SEMESTER - V

SEC- III ANIMAL BIOTECHNOLOGY

1. **Course Description**

Programme: BSc
Course Code: U24/BIT/SEC/501
Course Type: SEC-3
No. of credits: 2

Max. Hours: 30Hrs
Hours per week: 2Hrs
Max. Marks: 50

2. **Course Objectives**

- To outline the basic principles of animal cell culture and gene manipulation techniques.
- To demonstrate the applications of animal biotechnology in the production of transgenic animals with desirable characteristic features.

3. **Course Outcomes**

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

CO1: Define and describe the basics of animal cell culture techniques and development of transgenic animals **(REMEMBER, UNDERSTAND)**

CO2: Compute and compare the applications of animal biotechnology in therapeutics, as selectable markers and in stem cell technology **(APPLY, ANALYZE)**

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4. Course Content

MODULE I: BASICS OF ANIMAL TISSUE CULTURE AND TRANSGENIC ANIMALS **(15 Hrs)**

- Introduction to Animal cell culture: scope, facilities for animal cell culture, equipment- inverted microscope, buffer systems-CO2 incubator, culture vessels.
- Contamination: contamination, types – viral, bacterial, fungal, yeast, mycoplasma. Detection techniques.
- Sterilization techniques: aseptic practices, sterilization techniques and equipment used- heat sterilization, radiation sterilization, filtration.
- Various types of cell culture: Primary cell culture- steps, subculture- monolayer and suspension cultures.
- Stimulating natural condition for growing cell: media- natural, artificial, synthetic
- Molecular pharming, Transgenic animals and their applications, methods used for transgenesis with reference to transgenic mice, cattle, sheep, goats, pigs, chicken, and fish.
- Transfection methods: calcium phosphate precipitation, DEAE-Dextran mediated transfection, electroporation, and microinjection.
- Cell lines: Origin, nomenclature, characteristics, types (finite, continuous) and maintenance.
- Commonly used cell lines and their applications (CHO cell lines, BHK cell lines, SPO2 cell line, Vero cell lines, HEK cell lines).

MODULE II: APPLICATIONS OF ANIMAL BIOTECHNOLOGY **(15 Hrs)**

- Selectable markers: DHFR, TK, HGPRT genes in purine pyrimidine synthesis, importance in selection process and HAT medium selection.
- Reporter genes - GFP, luciferase genes and importance in selection.
- Stem cell technology: Differentiation - Totipotent, pluripotent, and multipotent stem cells and their sources. Embryonic stem cells, adult stem cells and Stem cell banking.
- Production of Monoclonal antibodies: hybridoma technology. Monoclonal antibodies versus polyclonal antibodies.
- Applications of Monoclonal antibodies: therapeutics, diagnostics, biochemical analysis and purification, diagnostic imaging, miscellaneous applications.
- Applications, Advantages, and disadvantages of animal tissue culture.

5. Reference books

1. Basant Kumar Sinha, Rinesh Kumar (2008). *Principles of animal cell culture.* Lucknow, Uttar Pradesh: International Book Distributing Co.
2. R. Ian Freshney. (2005) *Culture of Animal Cells: A Manual of Basic Technique, Fifth Edition*:John Wiley & Sons, Inc.
3. Purohit, S. (2005). *Biotechnology: Fundamentals and applications* (4th edition.). Jodhpur, India: Agrobios.
4. M M, Ranga. (2002). *Animal Biotechnology*: Agrobios.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global (Module 1 & 2)	The worldwide applicability of animal biotechnology in a variety of domains, such as environmental management, conservation and medicine is reflected in the curriculum. Animal biotechnology plays a significant role in improving food security, human health, environmental sustainability, and biodiversity conservation on a worldwide scale by tackling important issues and opportunities in these areas.

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b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Introduction to animal cell culture- media and to maintain aseptic environment	Students will be given demonstration on preparation of animal cell culture media and to establish cell lines in the laboratory.
Employability	Development and maintenance of cell lines	Field trip to research institutes will enhance their experiential learning
Entrepreneurship	Module I and II	Students will be engaged in a research project which employs animal cell culturing methods.

7. Course Assessment Plan

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

Formative Assessment - FA (40%)	Summative Assessment - SA (60%)
CIA-20 marks **Article writing/ presentations/Case studies/Quiz**	**End Semester exam-30 Marks**

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b) Model Question Paper- End Semester Exam

ANIMAL BIOTECHNOLOGY

MODEL QUESTION PAPER

Course Code: U24/BIT/SEC/501 **Max. Marks: 30**
Credits: 2 **Time: 1 Hr**

SECTION – A

I. Answer any Six out of the following: **6 x 5 = 30 M**

1. Classify the types of contamination in animal cell culture
2. Compare the types of primary cell culture methods
3. Describe the properties of finite and continuous cell lines
4. Illustrate the process of microinjection
5. Distinguish between the various types of reporter genes
6. How would you apply monoclonal antibodies in diagnostics, therapeutics, and protein purification?
7. List out about various sources of stem cell banking and its applications
8. Summarize the applications of animal cell culture

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SEMESTER-END MODEL QUESTION PAPER

SECTION A - ANSWER ANY 6 OUT OF 8
6 Q X 5 M = 30 M
(To compulsorily have **FOUR** questions from **each** module)

Question Number	Question	Question	CO	BTL (Blooms Taxonomy Level)
1	Module 1	Classify the types of contamination in animal cell culture	CO 1	II
2	Module 1	Compare the types of primary cell culture methods	CO 1	II
3	Module 1	Describe the properties of finite and continuous cell lines	CO 1	I
4	Module 1	Illustrate the process of microinjection	CO 1	II
5	Module 2	Distinguish between the various types of reporter genes	CO 2	IV
6	Module 2	How would you apply monoclonal antibodies in diagnostics, therapeutics and protein purification?	CO 2	III
7	Module 2	List out about various sources of stem cell banking and its applications	CO 2	IV
8	Module 2	Contrast the applications of animal cell culture	CO 2	IV

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Prepared by	Checked & verified by	Approved by
4/3/24 (Mini Fernandez) Name and Signature of the teaching faculty	4/3/24 (Ms. Shouni Nivedita) Name and Signature of HoD	Name and Signature of Principal

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SEC-3 BIOANALYTICAL TECHNIQUES

1. Course Description

Programme: B.Sc. **Max. Hours: 30**
Course Code: U24/BIC/SEC/501 **Hours per week: 2**
Type of course: SEC **Max. Marks: 50**
No. of credits: 2

2. Course Objectives

a. To gain understanding of the various instruments in Life Sciences

b. To learn step wise approach to Biochemical investigation.

3. Course Outcome:

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

CO1: Infer the basics of Scientific calculations and use the concepts of GLP(L3,4)

CO 2: Assess the principles of separation techniques(L5)

4. Course content-

Module I : BASIC LABORATORY CALCUATIONS AND GLP **(15 hrs)**

Safety practices in the laboratory (GLP). Preparation of buffers for a given pH (Acetate, Phosphate), Calculation of Molarity, Normality, Percent solution (W/V,V/V,W/W). Preparation of stock standard, working standard and storage of solutions. Concepts of solution concentration. Introduction to IPR.

Module II : CHROMATOGRAPHIC AND ELECTROPHORETIC TECHNIQUES (15 hrs)

General principles of chromatography. Principles, operational procedure and applications of paper chromatography (ascending & descending) of sugars and amino acids, thin layer chromatography of Lipids, Gel filtration chromatography, High performance liquid chromatography (Demo).

Electrophoretic techniques: General principles, factors affecting migration rate. Electrophoresis with paper, cellulose agarose, SDS-PAGE, Immuno electrophoresis.

5. Reference Books:

1. Keith Wilson and John Walker, Principles & Techniques of Practical Biochemistry, (1999) Cambridge Press.
2. RS Khandpur Handbook of Biomedical Instrumentation, (2004). Tata McGraw-Hill Publishing Company Ltd, New Delhi
3. Shawney, Randhir Singh Introduction to Practical Biochemistry (2001) , Narasa Pub, N.Delhi.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	Bioanalytical techniques play crucial roles in various scientific processes in biochemistry, pharmaceuticals, and environmental monitoring.

7. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill	Module 1 & 2	Problem Solving & Practicals in Lab

8. Course Assessment Plan

a) **Weightage of Marks in Formative and Summative Assessments**

Formative Assessment - FA (40%)	Summative Assessment - SA (60%)
CIA-20 marks Mini project/Assignment/ Problem solving	End Semester exam-30 Marks

E XTERNAL- MODEL QUESTION PAPER PRACTICAL

Course Code: U24/BIC/SEC/501 **Max Time: 1 Hr**
Credits: 2 **Max. Marks: 30**

Answer the following.

1. Demonstrate the separation technique
   (Paper chromatography/ Electrophoresis) (10M)
2. Problems on calculation of Molarity/Normality (15M)
3. Record (5M)

Prepared by Course Teacher [Name & Signature]	Checked & Verified by HOD [Name & Signature]	Approval by the Principal
(S. Malathi Varma)	21/12/24 (S. Malathi Varma)	

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SEMESTER-V

BIOCHEMISTRY OF DISEASES

1. Course Description:

Programme: B.Sc.
Course Code: U24/BIC/DSE/502
Type of course: DSE 15
No. of credits: 4

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

2. Course Objective:

- Students will be able to analyze the various types of lifestyle & metabolic disorders.
- Assess the principles underlying the application of clinical biochemistry investigations in human diseases.

3.Course Outcome: This course will help students in the –

CO 1: Interpret and apply biochemical concepts of various metabolic diseases and disorder. (L3)

CO 2: Use disease indications for diagnostic relevance. (L3)

CO 3: Examine disease occurrence with the understanding of biochemistry. (L4)

CO 4: Categorize various techniques used in diagnosis of clinical evaluation. (L4)

4.Course Content

Module I: METABOLIC AND LIFESTYLE DISORDERS **(15 hrs)**

Obesity and eating disorders – Anorexia &Bulimia, Diabetes mellitus – a metabolic disorder and relationship with hypertension, obesity, hypothyroidism, and stress. Inflammatory Bowel Disease (IBD)-biochemistry behind the disease and the influence of diet, stress, and environment to the condition. Fatty Liver, Cardiovascular diseases, and atherosclerosis – understanding the factors contributing the disorder, biochemical aspect and management of the condition. Inborn errors of Metabolism. Cancer- Etiology and stages of cancer, biochemistry of cancer, proto-oncogenes, tumor suppressor genes, mutations and tumor viruses, Biochemical analysis of cancer and Biomarkers.

MODULE II: CLINICAL BIOCHEMISTRY **(15 hrs)**

Plasma proteins in health and disease. Disorders of blood coagulation(hemophilia). Types of anemias, haemoglobinopathies – sickle cell anemia and thalassemia.Structure and functions of the liver. Liver diseases – jaundice, hepatitis, cirrhosis. Liver function tests – conjugated and total bilirubin in serum, albumin globulin ratio, hippuric acid and bromosulphthalein test, serum enzymes in liver diseases - SGPT, SGOT and alkaline phosphatase.Kidneys-structure of nephron, urine formation, normal and abnormal constituents of urine. Biological buffers. Role of kidneys in maintaining acid base and electrolyte balance in the body. Renal function tests– creatinine and urea clearance tests, phenol red test.

Biochemical tests for the diagnosis of heart disease – HDL/ LDL, cholesterol, SGOT, LDH, CK, C-reactive protein, cardiac troponins.

MODULE III: DISORDERS DUE TO PROTEIN MISFOLDING AND GENETIC ANOMALIES

(15 hrs)

Overview of protein misfolding and genetic anomalies. Prions and prion diseases. Alzheimer, kuru, creutzfelt-Jakob disease, Huntington's Syndrome.Down's Syndrome, , Edward's Syndrome, Klinefelter Syndrome, Turner Syndrome and XXX, Sickle cell anemia, Thalassemia

MODULE IV: MOLECULAR & IMMUNODIAGNOSTICS **(15 hrs)**

Basics of Immunology. Antigen – antibody reactions-immunoprecipitation, agglutination, immunodiffusion. Immunodiagnostics - RIA & ELISA, direct & indirect immunofluorescence, flow cytometry, biosensor assay & Immuno blotting techniques. PCR.Monoclonal antibodies. Vaccines and their classification – Traditional vaccines- Live and attenuated vaccines, toxoids. Modern vaccines – recombinant, peptide vaccines and DNA vaccines.

5. Reference Books

1. Devlin, Text book of Biochemistry with Clinical Correlations (2011) T.M. John Wiley & Sons, Inc. (New York),
2. Coico, R and Sunshine, Immunology: A Short Course (2009) 6th ed. G. John Wiley & sons, Inc (New Jersey)
3. Berg, J.M., Tymoczko, J.L. and Stryer, L. Biochemistry (2012) 7th ed, W.H Freeman and Company.
4. Snustad, D.P. and Simmons, Genetics (2012) 6th ed., M.J., John Wiley & Sons. (Singapore)

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	Understanding immune responses is essential to addressing global health issues and promoting general wellbeing.
Global and National	The field of clinical biochemistry is fundamental to public health initiatives, illness management, and healthcare delivery.

b) Components on Skill Development/Entrepreneurship development/Employability

SD	Unit 4	Practicals
EMP	Unit 2	Theoretical as well as practical knowledge on clinical biochemistry concepts helps students to work in diagnostic labs

7. Pedagogy

S.No	Student Centric Methods Adopted	Type/Description of activity
1.	Quiz	Experiential Learning
2.	Poster presentation	Participative Learning
3.	Case studies	Problem solving

8. Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

CO	Formative Assessment – FA (40%)	Summative Assessment - SA (60%)
CO1	CIA-1	End Semester exam
CO2	CIA-1	
CO3	CIA-2 Presentation	
CO4	CIA-2 Quiz	

b) Model Question Paper

BIOCHEMISTRY OF DISEASES

Course Code: U24/BIC/DSE/502
Credits: 4

Max Marks: 60
Time: 2 Hrs

I. Answer the following questions **(4x10=40M)**

1. (a)Illustrate Diabetes Mellitus as a metabolic disorder.
   (OR)
   (b)Demonstrate inborn errors of metabolism? Discuss with examples.

