helps in everyday life
Regional	Learning the concepts of surface chemistry and pericyclic reactions changes their perspective towards various processes
National	Through Knowledge of spectral interpretation opens new horizons in skill development and employability
Global	A complete idea of complexes and spectral interpretation increases students inclination towards research

b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD EMP	Module 1 synthesis of complexes	Some complexes are synthesized in the Lab.Many metal complexes are widely used in the pharmaceutical companies.This enhances their skill development and employability.
SD	Module 3 Spectral interpretation	Students are taught the instrumentation of all the spectroscopic methods, they are taken to various research labs to show live instrumentation techniques. They are thoroughly trained in spectral interpretation by giving assignments.

7. **Pedagogy**

S. No.	Student Centric Methods Adopted	Type / Description of Activity
1.	Field trips	Students are taken to various institutes like IICT, HCU, IIT , ARCI etc
2.	Role play	Students are made to enact various concepts of chemistry
3.	Seminars/ workshops/ research projects	Students are allowed to participate in seminars and workshops organized in and

Chairperson Board of Studies in Chemistry Dept of Chemistry Osmania University, Hyd-07.

Head Department of Chemistry UCS, Osmania University Hyderabad-500 007.

Chairperson of Studies in Chemistry Dept of Chemistry Osmania University, Hyd-07.

		outside the college. They are encouraged to take up research projects.

8. Course Assessment Plan

a. Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 50%	End Semester Examination-50%
CO1	CIA 1 written exam (10 M)	Written Exam
CO2	Skill Test 1 (10 M)	
CO3	CIA 1 written exam (10 M)	
CO4	Skill Test 2 (10 M)	

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

b. Model Question Paper - End Semester Exam

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
(An Autonomous College Affiliated to Osmania University)
Faculty of Science – Department of Chemistry
MODEL PAPER
B.SC. II YEAR SEMESTER -VI
ADVANCED CHEMISTRY

TIME: 2hrs **Course Code: U24/CHE/DSE/601**
Max. Marks: 50

SECTION –A (Essay Questions)

I. Answer the following **4X10 =40 Marks**

1. a) Describe the structure of $[Cu(NH_3)_4]$ using Valence bond theory. (CO1) **L1** 5M
   b) Define optical isomerism? Draw and explain the optical isomerism in octahedral complexes. (CO1) **L1** 5M

OR

2. a) Summarise Werner's theory with examples. (CO1) **L2** 5M
   b) Explain the Crystal field splitting in octahedral complexes. (CO1) **L5** 5M
3. Outline the mechanism of SN^1 in the octahedral and SN^2 in square planar complexes with one example each. (CO2) **L2** 10 M

OR

4. a) Define trans effect? Discuss the theories and applications of trans effect. (CO2) **L2** 5M
   b) Distinguish labile and inert complexes? Explain with examples. (CO2) **L4** 5M
5. a) What is the chemical shift? Explain the change in position of signals with examples. (CO3) **L1** 5M
   b) Elaborate about (M+1), (M+2) and base peaks with two examples in Mass spectrometry. (CO3) **L6** 5M

OR

6. a) Indicate the number of signals possible for CH_3-CH_2-CH_2-OH and explain spin- spin splitting. (CO3) **L6** 5M
   b) Explain the basic principles of ESR spectroscopy. (CO3) **L5** 5M
7. a) Classify the various types of colloids? (CO4) **L5** 5M
   b) Deduce the expression for Langmuir adsorption isotherms. (CO4) **L5** 5M

OR

8. What are Flourescence and Phosphorescence ? Explain the phenomenon of florescence and phosphorescence using Jablonski diagram. 10M

SECTION – B (Short answer questions)

II. Answer any four questions. **4 X 5 = 20 Marks**

9. Explain the Job's method of determination of composition of a complex. **(L2)**
10. What is EAN? Calculate the EAN for [Co(NH3)6] and [FeF6]3- **(L1)**
11. Describe the acid hydrolysis of octahedral complexes. **(L2)**
12. Define Hardy Schulze rule and Gold number. **(L1)**
13. Show how the molecular formula of a compound is determined based on its Mass spectrum? **(L1)**
14. Discuss the quantum yield for the photochemical combination of H_2& Cl_2 to form HCl **(L5)**

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyderabad.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

11. Describe the acid hydrolysis of octahedral complexes. **(L2)**
12. Define Hardy Schulze rule and Gold number. **(L1)**
13. Show how the molecular formula of a compound is determined based on its Mass spectrum? **(L1)**
14. List out the various types of NMR signals expected for 1,1,2-tribromoethane? What is the intensity ratio of the peaks? **(L1)**

c. **Question Paper Blueprint**

Modules	Hours Allotted in the Syllabus	Cos Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	1	2	10	2	20
2	15	2	2	10	1	15
3	15	3	2	10	2	20
4	15	4	2	10	1	15

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions (Hrs)
1	2,5	Understanding	15
2	1,7	Applying & Analysing	15
3	2,7	Remembering	15
4	4	Creating & Evaluating	15

Prepared by	Checked & Verified by	Approved by
Madhu	D. Sumalatha	
Name and Signature of the teaching faculty Y. Lakshmi madhuri	Name and Signature of the HoD Dr. D.Sumalatha	Name and Signature of Principal Dr. Uma Joseph

Chairperson
Board of Studies in Chem.
Dept of Chemistry
Osmania University, Hyd-07.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

b. Model Question Paper - End Semester Exam

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
(An Autonomous College Affiliated to Osmania University)
Faculty of Science – Department of Chemistry
B.SC. III YEAR SEMESTER -VI
ADVANCED CHEMISTRY

TIME: 2hrs **Course Code: U24/CHE/DSE/601**
Max. Marks: 50 **Credits: 4**

SECTION A - INTERNAL CHOICE		**4 X 10 M = 40M**		
Question Number	**Question**		**CO**	**BTL**
1	**Module 1**	(a) Describe the structure of [Cu(NH3)4] using Valence bond theory. 5M (b) Define optical isomerism? Draw and explain the optical isomerism in octahedral complexes. **OR**	**CO1**	**Level 1**
2	**Module 1**	(a) Summarise Werner's theory with examples. (b) Explain the Crystal field splitting in octahedral complexes.	**CO1**	**Level I**
3	**Module 2**	Outline the mechanism of SN^1 in the octahedral and SN^2 in square planar complexes with one example each. 10 M **OR**	**CO2**	**Level 2**
4	**Module 2**	(a) Define the trans effect? Discuss the theories and applications of trans effect. (L1) 5M (b) Distinguish labile and inert complexes? Explain with examples. (L4) 5M	**CO2**	**Level 2**
5	**Module 3**	(a) What is the chemical shift? Explain the change in position of signals with examples. 5M (b) Elaborate about (M+1), (M+2) and base peaks with two examples in Mass spectrometry 5M **OR**	**CO3**	**Level 1**
6	**Module 3**	(a) Develop the number of signals possible for CH_3-CH_2-CH_2-OH and explain spin- spin splitting. 5M (b) Explain the basic principles of ESR spectroscopy.	**CO3**	**Level 5 & 6**
7	**Module 4**	(a) Classify the various types of colloids? 5M (b) Deduce the expression for Langmuir adsorption isotherms. 5M **OR**	**CO4**	**Level 5**
8	**Module 4**	What are Flourescence and Phosphorescence ? Explain the phenomenon of florescence and phosphorescence using Jablonski diagram.	**CO4**	**Level 2**

Department of Chemistry, St. Francis College for Women

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

SECTION B – (Short answer questions) ANSWER ANY 4 OUT OF 6			4 X 5M = 20 M	
9	Module 1	9. Explain the Job's method of determination of composition of a complex.	CO1	Level 2
10	Module 2	10.What is EAN ? Calculate the EAN for [Co(NH3)6] and [Fe6]3-	CO1	Level 1
11	Module 3	11. Describe the acid hydrolysis of octahedral complexes.	CO2	Level 2
12	Module 4	12. Define Hardy Schulze rule and Gold number	CO4	Level 1
13	Module 2	13. Show how the molecular formula of a compound is determined based on its Mass spectrum? (L1)	CO3	Level 1
14	Module 3	14. Discuss the quantum yield for the photochemical combination of H_2& Cl_2 to form HCl	CO4	Level 5

SEMESTER VI

CELL AND MOLECULAR BIOLOGY

1. Course Description

Program:	**B. Sc**	**Max. Hours:**	**60**
Course Code:	**U24/ BOT/ DSE/601**	**Hours per week:**	**4**
Type of Course:	**DSE - 3**	**Max. Marks:**	**60**
No. of Credits:	**4**		

2. Course Objectives

1. To describe the cellular components and the cell division.
2. To explain the basic principles of inheritance at the molecular, cellular and organism levels.

3. Course Outcomes

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

CO1: Discuss cell theory, types of cell division and the ultrastructure of plant cells and organelles.
CO2: Explain the structure of nucleus, mutation types and their causes along with the significance of mobile genetic elements
CO3: Interpret the structure of genetic material and the mechanism of DNA replication
CO4: Discuss the regulation of gene expression and infer the process of transcription and translation

4. Course Content

Module I: Cell as a Module of Life **15 Hours**

1.1. The Cell Theory; Prokaryotic and eukaryotic cells; Cell size and shape; Cell organelles- Mitochondria, Chloroplast. ER, Golgi body, Lysosomes, Peroxisomes and Glyoxisomes.
1.2. The functions of cell membranes; Models of cell membrane structure; the fluidity of membrane. Membrane proteins and their functions; Carbohydrates in the membrane; Faces of the membranes; Selective permeability of the membranes; Cell wall.
1.3. Overview of Cell cycle, Mitosis and Meiosis; Molecular controls- cyclins and cyclin dependent kinases

Module II: Genome Organization **15 Hours**

1.1. Nucleus: Nuclear Envelope- structure of nuclear pore complex; chromatin; molecular organization, DNA packaging in eukaryotes, euchromatin and heterochromatin, nucleolus and ribosome structure (brief).

