SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA:: VIJAYAWADA-10
(An Autonomous College in the Jurisdiction of Krishna Unviersity, Machilipatnam)
DEPARTMENT OF BIOCHEMISTRY

Course Code							
Title of the Course				Analytical Techniques			
Offered to: (Programme/s)				B.SC. Honors			
L	**4**	**T**	**0**	**P**	**0**	**C**	**4**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Major			**Course Relates to:**	Global		
Year of Revision:	-			**Percentage:**	-		
Type of the Course:				Employability			
Crosscutting Issues of the Course :				Human Values and Professional Ethics			
Pre-requisites, if any				Basic knowledge in physics and chemistry			

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA:: VIJAYAWADA-10
(An Autonomous College in the Jurisdiction of Krishna Unviersity, Machilipatnam)

Course Description:

Analytical technique is a procedure or a method for the analysis of some problem, used to determine the physical or chemical properties of a chemical substance, element or mixture. They can be used for qualitative and quantitative analysis and can range from simple weighing to advanced techniques that use specialized instrumentation. It includes principle and applications of Centrifugation, chromatographic Techniques. The course is designed to understand the methods of electrophoresis and colorimeter with its applications. To make aware students the Principle and types of Spectrophotometer and to evaluate the use of Radioisotopes in various fields. It is designed to make students to get an idea on design of experiment using analytical techniques. To make aware students giving the indispensability importance of modern techniques in bio analytical research and living.

COURSE AIMS AND OBJECTIVES:

S.NO	COURSE OBJECTIVES
1	To provide students with a comprehensive understanding of tissue homogenization, salt and organic solvent extraction, and fractionation techniques.
2	To equip students with the skills necessary to perform and interpret chromatographic and electrophoretic techniques for the separation and analysis of biomolecules
3	Students will be able to apply principles and working methods of various centrifugation technique
4	To enable students to understand and utilize spectrophotometric and colorimetric methods for the quantification of biochemical substances, including the application of Beer-Lambert's law
5	To prepare students to safely handle radioisotopes in biochemical research, understand their applications, and measure radioactivity using appropriate detection methods.

Course Outcomes

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

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Students will be able to understand the significance of each separation technique for individual biomolecule separation.	K2	2	1

CO2	Students will be able to apply principles and working methods of various chromatographic (e.g., Paper chromatography, TLC, Ion exchange chromatography) and electrophoretic (e.g., Agarose gel electrophoresis, PAGE) techniques for the separation and analysis of biomolecules.	K3	2	2
CO3	Students will be able to analyze and evaluate various tissue homogenization methods, salt and organic solvent extraction techniques, and centrifugation processes.	K4	6	1
CO4	Students will be able to understand and apply spectrophotometric and colorimetric methods for the quantification of biochemical substances	K3	6	2
CO5	Students will be able to assess the applications of stable radioisotopes and manage radiation hazards, including using Geiger-Müller counters and scintillation counters for radioactivity measurement in biochemical research.	K3	2	1

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1	2	3				1		2	3
CO2	2	3				3		2	3
CO3	2	3				1		3	3
CO4	2	3				3		2	3
CO5	2	3				1		2	3

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure:

UNIT-I [Chromatography] (12Hrs)

1.1 Methods of tissue homogenization.
1.2 Dialysis, Lyophilization.
1.3 Chromatography: Principle, Working method and Application of
a. Partition chromatography-Paper chromatography
b. Adsorption chromatography-TLC
c. Ion exchange chromatography
d. Gel filtration chromatography
e. Affinity chromatography
1.4 Principle and applications of GLC and HPLC.

- [Case Study 1- Separation of Carotenoids]
- [Case Study 2- Separation of Plant pigments by HPLC]

Exercises/Projects:

- [Project 1- Clinical Chemistry]
- [Project 2-Analyte Detection]

Specific Resources:

- [https://www.researchgate.net/]

UNIT-II [Electrophoresis] (12Hrs)

2.1 Principle, working method and application of Paper electrophoresis
2.2 Gel electrophoresis-Agarose, PAGE and Capillary
2.3 Isoelectric focusing
2.4 High voltage electrophoresis, Pulse field electrophoresis
2.5 Immunoelectrophoresis

- [Case Study 1- Forensic sciences]
- [Case Study 2- Extraction studies]

Exercises/Projects:

- [Project 1- Separation of Nucleic Acids]
- [Project 2-Separation of Proteins]

Specific Resources:

- [https://en.wikipedia.org/wiki/Electrophoresis]

UNIT-III [Centrifugation] (12Hrs)

3.1 Sedimentation and Centrifugation: Principle , procedure and application
3.2 Different types of centrifuges and rotors.
3.3 Principle, procedure and application of differential centrifugation
3.4 Density gradient ultracentrifugation
3.5 Rate zonal centrifugation, Isopycnic centrifugation.

- [Case Study 1- Centrifugation in Diagnosis]
- [Case Study 2- Plant Tissues studies]

Exercises/Projects:

- [Project 1- Separation of Cell constituents]
- [Project 2-Separation of Proteins]

Specific Resources:

- [https://www.sciencedirect.com/topics/neuroscience/electrophoresis]

UNIT-IV [Spectroscopy] (12Hrs)

4.1Colorimetry and Spectrophotometry: Laws of light absorption -Beer - Lambert's law.
4.2UV and visible absorption spectra, Molar extinction Coefficient and Quantitation.
4.3Principle and applications of Colorimetry and Spectrophotometry.
4.4Principle and applications of Fluorometry,
4.5Principle and applications of Atomic absorption and Emission Spectrophotometer.

- [Case Study 1- Quantitative Estimations]
- [Case Study 2- Coefficient studies]

Exercises/Projects:

- [Project 1- Biochemical estimations]
- [Project 2- Absorption Maxima studies]

Specific Resources: (web)

- [https://en.wikipedia.org/wiki/Spectroscopy]

UNIT-V [Radioisotopes] (12Hrs)

5.1Important stable radioisotopes used in biochemical research.
5.2Uses of P 32, I 125, I131, Co 60. C 14 etc.
5.2Radiation hazards and precautions taken while handling radioisotopes.
5.3Principle and application of RIA.
5.4Measurement of radioactivity by GM counter and Scintillation counter.

- [Case Study 1- Radioisotopic studies]
- [Case Study 2- Isotopes in Medicine]

Exercises/Projects:

- [Project 1- Radipisotopes in Industry]
- [Project 2- Uses of Radioisotopes]

Specific Resources:

[https://world-nuclear.org/information-library]

TEXT BOOKS:

1. Friefelder D., (1982), Physical Biochemistry- Application to Biochemistry and Molecular Biology, 2nd Edition, WH Freeman and Company.
2. Ed. K. Wilson and J. Walker, (2018) Principles and Techniques of Biochemistry and Molecular Biology,8th Edition, Cambridge Univerity Press.
3. Upadhayay A, Upadhayay K and Nath N., (2020), Biophysical chemistry. Principles and Techniques,2nd Edition, Himalaya publishing house.
4. Gurumani.N., (2011), Research Methodology for Biological Sciences,2nd edition, M.J.P. Publishers., Chennai, India.