2. (a)Analyse the different types of plasma proteins and elaborate on it functions
   (OR)
   (b)Infer KFT and its reference to the kidney diseases explaining the structure of kidney.

3. (a)Explain sickle cell anemia and its biochemical Considerations.
   (OR)
   (b)Discuss prion diseases? Explain giving examples.

4. (a)Classify the Antigen -antibody reactions. Add a note on its applications
   (OR)
   (b)Categorise vaccines and their classification with examples.

II. Write short notes on any 4 questions **(4 X 5=20M)**

5. Obestiy
6. Jaundice
7. RIA
8. Schizophrenia
9. Turner's syndrome
10. ELISA

CBCS-2024

GUIDELINES FOR MODEL PAPER SETTING AS PER BLOOMS TAXONOMY LEVEL (BTL)

DSE 1 B: Biochemistry of Diseases

SECTION A - INTERNAL CHOICE (4 X 10 M = 40 M)				
Question Number	**Question**	**Question**	**CO**	**BTL (Blooms Taxonomy Level)**
1	Module 1	Illustrate Diabetes Mellitus as a metabolic disorder.	CO 1	3
2	Module 1	Demonstrate inborn errors of metabolism? Discuss with examples.	CO 1	3
3	Module 2	Analyse the different types of plasma proteins and elaborate on its functions.	CO 2	4
4	Module 2	Infer KFT and its reference to the kidney diseases explaining the structure of kidney.	CO 2	4
5	Module 3	Explain sickle cell anaemia and its biochemical Considerations	CO 3	2
6	Module 3	Discuss prion diseases? Explain giving examples.	CO 3	2
7	Module 4	Classify the antigen -antibody reactions. Add a note on its applications.	CO 4	4
8	Module 4	Categorise Vaccines and their classification with examples.	CO 4	4
SECTION B - ANSWER ANY 4 OUT OF 6 4Q X 5 M = 20 M (To compulsorily have ONE question from each module)				
9	Module 1	Obesity	CO 1	4
10	Module 2	Jaundice	CO 2	4
11	Module 4	RIA	CO 4	5
12	Module 3	Schizophrenia	CO 3	4
13	Any Module	Turner syndrome	CO 3	4
14	Any Module	ELISA	CO4	5

BIOCHEMISTRY OF DISEASES

PRACTICAL

Programme : B.Sc. **Max. Hours: 30**
Course Code : U24/BIC/DSE/502/P **Hours per week: 2**
Type of course: DSE **Max. Marks: 50**
No. of credits : 1

Course objective:

- Introduce the students to biochemical aspects of diseases and prepare them for specialization in clinical aspects of biochemistry.

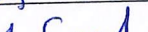
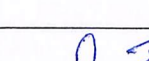
Course Outcome: This course will help the students to-

CO1: Analyze their skills in testing various clinical parameters in relation to human health. (L4)

CO2: Illustrate the abnormal concentrations of various components in body and how they can be used to identify various clinical aspects of the human body. (L3)

PRACTICAL SESSION

1. Determination of Rh and Blood Group Typing
2. Blood Pressure Measurement by Sphygmomanometer.
3. Estimation of Hemoglobin by Sahli's and Drabkin's Method
4. Estimation of Creatinine in urine
5. Estimation of Creatine in urine
6. Estimation of Serum Iron
7. Estimation of Serum Phosphorus
8. Estimation of Serum Urea
9. Estimation of Serum Cholesterol
10. Qualitative Analysis of Urine
11. Ouchterlony Immunodiffusion Technique
12. Immuno Electrophoresis
13. Dot ELISA, WIDAL, VDRL Test

Prepared by Course Teacher [Name & Signature]	Checked & Verified by HOD [Name & Signature]	Approval by the Principal
		

SEMESTER - V

BIOTECHNOLOGY FOR HUMAN WELFARE

1. **Course Description**

Programme: BSc **Max. Hours:60**
Course Code: U24/BIT/DSE/502 **Hours per week: 4**
Course Type: DSE-IB **Max. Marks: 100**
No. of credits: 4

2. **Course Objectives**

- To interpret and apply the knowledge of genetically modified foods, food safety, revival of marine ecosystems, techniques to develop healthcare and food products obtained through fisheries.
- To assess the role of nanomedicines and nanodevices in disease diagnosis and to develop good entrepreurship skills.

3. **Course Outcomes:**

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

CO1: Identify and distinguish between organic and GM foods and their benefits **(REMEMBER, ANALYZE)**

CO2: Summarize the applications of biotechnology in aqua/marine culture and to assess the impact of biofouling. **(UNDERSTAND, EVALUATE)**

CO3: Translate, develop, and evaluate the applications of Nanodevices and Nanomedicines in drug delivery **(UNDERSTAND, APPLY, EVALUATE)**

CO4: Interpret, design, and develop marketing and export of biotechnological products **(UNDERSTAND, APPLY, CREATE)**

4. Course Content

MODULE -I: FOOD BIOTECHNOLOGY **15Hrs**

- Genetically modified foods: organic foods, types of organic food- organic vegetables and fruits, organic meat, organic dairy products, organic fish.
- Identifying organic food and GM food- coding and labels on foods.
- Nutritional and environmental benefits of organic foods and GM foods. Organic food preservatives- hazards of chemical preservatives, examples of natural preservatives- vinegar, salt, sugar, alcohol.
- Genetic modification in food industry- background, history, risks, applications and future.
- Controversies over GM foods-march against Monsanto.

MODULE -II: MARINE BIOTECHNOLOGY **15Hrs**

- Biotechnology in marine science- history of marine biotechnology, application in aquaculture.
- Cell lines: development of cell lines of shrimp- Primary lymphoid cell line, PMO and fish- ZF4, ZEM2S, BF-2 and applications.
- Biofouling- impact. Antifouling methods- biocides, nontoxic coatings, energy methods, other methods.
- Indicator organisms- coliform and non-coliform bacteria, fungi, molds, helminth eggs.
- Probiotics in aquaculture- lack of probiotics and effects.
- Diseases in marine organisms: application of biotechnology in disease diagnosis; prevention and control; Gene probes.

MODULE III: INTRODUCTION & APPLICATIONS OF NANOBIOTECHNOLOGY

15Hrs

- Introduction to nanobiotechnology: – nanodevices & techniques – micro & Nano systems – synthesis & characterization of nanoscale
- Nano molecules in proteins, lipids, RNA & DNA – peptide coupled nanoparticles – proteins nanodevices – cell nanotechnology – cell motility – nanomotors& cellular navigation – chemotaxis – transmembrane signaling – nanoscale artificial platform
- Nanotechnology in drug delivery – nanoscale devices for drug delivery – micelles – protein targeting – protein interaction with other molecule – microarray – genomic chips – nano biosensors – nano biochips – Nanotechnology for cancer diagnosis & treatment.

MODULE -IV: MARKETING AND EXPORT OF BIOTECHNOLOGICAL PRODUCTS

15Hrs

- External trade in Agricultural products, Present status, policy and prospects under WTO regime, Export import policy, Regulation of Agricultural marketing system
- Infrastructural facilities for exporting efficiency, Biotechnological Products in India, Quality parameters and quarantine procedures of export- Market integration:
- Biotech industries & institutes in India & world, Concepts of Biotech Park/ Biotech Hub to different small scale and large scale Agro-based products. Study the production techniques of biotech products.
- Collecting the information on export import data on biotech products, quality standards for export and their potential-Analyse data in relation to demand supply.
- Comparison between non biotechnological products and biotechnological products. Safety and licensing for import and export of biotechnological products.

5. Reference books

1. George, K., & Richard, T. (2012). *Introduction to Marine Biology*: Brooks Cole.
2. Castro, P., & Huber, M. (2010). *Marine biology* (8th ed.). New York: McGraw-Hill.
3. Primrose SB and Twyman RM. (2006). *Principles of Gene Manipulation and Genomics*, 7th edition: Blackwell Publishing, Oxford, U.K.
4. H.S. Chawla. (2002*). Introduction to Plant Biotechnology*. Science Publishers.
5. Carol, L., & Timothy, P. (1997). *Biological Oceanography*: Butterworth-Heinemann.
6. S.S. Bhojwani, M.K. Razdan. (1996). *Plant Tissue Culture: Theory and Practice*. Elsevier
7. J D, Watson. (1992). *Recombinant DNA*. New york: Scientific American Books
8. Agriculture Marketing in India by Acharya and Agrawal 1999, Oxford IBH, N. Delhi. Principles of Marketing by Kotlar and Armstrong 1997, Prentice-Hall, N. Delhi.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global (Modules 1,2 & 3)	Modern drug delivery methods made possible by nanotechnology revolutionizing medical treatment and reduce side effects. Development of agriculture, food safety, processing, nutritional enhancement, and utilization of bioactive substances from marine organisms in medicine and cosmetics are among the uses of food and marine biotechnology.
National (module 4)	Assist nation in realizing the potential of biotechnology to promote employment, economic growth, create jobs, improve healthcare, and address challenges such as food security, environmental sustainability, and public health.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill development	Modules 1,2	Presentations by the students on distinguishing between organic and GM foods, Group discussions on the pros and cons of GMOs. Lab sessions on identification of indicator organisms like bacteria, fungus etc
Employability	Modules 3,4	Synthesis and analysis of nanoparticles and nanodrugs in pharma industry and health care sectors. Quality control, marketing and export of biotechnological products

7. Pedagogy

S. No	Student Centric Methods Adopted	Type/Description of Activity
1.	Participative Learning	Seminar
2.	Participative Learning	Presentation
3.	Experiential Learning	Quiz
4.	Participative Learning	Group Discussion
5.	Experiential Learning	Research Projects
6.	Experiential Learning	Internship opportunities
7.	Problem Solving	Case Studies

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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 Exam	Written Exam
CO2	CIA-1 Assignment/Case study/Group discussions/Quiz	
C03	CIA-2 Written Exam	
C04	CIA-2 Assignment/Presentation	

b) Model Question Paper- End Semester Exam

MODEL QUESTION PAPER- THEORY

Course Code: U24/BIT/DSE/502 **Max Marks: 60**
Credits: 4 **Time: 2 Hrs**

SECTION – A

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

1. Define Genetically modified foods. Outline its applications and limitations.

OR

2. How do you make a distinction between organic and GM foods. Discuss their applications and limitations
3. Explain the methods and impact of Biofouling.

OR

4. How can you assess the role of probiotics in aquaculture. Add a note on its effect.
5. How would you classify different types of Nanoparticles.

OR

6. How would you apply Nanotechnology in drug delivery and cancer diagnosis.
7. Summarize the present status and production techniques of biotech products in India

OR

8. How can you make a distinction between non biotechnological products and biotechnological products. Add a note on their safety and licensing issue for import and export.

SECTION – B

II. Answer any <u>four</u> of the following **4 x 5 = 20 M**

9. Outline coding and labelling of GM foods
10. What conclusion can be drawn from march against Monsanto
11. Describe Marine cell lines with suitable examples
12. Explain different indicator organisms in aqua culture
13. How can you use Nanoscale artificial platform
14. How would you elaborate on regulation of agricultural marketing system

SEMESTER-END MODEL QUESTION PAPER

SECTION A - INTERNAL CHOICE 4Q X 10 M = 40 M				
Question Number	**Question**	**Question**	**CO**	**BTL (Blooms Taxonomy Level)**
1	Module 1	Define Genetically modified foods. Outline its applications and limitations.	CO 1	I
2	Module 1	How do you make a distinction between organic and GM foods. Discuss their applications and limitations	CO 1	IV
3	Module 2	Explain the methods and impact of Biofouling	CO 2	II
4	Module 2	How can you assess the role of probiotics in aquaculture. Add a note on its effect	CO 2	V
5	Module 3	How would you classify different types of Nanoparticles.	CO 3	II
6	Module 3	How would you apply Nanotechnology in drug delivery and cancer diagnosis	CO 3	III
7	Module 4	Summarize the present status and production techniques of biotech products in India	CO 4	II
8	Module 4	How can you make a distinction between non biotechnological products and biotechnological products. Add a note on their safety and licensing issue for import and export	CO 4	IV

SECTION B - ANSWER ANY 4 OUT OF 6

4 Q X 5 M = 20 M

(To compulsorily have **ONE** question from **each** module)

9	Module 1	Outline coding and labelling of GM foods	CO 1	I
10	Module 1	What conclusion can be drawn from march against Monsanto	CO 1	IV
11	Module 2	Discuss Marine cell lines with suitable examples	CO 2	II
12	Module 2	Explain different indicator organisms in aqua culture	CO 2	II
13	Module 3	How can you Nanoscale artificial platform	CO 3	III
14	Module 4	How would you elaborate on regulation of agricultural marketing system	CO 4	VI

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SEMESTER-V

BIOTECHNOLOGY FOR HUMAN WELFARE- PRACTICAL

1. Course description

Programme: B.Sc **Max. Hours: 30**

Course Code: U24/BIT/DSE/502/P **Hours per week:2**

Course Type: DSE-IB **Max. Marks: 50**

No. of credits: 1

2. Course Objective:

- To analyze food adulterations and summarize the importance of nanoparticles as antimicrobial agent.

3. Course Outcomes:

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

CO1: Interpret, determine, and compare various food contaminants and detect adulterations in food. **(UNDERSTAND, ANALYSE)**

CO2: Prepare nanoparticles for assessing its antimicrobial properties **(CREATE, EVALUATE)**

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PRACTICAL SESSIONS

1. To determine vitamin C content in a citrus fruit.
2. Isolation and identification of important marine fungi.
3. Direct microscopic examination of food contaminants.
4. Determination of purity of milk using methyl reductase test.
5. Determination of adulteration in food samples
6. Synthesis of silver nanoparticles
7. Effect of nanoparticles on bacterial growth
8. Visit to biotech company to understand marketing and production strategies

Spotters:

1. Common food contaminants
2. Methyl reductase test
3. Types of nanoparticles
4. Chemical preservatives
5. Marine fungi
6. Food adulteration
7. Graph showing effect of nanoparticles on bacterial growth
8. Marketing strategies of biotechnological products

SEMESTER-V

BIOTECHNOLGY FOR HUMAN WELFARE- PRACTICAL

Course Code: U24/BIT/DSE/502/P **Max. Marks: 50**
Credit: 1 **Time: 2Hrs**

I. MAJOR: (20M)

Determine the purity of the given sample by methyl reductase method. Write the principle and procedure and report the results

II. MINOR: (10M)

Examine the contaminants from the given samples and report the results.