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

2.2. Linear and circular DNA molecules. Gene and chromosomal mutation – types, causes and detection, mutant types – lethal, conditional, biochemical, germinal vs somatic mutants
2.3. Basic idea about Mobile genetic elements - IS elements and transposons, insertional mutagenesis

Module III: DNA replication **15 Hours**

3.1. Genetic material DNA: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment.
3.2. DNA structure, types of DNA (A, B, and Z DNA)
3.3. DNA replication (Prokaryotes and eukaryotes), bidirectional replication, semi–conservative model

Module IV: Gene expression **15 Hours**

4.1. Concept of gene, One gene one enzyme, One gene one polypeptide hypothesis, the central dogma, reverse transcription.
4.2. Transcription (Prokaryotes and Eukaryotes -Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; Translation (Prokaryotes and eukaryotes), genetic code.
4.3. Regulation of gene expression Prokaryotes: Lac operon and Tryptophan operon.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

Head of the Department
St. Francis College,
Begumpet.

5. Reference Books

1. Karp, G. 2010. *Cell and Molecular Biology: Concepts and Experiments*. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. *Cell and Molecular Biology*. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009. *The Cell: A Molecular Approach.* 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. *The World of the Cell.*7th edition. Pearson Benjamin Cummings Publishing, San Francisco
5. Verma, P. S., Agarwal, V. K. 1974. *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S. Chand & Company Ltd, New Delhi.
6. Veer Bala Rastogi. 2008. *Fundamentals of Molecular Biology*. Ane Books India.
7. C. B. Powar. Cell Biology, 2001. Himalaya Publishing, Mumbai.
8. P. S. Verma and V.K. Agarwal. 2004. *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology.* S. Chand & Co. Ltd., New Delhi.
9. P. S. Verma and V.K. Agarwal. 2006. *Genetics*. S. Chand & Co. Ltd., New Delhi.
10. Monroe. W. Strickberger. 2001. *Genetics*. Prentice Hall India, New Delhi.
11. P.K. Gupta. 2000. *Genetics*. Rastogi Publications, Meerut.
12. P.C. Winter, G.I. Hickey & H.L. Fletcher. 2000. *Instant Notes in Genetics*. Viva Books Private Limited, New Delhi.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

Head of the Department
St. Francis College,
Begumpet.

6. Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global Development Needs	Cell being the structural & functional unit of life, with the knowledge of how cell functions and available molecular techniques, researchers will be able to create new vaccines, potent medicines, diagnose diseases and their cure.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Module I	Prepare a temporary slide of onion root tip and flower bud and observe different stages of mitosis and meiosis respectively
	Module III	Isolation of DNA from tomato
		Separation of DNA by Gel electrophoresis.

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Experiential Learning	• Science Experiments and Field Trips • Live experiments like Meiosis from Onion bud • Visit to Scientific Institutes like CCMB, NIPHM, CRIUM • Interactive Class room games/Quiz • Kahoot or Edpuzzle
2.	Participative Learning	• Reading and Information Collection from Library • Group Discussion • Teams of three or four to discuss on Cell Division, DNA Structure, Protein Synthesis • Presentation Seminar topics on Plasma Membrane, Genome Organization. • D Models - creation and presentation
3.	Problem solving	• Case Studies Relevant to the Course content from Science Journals

Head of the Department
St. Francis College,
Begumpet,

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination- 60%
CO1	CIA 2 – Test 1: MCQ's, Quiz test or subjective	Written Exam
CO2	CIA 1 - Subjective	
CO3		
CO4	CIA 2 – MCQ's / Assignment	

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

b) Model Question Paper – End Semester Exam Theory

CELL AND MOLECULAR BIOLOGY

Course Code: U24/ BOT/ DSE/601

Time: 2 Hours **Max. Marks: 60**

Note: This question paper consists of Section A and B. The answer to Section A and B must be written in the answer book given.

Section A (Long Essay Type)

I. Answer all Questions **Marks 4 x 10 – 40**

1. With the help of a neat diagram describe the autonomous organelles of a cell.

OR

2. Explain Mitosis in detail with significance.

3. Illustrate the method of DNA packaging in eukaryotes.

OR

4. What is Mutation and add a note on Mutant types.

5. Elaborate DNA replication in eukaryotes.

OR

6. Describe Hershey-Chase bacteriophage experiment and types of DNA.

7. Describe the structure of RNA and add a note on RNA polymerase.

OR

8. Explain in detail Lac operon concept.

Section B (Short Essay Type)

II. Write short notes on any **FOUR** of the following: **Marks 4 x 5 - 20**

9. Illustrate Fluid Mosaic Model.
10. Compare IS elements and Transposons.
11. Elaborate DNA Structure.
12. Explain Genetic code.
13. What is central dogma?
14. Assess the role of Peroxisomes.

Head of the Department
St. Francis College.
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

SECTION A - INTERNAL CHOICE				4Q X 10 M = 40 M
Question Number	Question	Question	CO	BTL (Blooms Taxonomy Level)
1	Module 1	With the help of a neat diagram describe the autonomous organelles of a cell.	CO 1	Level I, II
2	Module 1	Explain Mitosis in detail with significance.	CO 1	Level II
3	Module 2	Illustrate the method of DNA packaging in eukaryotes.	CO 2	Level II
4	Module 2	What is Mutation and add a note on Mutant types.	CO 2	Level I
5	Module 3	Elaborate DNA replication in eukaryotes.	CO 3	Level VI
6	Module 3	Describe Hershey-Chase bacteriophage experiment and types of DNA.	CO 3	Level I, II
7	Module 4	Describe the structure of RNA and add a note on RNA polymerase.	CO 4	Level I, II
8	Module 4	Explain in detail Lac operon concept.	CO 4	Level II
SECTION B - ANSWER ANY 4 OUT OF 6 (To compulsorily have ONE question from each module)				4Q X 5 M = 20 M
9	Module 1	Illustrate Fluid Mosaic Model.	CO 1	Level II
10	Module 2	Compare IS elements and Transposons.	CO 2	Level II
11	Module 3	Elaborate DNA Structure.	CO 3	Level VI
12	Module 4	Explain Genetic code.	CO 4	Level II
13	Module 4	What is central dogma?	CO 4	Level I
14	Module 1	Assess the role of Peroxisomes.	CO 1	Level V

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO 1	2	10 each	1	5
2	15	CO 2	2	10	1	5
3	15	CO 3	2	10	1	5
4	15	CO 4	2	10	1	5

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions (hrs)
1	1,2,4,5,6	Understanding	15
2	1,2,4,5,6	Understanding	15
3	1,2,4,5,6,7	Understanding	15
4	1,2,4,5,6,7	Understanding	15

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

CELL AND MOLECULAR BIOLOGY

Practical Syllabus

1. Course Description

Programme:	**B. Sc**	**Max. Hours:**	**30**
Course Code:	**U24/ BOT/ DSE/601/P**	**Hours per week:**	**2**
Type of Course:	**DSE - 3**	**Max. Marks:**	**50**
No. of Credits:	**1**		

2. Course Objectives

1. To examine the structure of plant cell and different cell division stages.
2. To describe the process involved in isolation and separation of DNA.

3. Course Outcomes

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

CO 1: Develop basic skills to make cytological preparations and identification of various stages of cell division

CO 2: Devise methods to improve skills and techniques in the field of molecular biology

4. Course Content

1. To study prokaryotic (bacteria), viruses, eukaryotic cells with the help of light and electron micrographs.
2. Study of the photomicrographs of cell organelles.
3. To study the structure of plant cell through temporary mounts.
4. Study of mitosis in onion root tips (temporary mounts and permanent slides).
5. Study of meiosis in any flower bud/anther.
6. Isolation of DNA.
7. Preparation of the karyotype and ideogram from given photograph of somatic metaphase chromosome.
8. Separation of DNA by Gel electrophoresis.

Head of the Department
St. Francis College.
Begumpet,

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

5. Model Question Paper – End Semester Exam Practical

CELL AND MOLECULAR BIOLOGY

Course Code: U24/ BOT/ DSE/601/P

Time: 2 Hours **Maximum Marks: 50**

Q I. Carry out the cytological preparation and staining of the given material **'A'** and report Any **TWO** stages of cell division to the Examiners.
Scheme for valuation:(Procedure – 4 marks; Slide preparation – 3 marks; Observation or recording of results (figures) - 3 marks). **10 Marks**

Q II. Conduct the experiment **'B'** allotted to you and writes the procedure.
Scheme for valuation:(Preparation – 2marks; Procedure - 3 marks) **5 Marks**

Q III. Critical notes on Three spotter's **'C', 'D', 'E'.**
Scheme for valuation:(Identification-1mark; Notes for each spotter-4). **3x5 – 15Marks**

Q IV. Project **10 marks**

Q V. Viva-voce **5 marks**

Q VI. Record. **5 marks**

Prepared by	Checked &verified by	Approved by
Basanti. Ch **Dr. Basanti Chintapalli** **Teaching faculty**	Basanti. Ch **Dr. Basanti Chintapalli** **HoD**	**Dr. Uma Joseph** **Principal**

Basanti. Ch
Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

SEMESTER-VI

ECOLOGY, EVOLUTION & ZOOGEOGRAPHY

1. Course Description

Programme: B.Sc.

Course Code: U24/ZOO/DSE/601

Type of course: DSE - II

No. of credits: 4

Max. Hours: 60

Hours per week: 4

Max. Marks: 100

2. Course Objectives

- To understand the origin of life, diversity of animal life on earth and mechanism of evolution
- To comprehend and summarize ecological concepts.
- To study the distribution of animals.

3. Course Outcomes

On completion of the course the student will be able to:

CO1: To comprehend the working principles of ecology, it's association between biotic and abiotic factors.

CO2: To apply ecological concepts on population ecology, its adaptations, environmental pollution and wildlife conservation.

CO3: To remember zoogeography and its application in conservation of species and biodiversity.