REFERENCES:

1. Cooper T.G. (2011), The Tools of Biochemistry.2nd Edition, John Wiley and Sons Publication.
2. Cark Jr J. M. and Switzer R.L,(1999), Experimental Biochemistry, 3rd Edition, H. Freeman and Company.

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SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA:: VIJAYAWADA-10
(An Autonomous College in the Jurisdiction of Krishna Unviersity, Machilipatnam)

Course Code							
Title of the Course				Analytical Techniques Lab			
Offered to: (Programme/s)							
L	**0**	**T**	**0**	**P**	**2**	**C**	**1**
Year of Introduction:	**2024-25**			**Semester:**		**3**	
Course Category:				**Course Relates to:**			
Year of Revision:				**Percentage:**			
Type of the Course:				Employability			
Crosscutting Issues of the Course :				Human Values and Professional Ethics			
Pre-requisites, if any				Handling of Microscopes, glass ware, pipetting			

Course Description:

Analytical technique Lab is a procedure or a method for the analysis of some problem which is used to determine the physical or chemical properties of a substance, element or mixture. They can be used for qualitative and quantitative analysis and can range from simple weighing to advanced techniques that use specialized instrumentation. It includes principle and applications of Centrifugation, chromatographic Techniques. The course is designed to understand the methods of electrophoresis and colorimeter with its applications.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To understanding of tissue homogenization, salt and organic solvent extraction, and fractionation techniques.
2	To perform and interpret chromatographic and electrophoretic techniques for the separation and analysis of biomolecules
3	To apply principles and working methods of various centrifugation techniques
4	To understand and utilize spectrophotometric and colorimetric methods for the quantification of biochemical substances.
5	To prepare students to safely handle radioisotopes and measure radioactivity using appropriate detection methods.

Course Outcomes

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

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Students will be able to understand the significance of each technique for biomolecule separation.	K2	2	1
CO2	Students will be able to apply techniques for the separation and analysis of biomolecules.	K3	2	1
CO3	Students will be able to analyze and evaluate organic solvent extractionTechniques.	K4	6	1
CO4	Students will be able to understand and apply for the quantification of biochemical substances	K2	2	1
CO5	Students will be able to assess the applications of radioisotopes in biochemical research.	K3	2	1

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	3				3		2	3
CO2	2	3				3		2	3
CO3	2	3				3		2	3
CO4	2	3				3		2	3
CO5	2	3				3		2	3

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure

This lab list covers the key areas of a Analytical Techniques Lab course, providing hands-on practice with technology. (30Hrs)

1. Estimation of Ascorbic acid

Experiment: https://youtu.be/88xLMnJvySA?si=MsOvpQTqzu_FmOiH

Tasks: Ascorbic acid otherwise known as Vitamic C is antiscorbutic. It is present in citrus fruits, gooseberry, bittergourd etc. in high amount. Generally it is present in all fresh vegetables and fruits. It is water soluble and heat-labile vitamin. The method described below is easy, rapid and a large number of samples can be analyzed in a short time

2. Separation of total carotenoids by paper chromatography

Experiment: https://youtu.be/ej2zXOwASVI?si=i-s534U4T5Gk-Bo2

Tasks: The separation of carotenoids is usually carried out by column chromatography, thin layer chromatography and high performance liquid chromatography, in analytical or preparative scale, on many stationary phases such as silica-gel, alumina, MgO, Ca(OH)2 and reversed-phase material Separation of plant pigments by Thin layer Chromatography.

3. Separation of Amino acids by Paper Chromatography.

Experiment: https://youtu.be/YQGewIJk-k0?si=r21209ZStrsWFgy3

Tasks: Paper chromatography can separate and identify a combination of unknown amino acids. Spraying with ninhydrin, which interacts with amino acids to produce strongly colored products, can be used to determine the location of the amino acids in the chromatogram (purple).

4. Estimation of Phosphorus by Fiske and Subbarow method

Experiment: https://youtu.be/epCCuB5xIRA?si=l4sGn2MgjIAHrvsu

Tasks: The Fiske and Subbarow method is a colorimetric method for estimating inorganic phosphate in a sample by treating it with ammonium molybdate and 1-amino-2-naphthol-4-sulfonic acid. The method produces a blue color.

5. Characterization of fats– Demonstration of saponification number Acid number and R.M.Number

Experiment: https://youtu.be/iapo9_sx2_M

Tasks: This is the amount of potassium hydroxide or sodium hydroxide needed to saponify one gram of fat. It's a measure of the average molecular weight of fatty acids in the fat sample. A higher saponification number means the fatty acids are shorter in length and the triglycerides have a lighter mean molecular weight. Fats with a higher saponification value are better for making soap.

6. Demonstration of Phytoconstitutents by Soxhlet and Quantification.

Experiment: https://youtu.be/km-CEHUrjek?si=OHtqcUhoUCVSgDus

Tasks: Soxhlet extraction has traditionally been used for a solid sample with limited solubility in a solvent in the presence of insoluble impurities. A porous thimble loaded with a solid sample is placed inside the main chamber of the Soxhlet extractor.

LAB MANUAL:

1. Jayaraman, J. (2011). Laboratory Manual in Biochemistry,2nd Edition, New Age International (P) Ltd.
2. Sadasivam, S. and Manickam, A.,(2005), Biochemical Methods, 2nd Edition, New Age International (P) Ltd.

REFERENCES:

1. Chatwal. G and Anand.S,(2019), Instrumental Methods of Chemical Analysis,5thEdition, Himalaya Publishing House, Mumbai, India.
2. Williams.A., .L. & Wilson. K.,(1981), Biologist's Guide to Principles and Techniques of Practical Biochemistry, 2nd Edition., Edward Arnold Ltd. London.

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SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA:: VIJAYAWADA-10

(An Autonomous College in the Jurisdiction of Krishna Unviersity, Machilipatnam)

SEMESTER -END QUESTION PAPER STRUCTURE

Course Code & Title of the Course:	Analytical Techniques
Offered to:	B.Sc., Honors Biochemistry
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks) Answer All questions.

Each question carries 4 Marks.

Q1	(a)	Dialysis K2
		OR
	(b)	Lyophilization K2
	(a)	SDS K2
Q2		OR
	(b)	Immunoelectrophoresis K2
	(a)	Types of Centrifuges K2
Q3		OR
	(b)	Applications of Centrifugation K3
	(a)	Beer-Lambert law K2
Q4		OR
	(b)	Fluorometry K2
	(a)	Radioisotopes K3
Q5		OR
	(b)	RIA K3

Section B: Long Answer Questions (50 Marks) Answer All questions.