III. IDENTIFY THE GIVEN SPOTTERS: (10M)

IV. VIVA (5M)

V. RECORD (5M)

Prepared by	Checked & verified by	Approved by
4/3/2024 [Deepa Stoitha] **Name and Signature of the teaching faculty**	4/3/24 (Ms. Shouni Nivedita) **Name and Signature of HoD**	**Name and Signature of Principal**

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SEMESTER – V

SKILL ENHANCEMENT COURSE - III

CHEMINFORMATICS

1. Course Description

Programme: B.Sc.
Course Code: U24/CHE/SEC/301
Type of course: SEC
No. of credits: 2

Max. Hours: 30
Hours per week: 2
Max. Marks: 50

2. Course Objectives

- To provide a basic learning in the emerging area of chemical sciences and usage of cheminformatics in the industry.

3. Course Outcome

This SEC paper will help students to enhance their overall skills

CO 1: Introduce students to different methods of cheminformatics, provide examples on the use of cheminformatics in modern drug research.

CO 2: Gain practical experience through exercises with representative methods used in cheminformatics.

4. **Course Content**

MODULE I: COMPUTER AIDED DRUG DESIGN **10 Hrs**

Introduction to CADD, Drug design and discovery, Lead Compounds, Lead optimization, Pharmacophore, Pharmacokinetics, ADME property, Toxicity. Prodrugs and Soft drugs, Introduction to Ligand-Based and Structure Based Drug design.

MODULE II: PRACTICE OF CHEMISTRY SOFTWARE **20 Hrs**

1. Construction of small molecules.
2. Energy minimization and generation of SMILES Notation.
3. Property calculation.
4. Searching RCSB for protein information, download protein and Literature search.
5. Protein preparation.
6. Active site identification and grid Generation.
7. Docking of ligands.
8. Protein ligand interaction studies.

5. References

1. Leach A.R., Gillet V.J., (2007): *An introduction to Chemoinformatics*. Springer: The Netherlands.
2. Gasteiger, J. & Engel, T. (2003) *Chemoinformatics: A text-book*. Wiley-VCH.
3. Gupta, S. P. (2011) *QSAR & Molecular Modelling*. Anamaya Pub.: New Delhi.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Local	Optimizing and Energy minimization of existing drugs, development of new materials with enhanced properties
Regional	Designing new drugs from SAR drive innovation in computational and medicinal chemistry
National	Formulating symbiosis, understanding drug activities in the regulation of pharmacodynamic and pharmacokinetic properties, innovation in healthcare
Global	Improved energy efficiency and sustainability, development of new synthetic strategies, broad implications for industries and technologies

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b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Module 1	Medicinal chemists play a crucial role in the drug discovery process through the selection and synthesis of compounds that establish structure–activity relationships by using softwares.
EMP	Module 2	Involves the study of the effects of drug interactions on the target systems.

7. Pedagogy

S. No.	Student Centric Methods Adopted	Type / Description of Activity
1	Participative Learning	Online search engines for ADMET properties.
2	Experiential Learning	Practice of Chemistry software.

8. Course Assessment Plan

a. Weightage of Marks in Formative and Summative Assessments

Formative Assessment - FA (40%)	Summative Assessment - SA (60%)
CIA-20 marks Mini project/Assignment/ Problem solving/Case studies	End Semester exam-30 Marks

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b. Question Paper Pattern

EXTERNAL- MODEL QUESTION PAPER

PRACTICAL

Course Code: U24/CHE/SEC/301
Credits: 2

Max Time: 1 Hr
Max. Marks: 25

Answer the following.

1. Write about Molecular docking by iGEM Docking software and interpret the results. (CO 2) **L2** — 10M
2. Write a short note on generation of SMILES Notation. **(CO1) L1** — 5M
3. Viva — 5M
4. Record

Prepared by	Checked & verified by	Approved by
Name and Signature of the teaching faculty	Name and Signature of the HoD	Name and Signature of Principal
Dr. K. Susmitha Dr. M. Bhargavi M.Bhargavi	Dr. D. Sumalatha D. Sumalatha	Dr. Uma Joseph

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SEMESTER V

GENERIC ELECTIVE

CHEMISTRY OF COSMETICS AND FOOD TECHNOLOGY

1. Course Description

Programme: B.Sc
Course Code: U24/CHE/GE/501
Course Type: GE
No. of credits: 4

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

2. Course Objectives

- To learn the history of cosmetics and the importance of self grooming
- To learn the chemistry involved in cosmetics,chemicals/ natural products present in them. their usage in personal care.
- To understand the significance of various technological methods of food for better health.

3. Course Outcomes

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

CO1: Identify the types of cosmetics and learn about their chemistry.
CO2: Articulate the ingredients present in personal care products and apply it in their preparation.
CO3: Understand water purification process, and role of additives in food
CO4: Analyze the adulterants in food samples; learn steps involved in food processing and preservation

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4. Course Content

MODULE I: CHEMISTRY OF COSMETICS **15 hrs**

History of cosmetics, classification of cosmetics, professional image of self grooming, beauty and wellness.

Cosmetics emulsions: cream, cleansers, powders, moisturisers, sun screen, acne and anti aging creams.

Chemical peels and peeling agents, lasers and light devices, Electro Chemistry, bath salts, gels, soaps, bubble baths and scrubs.

MODULE II: PERSONAL CARE **15 hrs**

Skin Care

General Anatomy and Physiology of skin, Structure of skin, Growth and nutrition, dermal fillers

Hair Care

Structure of hair, growth of hair, Cosmetics used for hair – Shampoos, conditioners, Bleaches, hair dyes, hair gels, hair perms and hair relaxers/straighteners.

Nail Care

Structure of nail, cosmetics used for nail – Nail lacquer, nail polish remover, Manicure and Pedicure, nail care techniques.

Eye Care

Cosmetics used for the eye – eyebrow pencil, eye liner, eye shadows, mascaras. Eye concealer and eye creams.

Practical – Cosmetics Preparations

1. Preparation of Cold cream
2. Preparation of Talcum Powder.
3. Preparation of Bath salt.
4. Preparation of Lip Balm
5. Preparation of Nail Polish Remover
6. Preparation of Hand Wash.

MODULE III: INTRODUCTION TO FOOD, FOOD ADDITIVES & WATER PURIFICATION **15 Hrs**

Introduction - Food: source, functions of food- food groups- food guide- basic five food groups, usage of the food guide- food in relation to health- objectives of cooking.

Food Additives: Food additives: artificial sweeteners- saccharin, cyclomate, aspartame- food flavours- esters, aldehydes and heterocyclic compounds. Antioxidants. Food colours- changes in cooking, Restricted use. Spurious colours.Emulsifying agents, preservatives- leavening agents.Baking powder- Yeast. Taste Enhancers- MSG- vinegar.

Water: Purification processes- Ion exchangers , reverse osmosis, activated charcoal treatment. Use of chlorination, ozone and UV light disinfection. Specification of drinking water.

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MODULE IV: FOOD ADULTERATION, PROCESSING & PRESERVATION 15 hrs

Adulterants: Common adulterants in different foods- milk and milk products, vegetable oils, and fats, spices and condiments, cereals, pulses, sweetening agents and beverages.

Contamination with toxic chemicals- pesticides and insecticides. Methods involved in the analysis of detection and prevention of food adulteration.

Food deterioration, chemical methods of preservation and processing, and by freezing.

Heat processing of milk – pasteurization.Preservation of milk.Deep freeze preservation. Spray drying technique- milk powder, infant food preparation.

Practicals:

1. Estimation of total hardness of water.

2. Testing for the presence of adulterants in food samples.

5. References

1. Perry Romanowski, *Beginning Cosmetic Chemistry*, Allured Pub Corp.2009.
2. Dr. Ramesh Kumari, *Chemistry of Cosmetics*, Prestige Publishers.
3. Srilakshmi B., *Food Science*, New age International Pvt. Ltd. Publishers, III ed. 2003.
4. Shakuntala Manay N. and Shadaksharaswamy M. *FOODS: Facts and Principles*. New Age. International Pvt. Ltd. Publishers, II ed. 2002.
5. Norman N. Potter, *Food Science*, CBS publishers and distributors, New Delhi. 1994.
6. Swaminathan M. *Text Book on Food Chemistry*, Printing and Publishing CO., Ltd., Bangalore. 1993.
7. Swaminathan M. *Advanced Text Book on Food and Nutrition*, volume I and II Printing and Publishing CO., Ltd., Bangalore. 1993.

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6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Local	Knowledge of cosmetic and food chemistry helps to have a well groomed healthy life
Regional	Learning the concepts of cosmetology and processing involved in the food industry, helps to choose the best products.
National	Acquire knowledge to identify and choose better health products.
Global	The widespread increase in the adoption of skin care and personal care products rise along with the global ageing population.

b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Module 1 & 2	Students are taught to prepare various cosmetics using natural products and non toxic chemicals
EMP		
SD	Module 3 & 4	Students are trained to check the quality parameters of food and water samples.
EMP		

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7. Pedagogy

S. No.	Student Centric Methods Adopted	Type / Description of Activity
1.	Experiments	Students are taught to prepare cosmetics
2.	Presentations	Students present the toxic chemicals involved in various cosmetics products, and their alternatives
3.	Case studies	Students are made to evaluate various market samples of the same product.

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 exam 10 M	Written Exam
CO2	Practical Skill test 10 M	
CO3	CIA 1 Written exam 10 M	
CO4	Practical Skill test 10 M	

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b. Model Question Paper- End Semester Exam

CHEMISTRY OF COSMETICS AND FOOD TECHNOLOGY
B.SC. III YEAR SEMESTER -V

TIME: 2hrs **Course Code: U24/CHE/GE/501**
Max. Marks: 60

SECTION –A (Essay Questions)

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

1. Classify cosmetics on the basis of their raw materials. (**L2**) 10M

OR

2. a) Outline the history of cosmetics. (**L2**) 5 M
b) Discuss the importance of self grooming and professional image. (**L2**) 5 M
3. a) Describe the structure of the nail with the help of a neat diagram. (**L1**) 5 M
b) List out the ingredients used in Shampoos. (**L1**) 5 M

OR

4. a) Describe chemical peels and types of peeling agents? (**L2**) 5 M
b) Explain the structure and growth cycle of hair. (**L2**). 5 M
5. a)Classify foods based on their function. (**L4**) 5 M
b) Explain the advantages of cooking. (**L2**) 5 M

OR

6. a) Define reverse osmosis. How does it help in water purification? (**L3**) 5 M
b) Emphasize the significance of chlorination of water. (**L2**) 5 M
7. a) Define food adulteration . Write any two tests to determine adulteration of food of your choice. (**L3**) 5 M
b) Illustrate the methods involved in the preservation of milk. (**L3**) 5 M

OR

8. a) Write a brief note on contamination of food by toxic chemicals. (**L1**) 5 M
b) Discuss about the various factors which lead to food deterioration. (**L2**) 5M

SECTION – B (Short answer questions)

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

9. What is the scope of beauty and wellness? (**L1**)
10. How do fillers work? (**L1**)
11. Outline five functions of talcum powder? (**L2**)
12. How is UV radiation used in water purification plants? (**L4**)
13. Elaborate the role of leavening agents in the food industry. (**L5**)
14. Explain Chemical methods of food preservation. (**L5**)

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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 -V
EXPERIMENTS IN MEDICINAL & SUSTAINABLE CHEMISTRY
CHEMISTRY PRACTICALS – ELECTIVES 2

Program: B.Sc. Max. Hours: 30 Hrs
Course Code: U24/CHE/DSE/502/P Max. Marks: 50
Course: DSE 2 Hours per week: 2 Hrs
No. of Credits: 1

Course Objectives

- To apply the knowledge of synthetic methods in Chemistry to prepare drugs, nanoparticles.
- To design chemical products and processes for Green Chemistry.

Course Outcomes

CO1: Synthesize drugs, nanoparticles and developing green and sustainable methods.
CO2: Cut down the stream of chemicals pouring into the environment.

Synthesis and analysis

1. Preparation of Aspirin (conventional and green method)
2. Preparation of Paracetamol.
3. Preparation of Thiobarbeturic acid.
4. Preparation of Fluorescein.