CO4: To understand the evolutionary mechanism - both selective and random - which can explain the genetic composition of populations, form, and distribution of organisms

CHAIRMAN Board of Studies in Zoology, Osmania University, Hyd-07

PROFESSOR & HEAD Department of Zoology, UCS, Osmania University, Hyd-07

4. Course Content

MODULE I: Module I: Ecology – I **15 HRS**

1.1Ecosystem: structure and functions. Types of Ecosystems - Aquatic and Terrestrial

1.2 Biogeochemical cycles - Nitrogen, Carbon, Phosphorus and Water.

1.3 Energy flows in the ecosystem.

1.4 Food chain, food web and ecological pyramids.

1.5 Animal Associations - Mutualism, commensalism, parasitism, competition, predation

Module II: Ecology – II **15 HRS**

2.1 Concept of Species, Population dynamics and Growth Curve

2.2 Community Structure and dynamics and Ecological Succession.

2.3 Ecological Adaptations

2.4 Environmental Pollution -Sources, Effect and Control measures of Air, Water, Soil & Noise Pollution

2.5 Wildlife conservation - National parks and Sanctuaries of India, Endangered species.

MODULE II: Zoogeography **15 HRS**

3.1 Zoogeographical regions - Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions - their Climatic and faunal peculiarities

3.2 Wallace line, Discontinuous distribution

3.3 Continental Drift

3.4 Biodiversity and hotspots of Biodiversity in India

MODULE IV:Evolution **15 HRS**

4.1 Theories of evolution - Lamarckism and Neo-Lamarckism, Darwinism and Neo- Darwinism, Modern synthetic theory.

4.2 Evidence of Evolution. Causes and Role of Extinction in Evolution.

4.3 Forces of Evolution - mutation, gene flow, genetic drift, and natural selection. Hardy Weinberg Law

4.4 Isolation - Premating and post mating isolating mechanisms

4.5 Speciation: Methods of speciation - Allopatric and sympatric

CHAIR MEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

5. References

a) Ridley,M (2004) Evolution III Edition Blackwell publishing .

b) Hall, B.K. and Hallgrimson, B (2008). Evolution IV Edition. Jones and Barlett Publishers.

c) Campbell, N.A. and Reece J.B (2011). Biology. IX Edition. Pearson, Benjamin, Cummings.

d) Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.

e) Snustad. S Principles of Genetics. Pevsner, J (2009).

f) Bioinformatics and Functional Genomics. II Edition Wiley-Blackwell.

g) Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.

h) Krebs, C. J. (2001). Ecology. VIEdition. Benjamin Cummings.

i) Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole

j) Robert Leo Smith Ecology and field biology Harper and Row publisher

k) Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres

CHAIR MEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

6. Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Local Development Needs	The course aims at developing an understanding of structural components of the environment & ecological aspects, which helps the individual to analyse the factors involved in disturbing the natural environmental conditions in their immediate surroundings..
Regional Development Needs	The Course also creates a deep understanding of possible solutions to control environmental issues related to the given region.
National Development Needs	To educate in the conservation of the nation's natural resources. To understand the evolutionary mechanisms.
Global Development Needs	To aid the preservation and conservation of biodiversity. To comprehend the ecological impact on evolution and Zoogeography.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module I & II	Field visits to local water bodies to analyse different parameters
Entrepreneurship Development	Module I & II	Projects will be given on finding ways or solutions for sustainable living
Employability	Module I - IV	Field work on analysing animal diversity and behavioural studies in animals. Internships in institutes such as Zoological parks, ZSI,LaCONES etc.

CHAIR MEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Presentation	Participative Learning
2.	Field Trips	Experiential Learning
3.	Case Study	Problem Solving Learning

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA-1 Written Test	Written Exam
CO2	CIA-1 Written Test	
CO3	CIA-2 Assignment	
CO4	CIA-2 Objective test	

CHAIR MEN
Board of Studies in Zoology.
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

b) Model Question Paper- End Semester Exam

ECOLOGY, EVOLUTION & ZOOGEOGRAPHY
MODEL QUESTION PAPER

Course Code: U24/ZOO/DSE/601 **Max Marks: 60**
Credits: 4 **Time: 2Hrs**

ILLUSTRATE WITH DIAGRAMS WHEREVER NECESSARY

SECTION-A

I. Answer the following: - **4 x 10 =40 M**

1. Define Ecosystem and explain types of Ecosystems.

OR

2. Describe biogeochemical cycles and explain Nitrogen and Phosphorus cycles.

3. What is Ecological succession and explain in detail.

OR

4. What are different types of pollution & analyse the various threats of air pollution to the environment. List out the solutions to control it.

5. Examine the Biodiversity hotspots of India.

OR

6. Distinguish between the faunal peculiarities of Oriental and Palaearctic realm

7. Write a note on Lamarckism and classify the evidence of evolution.

OR

8. Derive the Hardy Weinberg Law and illustrate it.

SECTION- B

II. Answer any <u>FOUR</u> **4 x 5 =20 M**

9. How does studying food chains help us to understand energy flow in ecosystems?
10. How can we preserve endangered animals?
11. Identify the Biodiversity hotspots in India
12. Differentiate between Allopatric and sympatric speciation
13. Explain population dynamics
14. Elaborate different animal associations

ECOLOGY, EVOLUTION & ZOOGEOGRAPHY
MODEL QUESTION PAPER

SECTION A - INTERNAL CHOICE			4 Q X 10 M = 40 M	
Question Number	**Question**	**Question**	**CO**	**BTL(Bloom's Taxonomy Level)**
1	Module 1	Define Ecosystem and explain types of Ecosystems.	CO 1	Level I
2	Module 1	Describe Biogeochemical cycles and explain Nitrogen and Phosphorus cycles	CO 1	Level I & Level II
3	Module 2	What is Ecological succession and explain in detail.	CO 2	Level V
4	Module 2	What are different types of pollution & analyze the various threats of air pollution to the environment. List out the solutions to control it.	CO 2	Level V & VI
5	Module 3	Examine the Biodiversity hotspots of India.	CO 3	Level IV
6	Module 3	Distinguish between the faunal peculiarities of Oriental and Palaearctic realm	CO 3	Level IV
7	Module 4	Write a note on Lamarckism and classify the evidence of evolution.	CO 4	Level I & Level II
8	Module 4	Derive the Hardy Weinberg Law and illustrate it.	CO 4	Level II

CHAIRMEN
Board of Studies in Zoology
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS.
Osmania University, Hyd-07.

SECTION B - ANSWER ANY 4 OUT OF 6			4 Q X 5M = 20 M	
9	Module 1	How does studying food chains help us to understand energy flow in ecosystems?	CO 1	Level IV
10	Module 2	How can we preserve endangered animals?	CO 2	Level VI
11	Module 3	Identify the Biodiversity hotspots in India	CO 3	Level III
12	Module 4	Differentiate between Allopatric and sympatric speciation	CO 4	Level IV
13	Module 2	Explain population dynamics	CO 2	Level II
14	Module 1	Elaborate different animal associations	CO 1	Level VI

CHAIRMEN
Board of Studies in Zoology.
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS.
Osmania University, Hyd-07.

ECOLOGY, EVOLUTION & ZOOGEOGRAPHY
PRACTICAL

Course Code: U24/ZOO/DSE/601/P **Hours per week: 2**

Max. Hours: 30 **Max. Marks: 50**

No. of credits: 1

Course Objectives:

- To understand the origin of life, diversity of animal life on earth and mechanism of evolution
- To comprehend and summarize ecological concepts.

Course Outcomes:

CO1: To analyze the evolutionary mechanism through the study of fossils.

CO2: To evaluate the water quality through different physicochemical parameters.

CO3: To remember zoogeography and its understand the distribution of fauna.

Syllabus:

1.Determination of pH of Soil and Water

2.Estimation of salinity (chlorides) of water in given samples.

3. Estimation of Carbonates and bicarbonates in the given water samples.

4.Estimation of dissolved oxygen of pond water, sewage water and effluents.

5.Identification of Zooplankton from a nearby water body.

6.Study of Pond Ecosystem / local polluted site - Report submission

7.Study of at least 3 endangered or threatened wild animals of India through photographs / specimens / models

8.Field visit to Zoo Park to study the management, behavior and enumeration of wild animals.

9.Identification of Zoogeographical realms from the Map and identify specific fauna of respective regions.

10. Museum Study of Fossil animals: Peripatus, Coelocanth Fish, Dipnoi fishes, Sphenodon, Archeopteryx.

11. Study of homology and analogy from suitable specimens and pictures

12. Problems on Hardy-Weinberg Law

13. Macroevolution using Darwin finches (pictures)

CHAIRMEN
Board of Studies in Zoology
Osmania University, Hyd-07, Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

ECOLOGY, EVOLUTION & ZOOGEOGRAPHY
MODEL QUESTION PAPER - PRACTICAL

Course Code: U24/ZOO/DSE/601/P **Max Time: 2 hrs**
Credits: 1 **Max. Marks: 50**

I. EXPERIMENT :WRITE THE PRINCIPLE, PROCEDURES, INFERENCE AND RESULTS **14 M**

1. Estimation of salinity (chlorides) of water in given samples. Determination of pH of Soil and Water

2.Estimation of Carbonates and bicarbonates in the given water samples. Determination of pH of Soil and Water

3. Estimation of dissolved oxygen of pond water, sewage water and effluents. Determination of pH of Soil and Water

4. Identification of Zooplankton from a nearby water body. Determination of pH of Soil and Water

5. Identification of Zoogeographical realms from the Map and identify specific fauna of respective regions.

II. PROBLEMS ON HARDY-WEINBERG LAW **5 M**

III. IDENTIFY THE FOLLOWING SPOTS **3 X 2 =6 M**

1. Museum Study of Fossil animals: Peripatus, Coelacanth Fish, Dipnoi fishes, Sphenodon, Archeopteryx.
2. Study of homology and analogy from suitable specimens and pictures
3. Macroevolution using Darwin finches(pictures)

CHAIR MEN
Board of Studies in Zoology
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS.
Osmania University, Hyd-07.

III. REPORT **10 M**

1. Study of Pond Ecosystem / local polluted site – Report submission
2. Study of at least 3 endangered or threatened wild animals of India through photographs / specimens /models
3. Field visit to Zoo Park to study the management, behavior and enumeration of wild animals.