Each question carries 10 Marks.

Q6	(a)	Explain in detail about TLC K2
		OR
	(b)	Describe Affinity Chromatography and its applications K3
Q7	(a)	Define Electrophoresis and Add a note on Agarose Gel Electrophoresis K2
		OR
	(b)	Give a Brief Note on Isoelectricfocussing K3
Q8	(a)	Explain in detail Differential Centrifugation K2

Course Code							
Title of the Course				**BASIC MICROBIOLOGY**			
Offered to: (Programme/s)				B.SC. Honors			
L	**4**	**T**	**0**	**P**	**0**	**C**	**4**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Major			**Course Relates to:**	Global		
Year of Revision:	-			**Percentage:**	-		
Type of the Course:				Employability			
Crosscutting Issues of the Course :				Human Values and Professional Ethics			
Pre-requisites, if any				Basic knowledge in Biological sciences			

OR

(b) Write in detail Density Gradient Centrifuge K3

Q9 (a) Explain the Principle and Applications of Colorimeter K3

OR

(b) Write the Principle, instrumentation and applications of spectrophotometer K3

Q10 (a) Explain the Precautionary measures of handling Radioisotopes K4

OR

(b) Explain the applications of Radioisotopes in Biochemical Research K4

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SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA:: VIJAYAWADA-10
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Course Description:

The course is to trace the history of development of the discipline of Microbiology and to emphasize the existence of the immune diversity in the microbial world and maintenance of microbes under laboratory conditions. It will also give various salient features of microbes and the different methods of microbial culture techniques. This course is designed to impart the importance to isolate microbes from provided samples and to perform bacterial cultures in different media .Students acquire knowledge in performing routine microbiological practices such as sterilization, media preparation, maintenance of microbial culture, staining etc. and acquire expertise to culture and screen microbes for antibiotic resistance.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To understand the fundamentals of Microbiology, including the characteristics of bacteria, fungi, mycoplasma, and viruses.
2	To Gain basic knowledge about control methods of microorganisms and the industrial application of microbes in water and sewage treatment
3	To learn about the nutritional requirements of microorganisms, virus classification, morphology, methods of culturing viruses, and techniques for isolation, purification, and characterization
4	To Understand the genetic material, chromosomes, and genes, along with gene arrangement in prokaryotes

5	To Learn about various microbial diseases, their prevention, and treatment.

Course Outcomes

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

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Students will be able to Understand the concept of basic microbiology and sterilization techniques.	K2	1	1
CO2	Students will be able to understand the methods for isolating microorganisms from various sources..	K3	2	2
CO3	Students will be able to Apply staining techniques to study the morphology of microorganisms.	K3	1	1
CO4	Students will be able to Analyze the activity of antibiotics.	K3	2	2
CO5	Students will be able to Infer the importance of various biochemical test.	K3	1	1

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1	1	2				2		3	1
CO2	1	3				2		1	2
CO3	1	3				3		1	1
CO4	2	2				3		3	1
CO5	1	1				3		3	1

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure:

UNIT-I [Basic Microbiology] (12 Hrs)

1.1 Microbial diversity, Major characteristics used in microbial taxonomy

1.2 Morphology and Classification of bacteria (outline classification)

1.3 Methods of sterilization and Pasteurization

1.4 Isolation and cultivation of bacteria using culture media

1.5 Bacterial growth curve.

1.6 Staining techniques Gram-Staining-principle, Capsule staining

Examples/Applications/Case Studies:

- [Case Study 1- Modeling of Bacterial Growth curve]
- [Case Study 2-Bacterial Growth Dynamics]

Exercises/Projects:

- [Project 1-Antibacterial activity]
- [Project 2-*Microbial synthesis of novel antimicrobial compounds*]

Specific Resources:

[https://microbiologysociety.org/]

Unit–2: [Microscopic Organisms] (12 Hrs)

2.1 Morphology, Characteristics and Examples of yeast, algae and fungi

2.2 General characteristics of Rickettsiae, Spirochaetes & Mycoplasma.

Examples/Applications/Case Studies:

- Case Study 1- Role of Microorganisms in Humans
- Case Study 2- Tracking down water bears

Exercises/Projects:

- [Project 1-Microbe Mapper]
- [Project 2-Infectious Diseases]

Specific Resources:

- [https://en.wikipedia.org/wiki/Microorganism]

UNIT-III [Microbial interactions] (12 Hrs)

3.1 Positive interactions: Mutualism, Protocooperation, Commensalism, Symbiosis
3.2 Negative interactions: predation, parasitism, amensalism, competition
3.3 Applications of Microorganisms in sewage treatment
3.4 Microbiology of fermented foods (Any two examples)

Examples/Applications/Case Studies:

- [Case Study 1- Plant Holobiont]
- [Case Study 2- Sewage Treatment]

Exercises/Projects:

- [Project 1- Current trends in Microbial Interactions]
- [Project 2- Microbial interactions in Nature]

Specific Resources: (web)

- [https://www.sciencedirect.com/science/article/pii/S1369527416300340]

UNIT-IV [Microbial diseases] (12 Hrs)

Pathogenesis of bacterial diseases –

4.1 Airborne diseases–Tuberculosis
4.2 Food and Water born- Vibrio Cholera, Salmonella typhi
4.3 Vector borne- Malaria
4.4 Opportunistic infection- Candidiasis

Examples/Applications/Case Studies:

- [Case Study 1-Microbes and Human Body]
- [Case Study 2-Disease caused by Microbes]

Exercises/Projects:

- [Project 1- Human Microbiome]
- [Project 2- Microbes in Human Health and Dieases]

Specific Resources: (web)

- [https://microbiologysociety.org/why-microbiology-matters]

UNIT-V [Virus] (12 Hrs)

5.1 Viruses- Classification, structure
5.2 Replication of viruses
5.3 Viral diseases – Dengue, Hepatitis, Rabies, SARS (Structure, epidemiology and symptoms)
5.4 Antiviral agents- chemical and biological agents.

