DKM COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE -1

DEPARMENT OF MICROBIOLOGY

B.Sc MICROBIOLOGY

SYLLABUS

With effect from 2021-2022

D.K.M COLLEGE FOR WOMEN (AUTONOMOUS) VELLORE-1

(CBCS PATTERN)

B.Sc MICROBIOLOGY SYLLABUS TEMPLATE 2021-2022

S.NO	Part	Study Components		Ins.Hrs / Week	Credit	Title of the Paper	Max Marks		
		Course Title					CIA	Sem. Exam	Total
SEMESTER I									
1	I	Language	Paper I	6	4	Tamil-I	25	75	100
2	II	English	Paper I	6	4	English –I	25	75	100
3	III	Core	Paper I	6	5	General Microbiology	25	75	100
4	III	Core	Practical I	3	0	Basic techniques in Microbiology	-	-	-
5	III	Allied	Paper I	4	4	Biochemistry I	25	75	100
6	III	Allied	Practical I	3	0	Biochemistry	-	-	-
7	IV			2	2	Environmental Science	25	75	100
				30	**19**		**125**	**375**	**500**
SEMESTER II							**CIA**	**Sem. Exa**	**Total**
8	I	Language	Paper II	6	4	Tamil-II	25	75	100
9	II	English	Paper II	5	4	English-II	25	75	100
10	III	Core	Paper II	5	5	Cell biology and Genetics	25	75	100
11	III	Core	Practical I	3	3	Basic techniques in Microbiology	40	60	100
12	III	Allied	Paper II	4	4	Biochemistry II	25	75	100
13	III	Allied	Practical I	3	2	Biochemistry	40	60	100
14	IV			2	2	Value Education (Gen Awareness)	-	50	50
15	IV			2	1	Soft skill	-	50	50
				30	**25**		**180**	**520**	**700**

SEMESTER III							CIA	Sem.Exam	Total
16	I	Language	Paper III	6	4	Tamil-III	25	75	100
17	II	English	Paper III	6	4	English-III	25	75	100
18	III	Core	Paper III	4	4	Immunology	25	75	100
19	III	Core	Practical II	3	0	Immunology	-	-	-
20	III	Allied	Paper III	4	4	Bioinstrumentation	25	75	100
21	III	Allied	Practical II	3	0	Bioinstrumentation & Biostatistics	-	-	-
22	IV	Skill Based I		2	2	MLT – I General principles of laboratory	-	50	50
23	IV	Non Major		2	2	Mushroom cultivation	-	50	50
				30	**20**		**100**	**400**	**500**

SEMESTER –IV							CIA	Sem.Exam	Total
24	I	Language	Paper IV	6	4	Tamil-IV	25	75	100
25	II	English	Paper IV	6	4	English-IV	25	75	100
26	III	Core	Paper IV	4	4	Molecular biology	25	75	100
27	III	Core	Practical	3	3	Immunology	40	60	100
28	III	Allied	Paper IV	4	4	Biostatistics	25	75	100
29	III	Allied	Practical	3	2	Bioinstrumentation & Biostatistics	40	60	100
30	IV	Skill Based II		2	2	MLT – II Clinical Pathology &Haematology	-	50	50
31	IV	Non Major Elective II		2	2	Vermitechnology	-	50	50
				30	**25**		**180**	**520**	**700**

Internship (Optional) during the summer vacation with 1 to 3 credits

SEMESTER –V							CIA	Sem.Exam	Total
32	III	Core	Paper V	5	5	Medical Bacteriology	25	75	100
33	III	Core	Paper VI	4	4	Food & Dairy Microbiology	25	75	100
34	III	Core	Paper VII	4	4	Medical Mycology & Parasitology	25	75	100
35	III	Core	Practical III	5	0	Medical Microbiology	-	-	-
36	III	Core	Practical IV	4	0	Applied Microbiology	-	-	-
37	III	Elective I	Paper I	3	3	Recombinant DNA technology	25	75	100
38	III	Elective II	Paper II	3	3	Principles of Biology	25	75	100
39	IV	Skill Based III		2	2	MLT – III Biochemistry Histopathology &	-	50	50
				30	**21**		**125**	**425**	**550**

SEMESTER-VI							CIA	Sem. Exam	Total
39	III	Core	Paper VIII	5	5	Medical Virology	25	75	100
40	III	Core	Paper IX	4	4	Environmental & Agricultural Microbiology	25	75	100
41	III	Core	Paper X	4	4	Industrial and Pharmaceutical	25	75	100
42	III	Core	Practical III	5	3	Medical Microbiology	40	60	100
43	III	Core	Practical IV	4	3	Applied Microbiology	40	60	100
44	III	Elective III	Paper III	3	3	Microbial Biotechnology	25	75	100
45	III	Elective IV	Paper IV	3	3	Marine Microbiology	25	75	100
46	IV	Skill Based IV		2	2	MLT – IV Clinical Microbiology	-	50	50
47	V	Extension Activities			3	Service	100	-	100
				30	**30**		**305**	**545**	**850**
				180	**140**				**3800**

CONSOLIDATED STATEMENT

Part	Subject	Papers	Credit	Total credits	Marks	Total marks
Part I	Languages	4	4	16	100	400
Part II	English	4	4	16	100	400
Part III	Allied (Odd Sem)	2	4	8	100	200
	Allied (Even Sem)	2	4	8	100	200
	Allied Prac(Even Sem)	2	2	4	100	200
	Electives	4	3	12	100	400
	Core	10	4-5	44	100	1000
	Core prac	4	3	12	100	400
Part IV	Env. Science	1	2	2	100	100
	Soft skill	1	1	1	50	50
	Value Education	1	2	2	50	50
	Non major	2	2	4	50	100
	Skill based	4	2	8	50	200
Part V	Extension	1	3	3	100	100
	Total	**42**		**140**	**1200**	**3800**

PROGRAM EDUCATIONAL OBJECTIVES (DEPARTMENT OBJECTIVES):

PEO1 To enable the students to know about the basics of Microbiology and its applications in various fields

PEO2 To inculcate in-depth knowledge and research skills for professional careers in Microbiology.