IV. VIVA **5 M**

V. RECORD **5 M**

Prepared by	Checked & verified by	Approved by
S. SRAVANTHI Name and Signature of the teaching faculty	DR. JYOTHI RANI Name and Signature of HoD	Name and Signature of Principal

CHAIRMAN
Board of Studies in Zoology,
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

SEMESTER VI

ECONOMIC BOTANY AND BIOTECHNOLOGY

1. Course Description

Program:	**B. Sc**	**Max. Hours:**	**60**
Course Code:	**U24/ BOT/ DSE/602**	**Hours per week:**	**4**
Type of Course:	**DSE - 4**	**Max. Marks:**	**60**
No. of Credits:	**4**		

2. Course Objectives

1. Evaluate how plants and plant products impact the world economy, with emphasis on those plants and plant products that substantially impact the economy.
2. Provide students with an understanding of the subject specific knowledge, as well as the critical, analytical and flexible approach to problem solving in the field of biotechnology

3. Course Outcomes

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

CO1: Recognise the role plants play in human welfare with special emphasis on economic and commercially significant plants
CO2: Categorize and demonstrate the principle and basic protocols for Plant Tissue Culture and its applications
CO3: Interpret plant biotechnology practices such as hairy root culture alongside secondary metabolite production and rDNA technology
CO4: Recognize the various gene transfer methods and implement the concepts and practices of intellectual property rights

4. Course Content

Module I: Plant products **15 Hours**

1.1 Concept of centers of origin, their importance with reference to Vavilov's work; Cereals: Wheat - Origin, morphology, uses. Legume: General account with special reference to Gram and soybean.
1.2 Spices and Beverages: General account with special reference to clove and black pepper (Botanical name, family, part used morphology and uses). Tea (morphology, Processing, uses).
1.3 General description with special reference to groundnut and Cotton. (Botanical name, family, part used, morphology and uses)

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
DEPT. OF BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

Module II: Tissue culture **16 Hours**

2.1 Tissue culture: Introduction, sterilization procedures, explants, culture media – composition and preparation; Micropropagation.

2.2 Organ culture: Vegetative Organs-Root, Shoot, Leaf culture Reproductive Organs - Anther, Embryo culture; Cell and protoplast culture, Somatic hybrids and Cybrids.

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

Module III: Biotechnology **12 Hours**

3.1 Production of hairy roots and its applications in production of secondary metabolites.

3.2 Biotechnology: Introduction, history, scope and applications. rDNA technology: Basic aspect of gene cloning, Enzymes used in gene cloning.

3.3 Gene Cloning -Vectors – cloning vehicles (Plasmid, Cosmids, Bacteriophages, & Phasmids); application of r DNA technology. Gene Libraries: Genomic Libraries, cDNA Libraries

Module IV: Techniques **17 Hours**

4.1 Polymerase chain reaction and its applications; Method of gene transfer in plants (*Agrobacterium* and Microprojectile); Production of transgenic plants, Bt –application in cotton and brinjal. Application of Transgenic in crop improvement.

4.2 Chromatography – Principle, Paper & Column chromatography; Electrophoresis – PAGE, SDS – PAGE.

4.3 Spectrophotometry – Principle & applications

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

5. Reference Books

1. Kochhar, S.L. (2011). *Economic Botany in the Tropics*, MacMillan Publishers India Ltd., New Delhi. 4th edition.
2. Ashok Bendre and Ashok Kumar ,2000. *Economic Botany,* Rastogi Publications, U.P.
3. Bhojwani, S.S. and Razdan, M.K., (1996). *Plant Tissue Culture: Theory and Practice*. Elsevier Science Amsterdam. The Netherlands.
4. Balasubramanian, D., C. F. A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004. *Biotechnology.* Universities Press (India) Private Limited, Hyderabad.
5. Channarayappa. 2007. *Molecular Biotechnology – Principles and Practices*. Universities Press (India) Private Limited, Hyderabad.
6. Chawala, H. S. 2002. *Introduction to Plant Biotechnology*. Oxford & IBH Publishing Company, New Delhi.
7. Dubey, R. C. 2001. *A Textbook of Biotechnology*. S. Chand & Company Ltd., New Delhi.
8. Edmond J. B., T. L. Senn, F. S. Adrews and R. J. Halfacre. 1977.
9. Jha, T.B. and B. Ghosh. 2005. *Plant Tissue Culture – Basic and Applied*. Universities Press (India) Private Limited, Hyderabad.
10. P.K Gupta, 2019. *Elements of Biotechnology*. Rastogi Publications, U.P.
11. Verma V,1974. *A Textbook of Economic Botany*. Emkay Publications, Delhi.
12. Plummer, D.T. (1996). An Introduction to Practical Biochemistry. Tata McGraw- Hill Publishing Co. Ltd. New Delhi. 3rd edition.
13. Ruzin, S.E. (1999). Plant Microtechnique and Microscopy, Oxford University Press, New York. U.S.A.
14. Ausubel, F., Brent, R., Kingston, R. E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K. (1995). Short Protocols in Molecular Biology. John Wiley & Sons. 3rd edition.

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

6. Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	**Relevance**
Global needs	Integration of economic botany and biotechnology, can harness the potential of plant resources for socioeconomic development through technological approach.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	**Syllabus Content**	**Description of Activity**
SD	Module II: Tissue culture	Hands on training sessions on culturing explants in suitable plant growth medium
	Module IV: Techniques	Understand the essentials of new techniques like electrophoresis, chromatography, spectrophotometry for research activities,

Head O... St. Francis College Begumpet.

CHAIRPERSON B.O.S. IN BOTANY OSMANIA UNIVERSITY HYDERABAD-500 007

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative Learning	• Information collection from Library • Group Discussion Teams of three or four to discuss on plant tissue culture technique for crop improvement Presentation • Seminar topics on Transgenic Plants and IPR. • 3 D Models - creation and presentation
2.	Experiential Learning	• Science Experiments and Field Trips • Live experiments like Plasmolysis, tissue Culture Media, Gel Electrophoresis (Interdepartmental Activity) • Visit to Scientific Institutes like NIRD and Agribiotech • Interactive Class room games/Quiz Using Kahoot.
3.	Problem solving	• Minor research projects using the mentioned techniques in the syllabus.

Head of the Dept.
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination- 60%
CO1	CIA 2 – Test 1: MCQ's, Quiz test or subjective	Written Exam
CO2	CIA 1 - Subjective	
CO3		
CO4	CIA 2 – Test 2: MCQ's / Presentation / Seminar topics	

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

b) Model Question Paper – End Semester Exam Theory

ECONOMIC BOTANY AND BIOTECHNOLOGY

Course Code: U24/ BOT/ DSE/602

TIME: 2 hours **MAXMARKS: 60**

Note: This question paper consists of Section A and B. The answer to Section A & B must be written in the answer book given.

Section –A (Long Essay Type)

I. Answer ALL questions: **Marks: 4x 10 - 40 M**

1. Explain the economic value of spices - clove and pepper.

OR

2. Elaborate the role of oil yielding plants with example of groundnut.

3. Describe Anther culture and its application.

OR

4. List the techniques in plant Tissue culture.

5. Illustrate the procedure of r-DNA technology.

OR

6. Assess the role of cloning vehicles.

7. Explain PCR and its applications.

OR

8. What are transgenic plants? Describe the application of transgenics in crop improvement.

Section B (Short Essay Type)

II. Write short notes on any **FOUR** of the following: **Marks 4 x 5 - 20**

9. Explain the economic importance of Cotton.
10. What are Somatic hybrids?
11. List the types of Restriction enzymes
12. Elaborate the method of Gel electrophoresis
13. List the economic uses of Wheat
14. What are Synthetic seeds? Explain their applications

Basanti. d
Head of the Department
St. Francis College,
Begumpet.

A. Savitha Rao
CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

SECTION A - INTERNAL CHOICE				4Q X 10 M = 40 M
Question Number	Question	Question	CO	BTL (Blooms Taxonomy Level)
1	Module 1	Explain the economic value of spices - clove and pepper	CO 1	Level II
2	Module 1	Elaborate the role of oil yielding plants with example of groundnut.	CO 1	Level VI
3	Module 2	Describe Anther culture and its application.	CO 2	Level I, II
4	Module 2	List the techniques in plant Tissue culture.	CO 2	Level I, IV
5	Module 3	Illustrate the procedure of r-DNA technology.	CO 3	Level II
6	Module 3	Assess the role of cloning vehicles	CO 3	Level V
7	Module 4	Explain PCR and its applications.	CO 4	Level II
8	Module 4	What are transgenic plants? Describe the application of transgenics in crop improvement.	CO 4	Level I
SECTION B - ANSWER ANY 4 OUT OF 6 (To compulsorily have ONE question from each module)				4Q X 5 M = 20 M
9	Module 1	Explain the economic importance of Cotton.	CO 1	Level II
10	Module 2	What are Somatic hybrids?	CO 2	Level I
11	Module 3	List the types of Restriction enzymes	CO 3	Level I, IV
12	Module 4	Elaborate the method of Gel electrophoresis	CO 4	Level VI
13	Module 4	List the economic uses of Wheat	CO 4	Level I, IV
14	Module 1	What are Synthetic seeds? Explain their applications	CO 1	Level I, II

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO 1	2	10 each	1	5
2	16	CO 2	2	10	1	5
3	12	CO 3	2	10	1	5
4	17	CO 4	2	10	1	5

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions (hrs)
1	1,4,5,6	Remember	15
2	1-7	Analyzing	16
3	1-7	Understanding	12
4	1-7	Remembering	17

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

ECONOMIC BOTANY AND BIOTECHNOLOGY

Practical Syllabus

1. Course Description

Programme:	**B. Sc**	**Max. Hours:**	**30**
Course Code:	**U24/ BOT/ DSE/602**	**Hours per week:**	**2**
Type of Course:	**DSE - 4**	**Max. Marks:**	**50**
No. of Credits:	**1**		

2. Course Objectives

1. To identify and classify plants that are of economic importance
2. To summarize the concept of plant tissue culture techniques and gene cloning techniques for improved plant propagation.

3. Course Outcomes

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

CO1: Identify members of the major angiosperm families by observing their diagnostic features and economic importance

CO2: Devise methods to improve basic skills and techniques related to molecular biology

4. Course Content

1. Study of economically important plants: Wheat, Gram, Soybean, Black pepper.
2. Clove, Tea, Cotton, Groundnut through specimens, sections and microchemical tests.
3. Familiarization with basic equipment in tissue culture.
4. Isolation of plant DNA (Onion)
5. Production of synthetic seeds /Encapsulation of embryo.
6. Preparation of plant tissue culture medium.
7. Study of biotechnology products: Samples of antibiotics and vaccines; Photographs of transgenic plants Bt Cotton; Bt Brinjal.
8. Study through photographs: Anther culture, somatic embryogenesis, endosperm and Embryo culture; Micropropagation.