Examples/Applications/Case Studies:

- [Case Study 1- Covid -19 Pandemic]
- [Case Study 2-Molecular Plant Virology]

Exercises/Projects:

- [Project 1- Global Virome Project]
- [Project 2- Molecular Plant Virology]

Specific Resources: (web)

[https://plantvirology.unl.edu/projects]

Text Books:

1. Pelczar, Chan & Krieg.,(1995),*Microbiology*,5th edition, Mc Grew- Hill.
2. R.C.Dubey., & D.K.Maheswari, (2001),*A Textbook of Microbiology*,S.Chand Co Publishers.
3. Hugo., & Russell, (1987), *Pharmaceutical Microbiology*, , Blackwell Scientific .
4. S.B.Biswas, *An Introduction to Viruse*s, , Vikas Publishing house.
6.M. Frebisher, *Fundamentals of Microbiology.*

References:

1. Prescott, Harley, Klein, Microbiology 4th edition, Mc grew Hill.
2. Boyd, R.F., Times Mirror/ Mosby College.,(1984),*General Microbiology,*

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Course Code							
Title of the Course				Basic Microbiology Lab			
Offered to: (Programme/s)				B.Sc., Biochemistry			
L	**0**	**T**	**0**	**P**	**2**	**C**	**1**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Major			**Course Relates to:**		Global	
Year of Revision:	-			**Percentage:**		-	
Type of the Course:				Employability			
Crosscutting Issues of the Course :				Human Values and Professional Ethics			
Pre-requisites, if any				Basic knowledge in Biological sciences			

Course Description:

The existence of the immune diversity in the microbial world and maintenance of microbes under laboratory conditions give various salient features of microbes and the different methods of microbial culture techniques. This course is designed to impart the importance to isolate microbes from provided samples and to perform bacterial cultures in different media. The microbiological practices such as sterilization, media preparation, maintenance of microbial culture, staining etc.,

Course Aims and Objectives: To learn about the nutritional requirements of microorganisms, methods of culturing and techniques for isolation, purification, and characterization

S.NO	COURSE OBJECTIVES
1	To understand the Basic Techniques and fundamentals of Microbiology
2	To learn about the nutritional requirements of microorganisms, methods of culturing and techniques for isolation, purification and characterization.
3	To Gain basic knowledge on methods of culturing
4	To Gain basic knowledge about methods and techniques for isolation, purification, and characterization
5	To Gain basic knowledge about methods of microorganisms and the industrial application of microbes in water and sewage treatment

Course Outcomes

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

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Students will be able to Understand the concept of basic microbiology and sterilization techniques.	K1	6	1
CO2	Students will be able to prepare media for the Growth of Microorganisms.	K2	2	2
CO3	Students will be able to use different culturing techniques for the isolaton of Microorganisms	K2	7	2
CO4	Students will be able to staining techniques to study the morphology of microorganisms.	K3	7	2
CO5	Students will be able to Infer the importance of various biochemical test.	K4	2	2

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1	1	3				2		3	1
CO2	1	3				2		3	1
CO3	1	3				2		3	1
CO4	1	3				2		3	1
CO5	1	3				2		3	1

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure

This lab list covers the key areas of a Basic Microbiology course, providing hands-on practice with technology.

1.Sterilization Techniques-Autoclaving, hot-air oven sterilization

Dataset : https://youtu.be/Pcr2MJPURSk?si=SR8lCNy4oS08BHH3
https://youtu.be/ZYJRYHLzW7A?si=nmOYusZdrB4W_soK

Tasks: Sterilization in hot air oven is performed at a temperature of 160C and maintained or holding for one hour. Spores are killed at this temperature and this is the most common method of sterilization of glassware, swab sticks, pestle and mortar, mineral oil etc.

2.Preparation of culture media – Nutrient Broth, Nutrient Agar

Dataset : https://youtu.be/P-CleIrWQf4?si=HApCBIBGmjvj4Z_K
https://youtu.be/Ad1xAV6tupI?si=9CPRNbgbC0_N9Lpx

Tasks: To prepare nutrient broth or nutrient agar, dissolve the required amount of dehydrated nutrient broth or agar powder in distilled water, mix thoroughly, and sterilize by autoclaving at 121°C for 15 minutes;

3.Preparation of Enriched media Blood agar Mac Conkey's agar & Potato dextrose agar.

Dataset : https://youtu.be/k8mz32cNnqY?si=yJrhEkGZQ8I31k1t
https://youtu.be/z9fIYOJRxEs?si=YqMk-au3wotTGo-8

Tasks: Dehydrated medium Suspend 51.5 g of the powder in 1 liter of distilled or deionized water. Mix well. Heat to boil for 1 minute shaking frequently until completely dissolved. Sterilize in autoclave at 121°C for 15 minutes.

4.Isolation of bacteria – Streak plate and pour plate methods

Dataset :https://youtu.be/hhkk_dNEtRA?si=aThM884fcR3gNC2A
https://youtu.be/AQYDr3oUsAw?si=epVHtkM3T6z_5V5g

Tasks: A microbiological medium (plural: media) contains the nutrient and is used for culturing bacteria, yeasts, molds, and algae. Media contain necessary nutrients supporting the growth (replication) of microorganisms.

5.Identification of bacteria by staining techniques – simple, differential, Gram staining and acid-fast staining.

Dataset :https://youtu.be/McINCWMbseI?si=myMg_XGp5KlwYqFV

Tasks: Simple staining is one step method using only one dye. Basic dyes are used in direct stain and acidic dye is used in negative stain.

6.Motility of Bacteria – "Hanging drop" technique

Dataset :https://youtu.be/ujzSmsmg7ok?si=TVf-UvCXCaYlOfPD

Tasks: Bacterial motility is the ability of bacteria to move on their own using metabolic energy. It's a common trait in bacteria and is often achieved through the use of flagella

7.Bacteriological examination of water and milk **Dataset**

https://youtu.be/7Cu7spK6vco?si=_8COTvtHeAEdqqdX

Tasks: Bacteriological examinations of water are performed by water utilities and government agencies to ensure water is safe for drinking, bathing, swimming, and other uses. The process involves collecting samples from various points in the water distribution system, transporting them to a lab, and analyzing them for bacteria using techniques like culture, molecular biology, and biochemical tests.

TEXT BOOKS:

1. Vasanthakumari.R, (2009) Practical Microbiology, BI Publishers Pvt Ltd, India
2. Dubey.R.C., & Maheshwari D.K., (2002), Practical Microbiology, S.Chand& comp Ltd, NewDelhi.

SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA:: VIJAYAWADA-10
(An Autonomous College in the Jurisdiction of Krishna Unviersity, Machilipatnam)

SEMESTER -END QUESTION PAPER STRUCTURE

Course Code & Title of the Course:	Basic Microbiology
Offered to:	B.Sc., Honors Biochemistry
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks) Answer All questions.

Each question carries 4 Marks.

Q1 (a) Gram Staining K1
OR
(b) Bacterial Culture Media Types K1/K2

Q2 (a) General Characteristics of Spirochaetes K2
OR
(b) General Characteristics of Mycoplasma K1

Q3 (a) Fermented food products K3
OR
(b) Role of Microorganisms in sewage treatment K3

Q4 (a) Malaria K2
OR
(b) Candidiasis K2

Q5 (a) SARS K2
OR
(b) Hepatitis K3

Section B: Long Answer Questions (50 Marks) Answer All questions.
Each question carries 10 Marks.