Green Methods for the preparation of the following:

1. Preparation of Acetanilide.
2. Preparation of p-Bromo acetanilide.
3. Preparation of Dihydropyrimidinone.

Synthesis of Nanoparticles:

1. Preparation of nano silver.
2. Preparation of nano ZnO.
3. Preparation of Ferrofluid.
4. Preparation of nano CuO.

References

1. Krupadanam.D, VijayaPrasad.D, Varaprasad Rao.K, Reddy.K.L.N, Sudhakar.C, (2001), *Drugs,* Universities Press (India) Limited.
2. Patrick.G, (2001), Medicinal Chemistry, BIOS Scientific Publications
3. Ahluwalia V.K ,*Green Chemistry :Greener Alternatives for Synthetic Organic Transformation* :Narosa Publishing House
4. Ahluwalia V.K ,*Green Chemistry : Environmentally benign reaction* : Ane books Pvt.Ltd,2006
5. Kulkarni.K.S, (2011), *Nanotechnology- Principles & Practices*, Co-Published by Springer International Publishing Company, Switzerland, New Delhi, Capital Publishing Company.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Local	To develop products that benefit the environment either directly or indirectly.
Regional	Nanotechnology helps in improving many technology and industry sectors and even revolutionize.
National	The concepts of Green Chemistry reduces the use of energy and fuel by using renewable inputs wherever possible
Global	Recent advances in Medicinal Chemistry, Green Chemistry and Nanotechnology provide reliable synthetic pathways for sustainable development goals.

b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	All	Educational tour to industries/factories to make students learn outside the classroom
ED	All	Case studies relevant to the problems, challenges and help students to develop solutions
EMP	All	Systematic and sustained effort to adapt specific skills for improving career goals

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Experiential Learning	Field Trips
2.	Participative Learning	Role play
3.	Problem solving	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	CIA1-Written Exam	Written Exam
CO2	CIA1-Written Exam	
CO3	CIA2- Case Study	
CO4	CIA2- Presentations (poster/ ppt)	

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b. Model Question Paper - End Semester Exam

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FACULTY OF SCIENCE – DEPARTMENT OF CHEMISTRY

B.Sc. III YEAR SEMESTER -V

MEDICINAL & SUSTAINABLE CHEMISTRY

TIME: 2hrs **Course Code: U24/CHE/DSE/502**

Max. Marks: 60 **Credits: 4**

SECTION –A (Essay Questions)

SECTION A - INTERNAL CHOICE			**4 X 10 M = 40M**	
Question Number	**Question**		**CO**	**BTL**
1	**Module 2**	a) Evaluate the structure of Penicillin G & discuss its commercial production 5M b) Explain briefly about diluents and stabilizing agents with examples. 5M **OR**	**CO 2**	**(Level I, V)**
2	**Module 2**	Outline the synthetic route and brief therapeutic action of i) Ciprofloxacin ii) Aspirin iii) Salbutamol iv) Omeprazole 10M	**CO 2**	**(Level II)**
3	**Module 1**	a) Summarize briefly about agonist and antagonist. 5M b) What are anaesthetic and antipyretic drugs? 5M **OR**	**CO 1**	**(Level I, II)**
4	**Module 1**	Describe in detail about ADME. 10M	**CO 1**	**(Level I)**
5	**Module 3**	a) List out the basic principles of green chemistry. 5M b) Simplify the atom economy? Calculate atom economy using suitable examples. 5M **OR**	**CO 3**	**(Level I, IV)**
6	**Module 3**	a) Assess the need for green chemistry. 5M b) Interpret the selection of solvents in green synthesis. 5M	**CO 3**	**(Level V)**

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7	Module 4	a) Give two methods for synthesis of Nanoparticles. 5M b) Compose a note on carbon nanotubes.5M **OR**	CO 4	(Level I, VI)
8	Module 4	a) Elaborate a note on Zeolites? 5M b) Compile the principle and working of STM. 5M	CO 4	(Level VI)
SECTION B – (Short answer questions) **ANSWER ANY 4 OUT OF 6**				**4 X 5M = 20 M**
9	Module 1	How would you explain drugs acting on the renal system?	CO 1	(Level II)
10	Module 2	Build a short note on clinical trials.	CO 2	(Level III)
11	Module 1	What are chemotherapeutic agents? Discuss about antimalarial drugs.	CO 1	(Level I)
12	Module 2	Construct briefly about computer aided drug designing.	CO 2	(Level III)
13	Module 3	Analyze the role of phase transfer catalyst in green synthesis.	CO 3	(Level IV)
14	Module 4	Give any four applications of Nanomaterials.	CO 4	(Level I)

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b. Model Question Paper - End Semester Exam

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FACULTY OF SCIENCE – DEPARTMENT OF CHEMISTRY

b. MODEL PAPER - B.Sc. III YEAR SEMESTER -V

MEDICINAL & SUSTAINABLE CHEMISTRY

TIME: 2hrs **Course Code: U24/CHE/DSE/502**

Max. Marks: 60

SECTION –A (Essay Questions)

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

1. a) Evaluate the structure of Penicillin G & discuss its commercial production(CO2) **L5** 5M
   b) Explain briefly about diluents and stabilizing agents with examples. (CO 2) **L1** 5M

OR

2. Outline the synthetic route and brief therapeutic action of 10M
   i) Ciprofloxacin ii) Aspirin iii) Salbutamol iv) Omeprazole (CO 2) **L2**
3. a) Summarize briefly about agonist and antagonist. (CO 1) **L2** 5M
   b) What are anaesthetic and antipyretic drugs? (CO 1) **L1** 5M

OR

4. Describe in detail about ADME. (CO 1) **L1** 10M
5. a) List out the basic principles of green chemistry. (CO3) **L1** 5M
   b) Simplify atom economy? Calculate atom economy using suitable examples.(CO3) **L4** 5M

OR

6. a) Assess the need for green chemistry. (CO3) **L5** 5M
   b) Interpret the selection of solvents in green synthesis. (CO3) **L5** 5M
7. a) Give two methods for synthesis of Nanoparticles. (CO4) **L1** 5M
   b) Compose a note on carbon nanotubes. (CO4) **L6** 5M

OR

8. a) Elaborate a note on Zeolites? (CO4) **L6** 5M
   b) Compile the principle and working of STM. (CO4) **L6** 5M

SECTION –B (Short Answer Questions)

II. Answer any four. **4x5=20 Marks**

9. How would you explain drugs acting on the renal system? (CO 1) **L2**
10. Build a short note on clinical trials. (CO 2) **L3**
11. What are chemotherapeutic agents? Discuss about antimalarial drugs. (CO 1) **L1**
12. Construct briefly about computer aided drug designing.(CO2) **L3**
13. Analyze the role of phase transfer catalyst in green synthesis. (CO3) **L4**
14. Give any four applications of Nanomaterials. (CO4) **L1**

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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	5
2	15	2	2	10	2	5
3	15	3	2	10	1	5
4	15	4	2	10	1	5

5. 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
Shikha Chander M. Deepthi Name and Signature of the teaching faculty Dr. Shikha Chander M. Deepthi	D. Sumalatha Name and Signature of the HoD Dr. D. Sumalatha	Name and Signature of the Principal Dr. Uma Joseph

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SEMESTER – V

CLINICAL BIOCHEMISTRY & IMMUNOLOGY

1. Course Description

Programme : B.Sc.
Course Code : U24/BIC/DSE/501
Course Type : DSE IA
No. of credits: 4

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

2. Course Objectives:

1. Prepare the students for clinical and immunological aspects of human body.
2. Learn Immunological techniques which are used as a diagnostic tool.

3. Course Outcomes

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

CO1: Examine the physiology with respect to important systems of the human body. (L4)

CO2: Analyze the biochemical aspects of the clinical conditions in the human body. (L4)

CO3: Compare the organization of the immune system and understand different immunological responses. (L4)

CO4: Assess the principles, procedures, and applications of various immune techniques. (L5)

4. Course Content –

MODULE I: PHYSIOLOGY **(15 Hrs)**

Composition of blood and coagulation of blood. Hemoglobin and transport of gases in blood (oxygen and CO2) Heart – Structure of the heart, cardiac cycle and cardiac factors controlling blood pressure. Muscle - Types of muscles, Structure of myofibril, organization of contractile proteins mechanism of muscle contraction. Anabolic steroids. Nervous system - structure of neuron, resting potential, action potential, propagation of nerve impulse, synapse, synaptic transmission. Excitatory and inhibitory neurotransmitters. Physiology of vision – visual pigments and visual cycle. Bone – types, composition. Effect of ageing on bones.

MODULE II: CLINICAL BIOCHEMISTRY **(15 Hrs)**

Plasma proteins in health and disease. Disorders of blood coagulation(haemophilia). Types of anemias, haemoglobinopathies – sickle cell anemia and thalassemia.Structure and functions of the liver. Liver diseases – jaundice, hepatitis, cirrhosis. Liver function tests – conjugated and total bilirubin in serum, albumin globulin ratio, hippuric acid and bromosulphthalein test, serum enzymes in liver diseases - SGPT, SGOT and alkaline phosphatase.Kidneys-structure of nephron, urine formation, normal and abnormal constituents of urine. Biological buffers. Role of kidneys in maintaining acid base and electrolyte balance in the body. Renal function tests – creatinine and urea clearance tests, phenol red test. Biochemical tests for the diagnosis of heart disease – HDL/ LDL, cholesterol, SGOT, LDH, CK, C- reactive protein, cardiac troponins.

MODULE III: IMMUNOLOGY **(15 Hrs)**

Organisation of immune system. Organs and cells of the immune system. Innate and acquired immunity Cell mediated and humoral immunity. Antigen, epitopes/ antigenic determinants. Concept of haptens, adjuvants. Major histocompatibility antigens. Blood group antigens. Structure & Classification of immunoglobulins, Isotype, allotype & idiotype Theories of antibody formation - Clonal selection theory of antibody formation. Genetic basis of antibody diversity. Outlines of hypersensitivity reactions. Fundamentals of graft rejection and MHC proteins. Outline of autoimmunity

MODULE IV: IMMUNOLOGICAL TECHNIQUES **(15 Hrs)**

Antigen – antibody reactions – immunoprecipitation, agglutination, immunodiffusion. Immunodiagnostics - RIA& ELISA, direct & indirect immunofluorscence, flow cytometry, biosensor assay & Immuno blotting techniques. Monoclonal antibodies. Vaccines and their classification – Traditional vaccines- Live and attenuated vaccines,
toxoids. Modern vaccines – recombinant, peptide vaccines and DNA vaccines.

5. Reference Books:

1. Judy Owen, Jenni Punt and Stranford: Kuby Immunology 2012 Seventh Edition. ISBN-10: 1-4292-1919-X; ISBN-13: 978-1-4292-1919-8.
2. Gerard .J. Tortora and Bryan Derrickson : Principles of Anatomy and Physiology, 13th edition, 2011. John Wiley & sons Inc. ISBN-13: 978-1118345009.
3. Thomas. M. Devlin : Textbook of Biochemistry with Clinical Correlations, 7th edition, 2010; Wiley – Liss New York. ISBN-13: 978-0470281734.
4. Delves, Martin, Burton &Roitt: Roitt's Essential Immunology. 12th Edition 2012, Wiley Blackwell. ISBN-13: 000-1405196831.
5. Dr. A.C. Deb, Concepts of Biochemistry 1999, Books and Allied Publication Ltd. ISBN: 81-87134-29-1.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	It is integral to modern medicine, providing information of diagnosis, treatment and monitoring of different medical conditions.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 4	Practicals

7. Pedagogy

S.No	Student Centric Methods Adopted	Type/Description of activity
1.	Case studies	Problem Solving
2.	Quiz	Experiential Learning
3.	Group Discussion	Participative Learning

8. Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

CO	Formative Assessment - FA (40%)	Summative Assessment - SA (60%)
CO1	CIA-1	End Semester exam
CO2	CIA-1	
C03	CIA-2 Presentation	
C04	CIA-2 Quiz	

b) Model question paper

CLINICAL BIOCHEMISTRY & IMMUNOLOGY

Course Code: U24/BIC/DSE/501 **Max Marks: 60**
Credits: 4 **Time: 2 Hrs**

SECTION – A

I. Answer the following **(4 x 10 = 40 M)**

1. (a) Explain the role of kidney in glomerular filtration and reabsorption.

   OR

   (b) Explain in detail the physiology of Vision. What is visual cycle.

2. (a) Categorize various Liver Function Tests

   OR

   (b)Arrange and analyse the disorders of Blood Coagulation. Add a note on Sickle Cell Anemia.

3. (a) Analyse in detail about cell mediated immunity

   OR

   (b) Illustrate the basic structure of Immunoglobulins and write their classification.

4. (a) Demonstrate how monoclonal antibodies are produced by hybridoma technology

   OR

   (b) Illustrate the various types of vaccines used for the prevention of common diseases.

SECTION – B

II. Write Short notes on any 4 Questions **(4X5=20M)**

5. Visual Cycle
6. Renal Function Tests
7. Albumin
8. SGPT
9. Major Histocompatibility Complex
10. ELISA

GUIDELINES FOR MODEL PAPER SETTING AS PER BLOOMS TAXONOMY LEVEL (BTL)

DSE 1A: Clinical BC & Immunology

SECTION A - INTERNAL CHOICE (4 X 10 M = 40 M)				
Question Number	**Question**	**Question**	**CO**	**BTL (Blooms Taxonomy Level)**
1	Module 1	Explain the role of kidney in glomerular filtration and reabsorption	CO 1	2
2	Module 1	Explain in detail the physiology of Vision. What is visual cycle.	CO 1	2
3	Module 2	Categorize various Liver Function Tests	CO 2	4
4	Module 2	Arrange and analyze the disorders of blood coagulation. Write a note on Sickle cell anemia	CO 2	4
5	Module 3	Analyze in detail about cell mediated immunity	CO 3	4
6	Module 3	Illustrate the basic structure of Immunoglobulins and write their classification.	CO 3	3
7	Module 4	Demonstrate how monoclonal antibodies are produced by hybridoma technology	CO 4	3
8	Module 4	Illustrate the various types of vaccines used for the prevention of common diseases.	CO 4	3
SECTION B - ANSWER ANY 4 OUT OF 6 4Q X 5 M = 20 M (To compulsorily have ONE question from each module)				
9	Module 1	Visual Cycle	CO 1	4
10	Module 2	Renal Function Tests	CO 2	4
11	Module 2	Albumin	CO 2	4
12	Module 2	SGPT	CO 2	4
13	Any Module	Major Histocompatibility Complex	CO 3	4
14	Any Module	ELISA	CO4	5

CLINICAL BIOCHEMISTRY & IMMUNOLOGY
PRACTICAL

1. Course Description:

Programme : B.Sc.
Course Code : U20/BIC/DSE/501/P
Type of course : DSE
No. of credits : 1

Max. Hours: 30
Hours per week: 2
Max. Marks: 50

2. Course objective:

- Prepare students for clinical and immunological techniques used to study various aspects of human body.

3. Course Outcomes:

- CO1: Demonstrate and analyse the abnormal concentrations of various components in the blood and metabolites in the urine
- CO2: Design the skills of immunological techniques to test infectious diseases.

PRACTICAL SESSIONS

1. Determination of Rh and Blood Group Typing
2. Blood Pressure Measurement by Sphygmomanometer.
3. Estimation of Hemoglobin by Sahli's and Drabkin's Method
4. Estimation of Creatinine in urine
5. Estimation of Creatine in urine
6. Estimation of Serum Iron
7. Estimation of Serum Phosphorus
8. Estimation of Serum Urea
9. Estimation of Serum Cholesterol
10. Qualitative Analysis of Urine
11. Ouchterlony Immunodiffusion Technique
12. Immuno Electrophoresis
13. Dot ELISA, WIDAL, VDRL Test

MODEL QUESTION PAPER
PRACTICAL

Course Code: U20/BIC/DSE/501/P
Credits: 1

Max Time: 2 Hrs
Max. Marks: 50

Answer the following.