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

5. Model Question Paper – End Semester Exam Practical

ECONOMIC BOTANY AND BIOTECHNOLOGY

Course Code: U24/ BOT/ DSE/602/P

Time: 2 Hours **Maximum Marks: 50 Marks**

Q I. Conduct the biotechnological experiment **'A'** allotted to you and writes the procedure. **5 Marks**

Q II. Carry out the microchemical test of the given material **'B'** and **'C'**. Identify, draw and describe. **2 x 5 – 10 Marks**

Q III. Critical notes on three spotters **3 x 5 - 15 Marks**

Q IV. Viva-voce **5 Marks**

Q V. Project **10 Marks**

Q V. Record **5 Marks**

Prepared by	Checked &verified by	Approved by
Dr. S. Revathi **Teaching faculty**	**Dr. Basanti Chintapalli** **HoD**	**Dr. Uma Joseph** **Principal**

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
(An Autonomous College Affiliated To Osmania University)
FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY
PRACTICAL SYLLABUS CBCS-2024
SEMESTER -VI
EXPERIMENTS IN PHYSICAL CHEMISTRY II AND INSTRUMENTATION

Program: B.Sc.
Course Code: U20/CHE/DSE/601/P
Course: DSE-3&4
No. of Credits : 1

Max. Hours: 30 Hrs
Max. Marks: 50
Hours per week: 3 Hrs

Course Objectives

- To equip the students with skills to determine various physical parameters using instrumentation methods and to synthesize complexes.

Course Outcomes

CO1: Achieve the expertise in determining pH, conductivity, unknown concentration of solutions and rate constants of reactions.
CO2: Acquire the ability to synthesize metal complexes.

Chemical Kinetics:

1. Catalytic Decomposition of Hydrogen Peroxide.
2. Acid catalyzed hydrolysis of methyl acetate.
3. Kinetic study of oxidation of I^- by $K_2S_2O_8$.

Colorimetry:

4. Determination of Dichromate and Permanganate in a mixture using Beer Lambert's Law.
5. Job's Method for the determination of ferric thiocyanate complex.

pH metry:

6. Titration of strong acid Vs strong base.
7. Determination of ionization constant of acetic acid by pH metric method.

Preparation of Complexes:

8. To prepare a complex of tetraammine copper II sulphate complex.
9. To prepare a complex of chloropentaamminecobalt III chloride.
10. To prepare a complex of hexammine nickel II chloride.

References

1. Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
2. Svehla, G, *Vogel's Qualitative Inorganic Analysis:* Pearson Education, 2012.
3. Mendham, J, *Vogel's Quantitative Chemical Analysis:* Pearson, 2009.

Chairperson
Board of Studies in Che
Dept of Chemistry
Osmania University, Hyd

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

6. **Syllabus Focus**

a. Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Local	Knowledge of chemistry of complexes helps in everyday life
Regional	Learning the concepts of surface chemistry and pericyclic reactions changes their perspective towards various processes
National	Through Knowledge of spectral interpretation opens new horizons in skill development and employability
Global	A complete idea of complexes and spectral interpretation increases students inclination towards research

b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD EMP	Module 1 synthesis of complexes	Some complexes are synthesized in the Lab.Many metal complexes are widely used in the pharmaceutical companies.This enhances their skill development and employability.
SD	Module 3 Spectral interpretation	Students are taught the instrumentation of all the spectroscopic methods, they are taken to various research labs to show live instrumentation techniques. They are thoroughly trained in spectral interpretation by giving assignments.

7. **Pedagogy**

S. No.	Student Centric Methods Adopted	Type / Description of Activity
1.	Field trips	Students are taken to various institutes like IICT, HCU, IIT , ARCI etc
2.	Role play	Students are made to enact various concepts of chemistry
3.	Seminars/ workshops/ research projects	Students are allowed to participate in seminars and workshops organized in and

Chairperson Board of Studies in Chemistry Dept of Chemistry Osmania University, Hyd-07.

Head Department of Chemistry UCS, Osmania University Hyderabad-500 007.

		outside the college. They are encouraged to take up research projects.

8. Course Assessment Plan

a. Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 50%	End Semester Examination-50%
CO1	CIA 1 written exam (10 M)	Written Exam
CO2	Skill Test 1 (10 M)	
CO3	CIA 1 written exam (10 M)	
CO4	Skill Test 2 (10 M)	

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

b. Model Question Paper - End Semester Exam

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016

(An Autonomous College Affiliated to Osmania University)

Faculty of Science – Department of Chemistry

MODEL PAPER

B.SC. II YEAR SEMESTER -VI

ADVANCED CHEMISTRY

TIME: 2hrs **Course Code: U24/CHE/DSE/601**

Max. Marks: 50

SECTION –A (Essay Questions)

I. Answer the following **4X10 =40 Marks**

1. a) Describe the structure of $[Cu(NH_3)_4]$ using Valence bond theory. (CO1) **L1** 5M
   b) Define optical isomerism? Draw and explain the optical isomerism in octahedral complexes. (CO1) **L1** 5M

OR

2. a) Summarise Werner's theory with examples. (CO1) **L2** 5M
   b) Explain the Crystal field splitting in octahedral complexes. (CO1) **L5** 5M
3. Outline the mechanism of SN^1 in the octahedral and SN^2 in square planar complexes with one example each. (CO2) **L2** 10 M

OR

4. a) Define trans effect? Discuss the theories and applications of trans effect. (CO2) **L2** 5M
   b) Distinguish labile and inert complexes? Explain with examples. (CO2) **L4** 5M
5. a) What is the chemical shift? Explain the change in position of signals with examples. (CO3) **L1** 5M
   b) Elaborate about (M+1), (M+2) and base peaks with two examples in Mass spectrometry. (CO3) **L6** 5M

OR

6. a) Indicate the number of signals possible for CH_3-CH_2-CH_2-OH and explain spin- spin splitting. (CO3) **L6** 5M
   b) Explain the basic principles of ESR spectroscopy. (CO3) **L5** 5M
7. a) Classify the various types of colloids? (CO4) **L5** 5M
   b) Deduce the expression for Langmuir adsorption isotherms. (CO4) **L5** 5M

OR

8. What are Flourescence and Phosphorescence ? Explain the phenomenon of florescence and phosphorescence using Jablonski diagram. 10M

SECTION – B (Short answer questions)

II. Answer any four questions. **4 X 5 = 20 Marks**

9. Explain the Job's method of determination of composition of a complex. **(L2)**
10. What is EAN? Calculate the EAN for [Co(NH3)6] and [FeF6]3- **(L1)**
11. Describe the acid hydrolysis of octahedral complexes. **(L2)**
12. Define Hardy Schulze rule and Gold number. **(L1)**
13. Show how the molecular formula of a compound is determined based on its Mass spectrum? **(L1)**
14. Discuss the quantum yield for the photochemical combination of H_2& Cl_2 to form HCl **(L5)**

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyderabad.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

11. Describe the acid hydrolysis of octahedral complexes. **(L2)**
12. Define Hardy Schulze rule and Gold number. **(L1)**
13. Show how the molecular formula of a compound is determined based on its Mass spectrum? **(L1)**
14. List out the various types of NMR signals expected for 1,1,2-tribromoethane? What is the intensity ratio of the peaks? **(L1)**

c. **Question Paper Blueprint**

Modules	Hours Allotted in the Syllabus	Cos Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	1	2	10	2	20
2	15	2	2	10	1	15
3	15	3	2	10	2	20
4	15	4	2	10	1	15

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions (Hrs)
1	2,5	Understanding	15
2	1,7	Applying & Analysing	15
3	2,7	Remembering	15
4	4	Creating & Evaluating	15

Prepared by	Checked & Verified by	Approved by
Madhuri	D. Sumalatha	
Name and Signature of the teaching faculty Y. Lakshmi madhuri	Name and Signature of the HoD Dr. D.Sumalatha	Name and Signature of Principal Dr. Uma Joseph

Chairperson
Board of Studies in Chem.
Dept of Chemistry
Osmania University, Hyd-07.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

b. Model Question Paper - End Semester Exam

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016

(An Autonomous College Affiliated to Osmania University)

Faculty of Science – Department of Chemistry

B.SC. III YEAR SEMESTER -VI

ADVANCED CHEMISTRY

TIME: 2hrs **Course Code: U24/CHE/DSE/601**

Max. Marks: 50 **Credits: 4**

SECTION A - INTERNAL CHOICE		4 X 10 M = 40M		
Question Number	**Question**		**CO**	**BTL**
1	**Module 1**	(a) Describe the structure of [Cu(NH3)4] using Valence bond theory. 5M (b) Define optical isomerism? Draw and explain the optical isomerism in octahedral complexes. **OR**	**CO1**	**Level 1**
2	**Module 1**	(a) Summarise Werner's theory with examples. (b) Explain the Crystal field splitting in octahedral complexes.	**CO1**	**Level I**
3	**Module 2**	Outline the mechanism of SN^1 in the octahedral and SN^2 in square planar complexes with one example each. 10 M **OR**	**CO2**	**Level 2**
4	**Module 2**	(a) Define the trans effect? Discuss the theories and applications of trans effect. (L1) 5M (b) Distinguish labile and inert complexes? Explain with examples. (L4) 5M	**CO2**	**Level 2**
5	**Module 3**	(a) What is the chemical shift? Explain the change in position of signals with examples. 5M (b) Elaborate about (M+1), (M+2) and base peaks with two examples in Mass spectrometry 5M **OR**	**CO3**	**Level 1**
6	**Module 3**	(a) Develop the number of signals possible for CH_3-CH_2-CH_2-OH and explain spin- spin splitting. 5M (b) Explain the basic principles of ESR spectroscopy.	**CO3**	**Level 5 & 6**
7	**Module 4**	(a) Classify the various types of colloids? 5M (b) Deduce the expression for Langmuir adsorption isotherms. 5M **OR**	**CO4**	**Level 5**
8	**Module 4**	What are Flourescence and Phosphorescence ? Explain the phenomenon of florescence and phosphorescence using Jablonski diagram.	**CO4**	**Level 2**

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

Head
Department of Chemistry
UCS, Osmania University
Hyderabad-500 007.