Q6 (a) Write an essay on morphology and classification of bacteria K2
OR
(b) Discuss different sterilization techniques and their applications K2

Q7 (a) Write a detail account on characteristics of Algae and Fungi K2
OR
(b) Write a detail account on characteristics of Yeast K2

Q8 (a) Write an essay on positive microbial interactions K2
OR
(b) Write an essay on negative microbial interactions K2

Q9 (a) Write an essay on airborne bacterial diseases K3
OR
(b) Write a detailed account any food and water born of bacterial disease K3

Q10 (a) Describe about the replication of viruses K2
OR
(b) Write an essay on chemical and biological antiviral agents K2

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Course Code							
Title of the Course				**General Physiology**			
Offered to: (Programme/s)				B.SC. Honors			
L	**4**	**T**	**0**	**P**	**0**	**C**	**4**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Major			**Course Relates to:**	Global		
Year of Revision:	-			**Percentage:**	-		
Type of the Course:				Employability			
Crosscutting Issues of the Course :				Human Values and Professional Ethics			
Pre-requisites, if any				Basic knowledge in tissues and organs			

Course Description:

To acquaint students with various aspects of physiological actions of selected organs which can be explained by particular biochemical processes. To understand fundamental mechanisms underlying normal function of cells, tissues, organs, and organ systems of the human body. On completion of the course, students shall be able to gain knowledge on how the human body works and the importance of blood and its components and their interactions during a disease or imbalances and carry out simple experiments on physiology.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To impart knowledge about blood composition and function and blood clotting mechanism.
2	To study about the muscular and nervous system.
3	To appreciate about the components of Urinary system and mechanism of Urine formation
4	To understand the structure and function and different components of the Digestive system.
5	To introduce the organization of endocrine system and classification of hormones

Course Outcomes

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

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Students will be able to learn and understand blood cells and blood groups Blood clotting mechanism.	K2	1	1
CO2	Students will be able to Outline the muscular and nervous system, Mechanism of muscle contraction and structure of brain and spinal cord	K2	1	1
CO3	Students will be able to Understand the knowledge about the structure of kidney and nephron, to understand the mechanism of Urine formation and learn the concept of Dialysis	K3	2	1
CO4	Students will Acquire knowledge about the components of Digestive system, Hcl formation and Digestion process	K2	1	1
CO5	Students will be able to Compile the classification of Hormones and its biological role	K4	1	1

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1	3	3				3		3	1
CO2	3	1				1		3	1
CO3	3	1				1		3	1
CO4	3	1				1		3	1
CO5	3	1				1		3	1

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure:

Unit – 1 : [Blood] (12Hrs)

Blood- Composition & Function, Blood cells formation, Blood grouping (ABO and Rh factor) Function of plasma proteins, lymphatic system and lymphoid organs, Blood clotting mechanism, anticoagulants.

Examples/Applications/Case Studies:

- [Case study-1 Blood Tests Interpretation]
- [Case study-2 Hematopoiesis case studies 2]

Exercises/Projects:

- [Project-1 Pediatric patient with Bombay blood group: A rare case report]
- [Project-2 Haematology]

Specific Resources: (web)

- [https://www.hematology.org/education/trainees/fellows/case-studies]

Unit-2: [Muscle] (12Hrs)

Muscular system- types of muscles, Mechanism of muscle contraction, Brief outline of nervous system Structure of neuron, Structure of brain & Structure of spinal cord, Synapses-Membrane potential and action potential- Transmission of nerve impulse, Neurotransmitters.

Examples/Applications/Case Studies:

- [Case study-1 Muscle and Movement]
- [Case study-2 Weight gain and Muscle Weakness]

Exercises/Projects:

- [Project-1 Disorders of Muscular System1]
- [Project-2 Neuromuscular case study 2]

Specific Resources: (web)

- [https://www.physio-pedia.com/Duchenne_Muscular_Dystrophy]

Unit – 3 : [Kidneys] (12Hrs)

Urinary system –Kidney structure and functions, Structure of nephron, Mechanism of urine formation, Normal and abnormal constituents of urine,Role of kidney in maintaining the Blood pressure.

Examples/Applications/Case Studies:

- [Case study-1 GFR in Renal system 1]
- [Case study-2 KFTs 2]

Exercises/Projects:

- [Project-1 Kdney Diseases1]
- [Project-2 Kidney Transplantation 2]

Specific Resources:

(https://www.hopkinsmedicine.org/health/wellness-and-prevention/anatomy-of-the-urinary-system)

Unit – 4: [Digestive System] (12Hrs)

Parts of GI tract, Functions of Accessory Organs (Pancreas & Liver), Role of Gastric hormones and enzymes in digestion, Digestion and absorption of carbohydrates, lipids, and proteins

Examples/Applications/Case Studies:

- [Case study-1 Gastro intestinal Disoders 1]
- [Case study-2 Working Model of Digestive System 2]

Exercises/Projects:

- [Project-1 Histological structure of GI tract1]
- [Project-2 Composition of Saliva and Bile 2]

Specific Resources: (web)

- [https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works]

Unit – 5 : [Endocrinology] (12Hrs)

General organization of endocrine system, Classification of hormones, Biological functions of Pituitary hormones, Biological functions of - Thyroid and Parathyroid hormones, Biological role of Insulin and Glucagon, Hormones of the adrenal glands,Gonadal hormones (Estrogen& Testosterone)

Examples/Applications/Case Studies:

- [Case study-1 Endocrine system]
- [Case study-2 Clinical Cases in Endocrinology]

Exercises/Projects:

- [Project-1 Endocrine system]
- [Project-2 Effect of Insulin Hormone]

Specific Resources: (web)

- [https://paediatric-endocrinology.medwirenews.com/-endocrinology/ 1]

Text Books:

1. Guyton., & Hall. (2006).*Textbook of Medical Physiology* (11th ed.). ,Elsevier Publishers
2. John.A.A.Hunte.,(2005). *Davidson's Principles and Practice of Medicine (* 20th Ed)., Churchill Livingstone.
3. Elaine N,. & Marieb.(1995). *Human Anatomy & Physiology* (3rd ed) Benjamin Cummngs.
4. MN.Chatterjee,.& Rana Shinde .(2008).*Text book of Medical Biochemistry Physiology (*7th ed). Jaypee Brothers Medical Publishers
5. Mariakuttikan ,. & Arumugam.(2007) *Animal physiology (*5th Ed). Saras Pulication.