1. Write the principles for the given experiments. (2 x 5 = 10 M)
   a) Estimation of serum Iron
   b) Estimation of Hemoglobin by Sahli's Method.
2. Quantitatively estimate the concentration of serum Iron in the given sample. Plot the calibration curve for the standard. Identify the concentration for the given unknown sample. Add a note on the clinical significance and write the normal range. (20 M)
3. Identify the abnormal constituents present in the given urine sample (10 M)
4. Viva (5 M)
5. Record (5 M)

Prepared by Course Teacher [Name & Signature]	Checked & verified by HOD [Name & Signature]	Approved by the Principal
	21/12/24 (S. Malathi Varma)	

HOD Biochemistry
St. Francis College for Women
Begumpet, Hyderabad-16.

Professor Karuna Rupula
Department of Biochemistry
University College of Science
Osmania University
Hyderabad-500 007 (TS)

SEMESTER - V

FORENSIC SCIENCE

1. Course Description

Programme: B.Sc
Course Code: U24/BIT/GE/501
Course Type: GE
No. of credits: 4

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

2. Course Objectives

- To provide knowledge about basic principles of Forensic Science, various branches, functions, nature, and scope of Forensic Science.
- To emphasize the importance of scientific methods in crime detection.
- To make the students review and apply skills gained in policing and criminal investigation.

3. Course Outcomes

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

CO1: Define and interpret the application of Forensic Science, documentation of evidences and crime scene management **(REMEMBER, UNDERSTAND)**

CO2: Describe the importance of autopsy in crime investigation and analyse various medico-legal aspects of offences (**UNDERSTAND, ANALYZE)**

CO3: Assess various interrogative techniques used in crime investigation (**EVALUATE)**

CO4: Analyse and deduce the importance of techniques used in DNA Profiling, crime scene photography and sketching (**ANALYZE, EVALUATE)**

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4. Course Content

MODULE I: CRIMINAL JUSTICE SYSTEM & FORENSIC SCIENCE **(15 Hrs)**

- Forensic Science – Introduction & History, Organization of Forensic Science Laboratories and other allied institutions (FSL, CFSL, GEsQD, FPB etc)
- Role of Forensic Science in crime investigation
- Types of Crime scene
- Processing of crime scene- Photo / video graphing and sketching
- Searching of crime scene- Collection, preservation, packing and forwarding of physical evidence
- Chain of custody
- Probative value of physical evidence
- Reconstruction of scene of crime
- Investigation of crime
- Modus operandi
- Court Testimony Introduction, Admissibility of expert testimony
- Expert and lay witnesses and Giving testimony as an Expert.

MODULE II: FORENSIC MEDICINE **(15 Hrs)**

- Personal identification of living and dead
- Postmortem examination (autopsy) – External examination & Internal examination
- Postmortem changes and their importance in determination of time after death
- Mechanical injuries, Thermal injuries, Medico legal aspects of injuries
- Sexual offences– Rape, Unnatural sexual offences; Abortion; Infanticide, Medico legal aspects, Linkage with forensic science laboratory.

MODULE III: INTERROGATION TECHNIQUES **(15 Hrs)**

- Polygraph/Lie Detector Test: Objectives, theoretical basis, stages of examination (Pre-test, In-test, post-test
- Questioning techniques, Stim test, Limitations, Admissibility in the court of law, NHRC guidelines
- Brain Fingerprinting/Brain-Mapping: Principle, Importance, History, process, reliability, case studies, admissibility
- Narco-analysis: Principle, History, drugs used, procedure, reliability, admissibility, limitations, Indian scenario, case studies, etc

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Hyderabad-500 007. T.S.

MODULE IV: CRIME SCENE LAB **(15 Hrs)**

- Sketching of crime scene.
- Photography of crime scene.
- Collection and packing of physical evidence at the scene of crime.
- Extraction of DNA from blood.
- Quality check and quantitation of DNA
- Complete DNA Fingerprinting technique.
- Case studies

5. Reference books

1. Dr. K. S. Narayan Reddy. (2010). *Textbook of Medical Jurisprudence & Toxicology.*
2. James, S. H. and Nordby, J. J. (2005 & 2003). *Forensic Science: An Introduction to Scientific and Investigative Techniques*: CRC Press.
3. James, P.J. (2005). *Encyclopedia of Forensic and Legal Medicine*: Elsevier.
4. Sharma, B. R.(2003). *Forensic Science in Criminal Investigation and Trials*: Universal Pub.
5. Modi, J. P. (2001). *Textbook of Medical Jurisprudence & Toxicology:* N.M. Tripathi Publication.
6. Pillay, V.V. (2001). *Handbook of Forensic Medicine and Toxicology*. (XII Edition): Paras Publication.
7. Turner, P.C., Mclennan, A.G., Bates, A.D. & White, M.R.H. (2001). *Instant notes in Molecular Biology* (II Edition): Viva Books Pvt. Ltd.
8. Parikh, C.K. (1999). *Text Book of Medical Jurisprudence, Forensic Medicine & Toxicology*. New Delhi: CBS Pub.
9. Robertson, J. (1999*). Forensic Examination of Hair.* Taylor and Francis.
10. Saferstein R. (1998). *Criminalistics – An Introduction to Forensic Science*. (V Edition). Prentice Hall

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6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global (Module 1, 2, 3 & 4)	The global importance of forensic science is reflected in its curriculum, which covers topics such as criminal justice, humanitarian aid, historical study, and human rights advocacy. Students who receive an education in forensic science are prepared to make a global contribution to justice, truth-seeking, and human dignity by gaining multidisciplinary knowledge and useful skills.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Searching and processing of crime scene	A mock crime scene will be constructed and various methods of searching the crime scene and processing of evidence will be demonstrated.
Employability	Module 4	Students will be taken for a field visit to a forensic science laboratory

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Experiential Learning	Interactive classroom games
2.	Experiential Learning	Quiz
3.	Participative Learning	Group discussion
4.	Participative Learning	Role play
5.	Participative Learning	Presentation
6.	Problem solving	Case studies

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- Group discussions/ Role play/Quiz	Written Exam
CO2	CIA1- Presentation/ Case studies	
CO3	CIA-2- Written Exam	
CO4	CIA-2- Written Exam	

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b) Model Question Paper- End Semester Exam

FORENSIC SCIENCE
MODEL QUESTION PAPER

Course Code: U24/BIT/GE/501 **Max. Marks: 60**
Credits: 4 **Time: 2 Hrs**

SECTION – A

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

1. How would you describe the role of forensic science in crime scene investigation

OR

2. How would you classify the types of crime scene
3. How can you summarize the post mortem examination?

OR

4. Summarize the various medico legal aspects of injuries.
5. Explain about narco analysis.

OR

6. Explain polygraph test.

7. List the different steps of DNA fingerprinting

OR

8. Determine the applications of forensic science

SECTION –B

II. Answer any Four of the following: **4 x 5 = 20 M**

9. Describe about chain of custody
10. Illustrate the process of personal identification of living and dead
11. Compare the various types of questioning techniques
12. Classify the different types of photographs in forensic photography
13. Explain about brain mapping
14. Illustrate the process of DNA extraction from blood

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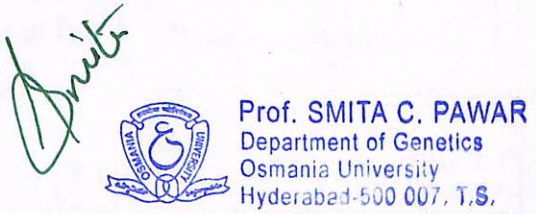
SEMESTER-END MODEL QUESTION PAPER

SECTION A - INTERNAL CHOICE 4 Q X 10 M = 40 M				
Question Number	**Question**	**Question**	**CO**	**BTL(Bloom's Taxonomy Level)**
1	Module 1	How would you describe the role of forensic science in crime scene investigation	CO 1	I
2	Module 1	How would you classify the types of crime scene	CO 1	II
3	Module 2	How can you summarize the post mortem examination	CO 2	II
4	Module 2	Summarize the various medico legal aspects of injuries	CO 2	II
5	Module 3	Explain about nacro analysis	CO 3	V
6	Module 3	Explain polygraph test	CO 3	V
7	Module 4	List the different steps of DNA fingerprinting	CO 4	IV
8	Module 4	Determine the applications of forensic science	CO 4	V

SECTION B - ANSWER ANY 4 OUT OF 6 4 Q X 5 M = 20 M (To compulsorily have **ONE** question from **each** module)				
9	Module 1	Describe about chain of custody	CO 1	I
10	Module 2	Illustrate the process of personal identification of living and dead	CO 2	II
11	Module 3	Compare the various types of questioning techniques	CO 3	V
12	Module 4	Classify the different types of photographs in forensic photography	CO 4	IV
13	Any Module	Explain about brain mapping	CO 3	V
14	Any Module	Explain the process of DNA extraction from blood.	CO 4	V



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 -V
INSTRUMENTAL METHODS OF ANALYSIS

1. Course Description

Program: B.Sc.
Course Code: U24/CHE/DSE/501
Course: DSE- 1
No. of Credits: 4

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

2. Course Objectives

- To understand the importance of separation techniques such as solvent extraction and to explore the principles and procedures of chromatographic techniques including paper, thin layer,
- To learn the principles of column, ion exchange chromatography, HPLC and GLC.
- To delve into the principle and instrumentation of UV/Visible spectrophotometry, and its application to the quantitative analysis of various ions.
- An approach towards the principle and application of electroanalytical analysis.

3. Course Outcomes

CO1: Understand various separation techniques and choose the most appropriate analytical technique for a variety of samples.
CO2: Explain the theoretical principles of various separation techniques in chromatography and their typical applications.
CO3: Interpret the theoretical principles of selected instrumental methods with spectrophotometric methods.
CO4: Review and assessment of electro analytical methods.

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4. Course Content

MODULE I: CHROMATOGRAPHY I — 15 Hrs

Solvent Extraction- Principle, Methods of extraction: Batch extraction, continuous extraction and counter current extraction. Application – Determination of Iron (III).

Chromatography: Classification of chromatographic methods, principles of differential migration, adsorption phenomenon, nature of adsorbents, solvent systems.

Thin layer Chromatography (TLC): Advantages, preparation of plates, development of the chromatogram, Detection of the spots, factors affecting R_f values and applications.

Paper Chromatography: Principle, choice of paper and solvent systems, development of chromatogram – ascending, descending, radial and two dimensional chromatography and applications.

MODULE II: CHROMATOGRAPHY II — 15 Hrs

Column Chromatography: Principle, Types of stationary phases, Column packing – Wet packing technique, Dry packing technique. Selection criteria of mobile phase (solvents) for eluting, polar, non-polar compounds and its applications.

Ion exchange chromatography: Principle, cation and anion exchange resins, its application in separation of ions.

Gas Chromatography: Theory and instrumentation (Block Diagram), Types of stationary phases and carrier gases (mobile phase).

High performance liquid chromatography: Theory and instrumentation, stationary phases and mobile phases. Analysis of paracetamol.

MODULE III: COLORIMETRY AND SPECTROPHOTOMETRY — 15 Hrs

General features of absorption – spectroscopy, transmittance, absorbance, and molar absorptivity. Beer Lambert's law and its limitations, difference between Colorimetry and Spectrophotometry.

Instruments – Single beam UV- Visible Spectrophotometer, Double beam UV- Visible Spectrophotometer. Lamps used as energy sources. Verification of Beer's law. Estimation of iron in water samples by thiocyanate method. Estimation of (i) Chromium and (ii) Manganese in steel.

IR Spectrophotometer: Principle, Sources of Radiations, Sampling, Block diagram of FT-IR Spectrophotometer.

MODULE IV: ELECTROANALYTICAL METHODS — 15 Hrs

Types of Electroanalytical Methods.

I) Interfacial methods – a) Potentiometry: Principle, Electrochemical cell, Electrodes- (i) Indicator and (ii) Reference electrodes – Normal Hydrogen Electrode, Quinhydrone Electrode,

Saturated Calomel Electrode. Numerical Problems. Application of Potentiometry – Assay of Sulphanilamide

b) Voltammetry – three electrode assembly; Introduction to types of voltammetric techniques, micro electrodes, over potential and Polarization.

II) Bulk methods – Conductometry, Conductivity Cell, Specific Conductivity, Equivalent Conductivity. Numerical problems. Applications of conductometry. Estimation of Cl - using $AgNO_3$. Determination of Aspirin with KOH.

5. References

1. David Krupadanam, *Analytical Chemistry*, Universities Press (India) Limited.
2. S. M. Khopkar, *Basic concepts of Analytical Chemistry*, New Age International Publishers.
3. Gurdeep R. Chatwal, Sham K. Anand, *Instrumental methods of Chemical analysis*, Himalaya Publishing House.
4. D.A. Skoog, F.J. Holler, T.A. Nieman, *Principles of Instrumental Analysis*, Engage earning India Edn.
5. D. A. Skoog, D.M. West, F.J. Holler, *Fundamentals of Analytical Chemistry* 6 th Edn., Saunders College Publishing, Fort worth (1992).
6. Cooper, T.G. *The Tools of Biochemistry*, John Wiley and Sons, N.Y. USA.16, 1977.
7. Vogel, A. I. *Vogel's Qualitative Inorganic Analysis* 7th Edn, Prentice Hall.
8. Vogel, A. I. *Vogel's Quantitative Chemical Analysis* 6th Edn, Prentice Hall.
9. Gary D. Christian, *Analytical Chemistry* 7th edition. (2004).
10. B. K. Sharma, *Industrial Chemistry* (including Chemical Engineering). edn. (1997).

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St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
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FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY
PRACTICAL SYLLABUS CBCS-2024
SEMESTER -V
~~CHEMISTRY PRACTICALS – ELECTIVES 1~~ Experiments in Physical Chemistry & Sustainable Chemistry

Program: B.Sc.
Course Code: U24/CHE/DSE/501/P
Course: DSE 1 & 2
No. of Credits: 1

Max. Hours: 30 Hrs
Max. Marks: 50
Hours per week: 2 Hrs

Course Objectives

- To equip the students with required analytical skills for potentiometry, TLC and determination of partition coefficient.
- To investigate analytes with the use of scientific instruments.