SECTION B – (Short answer questions) ANSWER ANY 4 OUT OF 6			4 X 5M = 20 M	
9	Module 1	9. Explain the Job's method of determination of composition of a complex.	CO1	Level 2
10	Module 2	10.What is EAN ? Calculate the EAN for [Co(NH3)6] and [Fe6]3-	CO1	Level 1
11	Module 3	11. Describe the acid hydrolysis of octahedral complexes.	CO2	Level 2
12	Module 4	12. Define Hardy Schulze rule and Gold number	CO4	Level 1
13	Module 2	13. Show how the molecular formula of a compound is determined based on its Mass spectrum? (L1)	CO3	Level 1
14	Module 3	14. Discuss the quantum yield for the photochemical combination of H_2& Cl_2 to form HCl	CO4	Level 5

SEMESTER -VI

FISHERIES AND LIMNOLOGY

1. **Course Description**

Programme: B.Sc. **Max. Hours: 60**

Course Code: U24/ZOO/DSE/602 **Hours per week: 4**

Course Type: DSE - II **Credits: 4**

2. Course Objectives

- To comprehend the basic concepts of fisheries and aquaculture techniques and management.
- To understand limnology and its reliance and application.

3. Course Outcomes

On completion of the course the student will be able to:

CO1: To discuss the scope of fisheries ,aquaculture systems and its management practices.

CO2: To analyze the different feeding , breeding and hatchery management of finfish and shellfish.

CO3: To describe the concepts ,limnology factors influencing the physical & chemical conditions of living organisms and the major group of organisms involved with it.

CO4: To summarize the productivity of lakes and the factors affecting its productivity.

CHAIRMEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

4. Course Content

MODULE I: Introduction to Fisheries, aquaculture systems, management practices

15 HRS

1.1 Introduction, definition, history, scope and significance of 'Fisheries'. Present status and prospects of Fisheries at global, national and local (state) level. Blue revolution.

1.2 Classification of Fisheries.

i) Fin fisheries & Shell fisheries;

ii) Capture fisheries & Culture fisheries;

iii) Freshwater (inland), Brackish water & Marine fisheries.

1.3 Aquaculture systems: Pond culture, pen culture, cage culture. Monoculture, composite culture, integrated culture systems.

1.4 Culture phases and management practices: Nursery, rearing and grow-out pond preparation. Liming, fertilization/manuring, and water quality management. Control of aquatic weeds, algal blooms, and weed fishes.

1.5 Traits of important cultivable finfish and shellfish: Indian major carps and Minor carps, Exotic carps, air breathing fishes, cold water fishes, freshwater prawns, mussels.

MODULE II: Feeding, Breeding and hatchery management of finfish and shellfish

15 HRS

2.1 Bundh breeding: Concept; wet and dry bundhs; Collection and hatching of eggs.

2.2 Induced breeding: Environmental factors affecting spawning; Hypophysation of fishes; Fish pituitary gland: Structure, collection, preservation, and preparation of extract for injection, dosages and methods of injection, dosages and methods of injection.

2.3 Brood-stock management and transportation of brood fish. Synthetic hormones are used for induced breeding of carps.

2.4 Types of fish hatcheries: Traditional, Chinese, Glass jar, Modern controlled hatcheries. Breeding and hatchery management of *Penaeus monodon* and *Macrobrachium rosenbergii.*

2.5 Fish nutrition: Natural and supplementary feeding of cultivable finfish and shellfishes. Forms of feeds: Wet feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets.

CHAIRMEN Board of Studies in Zoology, Osmania University, Hyd-07.

PROFESSOR & HEAD Department of Zoology, UCS, Osmania University, Hyd-07.

MODULE III: Limnology **15 HRS**

3.1 Introduction to limnology, Inland water bodies: Characteristics and field distribution of Ponds, Lakes, Reservoirs, Streams and Rivers.

3.2 Dynamics of lentic and lotic environments.

3.3 Major rivers and fresh water lakes of India. Origin, Classification and morphometry of lakes.

3.4 Influence of physical and chemical conditions on living organisms in inland waters- Temperature, Light, pH, Turbidity, Thermal stratification, Dissolved Oxygen (DO), Alkalinity, Acidity, Hardness, BOD, COD etc.

3.5 Major groups of organisms in freshwater bodies: Planktons, Periphytons, Neustons, Nektons, Benthos, large aquatic plants etc. Ecological adaptations of freshwater fauna.

MODULE IV: : Productivity of lakes **15 HRS**

4.1 Ecology of ponds and takes (Lentic ecosystems) - Structure and dynamics - Energy flow.

4.2 Productivity of water bodies: Concept of productivity, primary, secondary and tertiary productivity. Factors affecting productivity. Classification of takes based on productivity.

4.3 Laws of minimum and quantitative relationships in a standing crop.

4.4 Biotic potential and environmental resistance. Succession phenomenon and indices of productivity of lakes.

4.5 Eutrophication - causes, consequences and control mechanisms.

CHAIRMEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

5. References

1. Goldman CR. And Home AJ. 1983. Limnology. Mc Graw — Hill International Book Company.

2. Ruttner F. 1953. Fundamentals of Limnology. University of Toronto press, Toronto.

3. Welch PS, 1952. Limnology . 2nd Ed. Me Graw-Hill Book Co., New York.

4. Golterman, HL. 1975. Physiological Limnology. Elsevier Publishing Co., Amsterdam

5. Cole GA. 1983. Text book of Limnology. C.V Mosby Company, St. Louis, Missouri, USA.

6. Wetzel RG. 1975. Limnology. W.B. Sanders Company, Philadelphia.

CHAIRMEN
Board of Studies in Zoology
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS.
Osmania University, Hyd-07.

6.Syllabus Focus

a)Relevance to Local , Regional , National and Global Development Needs

Local /Regional/National /Global Development Needs	**Relevance**
Local development needs	To study and maximize sustainable biomass yield and increase employability.
Regional development needs	To comprehend and identify regional sources of fresh water bodies.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	**Syllabus Content**	**Description of Activity**
Skill Development	Module I- IV	Field visit to local or nearby fisheries units or fresh water bodies.
Employability	Module I- II	Visit to Research institute -NFDB- National fisheries development board.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Experiential Learning	Field Trips
2.	Participative Learning	Seminar and workshops
3.	Problem solving	Case studies Research Projects

8. Course Assessment Plan

a)Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA - I Written Test	Written Exam
CO2	CIA - I Written Test	
CO3	CIA - II Assignment	
CO4	CIA - II Objective test	

CHAIR MEN
Board of Studies in Zoology
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

b) Model Question Paper- End Semester Exam

FISHERIES AND LIMNOLOGY

MODEL QUESTION PAPER

Course Code: U24/ZOO/DSE/602 **Max Marks: 60**

Credits: 4 **Time: 2Hrs**

ILLUSTRATE WITH DIAGRAMS WHEREVER NECESSARY

SECTION-A

I. Answer the following: - **4 x 10 =40 M**

1. Write an elaborate note on Indian Major carps and Minor carps.

OR

2. Define fisheries. Classify the different types of fisheries.
3. What is induced breeding.Write in detail the environmental factors affecting spawning.

OR

4. Describe the types of fish hatcheries .Write a note on fish hatcheries.
5. How would you classify and measure morphology of lakes..

OR

6. What is Limnology ?Write a note on the influence of physical and chemical conditions on living organisms in inland waters.
7. Explain lentic ecosystem.

OR

8. Write the relation between primary, secondary and tertiary productivity of water bodies.

SECTION- B

II. Answer any <u>FOUR</u> **4 x 5 =20 M**

9. Scope of fisheries
10. Exotic carps
11. Forms of feed
12. Major rivers of India
13. Planktons
14. Laws of minimum

CHAIR MEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

FISHERIES AND LIMNOLOGY - MODEL QUESTION PAPER

SECTION A - INTERNAL CHOICE **4 Q X 10 M = 40 M**

Question Number	Question	Question	CO	BTL(Bloom's Taxonomy Level)
1	Module 1	Write an elaborate note on Indian Major carps and Minor carps.	CO 1	VI
2	Module 1	Define fisheries. Classify the different types of fisheries.	CO 1	I
3	Module 2	What is induced breeding. Write in detail the environmental factors affecting spawning.	CO 2	I
4	Module 2	Describe the types of fish hatcheries .Write a note on fish hatcheries.	CO 2	V
5	Module 3	How would you classify and measure morphology of lakes?	CO3	II
6	Module 3	What is Limnology ? Write a note on the influence of physical and chemical conditions on living organisms in inland waters.	CO 3	III
7	Module 4	Explain lentic ecosystem.	CO 4	IV
8	Module 4	Write the relation between primary ,secondary and tertiary productivity of water bodies.	CO 4	V

CHAIR MEN
Board of Studies in Zoology
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

SECTION B - ANSWER ANY 4 OUT OF 6				4 Q X 5 M = 20 M
11	Module 1	Scope of fisheries	CO 1	IV
12	Module 2	Exotic carps	CO 2	I
13	Module 3	Forms of feed	CO 2	V
14	Module 4	Major rivers of India	CO 3	I
15	Module 3	Plantons	CO 3	II
16	Module 4	Laws of Minimum	CO 4	III

FISHERIES AND LIMNOLOGY

c)Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO1	2	10	1	5
2	15	CO2	2	10	1	5
3	15	CO3	2	10	1	5
4	15	CO4	2	10	1	5

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

FISHERIES AND AQUACULTURE - PRACTICALS

Subject Code: U24/ZOO/DSE/602/P **Max Marks: 50**

No. of Credits: 1 **No. of Hrs allotted: 2 Hr**

Course objective:

1. To enhance the knowledge on basics of various water analysis.
2. To study the complex & diverse approaches of aquaculture practices.

Course outcome:

- To apply the principles involved in qualitative and quantitative analysis of physicochemical parameters in the given sample.
- To comprehend the identification of cultivable fishes and morphometric analysis of freshwater bodies.

Syllabus:

1. Aquaculture production statistics — World, India, and Telangana state.
2. Aquaculture resources of the World, India, and Telangana state.
3. Histological studies of testis and ovary of fish.
4. Identification of important cultivable freshwater fishes-Indian major carps, exotic carps,mahaseers, trouts, tilapias, catfishes and murrel fish.
5. Removal of fish pituitary gland and preparation of pituitary gland extract.
6. Morphometry of lakes, ponds and streams.
7. Determination of physical and chemical characteristics of lotic and lentic water bodies: Temperature, transparency, turbidity, pH, electrical conductivity, total dissolved solids, dissolved oxygen, free carbon dioxide, total alkalinity, total hardness, calcium, magnesium, inorganic nitrogen (ammonium and nitrate) and phosphorous.
8. Collection and identification of freshwater Phytoplankton.
9. Collection and identification of freshwater Zooplankton.
10. Estimation of primary productivity in freshwater bodies.
11. Field trip to local or nearby fisheries unit/freshwater body is to be conducted and certified field note book should be submitted at the time of practical examination.