References:

1. Sembulingam, 1999,Essentials of Medical Physiology, 8th edition, aypee Brothers Medical Publishers.
2. Ganong,2010,Medical Physiology,23rd Edition,McGrawHill Companies

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Course Code							
Title of the Course				GENERAL PHYSIOLOGY LAB			
Offered to: (Programme/s)				B.Sc., Honors			
L	**0**	**T**	**0**	**P**	**2**	**C**	**1**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Major			**Course Relates to:**	Global		
Year of Revision:	-			**Percentage:**	-		
Type of the Course:				Employability			
Crosscutting Issues of the Course :				Human Values and Professional Ethics			
Pre-requisites, if any				Basic knowledge in tissues and organs			

Course Description:

To acquaint students with various aspects of physiological actions of selected organs which can be explained by Practical Procedures. To understand fundamental mechanisms underlying normal Blood Composition and functions of Blood Components, cells, tissues, organs, and organ systems of the human body. On completion of the course, students shall be able to gain knowledge on how the human body works and the importance of blood and its components and their interactions during a disease or imbalances by carrying out simple experiments on physiology.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To impart interest about blood composition and function
2	To Improve knowledge about structure and interrelationships among different components of Blood.
3	To Know about Blood Grouping
4	To Understand about the infectious status and non infectious status of body
5	To impart Knowledge about blood Bleeding time and clotting time

Course Outcomes

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

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Students will be able to learn and understand blood cells	K2	1	1
CO2	Students will be able to blood grouping	K4	1	1
CO3	Students will be able to Understand the knowledge about the Blood clotting mechanism.	K2	1	1
CO4	Students will Acquire knowledge about Normal Values or Normal Range of different components of Blood	K3	1	1
CO5	Students will be able to understand the importance of Blood and its biological role	K4	1	1

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1	3	2				1		3	1
CO2	3	2				1		3	1
CO3	3	2				1		3	1
CO4	3	2				1		3	1
CO5	3	2				1		3	1

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure

This lab list covers the key areas of a General Physiology course, providing hands-on practice with Technique. (30Hrs)

1.Microscopy

Experiment:https://youtu.be/4c5ILWQmqRY?si=r2msZqS0Cc3gwX9i

Tasks:Microscopy is the technical field of using microscopes to view objects and areas of objects that cannot be seen with the naked eye (objects that are not within the resolution range of the normal eye). There are three well-known branches of microscopy: optical, electron, and scanning probe microscopy, along with the emerging field of X-ray microscopy.

2.RBC count & WBC count

Experiment:https://youtu.be/0f9p9JX4qJk?si=5icy8NHUB6543VTH

Experiment:https://youtu.be/xyhbIPSLBsA?si=fCNELPtYGEoj_J7O

Tasks: Red blood cell (RBC) count: 3.93 to 5.69 million cells per cubic millimeter (million/mm3) Hemoglobin (Hgb, Hb): 12.6 to 17.5 grams per deciliter (g/dL) for males; 12.0 to 16 g/dL for females. Hematocrit (HCT): 38% to 47.7% White blood cell (WBC) count: 3,300 to 8,700 cells per cubic millimeter (thousand/mm3

3.Differential leucocyte count by Leishman's staining

Experiment: https://youtu.be/czGCC6Fav_w?si=Bug_JZ_JOlrRedPJ

Tasks:A leukocyte count, also known as a white blood cell (WBC) count, measures the number of white blood cells in your blood. A normal WBC count is between 4,000 and 11,000 cells per microliter. However, the normal range can vary depending on age and race. For example, newborns typically have a higher count than adults

4.Estimation of Hemoglobin by Sahli's acid haematin method.

Experiment:https://youtu.be/6CqptdZyUaU?si=aMWitC7j-wDMmaax

Tasks: Hemoglobin estimation is a method for measuring the amount of hemoglobin in blood, which is usually done as part of a complete blood count (CBC). Hemoglobin levels are typically expressed in grams per deciliter (g/dl)

5.Determination of Packed cell volume (PCV)

Experiment:https://youtu.be/FOQ5R_dXuCs?si=__FAVt87r8YV1FMW

Tasks: Packed cell volume (PCV), also known as hematocrit (HCT), is a routine blood test that measures the percentage of red blood cells (RBCs) in your blood. The result is expressed as a percentage or fraction of cells in your blood. For example, a PCV of 40% means that 40 milliliters of your blood are made up of cells.

6.Determination of Erythrocyte sedimentation rate (ESR)

Experiment:https://youtu.be/FOQ5R_dXuCs?si=__FAVt87r8YV1FMW

Tasks: Erythrocyte sedimentation rate (ESR) is a blood test that that can show if you have inflammation in your body. Inflammation is your immune system's response to injury, infection and many types of conditions, including immune system disorders, certain cancers, and blood disorders. Erythrocytes are red blood cells.

7.Determination of Coagulation time & bleeding time

Experiment:https://youtu.be/AA36gZv5YmY?si=nhWAHS652OofljqR
Tasks: The bleeding time normal range is approximately 2-7 minutes, and the clotting time normal range is 8-15 minutes. Abnormal bleeding test results could indicate platelet-related disorders, such as thrombocytopenia, genetic bleeding disorder, increased risk of haemorrhages, and epistaxis.
8.Determination of blood group
Experiment:https://youtu.be/PLhbRulwNVo?si=wlwzCzG3BOpSXAil
Tasks: Blood grouping is the process of determining a person's blood type, which is based on the presence or absence of antigens on the surface of red blood cells. Blood types are inherited from parents

Lab Manual:

1. Manual -Dr. I Clement,. & Dr. B.S. Naveen, 2019, Text book on Physiology for DMLT & Paramedical Courses, 2nd Edition,EMMESS MEDICAL PUBLISHERS.

References:

1. Warley, H,2002 , Practical Clinical Biochemistry, 6th Edition,CBS Publishers]
2. Ranjana Chawla,2023 , Methods and Interpretations, 5th Edition, Jaypee Publishers

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SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA:: VIJAYAWADA-10
(An Autonomous College in the Jurisdiction of Krishna Unviersity, Machilipatnam)

SEMESTER -END QUESTION PAPER STRUCTURE

Course Code & Title of the Course:	General Physiology
Offered to:	
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks) Answer All questions.

Each question carries 4 Marks.

Q1 (a) Blood composition K1
OR
(b) Plasma Proteins K2
(a) Structure of Sarcomere K1
Q2 OR
(b) Neurotransmitters K1
(a) Structure and Functions of Kidney K3
Q3 OR
(b) Role of kidney in maintaining Blood Pressure K2
(a) Parts of GI tract K2
Q4 OR
(b) Functions of Liver K3
(a) Estrogen K3
Q5 OR
(b) Thyeoid Hormones K3

Section B: Long Answer Questions (50 Marks) Answer All questions.
Each question carries 10 Marks.