Course Outcomes

CO 1: Acquire the skills to determine partition coefficient, perform TLC and potentiometric titrations.
CO 2: The techniques such as spectroscopy, electrochemical analysis provides adequate knowledge and applications.

Distribution Experiments:

1. Distribution of partition coefficient of acetic acid in water and butanol.
2. Distribution of benzoic acid in benzene and water.

Potentiometry:

3. Titration of strong acid vs strong base (HCl vs NaOH)

4,

Thin Layer Chromatography :

4. Determination of Rf values and identification of Organic compounds: preparation of and separation of 2,4-dinitrophenylhydrazone of acetone and acetophenone using toluene and light petroleum (40:60)
5. Separation of ortho & para-nitroaniline mixtures.

Electrochemistry

6 Titration of Strong acid Vs Strong base (HCl Vs NaOH)
~~6~~ 7. Determination of dissociation constant (Ka) of acetic acid by conductivity measurements

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Colorimetry

7. Verification of Beer's Law using $KMnO_4$ and determination of the concentration of the given solution.

Adsorption

8. Adsorption of acetic acid on animal charcoal, Verification of Freundlich adsorption isotherm.

Reference Books

1. Khosla, B. D.; Garg, V. C. &Gulati, A. Senior Practical Physical Chemistry, R.
2. Chand & Co.: New Delhi (2011).
3. Mendham, J, *Vogel's Quantitative Chemical Analysis:* Pearson, 2009.
4. Analytical Chemistry 7th edition by Gary D. Christian (2004)
5. Vogel, A. I. Vogel's Qualitative Inorganic Analysis 7th Ed., Prentice Hall. 11. Vogel, A. I.
6. Vogel's Quantitative Chemical Analysis 6th Ed., Prentice Hall.

(9) Green Synthesis of Acetanilide

(10) Green Synthesis of (P-Bromo acetanilide) Aspirin

(11) Green Synthesis of Dihydropyrimidinone

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6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Local	To produce graduates with sound theoretical knowledge and technical skills.
Regional	To motivate students towards research.
National	To address the challenges with their innovative contributions for the benefit of mankind.
Global	To instill the essence of professionalism, ethical commitment to become researchers with core human values.

b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	1,2,3,4	Upskilling, cross skilling and reskilling
ED	1,2,3,4	Guest lecture Skill test involving creative thinking and problem solving
EMP	1,2,3,4	Using an engaging curriculum for career exploration

7. Pedagogy

S.No.	Student Centric Methods Adopted	Type / Description of Activity
1.	Experiential Learning	Science Experiments
2.	Participative Learning	Presentation
3.	Problem solving	Research Projects

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8. Course Assessment Plan

a. Weightage of Marks in Continuous Internal Assessments & 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- Mini Project	
CO4	CIA2- Paper Presentation	

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b. Model Question Paper - End Semester Exam

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(An Autonomous College Affiliated to Osmania University)
Faculty of Science – Department of Chemistry
MODEL PAPER - B.Sc. III YEAR SEMESTER -V
INSTRUMENTAL METHODS OF ANALYSIS
Course Code: U24/CHE/DSE/501

TIME: 2 Hrs
Max. Marks: 60

SECTION –A

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

1. Evaluate the principle of paper chromatography and development of chromatogram by four methods. (CO1) **L5** 10M

OR

2. a) Explain the Craig's counter current process of solvent extraction. (CO2) **L1** 5M
   b) Summarize a short note on Soxhlet extraction technique. (CO1) **L2** 5M

3. a) Apply the theory involved in Gas chromatography and draw the block diagram. (CO2) **L3** 5M
   b) Give the analysis of paracetamol by HPLC (CO3) **L1** 5M

OR

4. Describe the principle of Ion exchange chromatography. Give an account of cation and anion exchange resins. (CO1) **L2** 10M
5. a) Estimation of iron in water sample samples by thiocyanate method. (CO3) **L6** 5M
   b) Explain the instrumentation of the double beam spectrophotometer. (CO3) **L1** 5M

OR

6. Analyse the Principle, Sources of Radiations, Sampling technique in IR spectrophotometry. (CO3) **L4** 10M
7. a) Describe the working of Calomel electrode with a neat diagram (CO4) **L2** 5M
   b) How chloride ions are estimated using silver nitrate by conductometry. (CO4) **L1** 5M

OR

8. Determine the EMF of a cell initially of an acid- base titration where 25 ml 0.1 M of HCl is titrated potentiometrically against standard 0.1 M NaOH using hydrogen electrode as indicator electrode and saturated calomel electrode as reference electrode. What would be the EMF after the addition of 20, 25 and 30 ml of NaOH solution? (CO4) **L5** 10M

SECTION –B

II. Answer any four. **4x5=20 Marks**

9. Illustrate any two applications of TLC (CO2) **L2**
10. Give an account of different types of column packing. (CO1) **L1**
11. Distinguish between Colorimetry and Spectrophotometry. (CO3) **L4**
12. Classify chromatographic methods and explain any two. (CO1) **L1**
13. Outline a short note on three electrode assembly. (CO4) **L2**
14. Explain the instrumentation and principle of HPLC. (CO2) **L1**

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 -V
INSTRUMENTAL METHODS OF ANALYSIS

TIME: 2 Hrs **Course Code: U24/CHE/DSE/501**
Max. Marks: 60 **Credits: 4**

SECTION –A

SECTION A - INTERNAL CHOICE				**4 X 10 M = 40M**
Question Number	**Question**		**CO**	**BTL**
1	**Module 1**	Evaluate the principle of paper chromatography and development of chromatogram by four methods. 10M **OR**	**CO 1**	**(Level V)**
2	**Module 1**	a) Explain the Craig's counter current process of solvent extraction. 5M b) Summarize a short note on Soxhlet extraction technique. 5M	**CO 1**	**(Level I, II)**
3	**Module 2**	a) Apply the theory involved in Gas chromatography and draw the block diagram. 5M b) Give the analysis of paracetamol by HPLC 5M **OR**	**CO 2**	**(Level I, III)**
4	**Module 2**	Describe the principle of Ion exchange chromatography. Give an account of cation and anion exchange resins. 10M	**CO 2**	**(Level II)**
5	**Module 3**	a) Estimation of iron in water sample samples by thiocyanate method. 5M b) Explain the instrumentation of the double beam spectrophotometer. 5M **OR**	**CO 3**	**(Level I,VI)**
6	**Module 3**	Analyze the principle, sources of radiations, sampling technique in IR spectrophotometry. 10M	**CO 3**	**(Level IV)**

7	**Module 4**	a) Describe the working of Calomel electrode with a neat diagram 5M b) How chloride ions are estimated using silver nitrate by conductometry. 5M **OR**	**CO 4**	**(Level I, II)**
8	**Module 4**	a) What is the principle and instrumentation of potentiometry 5M b) Explain the three electrode assemblies of voltammetry. 5M	**CO 4**	**(Level I)**
SECTION B – (Short answer questions) **ANSWER ANY 4 OUT OF 6** **4 X 5M = 20 M**				
9	**Module 2**	Illustrate any two applications of TLC	**CO 2**	**(Level II)**
10	**Module 1**	Give an account of different types of column packing.	**CO 1**	**(Level I)**
11	**Module 3**	Distinguish between Colorimetry and Spectrophotometry.	**CO 3**	**(Level IV)**
12	**Module 1**	Classify chromatographic methods and explain any two.	**CO 1**	**(Level I)**
13	**Module 4**	Calculate the equivalent conductivity 0.1N concentrated sulphuric acid solution given specific conductivity is equal to $4 \times 10^{-2} Sm^{-1}$.	**CO 4**	**(Level II)**
14	**Module 2**	Explain the instrumentation and principle of HPLC.	**CO 2**	**(Level I)**

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St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
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FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY
THEORY SYLLABUS CBCS-2024
SEMESTER -V
MEDICINAL & SUSTAINABLE CHEMISTRY

1. Course Description

Program: B.Sc.
Course Code: U24/CHE/DSE/502
Course: DSE 2
No. of Credits: 4

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

2. Course Objectives

- To introduce students to the action of drugs on biological systems.
- To explain & discuss the drug formulation, synthetic routes and discovery process.
- To study the effects of chemical synthesis upon the environment and the importance of developing green techniques.
- Introduce students to the importance of nanoparticles, their properties and applications.

3. Course Outcomes

CO 1: Learn and understand the action of drugs on biological systems.
CO 2: Discuss the synthetic routes and therapeutic activity for some commonly used drugs.
CO 3: Acquire the ability to design green synthetic routes replacing conventional pathways.
CO 4: Apply the knowledge of Nanotechnology to synthesize, characterize Nanoparticles and explain their properties.

4. Course Content

MODULE I: MEDICINAL CHEMISTRY I **12 Hrs**

Terminology in Medicinal Chemistry **2 Hrs**
Disease, Drug, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics, metabolites, antimetabolites, agonist, antagonist and therapeutic index.

Nomenclature **1 Hr**
Chemical name, Generic name and Trade names. Trade names for the given generic names – (i) Aspirin (ii) Amoxycillin (iii) Ciprofloxacin (iv) Paracetamol (v) Mebendazole.

ADME **3 Hrs**
a) Absorption: Definition, absorption of drugs across the membrane – active and passive absorption, routes of administration of drugs. b) Distribution: definition and effect of plasma protein binding. c) Metabolism: definition, phase I and phase II reactions. d) Elimination: definition and renal elimination.

Classification of Drugs
Classification of Drugs based on therapeutic action–Chemotherapeutic agents, and Pharmacodynamic agents (brief explanation for the following)
(i) Chemotherapeutic agents **1 Hr**

Antimalarials – Chloroquine; Antibiotic – Amoxicillin; Antitubercular drugs – isoniazid; Antiprotozoals – metronidazole: Antibacterial – Sulphanilamide; Anthelmintics – Albendazole.

(ii) Pharmacodynamic agents **5 Hrs**

(a) Drugs acting on CNS: General (thiopental sodium)and local anaesthetics (Benzocaine),Analgesics (Ibuprofen),Antipyretics (Aspirin, Paracetamol), Sedatives & Hypnotics (Phenobarbital), Anticonvulsants (Diazepam), Anti-psychotics (Chlorpromazine) and Antidepressants (Fluoxetine).

(b) Drugs acting on PNS: Adrenergic (Salbutamol, Propranolol) & Cholinergic (Carbachol, Diphenhydramine) Drugs.

(c) Drugs acting on Cardiovascular System-Antihypertensive Drugs (Captopril, Nifedipine)

(d) Drugs acting on renal system- Diuretic drugs (Furosemide, Acetazolamide)

MODULE II: MEDICINAL CHEMISTRY II **11 Hrs**

SAR studies **1 Hr**

Introduction to Structure Activity Relationship Studies, Lead modification strategies.SAR of benzodiazepines.

Antibiotics **1 Hr**

Discovery- Isolation of Penicillin, Structure of Penicillin G, Penicillin-V, Penicillin-O &Amoxycillin.

Synthetic route and brief therapeutic action of the following drugs: **4 Hrs**

Chemotherapeutics: Chloroquine, Ciprofloxacin, Sulphanilamide, Metronidazole.

Drugs to treat metabolic disorders: Paracetamol, Salbutamol, Omeprazole, Mephensin, Aspirin, Thiobarbituric acid, L-Dopa, Phenobarbital, Oil of wintergreen, Nifedipine

Formulations **2 Hrs**

(a) Introduction: Need of conversion of drugs into medicine. Additives & their role (Brief account only). (b) Classification of Drug formulations: Oral, parenterals and topical dosage forms – advantages and disadvantages.

Brief Overview of Drug Development Process: **3 Hrs**

(a) Lead drug-Definition & example (b) Drug design-i) Based on Lead compound ii) Based on Target Structure(De novo drug design) iii) Computer aided Drug Design (Molecular modelling) (c) Drug Testing-Clinical trials.

MODULE III: GREEN CHEMISTRY **15 Hrs**

Principles of Green Chemistry and some real world cases

What is Green Chemistry? Twelve principles of Green Chemistry with their explanation and examples. Atom economy, Evaluation of the type of the reaction: Rearrangements, Addition, Substitution, elimination and Pericyclic reactions. Selection of solvent: Aqueous phase reactions, Reactions in ionic liquids, Solid supported synthesis, Solvent free reactions (solid phase reactions). Green catalysts: Phase transfer catalysts (PTC), Biocatalysts. Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy.

Microwave assisted reactions in water: Oxidation of toluene and alcohols, Claisen rearrangement, Pinacol pinacolone rearrangement.

Microwave assisted reactions in organic solvents, Diels-Alder reaction and Decarboxylation reaction, Fries rearrangement.

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Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine), Cannizaro reaction, Strecker synthesis, Friedal crafts acylation.
Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis).

MODULE IV: NANOTECHNOLOGY 15 Hrs

Nanotechnology: Introduction, types of crystalline nano materials, synthesis of nano materials- physical, chemical and biological methods (one method each).
Characterization of nanoparticles using electron microscope, tunneling microscope and X-ray diffraction. (Elementary treatment only)
Properties of nanomaterials-structure of nanomaterials, mechanical, electrical conductivity, optical, melting point, luminescence, magnetic properties
Special nanomaterials- fullerenes, carbon nanotubes, porous silicon, zeolites, aerogels, self-assembled nanoparticles, their preparation and structure.
Applications-- Electronics, energy, automobiles, fuel cells, home appliances, Nanolithography, defense, medicine, nanotechnology and environment.