MODEL QUESTION PAPER

PRACTICAL

Course Code: U24/ZOO/DSE/602/P **Max Time: 2 hrs**

Credits: 1 **Max. Marks: 50**

I. Dissect and display fish pituitary gland **15 M**

II. Perform the Physicochemical analysis on the given water sample. **12 M**

(Experiment 7M; Principle 1M; Procedure 2 M; Results 2M)

a. pH
b. Total Alkalinity
c. Total Hardness

III. Identify the given spots **4 X 2 = 8 M**

1. Labeo
2. Euglena
3. Daphnia
4. Cyanobacteria

IV. REPORT **5 M**

V. RECORD **5 M**

VI. VIVA **5 M**

Prepared by	Checked & Verified by	Approved by
X. Sheila Merlin Name and Signature of the teaching faculty	Dr. Jyothi Rani. M DR. JYOTHI RANI Name and Signature of HoD	Name and Signature of Principal

CHAIR MEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.

SEMESTER VI

Skill Enhancement Course IV

FLORICULTURE

1. Course Description

Programme:	**B. Sc**	**Max. Hours:**	**30**
Course Code:	**U24/BOT/SEC/601**	**Hours per week:**	**2**
Type of Course:	**SEC - 601**	**Max. Marks:**	**30**
No. of Credits:	**2**		

2. Course objectives

1. Describe career opportunities in the floriculture industry
2. Explain the techniques in grading, bunching and shipping cut flowers in preparation for market and to practice procedures to increase life span of floral materials

3. Course Outcomes

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

CO 1: Describe the gardening and nursery management methods and various ornamental plants and their cultivation methods.

CO 2: Compare the principles of garden designs and understanding the importance of various landscaping methods and various factors affecting the flower production.

4. Course Content

Module I: **14 hours**

1.1 Introduction: History of gardening; Importance and scope of floriculture and landscape gardening.

1.2 Garden Operations: Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary; Role of plant growth regulators.

1.3 Ornamental Plants: Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas; Cultivation of plants in pots; Indoor gardening; Bonsai.

Module II: **16 hours**

2.1 Principles of Garden Designs: English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Water Garden). Some Famous gardens of India.

2.2 Landscaping Places of Public Importance: Landscaping highways and educational institutions.

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

2.3 Commercial Floriculture: Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold, Rose, Lilium, Orchids). Diseases and Pests of Ornamental Plants.

6. Reference Books

1. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.

7. Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global Development Needs	The global demand for cut flowers is increasing, driving growth in the floriculture market. Favorable agricultural practices and technological advancements adopted by farmers enhance yield and profitability in commercial floriculture.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
ED	Module I	Enhances students' employability within florist occupations.
	Module II	Preparing students to cut and cultivate essential flowers like Carnations, Asters, Chrysanthemums, etc., enhances their employability in floriculture and related industries.

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

8. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative Learning	Presentations and Group discussions based on syllabus topics.
2.	Experiential Learning	Field Trips to local gardens and floriculture units.
3.	Problem solving	Minor research Projects like starting small gardens at home

9. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 20%	End Semester Examination- 30%
CO1	CIA 2 – Test 1: MCQ's, Quiz test, Practical project	Written Exam
CO2	CIA 2 – Test 2: MCQ's / Presentation / Seminar topics	

Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

b) Model Question Paper – End Semester Exam Theory

FLORICULTURE

Course Code: U24/ BOT/ SEC/601 **Max. Marks: 30**

Time: 1 Hour

Answer any FIVE of the following **5 x 6 – 30**

1. Describe the importance and scope of floriculture.
2. Explain the method of soil sterilization.
3. Discuss the role of plant growth regulators.
4. Explain about ornamental plants.
5. Describe the method of cultivation of indoor plants.
6. Describe some of the famous gardens of India.
7. Explain the factors affecting flower production.
8. Discuss on pest and disease management of ornamental plants.

Prepared by	Checked &verified by	Approved by
Basanti. ch **Dr. Basanti Chintapalli** **Teaching faculty**	Basanti. ch **Dr. Basanti Chintapalli** **HoD**	**Dr. Uma Joseph** **Principal**

Basanti. ch
Head of the Department
St. Francis College,
Begumpet.

CHAIRPERSON
B.O.S. IN BOTANY
OSMANIA UNIVERSITY
HYDERABAD-500 007

SEMESTER –VI
SEC-IV MATERIAL SCIENCE AND CATALYSIS

1. Course Description

Programme: B.Sc.
Course Code: U24/CHE/SEC/601
2 Type of course: SEC
No. of credits: 2

Max. Hours: 30
Hours per week:
Max. Marks: 50

2. Course Objectives:

- To provide students with a comprehensive understanding of catalysis at nanoscale with a focus on the unique properties.
- To equip students with application of catalysts including both homogeneous and heterogeneous types and their role in chemical processes and industries.

3. Course Outcome:

CO 1: Gain foundation in the principles of catalysis and apply at nanoscale.
CO 2: Identify and explain the mechanisms of catalytic reactions including the role of active sites and reaction pathways.

This SEC paper will help students to enhance their overall skills.

Chairperson
Board of Studies in Che...
Dept of Chemistry
Osmania University, Hyd-07.

4. Course Content:

Module I: NANOMATERIALS AS CATALYSTS **15 Hrs**

Introduction: Nanocatalyst-A New Fangled material in the Catalytic World, Challenges to Nanocatalysts, Types of Nanocatalysis.Types of Nanocatalysts, Metal Nanoparticles as Catalysts, Metal Oxide Nanoparticles as Catalysts.

Carbon Family Nanomaterials as Nanocatalyst, other Nanomaterials as Nanocatalysts, Size and Shape, Effect of Nanoparticles on Catalytic Activity, Mechanism of Nanocatalysis

Green Nanocatalysis, Nanocatalysis and the Prospects of Green Chemistry, Some Examples of Nano Catalytic Green Reactions, Recoverability and Recycling of Nanocatalysts.

Applications of Nanocatalysts, nanocatalysts and multicomponent reactions.The concept of nanoreactor photocatalysis.

Module II: CATALYSIS **15 Hrs**

Introduction: Definition of a catalyst and catalysis. Homogeneous and heterogeneous catalysis- Comparison of homogeneous and heterogeneous catalysis with specific examples. General characteristics of catalytic reactions.

Acid-base catalysis- Examples of acid and base catalysed reactions- Hydrolysis of esters and Aldol condensation. Kinetics of acid catalysed reactions. Specific acid and general acid catalysis, Specific base and general base catalysis. Effect of pH on reaction rate of acid and base catalysed reactions.

Phase transfer catalysis: Principle of phase transfer catalysis, classification of phase transfer catalysts. Factors influencing the rate of PTC reactions.

Enzyme catalysis, Characteristics of enzyme catalysis, Examples: (i) Invertase in inversion of cane sugar (ii) Maltase in conversion of maltose to glucose (iii) Urease in decomposition of urea and (iv) Zymase in conversion of glucose to ethanol. Factors affecting enzyme catalysis. Effect of temperature, pH, concentration and inhibitor on enzyme catalysed reactions. Michaelis Menten equation.

5. References:

- T. Pradeep *Nano: The Essentials*, McGraw-Hill Education.
- CNR Rao et.al. *Chemistry of nanomaterials: Synthesis, Properties and applications,* Wiley-VCH Verlag GmbH & Co. KGaA.
- William D. Callister, Jr. John Wiley & Sons Materials Science and Engineering An Introduction.
- Nanotechnology: Principles and Practices by Sulabha K. Kulkarni
- Principles of Physical Chemistry by Puri, Sharma and Pathania, 2017.
- Text Book of Physical Chemistry P.L Soni, O.P Dharmaha, U.N Dash.
- Physical Chemistry by Atkins and De Paula, 8 th Edn.

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	CIA1- Assignment	Written Exam
CO2	CIA2- Skill test	

9.

a) Weightage of Marks in Formative and Summative Assessments

Formative Assessment - FA (40%)	Summative Assessment - SA (60%)
CIA-20 marks	End Semester exam-30 Marks

Chairperson
Board of Studies in Che...
Dept of Chemist...
Osmania University, Hyd-07.

6. Syllabus Focus

a) Relevance to Local , Regional , National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Local and regional	Products made from nanomaterials and their roles in human life.
National and global	Catalysts commonly used in industry/research for the synthesis of numerous compounds.

7. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	All	Current progress on the application of nanomaterials synthesized using Nano catalysts.
ED	All	Gives us an insight of fundamentals of catalysts and its development in the production process.
EMP	All	Research and knowledge helps in designing nanomaterials, which are all important skills for working in biotechnology, pharmaceuticals, and advanced materials.

Chairperson
Board of Studies in Chem
Dept of Chemistry
Osmania University, Hyd-07.

b) Question Paper Pattern

St. FRANCIS COLLEGE FOR WOMEN BEGUMPET HYDERABAD – 500 016 (AN AUTONOMOUS COLLEGE AFFILIATED TO OSMANIA UNIVERSITY) CHEMISTRY

Model Paper

B.Sc. III - Semester VI

SKILL ENHANCEMENT COURSE

MATERIAL SCIENCES AND CATALYSIS

Course Code: U24/CHE/SEC/601

Time: 1 Hr
Max. Marks: 30

SECTION A - Answer any six questions 6 x 5 = 30 Marks

Question Number	MODULE	Question	CO	BTL
1	Module 1	What are the different Types of Nanocatalysis?	CO 1	(Level IV)
2	Module 1	Explain the Mechanism of Nanocatalysis.	CO 1	(Level II)
3	Module 1	Write a note on Prospects of Nanocatalysis in Green Chemistry with examples.	CO 1	(Level I)
4	Module 1	Explain any 4 applications of Nanocatalysis.	CO 1	(Level I)
5	Module 2	Define catalysis. Give the characteristics of catalysis.	CO 2	(Level I)
6	Module 2	Derive Michaelis - Menten Equation.	CO 2	(Level IV)
7	Module 2	Discuss the principle of Phase transfer Catalysis.	CO 2	(Level II)
8	Module 2	Explain the kinetics of Acid-catalyzed reactions.	CO 2	(Level IV)

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016

(An Autonomous College Affiliated To Osmania University)

FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY

THEORY SYLLABUS CBCS-2024

SEMESTER -VI

POLYMER CHEMISTRY

1. Course Description

Program: B.Sc. Max.
Course Code: U24/CHE/DSE/602
Course: DSE- 4
No. of Credits: 4

Hours: 60 Hrs
Max. Marks: 100
Hours per week: 4 Hrs

2. Course Objectives

- To familiarize the students with the mechanism of polymerization and determination of their molecular mass.
- To introduce different levels of polymer structures and significance of Tg and Tm.
- To learn about different types of polymers.
- To understand the factors that influence the degradation of polymers.