Q6 (a) Explain ABO Blood Grouping and determination of Rh factor K2
OR
(b) Define Blood Clotting? Write in detail the Blood clotting mechanism K1

Q7 (a) Explain the Types of Muscle and mechanism of muscle contraction K2
OR
(b) Explain the mechanism of Transmission of nerve impulse K2

Q8 (a) Discuss structure of Nephron and mechanism of urine formation K3/K4
OR
(b) Write in detail about the Normal and Abnormal constituents of urine K2

Q9 (a) Write an essay on structure, and function of digestive system K2
OR
(b) Write in detail the Digestion and absorption of carbohydrates and proteins K3

Q10 (a) Write about endocrine system and discuss classification of hormones K4
OR
(b) Explain the Biological role of Insulin and Glucagon Hormones K4/K5

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Course Code							
Title of the Course				**Genetics**			
Offered to: (Programme/s)				B.SC. Honors			
L	**4**	**T**	**0**	**P**	**0**	**C**	**4**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Major			**Course Relates to:**	Global		
Year of Revision:	-			**Percentage:**	-		
Type of the Course:				Employability			
Crosscutting Issues of the Course :				Human Values and Professional Ethics			
Pre-requisites, if any				Basic knowledge in Microbiology & life sciences			

Course Description:

The course explains the fundamental aspects of gene and genome organization to get basic knowledge to students. It is designed to illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences. It will give students exposure to application of plasmid isolation. Understand the vectors used in gene cloning, Learn the cDNA and Genomic library. It will also give Knowledge on gene transfer techniques giving ideas in strategizing research methodologies employing genetic engineering techniques it will also apply the experiments for DNA as a genetic material Remember genetic code, and various types of mutations.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To Learn and understand the fundamentals of genetics, including DNA as genetic material, chromosomes, genes, and gene arrangement in both prokaryotes and eukaryotes.
2	To Understand the bacteriophage life cycle, various plasmids, and CRISPR gene editing**.**
3	To Learn and understand bacterial transformation, transduction, conjugation, and transposable genetic elements, as well as their roles in antibiotic resistance.
4	To Understand gene structure in eukaryotic organisms, including introns, exons, pseudo genes, gene clusters, spacers, and repetitive sequences.
5	To understand the concepts of bacterial genetics, with detailed information about mutations.

Course Outcomes

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

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Students will be able to understand the about the fundamentals of genetics, including DNA as genetic material, Prokaryotic and Eukaryotic Chromosome structure and Chromosomal abnormalities	K2	1	2
CO2	Students will be able to learn the concepts of bacterial genetics, and understand the isolation and uses of	K3	2	1

	PBR322 and PUC19 plasmids.			
CO3	Students will be able to understand the bacteriophage life cycle and learn bacterial defense mechanisms, particularly CRISPR, and its applications.	K3	2	2
CO4	Students will be able to understand genes sstructure in eukaryotic organisms, Mapping of human genes, Mechanism of recombination in eukaryotes.	K3	2	2
CO5	Students will be able to Identify types of mutations and mutagens	K4	1	2

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1	3	2				1		1	3
CO2	2	3				3		2	3
CO3	2	3				2		2	3
CO4	2	3				1		1	3
CO5	3	1				1		1	3

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure:

Unit – 1 : [Genetic Material] (12Hrs)

1.7 Evidence of DNA & RNA as genetic material- experimental proof.
1.8 Prokaryotic Chromosome and Eukaryotic Chromatin and Chromosome structure
1.9 Karyotyping
1.10 Chromosomal abnormalities- Numerical and Structural

Examples/Applications/Case Studies:

- [Case Study 1- Rare Genetic Disorders]
- [Case Study 2- Genes and Inheritance]

Exercises/Projects:

- [Project 1- Human Genome Project]
- [Project 2- Genetic & Genomics]

Specific Resources:

- Resource-1 [https://www.ncbi.nlm.nih.gov/books/NBK7908/b**]**

Unit – 2 : [Bacterial Genetics] (12Hrs)

2.1 Plasmids and types, PBR322 and PUC19, plasmid- isolation and uses.
2.2 Recombination- Homologous Recombination, Site-Specific Recombination
2.3 Transformation, transduction, and conjugation in bacteria.
2.4 Linkage map

Examples/Applications/Case Studies:

- [Applications-Recombination]
- [Applications- Bacteriophages]

Exercises/Projects:

- [Exercise 1- Microbial Metabolism]
- [Exercise 2-Microbial Genetics]

Specific Resources:

- [https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/bacterial-genetics]

Unit – 3 : [Microbial Genetics] (12Hrs)

3.1 Structure and Types of Bacteriophages- T-phage, lambda phage:

3.2 Life Cycles of Bacteriophages: Lytic and Lysogenic cycle

3.3 Bacterial Defence Mechanism-CRISPR:-Application

Examples/Applications/Case Studies:

- [Case Study 1- Isolation of Phages from sewage water]
- [Applications 2- CRISPR]

Exercises/Projects:

- [Project 1- Modern Applications of Microbial Genetics]
- [Exercise 2-Microbial Genetics]

Specific Resources:

- [https://www.sciencedirect.com/topics/immunology-and-microbiology/microbial-genetics#:~:text=Microbial%20genetics%20is%20concerned%20with,how%20genetic%20information%20is%20expressed.]

Unit – 4 : [Concept of Genetics] (12Hrs)

4.1 Gene structure in eukaryotic organisms, introns and exons; pseudogenes ; gene clusters, spacers, repetitive sequences.

4.2 Single and multiple copy genes in eukaryotes – Histones, Alu elements and copia Retrotransposons, satellite DNA

4.3 Mapping of human genes

4.4 Extra nuclear inheritance- mitochondrial and chloroplast genetics

Examples/Applications/Case Studies:

- [Case Study 1- Human Genome Project]
- [Case Study 2- Gene Mapping]

Exercises/Projects:

- [Project 1-Nature Genetics]
- [Project 2- Genetics of Cancer]

Specific Resources:

- [https://www.ncbi.nlm.nih.gov/guide/genetics-medicine/]

Unit – 5 : [Mutations] (12Hrs)

5.5 Mutation – Types of mutations- Gene and Chromosomal , mutagens

5.6 Mutagenesis, induction and isolation of mutants

5.3 Epigenetics, mechanism and significance.

1. Phylogenetic inheritance.

Examples/Applications/Case Studies:

- [Case Study 1- AIDS Remissions]
- [Case Study 2- Cancer and Mutations]

Exercises/Projects:

- [Project 1- Phylogenic Mutations]
- [Project 2- Epigentetics]

Specific Resources: (web) [Resource 1-https://www.genome.gov/genetics-glossary/Mutation]

Text Books:

1. D Friefelder., 1987, Molecular Genetics D Friefelder, 2nd Edition, Jones and Bartlett
2. Lewin, 2008, Gene VII ,7th Edition, Oxford University Press.
3. Gardner., 1991,8th Edition., J.Wiley Publishers
4. James D.Watson, 2017, Molecular Biology of the gene, 7th Edition, Pearson Educatuion India.
5. G Zubay., 1987,Genetics,3rd edition, Benjamin cummings publishers.