5. References

1. G.L. David Krupadanam, D.Vijaya Prasad, K.Varaprasad Rao, K.L.N. Reddy, C. Sudhakar, *Drugs*, Universities Press (India) Limited 2007.
2. Graham L. Patrick, *An Introduction to Medicinal Chemistry,* Oxford University Press, New York. 1995
3. *Chemistry text book for B.Sc., Vol. IV* published by Telugu Academy, Govt. of Telangana.
4. Ahluwalia V.K, *Green Chemistry: Environmentally benign reaction*: Ane books Pvt.Ltd,2006.
5. Ahluwalia V.K & Kidwai M, *New Trends in Green Chemistry:* Springer,1 edition (29thFeb 2004)
6. Kulkarni. K.S, (2011), *Nanotechnology- Principles & Practices* Co-Published by Springer International Publishing Company, Switzerland, New Delhi, Capital Publishing Company.
7. Nanochemistry- A Chemical Approach to Nano World by Kusum Sharma
8. Poole Jr. C.P & Owens. J.F (copyright, reprint, 2006). *Introduction to Nanotechnology*, New Delhi, Wiley India(P) Ltd.
9. Thomas Nogrady, Medicinal Chemistry, Oxford Univ. Press, New York.2005.
10. David William and Thomas Lemke, Foye's Principles of Medicinal Chemistry, Lippincott Williams & Wilkins, 2008.
11. AshutoshKar Medicinal Chemistry, New Age International, 2005.
12. O.D. Tyagi & M.Yadav Synthetic Drugs by, Anmol Publications, 1998.
13. Medicinal Chemistry by Alka L. Gupta, Pragati Prakashan.
14. Samuel Delvin, *Green Chemistry* :Sarup & Sons(2005)
15. Anastas, P.T & Warner, J.C, *Green Chemistry: Theory and Practice:* Oxford University Press (1998).
16. T. Pradeep *Nano: The Essentials* , McGraw-Hill Education.
17. CNR Rao et.al. *Chemistry of nanomaterials: Synthesis, Properties and applications*
18. Gurdeep R. Chatwal *Chemistry and industry*
19. https://www.electrical4u.com/properties-of-superconductors/
20. Poole Jr. C.P & Owens. J.F(copyright, reprint,2006).*Introduction to Nanotechnology*, New Delhi,Wiley India(P) L

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6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Local	To develop products that benefit the environment either directly or indirectly.
Regional	Nanotechnology helps in improving many technology and industry sectors and even revolutionize.
National	The concepts of Green Chemistry reduces the use of energy and fuel by using renewable inputs wherever possible
Global	Recent advances in Medicinal Chemistry, Green Chemistry and Nanotechnology provide reliable synthetic pathways for sustainable development goals.

b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	All	Educational tour to industries/factories to make students learn outside the classroom
ED	All	Case studies relevant to the problems, challenges and help students to develop solutions
EMP	All	Systematic and sustained effort to adapt specific skills for improving career goals

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Experiential Learning	Field Trips
2.	Participative Learning	Role play
3.	Problem solving	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	CIA1-Written Exam	Written Exam
CO2	CIA1-Written Exam	
CO3	CIA2- Case Study	
CO4	CIA2- Presentations (poster/ ppt)	

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b. Model Question Paper - End Semester Exam

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FACULTY OF SCIENCE – DEPARTMENT OF CHEMISTRY

B.Sc. III YEAR SEMESTER -V

MEDICINAL & SUSTAINABLE CHEMISTRY

TIME: 2hrs **Course Code: U24/CHE/DSE/502**

Max. Marks: 60 **Credits: 4**

SECTION –A (Essay Questions)

SECTION A - INTERNAL CHOICE			**4 X 10 M = 40M**	
Question Number	**Question**		**CO**	**BTL**
1	**Module 2**	a) Evaluate the structure of Penicillin G & discuss its commercial production 5M b) Explain briefly about diluents and stabilizing agents with examples. 5M **OR**	**CO 2**	**(Level I, V)**
2	**Module 2**	Outline the synthetic route and brief therapeutic action of i) Ciprofloxacin ii) Aspirin iii) Salbutamol iv) Omeprazole 10M	**CO 2**	**(Level II)**
3	**Module 1**	a) Summarize briefly about agonist and antagonist. 5M b) What are anaesthetic and antipyretic drugs? 5M **OR**	**CO 1**	**(Level I, II)**
4	**Module 1**	Describe in detail about ADME. 10M	**CO 1**	**(Level I)**
5	**Module 3**	a) List out the basic principles of green chemistry. 5M b) Simplify the atom economy? Calculate atom economy using suitable examples. 5M **OR**	**CO 3**	**(Level I, IV)**
6	**Module 3**	a) Assess the need for green chemistry. 5M b) Interpret the selection of solvents in green synthesis. 5M	**CO 3**	**(Level V)**

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7	**Module 4**	a) Give two methods for synthesis of Nanoparticles. 5M b) Compose a note on carbon nanotubes.5M **OR**	**CO 4**	**(Level I, VI)**
8	**Module 4**	a) Elaborate a note on Zeolites? 5M b) Compile the principle and working of STM. 5M	**CO 4**	**(Level VI)**
SECTION B – (Short answer questions) **ANSWER ANY 4 OUT OF 6**			**4 X 5M = 20 M**	
9	**Module 1**	How would you explain drugs acting on the renal system?	**CO 1**	**(Level II)**
10	**Module 2**	Build a short note on clinical trials.	**CO 2**	**(Level III)**
11	**Module 1**	What are chemotherapeutic agents? Discuss about antimalarial drugs.	**CO 1**	**(Level I)**
12	**Module 2**	Construct briefly about computer aided drug designing.	**CO 2**	**(Level III)**
13	**Module 3**	Analyze the role of phase transfer catalyst in green synthesis.	**CO 3**	**(Level IV)**
14	**Module 4**	Give any four applications of Nanomaterials.	**CO 4**	**(Level I)**

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b. Model Question Paper - End Semester Exam

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

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FACULTY OF SCIENCE – DEPARTMENT OF CHEMISTRY

b. MODEL PAPER - B.Sc. III YEAR SEMESTER -V

MEDICINAL & SUSTAINABLE CHEMISTRY

TIME: 2hrs **Course Code: U24/CHE/DSE/502**

Max. Marks: 60

SECTION –A (Essay Questions)

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

1. a) Evaluate the structure of Penicillin G & discuss its commercial production(CO2) **L5** 5M

   b) Explain briefly about diluents and stabilizing agents with examples. (CO 2) **L1** 5M

OR

2. Outline the synthetic route and brief therapeutic action of 10M
   i) Ciprofloxacin ii) Aspirin iii) Salbutamol iv) Omeprazole (CO 2) **L2**
3. a) Summarize briefly about agonist and antagonist. (CO 1) **L2** 5M

   b) What are anaesthetic and antipyretic drugs? (CO 1) **L1** 5M

OR

4. Describe in detail about ADME. (CO 1) **L1** 10M
5. a) List out the basic principles of green chemistry. (CO3) **L1** 5M

   b) Simplify atom economy? Calculate atom economy using suitable examples.(CO3) **L4** 5M

OR

6. a) Assess the need for green chemistry. (CO3) **L5** 5M

   b) Interpret the selection of solvents in green synthesis. (CO3) **L5** 5M
7. a) Give two methods for synthesis of Nanoparticles. (CO4) **L1** 5M

   b) Compose a note on carbon nanotubes. (CO4) **L6** 5M

OR

8. a) Elaborate a note on Zeolites? (CO4) **L6** 5M

   b) Compile the principle and working of STM. (CO4) **L6** 5M

SECTION –B (Short Answer Questions)

II. Answer any four. **4x5=20 Marks**

9. How would you explain drugs acting on the renal system? (CO 1) **L2**
10. Build a short note on clinical trials. (CO 2) **L3**
11. What are chemotherapeutic agents? Discuss about antimalarial drugs. (CO 1) **L1**
12. Construct briefly about computer aided drug designing.(CO2) **L3**
13. Analyze the role of phase transfer catalyst in green synthesis. (CO3) **L4**
14. Give any four applications of Nanomaterials. (CO4) **L1**

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Head
Department of Chemistry
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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	5
2	15	2	2	10	2	5
3	15	3	2	10	1	5
4	15	4	2	10	1	5

5. 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
Shikha Chander M. Deepthi Name and Signature of the teaching faculty Dr. Shikha Chander M. Deepthi	D. Sumalatha Name and Signature of the HoD Dr. D. Sumalatha	Name and Signature of the Principal Dr. Uma Joseph

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SEMESTER V

NUTRITIONAL BIOCHEMISTRY

1. Course Description

Programme: B.Sc.
Course Code: U24/BIC/GE/501
Type of course: GE
No. of credits: 4

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

2. Course Objective:

- Students will have a comprehensive understanding of energy metabolism, biomolecules, vitamins, and nutraceuticals.
- Enabling them to apply this knowledge to real-world scenarios and make informed decisions related to nutrition and health.

2. Course Outcome:

This course will help students to –

CO 1: Explain the fundamentals of energy metabolism along with factors and techniques related to it. (L2)

CO 2: Analyze the nutritional relevance of carbohydrates and discuss the important amino acids and lipids and their role in maintaining overall health. (L2, L4)

CO 3: Classify various vitamins elaborately including their sources, biochemical. roles, deficiency, toxicity (L4)

CO 4: Assess nutritional status of an individual and nutraceuticals (L5)

4. Course Content

Module I: ENERGY METABOLISM **(15hr)**

Unit of energy, biological oxidation of foodstuff, Measurement of energy content of food. Physiological energy value of foods, SDA. Measurement of energy expenditure- Direct and indirect calorimetry, factors affecting thermogenesis, energy utilization by cells, energy output- Basal and resting metabolism, physical activity, factors affecting energy input- Hunger, appetite, energy balance. Energy expenditure in man. Estimating energy requirements, BMR factors. Recommended dietary allowances for different age groups.

MODULE II: DIETARY MACRONUTRIENTS & HEALTH **(15hr)**

Sources and classification of macronutrients in the body. Digestion, absorption, utilization, and storage of these with their hormonal regulation. Dietary requirements for homeostasis and health.

Nutritional relevance of carbohydrates- Simple sugar, Complex sugar, Dietary fibers, and GI.

Essential fatty acids. Function of EFA, RDA- excess and deficiency of EFA. Lipotropic factors, role of saturated fat, cholesterol, lipoproteins, and triglycerides. Importance of the following: Omega fatty acids-3 and 6, Mono, polyunsaturated and saturated fatty acids, Dietary implications of fats and oils.

Essential and non-essential amino acids, amino acid availability, antagonism, toxicity, amino acid supplementation, Effects of deficiency, Amino acid pool, NPU, biological Value. Nitrogen balance, Biological Value, RDA for different age groups' – Kwashiorkor, Marasmus.

Module III: MICRONUTRIENTS AND MINERALS **(15hr)**

Micronutrients: Vitamins - sources, structure, biochemical role, deficiency disorders of water- and fat-soluble vitamins, Role of Vitamin A as antioxidant in visual cycle, immunity, vitamin E as antioxidants, role of vitamin C as cofactors in Amino acid modification, extra skeletal role of vitamin D and its effects in bone physiology, Vitamin B6 dietary source, RDA, Hypervitaminosis

Minerals- Fe, Ca, Cr, Mn, Mg, I, Cu, Mo, Zn, Se, F, P distribution in the body, sources, functions, deficiency, and toxicity.

Module IV: ASSESMENT OF NUTRITIONAL STATUS & NUTRACEUTICALS **(15 hr)**

Anthropometric measurements. Z score, BMI, skinfold, circumference ratio, Biochemical Assessment-Urine analysis, Assessment of Anemia, ROS assessment, GTT and glycosylated Hb, Differential diagnosis of B12 and folate.

Nutraceuticals: Nutrient interactions, alcohol Consumption and nutrient deficiency, appetite changes with drug interaction and malnutrition. Food as medicine.

5. Reference Books:

1. Textbook of Biochemistry with Clinical Correlations, Devlin, T.M John Willey Sons. Inc. (New York), ISBN;978-0-4710-228173-4.
2. Principles of nutritional Assessment (2005). Rosalind Gibson. Oxford University Press.
3. Nutrition for Health Fitness and Sports (2-013); Williams. MH Anderson, DE Rawson, McGraw-Hill International Edition. ISBN 978-0-07-131816-7
4. Kraus's food and nutrition care process (2012); Mahan LK Strings Elsevier's Publication ISBN;978-1-43-77-22-33-8.
5. The vitamins, Fundamental aspects in nutrition and health (2008); GF Coombs Jr. Elsevier's Publication ISBN 13-978-0-12-183493-7.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	Important topics covered in curricula include global health, well-being, nutrition, metabolism, nutritional science, and developments in public health.

b) Components on Skill Development/Entrepreneurship development/Employability

SD	All general topics in module I, II, III, IV	Lecture
EMP	BMR, knowledge of homeostasis, health and nutritional status	Group Discussion
Entrepreneurship	Nutraceuticals	Lecture

7. Pedagogy

S. No	Student Centric Methods Adopted	Type/Description of Activity
1.	Model Making	Participative Learning
2.	Quiz	Experiential Learning
3.	Group Discussion	Participative Learning

8. Course Assessment Plan

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

COs	Continuous Internal Assessments – CIA (40%)	End Semester Examination (60%)
CO1	CIA-1	End Semester Examination
CO2	CIA-1	
C03	CIA-2 – Objective	
C04	CIA-2 – Assignment/ model making/ PPT	

b) Model Question Paper

NUTRITIONAL BIOCHEMISTRY

Code : U24/BIC/GE/501 **Max Marks : 60**
Credits : 4 **Time : 2Hrs**

I. Answer the following questions **(4x10=40M)**

1. (a) Explain the physiological energy value of food. Describe the method of measurement of energy content of food.

   OR

   (b) Explain BMR and factors effecting energy input.

2. (a) Explain the sources, absorption, and digestion of carbohydrates?

   OR

   (b) Explain in detail Protein energy malnutrition. Add a note on Symptoms of Kwashiorkor and marasmus.

3. (a) Explain the physiological role of micronutrients.

   OR

   (b) Classify the vitamins and explain the role of Vitamin A in Vision Cycle.

4. (a) Explain different methods of Assessment for nutritional status.

   OR

   (b) Explain Nutraceuticals. Justify Food as medicine.