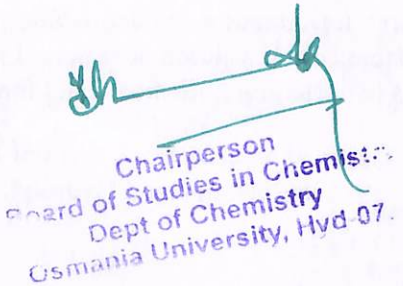
3. Course Outcomes

CO 1: Understand the different mechanisms of polymerization and methods of their molecular weight determination.

CO 2: Apply the knowledge of polymer structure to Tg and Tm.

CO3: Understand synthesis, properties and applications of rubbers and plastics.

CO 4: Develop fundamental knowledge of fibers, biodegradable polymers and polymer degradation.



POLYMER CHEMISTRY

4. Course Syllabus

Module 1: Polymerisation 15 Hrs

Introduction to Polymers, Classification of polymers based on structure, chemistry of polymerisation, addition polymerisation, copolymerisation, condensation polymerisation, coordination polymerisation, Ziegler-Natta catalyst, Kinetics of polymerization - Free radical chain polymerization, Cationic polymerization, Anionic polymerization.

Degree of polymerisation, physical properties, weight average number average molecular weight. Experimental methods of molecular weight determination- End group analysis, Viscometry and Light scattering.

Module 2: Crystallinity and Glass transition temperature 15 Hrs

Determination of crystalline melting point and degree of crystallinity. Factors affecting crystalline melting point. Effect of crystallinity on properties of polymers. Helix structures, Spherulites, Polymer single crystals. Glass Transition temperature (T_g). Factors affecting glass transition temperature. Importance of Glass Transition temperature, T_g and molecular weight, T_g and plasticisers, T_g and copolymers, T_g and melting point. Heat distortion temperature.

Module 3: Rubbers and Plastics 15 Hrs

Natural rubbers, drawbacks of natural rubber, vulcanization, rubber compounding, foamed rubbers, gutta-percha rubber, properties and applications of synthetic rubbers- poly isoprene, poly buta- diene, poly styrene butadiene, neoprene rubbers, nitrile rubbers, polysulfide rubbers.

Thermosetting and thermoplastics. Thermoplastics: poly olefins, poly styrene, PVC, teflon, their preparation, structure and applications. Thermosetting plastics: phenolic resins, amino resins, polyester resins, epoxy resins - preparation, structure and applications. Laminates and fabrication of plastics. Types and properties of Silicones and Adhesives.

Module 4: Fibers, biodegradable polymers and Polymer degradation 15 Hrs

Natural and synthetic fibers, study of synthetic fibers- polyamides, poly esters, poly acrylates.

Biodegradable Polymers: Introduction, biodegradation mechanism and properties of starch based polymers, polyesters, water soluble polymers. Environmental impacts. Applications of biodegradable polymers in agriculture, medicine and food packaging industry.

Polymer degradation: Types of degradation- thermal degradation, mechanical degradation, Photo degradation. Oxidative degradation and Hydrolytic degradation.

Chairperson
Board of Studies in Chem
Dept of Chemist
Osmania University, Hyd-07

5. References

1. Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, *Polymer science*, New Age International, 1986.
2. Vermani.O.P. Narula.A.K. (2004*), Industrial Chemistry*, New Delhi, Galgotia Publications Pvt Ltd.
3. Gopalan.R, Venkappayya & Nagarajan.S, (2005), *Textbook of Engineering Chemistry* (3rd edition) New Delhi,Vikas Publishing House Pvt. Ltd.
4. Jain and Jain , *Engineering chemistry* Dhanpat Raj Publishing company
5. Principles of Physical Chemistry by Puri, Sharma and Pathania, 2017.
6. Text Book of Physical Chemistry P.L Soni, O.P Dharmaha, U.N Dash.
7. Physical Chemistry by Atkins and De Paula, 8 th Edn.
8. Chatwal. R.G., (2006) Chemistry and Industry, New Delhi, Himalaya Publishing House.

6. Syllabus Focus

a) Relevance to Local , Regional , National and Global Development Needs

Local /Regional/National/ Global Development Needs	Relevance
Local	Products made from polymers and its unforgettable roles in human life.
Regional	Polymers are commonly being used in catalytic applications as supports for compounds.
National	Polymers are crucial due to their versatility, cost-effectiveness and wide applications in various industries.

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP (Mention any ONE of the above at a time)	Syllabus Content (Mention Module No. or part content applicable)	Description of Activity (Activity that will be conducted in class to support the focus of SD/ED/EMP in the syllabus content)
SD	All	Advancement of polymers processing techniques of exciting possibilities for creating novel polymer based elements and devices.
ED	All	Give us an insight of fundamentals of polymer business and its development in the production process.
EMP	All	Research and knowledge helps in designing machinery procurement.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Experiential Learning	Field Trip
2.	Participative Learning	Presentations
3.	Problem solving	Case studies

Chairperson
Board of Studies in Chem.
Dept of Chemistry
Osmania University, Hyd-07.

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	CIA1-Written Exam	Written Exam
CO2	CIA1-Written Exam	
CO3	CIA2- Role Play	Written Exam
CO4	CIA2- Group Survey	

b. Model Question Paper - End Semester Exam

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
(An Autonomous College Affiliated to Osmania University)
Faculty of Science – Department of Chemistry
B.Sc. III YEAR SEMESTER -VI
POLYMER CHEMISTRY

TIME: 2hrs **Course Code: U24/CHE/DSE/602**
Max. Marks: 60

SECTION A - INTERNAL CHOICE 4 X 10 M = 40M

Question Number	Question		CO	BTL
1	Module 1	Outline the mechanism of free-radical addition polymerization and Coordination polymerization. 10M **OR**	CO 1	(Level I)
2	Module 1	What is the average molecular weight? How is it determined by viscometry? 10M	CO 1	(Level I)
3	Module 2	a) Define crystalline melting point and discuss the factors affecting crystalline melting point. 5 M b) How does the crystalline melting point affect the properties of polymers? 5 M	CO 2	(Level III)

		OR		
4	**Module 2**	a) What is Glass Transition temperature (T_g). Explain the factors affecting glass transition temperature. 5M b) Describe the relationship between Tg and molecular weight. 5M	**CO 2**	**(Level I)**
5	**Module 3**	a) Why does natural rubber require vulcanisation and how is it done? 5 M b) Write the preparation, properties and applications of poly isoprene and poly styrene butadiene rubbers. 5 M **OR**	**CO 3**	**(Level II)**
6	**Module 3**	a) Differentiate between thermoplastics and thermosetting plastics. 5 M b) Discuss the synthesis, properties and applications of PVC and phenolic resins. 5 M	**CO 3**	**(Level I)**
7	**Module 4**	Explain the synthesis, properties and applications of polyamides and polyesters. 10 M **OR**	**CO 4**	**(Level II)**
8	**Module 4**	What are biodegradable polymers? Explain the biodegradation mechanism of starch based and water soluble polymers. 10 M	**CO 4**	**(Level I)**
SECTION B - ANSWER ANY 4 OUT OF 6			**4 X 5 M = 20 M**	
9	**Module 2**	Write short notes on helix structures and polymer single crystals.	**CO 1**	**(Level I)**
10	**Module 1**	How are the polymers classified based on their structure? Give suitable examples.	**CO 1**	**(Level I)**
11	**Module 3**	Discuss briefly about fabrication of plastics.	**CO 2**	**(Level II)**
12	**Module 1**	What is copolymerisation? Give the classification of copolymers.	**CO 2**	**(Level II)**
13	**Module 3**	Explain the applications of biodegradable plastics.	**CO 3**	**(Level II)**
14	**Module 4**	Write about thermal and photodegradation of polymers.	**CO 4**	**(Level II)**

Chairperson
Board of Studies in Chemis
Dept of Chemistry
Osmania University, Hyd-07.

SEMESTER - VI

PROJECT

Program: B.Sc
Course: PRJ
Semester: VI

Subject Code: U24/ZOO/PRJ /601
No. of Hrs allotted per week: 4
No. of Credits: 4

1. **Course objective:**

- To acquire knowledge and skills to conduct biological research and to understand the place of science in a broader context.
- To develop and carry out investigations that extend their science knowledge, including developing their understanding of the relationship between investigations and scientific theories and models.

2. **Course outcome:**

- To be able to design, conduct, record, analyze, and explain the results of biological experiments.
- Develop skills in scientific methods and critical analysis of research findings.
- Emphasis is on types of research, problem selection and hypothesis writing, research planning and design, data collection and measuring techniques, analysis and interpretation of data, and critical analysis of research reports.

CHAIR MEN
Board of Studies in Zoology,
Osmania University, Hyd-07

PROFESSOR & HEAD
Department of Zoology, U.C.S.
Osmania University, Hyd-...

3. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

Continuous Internal Assessments CIA -40%	End Semester Examination-60%
Internal Project Assessment - 40 M	External Project Viva - 60M

Prepared by	Checked & Verified by	Approved by
DR. JYOTHI RANI Name and Signature of the teaching faculty	DR. JYOTHI RANI Name and Signature of HoD	Name and Signature of Principal

CHAIR MEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

PROFESSOR & HEAD
Department of Zoology, UCS,
Osmania University, Hyd-07.