References:

1.Albert Bruce., A.Johnson & Etal.,Cell molecular biology, 5th edition,2017, Title, Edition, Garland Publishers.

2.Maniatis and Co Vol I, II, III, Molecular cloning, 4th Edition.

Course Code							
Title of the Course				Genetics Lab			
Offered to: (Programme/s)				B.Sc., Biochemitry Honors			
L	**0**	**T**	**0**	**P**	**2**	**C**	**1**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Major			**Course Relates to:**	Global		
Year of Revision:				**Percentage:**			
Type of the Course:				Employability			
Crosscutting Issues of the Course :				Human Values and Professional Ethics			
Pre-requisites, if any				Microbial cultivation, basic instruments handling in laboratories			

Course Description:

The course designed to illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences. It will give exposure to students on Genetic Engineering and utilization of the vectors in gene cloning. Learn the cDNA and Genomic library. It will also give Knowledge on gene transfer techniques giving ideas in strategizing research methodologies employing genetic engineering techniques.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To understand the fundamentals of genetics, including DNA as genetic material, chromosomes, genes, and gene arrangement in both prokaryotes and eukaryotes.
2	Understand how genes and chromosomes function
3	To analyse and interpretate the genetic information
4	students will gain knowledge in various fields of Genetics
5	To understand the concepts of bacterial genetics

Course Outcomes

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

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Students will be able to understand the DNA as genetic material, Prokaryotic and Eukaryotic Chromosome structure	K2	1	2
CO2	Students will be able to learn the concepts of bacterial genetics.	K1	1	2
CO3	Students will be able to apply the mechanisms of isolation of Genetic materials	K3	2	2
CO4	Students will be able to understand genes Chromosomal abberations	K2	2	2
CO5	Students will be able to analyze Karyotype study	K4	2	2

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1	2	3				2		1	3
CO2	2	3				2		2	3
CO3	2	3				2		2	3
CO4	2	3				2		1	3
CO5	2	3				2		1	3

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure

This lab list covers the key areas of a Genetics Lab course, providing hands-on practice with technology.

(30Hrs)

1. Isolation of phages from sewage and quantification by plaque assay
- **Experiment:** https://youtu.be/IpL6Htcqo6I?si=XY9MwY14dWuMwU9Z
- **Tasks:** Bacteriophages can be isolated from sewage samples using a variety of techniques, the sewage sample through a sterile cotton bed filter, then centrifuge to remove bacterial cells and debris. Next, pass the supernatant through membranes with pore sizes of 0.45 and 0.22 micron

2. Demonstration of chromosomal aberrations
- **Experiment**:https://youtu.be/7_p14l8gPhk?si=uIUSz9PQSmP_GW7C
- **Tasks:**A chromosomal abnormality, or chromosomal aberration, is a disorder characterized by a morphological or numerical alteration in single or multiple chromosomes, affecting autosomes, sex chromosomes, or both.

3. Demonstration of Karyotype study
- **Experiment**:https://study.com/academy/lesson/video/karyotype-definition-disorders-analysis.html
- **Tasks:** The study of karyotypes is part of cytogenetic studies, which involve examining the number and structure of chromosomes in cells to identify genetic abnormalities. A karyotype test is a genetic test that analyzes a sample of cells to determine the number, size, and shape of chromosomes

4. Isolation of DNA from bacteria
- E**xperiment**:https://youtu.be/I_HwCeKr4Xg?si=d3HGDhcOo7ZJbT5z
- **Tasks:** The basic protocol involves lysing bacteria from a liquid culture, removing proteins, and precipitating cell wall debris and polysaccharides. The resulting supernatant is then used to recover high-molecular-weight DNA via isopropanol precipitation

5.Isolation of Plasmid DNA from bacteria
- **Experiment**:https://youtu.be/SR4FX6O2u98?si=IRAnbsgGDt2fuPJm
- **Tasks:** Separate the plasmid DNA from the genomic DNA. This can be done by using a potassium acetate solution to neutralize the sample, which causes the genomic DNA to precipitate out of the solution

6.Isolation of genomic DNA from leaves
- **Experiment**: https://youtu.be/p2RARQj0X9Y?si=wkc0LBztU_AKYCIV
- **Tasks:** Plant samples can be prepared by cryogenically grinding tissue in a mortar and pestle after chilling in liquid nitrogen. Freeze dried plants can be ground at room temperature. In either case, a fine powder is best for extracting DNA. Transfer the ground plant tissue to a polypropylene tube.

7. Isolation of RNA by trizol methods
- **Experiment**: https://youtu.be/dklyRYBZv4c?si=7TJ0kPKR9l1fGy88
- **Tasks:** 1 ml Trizol (using small amount of tissue) for 50-100 mg tissue or 107 cells. Sample volume shoμld not exceed 10% of the volume of Trizol

Lab Manual:

1. James D.Watson, 2017, Molecular Biology of the gene, 7th Edition, Pearson Educatuion India.

References:

2. G Zubay., 1987,Genetics,3rd edition, Benjamin cummings publishers.

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SRI DURGA MALLESWARA SIDDHARTHA MAHILA KALASALA:: VIJAYAWADA-10
(An Autonomous College in the Jurisdiction of Krishna Unviersity, Machilipatnam)

SEMESTER -END QUESTION PAPER STRUCTURE

Course Code & Title of the Course:	Genetics
Offered to:	B.Sc., BiochemistryHonors
Category:	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks) Answer All questions.

Each question carries 4 Marks.

Q1	(a)	Chromatin K1
		OR
	(b)	Karyotyping K2
Q2	(a)	Linkage map K2
		OR
	(b)	Plasmid K1
	(a)	T Phage K2
Q3		OR
	(b)	Applications of CRISPR K3
	(a)	Histones K2
Q4		OR
	(b)	Pseudo Genes K2
	(a)	Phylogenetic inheritance K2
Q5		OR
	(b)	Mutants K2

Section B: Long Answer Questions (50 Marks) Answer All questions.
Each question carries 10 Marks.

Q6	(a)	Write about the structure of Eukaryotic Chromosome
		OR
	(b)	Describe DNA as genetic material explain with experimental proofs
Q7	(a)	Write a detailed account on bacterial gene transfer mechanisms
		OR
	(b)	Explain the Mechanism of Recombination
Q8	(a)	Explain the lysogenic and lytic life cycles of bacteriophage
		OR
	(b)	Discuss the mechanism of Transduction
Q9	(a)	Discuss about the structure of gene in eukaryotic organisms
		OR
	(b)	Explain in detail about the mapping of Human Genes
Q10	(a)	Define mutation and discuss types of mutation
		OR
	(b)	Write a detailed account on Epigenetics

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