II. Write Short notes on any 4 questions **(4x5=20M)**

5. Factors affecting thermogenesis.
6. RDA for young man/woman
7. Essential fatty acids
8. NPU
9. Biological Role of Ca
10. Hyper- vitaminosis

CBCS-2024

GUIDELINES FOR MODEL PAPER SETTING AS PER BLOOMS TAXONOMY LEVEL (BTL)

GE: Nutritional Biochemistry

SECTION A - INTERNAL CHOICE (4 X 10 M = 40 M)				
Question Number	**Question**	**Question**	**CO**	**BTL (Blooms Taxonomy Level)**
1	Module 1	Explain the physiological energy value of food. Describe the method of measurement of energy content of food	CO 1	2
2	Module 1	Explain BMR and factors effecting energy input.	CO 1	2
3	Module 2	Explain the sources, absorption, and digestion of carbohydrates	CO 2	2
4	Module 2	Explain in detail Protein energy malnutrition. Add a note on Symptoms of Kwashiorkor and marasmus.	CO 2	3
5	Module 3	Explain the physiological role of micronutrients.	CO 3	2
6	Module 3	Classify the vitamins and explain the role of Vitamin A in Vision Cycle	CO 3	4
7	Module 4	Explain different methods of Assessment for nutritional status.	CO 4	2
8	Module 4	Explain Nutraceuticals. Justify Food as medicine.	CO 4	2
SECTION B - ANSWER ANY 4 OUT OF 6 (4Q X 5M = 20M) (To compulsorily have **ONE** question from **each** module)				
9	Module 1	Factors affecting thermogenesis.	CO 1	2
10	Module 2	RDA for young man/woman	CO 2	2,4
11	Module 2	Essential fatty acids	CO 2	2,4
12	Module 2	NPU	CO 2	2,4
13	Any Module	Biological Role of Ca	CO 3	4
14	Any Module	Hyper- vitaminosis	CO 4	5

SEMESTER - V

PLANT BIOTECHNOLOGY THEORY

1. **Course Description**
   Programme: BSc
   Course Code: U24/BIT/DSE/501
   Course Type: DSE-IA
   No. of credits: 4

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

2. **Course Objectives:**

- To interpret the techniques employed to grow plant cells, tissues, or organs under sterile invitro conditions on a defined nutrient medium.
- To adapt the students with different techniques of plant tissue culture and conservation of economically significant plant species
- To develop expertise in theoretical and practical aspects of plant transformation techniques.

3. **Course Outcomes**

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

CO1: Identify, summarize, and apply knowledge in starting a plant tissue culture laboratory, preparation of nutrient media and culturing of single cells **(REMEMBER, UNDERSTAND, APPLY)**

CO2: Interpret, analyse, and assess the stages of micro propagation and production of haploid plants **(UNDERSTAND, ANALYSE, EVALUATE)**

CO3: Describe, apply, and develop the concepts of somatic hybridization, cybridisation and germplasm conservation for crop improvement. **(UNDERSTAND, APPLY, CREATE)**

CO4: Summarize, apply, and design transformation techniques to produce transgenic plants **(UNDERSTAND, APPLY, CREATE)**

Prof. SMITA C. PAWAR
Department of Genetics
Osmania University
Hyderabad-500 007. T.S.

4. Course Content

MODULE I: BASICS OF PLANT TISSUE CULTURE (15 Hrs)

- Introduction to Plant tissue culture.
- History of tissue culture techniques.
- General techniques-laboratory space, culture room, sterilization (Flame sterilization, Autoclaving, Filter sterilization, Wiping with 70% Ethanol, Surface sterilization).
- Media composition for plant tissue culture- MS media, White media and B5 media.
- Callus and Suspension cultures- Initiation of Callus culture, suspension cultures, Batch cultures, continuous cultures, immobilized cell cultures, Sub culturing.
- Estimation of Growth, Synchronization of cells, cloning.
- Isolation of single cells, Culture of single cells (Filter paper raft-nurse tissue technique, Microchamber technique, Microdrop method, Bergmann's plating technique and thin layer liquid medium culture technique).
- Cell Viability test

MODULE II: MICROPROPAGATION AND HYBRID SORTING (15 Hrs)

- Micro/clonal propagation- Meristem culture, Culture medium, Environmental conditions during culture.
- Stages of Micropropagation: Four stages- Selection and preparation of mother plants (stage 0), Culture initiation (stage 1), Multiplication (stage 2) – Proliferation of axillary buds, Induction of adventitious buds, bulbs and protocorms, Somatic Embryogenesis- Developmental pattern of Somatic Embryogenesis, Rooting of shoots (stage 3), Transfer of Plantlets to soil (stage 4)- in vitro and ex vitro hardening.
- Advantages and limitations of Micropropagation, Applications of Micropropagation.
- Haploid production- Androgenesis, Culture medium- N6 medium, MS, LS media, and Nitsch medium, Environmental conditions during culture.
- Pretreatments, Cytological and biochemical changes, Factors affecting Androgenesis.
- Advantages and limitations of Androgenesis, Applications of Androgenesis.
- Gynogenesis: Culture medium- N6 medium, MS, LS media, and Nitsch medium, Environmental conditions during culture, Factors affecting Gynogenesis, Advantages and limitations of Gynogenesis, Applications in plant breeding.
- Invitro pollination: Explant preparation, Nutrition and culture conditions, Culture medium- Nitsch medium, Growth regulators used in invitro pollination (eg: Brassica oleracea), Applications of Invitro pollination.
- Invitro fertilization using Millicell- CM dish in maize.

MODULE III: TECHNOLOGY FOR DISTANT HYBRIDISATION (15 Hrs)

- Protoplast isolation: introduction to Somatic Hybridization.
- Protoplast isolation- Enzyme activities, selection of plant tissues for protoplast isolation, purification, and culture.
- Protoplast fusion: Strategies to induce protoplast fusion (High pH-high Ca2+ treatment, Polyethylene glycol, Electrofusion).
- Selection of hybrid cells (visual markers, fluorescent dyes, complementation, Transgenic selectable markers, Culture of the entire fusion mixture) Regeneration of hybrid plants
- Advantages and limitations of somatic hybridization, Applications in crop improvement.
- Cybridization-Cybrids, strategies to produce cybrids, Applications of cybridization.
- Germplasm conservation/genetic resources- Cryopreservation, Stages involved in Cryopreservation (Choice of material, Preculture, Cryoprotection, Freezing, Storage, Thawing, Reculture). Improved methods of cryopreservation (vitrification, droplet method, encapsulation- dehydration, encapsulation-vitrification, simplified freezing procedures). Slow-growth cultures, effects on genetic constitution, Advantages, and limitations of cryopreservation. Applications of cryopreservation.

MODULE IV: PLANT TRANSFORMATION TECHNIQUES (15 Hrs)

- Production of Transgenic plants- Gene constructs- Promoter, cap site, leader sequence, initiation codon, exons, introns, stop codons and transcriptional termination site.
- Vectors- Co-integrate *p*Ti vectors and binary vector.
- Agrobacterium mediated gene transfer- Plasmid vectors used for plant cell transformation, Molecular biology of Agrobacterium infection, Properties of Crowngall cells, Ti plasmids, Organisation of T-DNA, Organisation of vir region, Transfer of T-DNA, integration of T-DNA into plant genome, coculture with tissue explants, In planta transformation.
- Particle gun bombardment method using helium pressure and microprojectiles.
- Genome editing-TALENs, CRISPR CAS9 technology.
- Applications of Transgenic plants, Herbicide resistance: Glyphosate action, Strategies for Glyphosate resistance (overproduction of EPSPS enzyme, Glyphosate tolerant EPSPS enzyme, Glyphosate oxidoreductase).

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5. Reference books

1. B D Singh. (2014). *Plant Biotechnology*: Kalyani Publishers.
2. P K Gupta. (2010). *Plant biotechnology*: Rastogi Publications.
3. M.W. Fowler and G.S. Warren.*Plant Biotechnology: The Genetic Manipulation of Plants.*(II Edition): Oxford University Press.
4. H.S. Chawla. (2002*). Introduction to Plant Biotechnology*: Science Publishers.
5. Kirsi-MarjaOksman-Caldentey and Wolfgang H. Barz.(2002).*Plant Biotechnology and Transgenic Plants*:CRC Press.
6. S.S. Bhojwani, M.K. Razdan. (1996). *Plant Tissue Culture: Theory and Practice:* Elsevier.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
National (Modules 1,2, & 3)	Plant biotechnology guarantees food security, enhances human health, supports sustainable agriculture, fosters economic growth, protects the environment, and benefits research for both developed and developing nations.
Global (Modules 3&4)	Addresses urgent global development requirements like conservation, biodiversity, disease resistance, climate change adaptation, nutritional enhancement, and crop improvement.

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b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill development	Module 1 & 4	Hands on training in preparation of nutrient media for plant tissue culture, Induction of callus and estimating the growth of tissue cultured cells in invitro conditions. Student's research project on cultural characteristics of agrobacterium species and in planta transformation
Employability	Module 2	Experiential learning of Ex-vitro hardening methods and establishment of tissue cultured plants in green houses.
Entrepreneurship development	Module 3	Presentation by the students on various germplasm conservation techniques

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative Learning	Seminar
2.	Experiential Learning	Science Experiments
3.	Participative Learning	Group Discussion
4.	Experiential Learning	Field trip
5.	Experiential Learning	Art Projects
6.	Participative Learning	Presentation
7.	Participative Learning	Workshop
8.	Problem solving	Case studies
9.	Problem solving	Research projects

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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 Exam	Written Exam
CO2	CIA-2 Quiz/ Art projects/ Group discussion/Assignments	
CO3	CIA-1 Written Exam	
CO4	CIA-2 Presentation/ Case studies	

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b) Model Question Paper- End Semester Exam

MODEL QUESTION PAPER- THEORY

Course Code: U24/BIT/DSE/501 **Max. Marks: 60**
Credits: 4 **Time: 2 Hrs**

SECTION – A

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

1. Explain the composition of MS media used in plant tissue culture.

OR

2. How would you summarize Suspension culture.
3. How would you evaluate the applications of haploid production in plant breeding.

OR

4. What are the various features and stages of Micropropagation. Add a note on its advantages and limitations.
5. How can you make use of somatic hybridization technique in crop improvement.

OR

6. How would you improve preservation of genetic resources by germplasm conservation methods.
7. How would you use Agrobacterium tumefaciens for gene transfer to produce transgenic plants.

OR

8. How can you elaborate on the production of BT crops. Add a note on its applications and limitations.

SECTION –B

II. Answer Any <u>Four</u> of the following: **4 x 5 = 20 M**

9. Outline different Cell viability tests
10. Describe the factors affecting gynogenesis
11. How would you use Electrofusion to produce somatic hybrids
12. Illustrate the process of Particle gun bombardment technique
13. Describe the process of invitro fertilization
14. How would you design a Binary vector system.

SEMESTER-END MODEL QUESTION PAPER

SECTION A - INTERNAL CHOICE 4 Q X 10 M = 40 M				
Question Number	**Question**	**Question**	**CO**	**BTL(Blooms Taxonomy Level)**
1	Module 1	Explain the composition of MS media used in plant tissue culture.	CO 1	II
2	Module 1	How would you summarize Suspension culture	CO 1	II
3	Module 2	How would you evaluate the applications of haploid production in plant breeding	CO 2	V
4	Module 2	What are the various features and stages of Micropropagation. Add a note on its advantages and limitations.	CO 2	IV
5	Module 3	How can you make use of somatic hybridization technique in crop improvement.	CO 3	III
6	Module 3	How would you improve preservation of genetic resources by germplasm conservation methods?	CO 3	VI

7	Module 4	How would you use Agrobacterium tumefaciens for gene transfer to produce transgenic plants	CO 4	III
8	Module 4	How can you elaborate on the production of BT crops. Add a note on its applications and limitations.	CO 4	VI
SECTION B - ANSWER ANY 5 OUT OF 7 4Q X 5 M = 20 M (To compulsorily have ONE question from each module)				
9	Module 1	Outline different Cell viability tests	CO 1	I
10	Module 2	Describe the factors affecting gynogenesis	CO 2	II
11	Module 3	How would you use Electrofusion to produce somatic hybrids	CO 3	III
12	Module 4	Illustrate the process of Particle gun bombardment technique	CO 4	III
13	Module 2	Describe the process of invitro fertilization	CO 4	II
14	Module 4	How would you design a Binary vector system	CO4	VI

PLANT BIOTECHNOLOGY- PRACTICAL

1. Course description

Programme : B.Sc
Course Code: U24/BIT/DSE/501/P
Course Type: DSE-I A
No. of credits: 1

Max. Hours: 30
Hours per week: 2
Max. Marks: 50

2. Course Objective:

- To implement various plant tissue culture methods to produce sterile, disease-free plants followed by ex-vitro hardening process.

3. Course Outcomes:

CO-1: To interpret and apply practical skills in media preparation, sterilization, and culturing of explants on MS media. **(UNDERSTAND, APPLY)**

CO-2: To demonstrate, compare and examine fused protoplast cells and polyploidy in onion root tips. **(APPLY, ANALYSE)**

CO-3: To compare and assess plant pigments by column chromatography **(ANALYSE, EVALUATE)**

PRACTICAL SESSIONS

1. MS Media preparation.
2. Surface sterilization of explants.
3. Callus initiation, Suspension culture.
4. Micro propagation of Banana, Ornamental plants.
5. Protoplast isolation: Observation of Brownian movements (Hibiscus leaf).
6. Protoplast fusion using PEG method.
7. Encapsulation of shoot bud by calcium alginate method.
8. Study of polyploidy in onion root tips by colchicine treatment.
9. Separation of plant pigments using column chromatography

Spotters:

1. Callus cultures
2. Sterilization techniques: autoclave and hot air oven
3. Somatic embryos
4. Synthetic seeds
5. Meristem culture
6. Plant regeneration
7. Cell suspension cultures
8. Isolation of protoplasts
9. Particle bombardment (Gene gun)
10. Binary or co-integrate vectors
11. Golden rice

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SEMESTER-IV

PLANT BIOTECHNOLOGY-PRACTICAL

Course Code: U24/BIT/DSE/501/P
Credits: 1

Max. Marks: 50
Time: 2 Hrs

I. MAJOR: (20 M)

Prepare a slide of fused protoplast cell using PEG method. Write the principle and procedure for the experiment. Report the results.

II. MINOR: (10 M)

Generate synthetic seeds by encapsulation technique. Write the principle and procedure of Encapsulation. Report the results

III. IDENTIFY THE GIVEN SPOTTERS: (10M)

IV. VIVA : (5 M)

V. RECORD: (5 M)

Prepared by	Checked & verified by	Approved by
4/3/24 (V. Deepa Switha) **Name and Signature of the teaching faculty**	4/3/24 (Ms. Shouni Niveditha) **Name and Signature of HoD**	**Name and Signature of Principal**

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