PROGRAMME OUTCOMES:

PO1 To provide thorough knowledge and understanding of the core concepts in the discipline of Microbiology.

PO2 To equip the students to apply knowledge of prokaryotic and eukaryotic cellular processes, classification, interaction of microorganisms among themselves, with physical and chemical agents and higher order organisms.

PO3 To understand the vital role of microorganisms in biotechnology, fermentation, medicine, and industries important to human well being.

PO4 To demonstrate that microorganisms have an indispensable role in the environment, including elemental cycles, biodegradation, etc.

PO5 To identify ways how microorganisms causes disease, and the methodologies used in disease treatment and prevention.

PO6 To impart knowledge in laboratory safety and in routine and specialized microbiological laboratory skills applicable to microbiological research or clinical methods including accurately reporting observation and analysis.

PROGRAM EDUCATIONAL OBJECTIVES:

PEO1 To enable the students to know about the basics of Microbiology and its applications in various fields

PEO2 To inculcate in-depth knowledge and research skills for professional careers in Microbiology.

PROGRAMME OUTCOMES:

PO1 The students acquire thorough knowledge of understanding the core concepts in the discipline of Microbiology.

PO2 Students acquire the knowledge of the indispensable role of microorganisms in the environment including elemental cycles, biodegradation and bioremediation.

PO3 The students understand the vital role of microorganisms in biotechnology and can find job in food, dairy and fermentation industries.

PO4 Students identify the ways how microorganism's causes disease, and the methodologies used in disease treatment and prevention.

PO5 The course imparts knowledge in laboratory safety and in routine and specialized microbiological laboratory skills applicable to microbiological research or clinical methods including accurately reporting observation and analysis.

PO6 The students develop good, deep knowledge and strong skills to work in pharmaceutical industries that produce biopharmaceuticals and in multi specialty hospitals.

CORE I

GENERAL MICROBIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
I		Core	90	6	90	6	0	0	5

COURSE OBJECTIVES

To enable the students to understand the basics in Microbiology

COURSE OUTCOMES

On the successful completion of the course, students will be able to know the basics in Microbiology.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand about the microscopes & the contributions of various scientists to the microbial world.	K2
CO2	To understand the nomenclature & classification of microorganisms.	K2
CO3	To understand the sterilization techniques & the role of antibiotics in the control of microorganisms.	K2
CO4	To understand the staining & cultivation techniques of different microorganisms.	K2
CO5	To understand about the growth pattern & nutrient uptake mechanisms of different microorganisms.	K2

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	S	S	S
CO2	S	S	M	M	S	M
CO3	S	M	M	S	M	M
CO4	S	S	S	S	S	S
CO5	S	M	S	M	S	M

S- Strong; M- Medium; L- Low

Unit-I: History and Microscopy **(20 Hrs)**

Definition, branches and scope of microbiology – History – Contributions of Antony Van Leewenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Beijerinck, Winogradsky, Alexander Fleming Selman Waksman, Lazarro Spallanzani and John Tyndall. Spontaneous generation and biogenesis. Branches of Microbiology – Industrial, medical and Environmental microbiology. Microscopy – Simple, Compound – Light, Dark, Phase contrast and Fluorescent microsopes. Electron microscopy – Transmission and scanning electron microscopes.

Unit-II: Microbial Classification and Taxonomy **(18 Hrs)**

Microbial kingdoms: Woose classification - Bacteria, Eubacteria, Archaebacteria, Hackels three kingdom classification and Whittaker's five kingdom classification. General characteristics of algae, fungi & viruses. Anatomy of Prokaryotes – Ultra structure and function of cell wall, flagella, slime layer, capsule, pili, cytoplasmic membrane, cytoplasmic inclusions and endospore. Mechanism of spore germination and sporulation.

Unit-III: Sterilization and Antimicrobial chemotherapy **(17 Hrs)**

Definitions: Sterilization, flaming, incineration, disinfection and antisepsis. Sterilization principles & techniques – dry heat, moist heat, pasteurization, tyndallization, radiation and filtration. Disinfection methods. Antimicrobial chemotherapy: Classification & mode of action of antibiotics[Cellwall synthesis inhibitors, antibiotic causes damage to cell membrane, inhibitors of protein & nucleic acid synthesis and inhibitors of specific enzyme system]: Testing methods – disc diffusion and dilution susceptibility [MIC] test.

Unit-IV: Culture and Staining techniques **(17 Hrs)**

Culture media and its types – basal, enriched, enrichment, selective, differential, transport & anaerobic media. Preservation of cultures – Lyophillization – aerobic and anaerobic culture techniques. Stains and staining techniques – Simple staining, differential staining [Gram staining & Acid fast staining], special staining [capsule staining & endospore staining].

Unit-V: Bacterial growth and metabolism **(18 Hrs)**

Microbial growth – factors affecting microbial growth, techniques for quantifying microbial growth. Nutritional requirements – Growth factors - Growth curve. Microbial metabolism: Respiration –

aerobic respiration [ETC, TCA Cycle], Anaerobic respiraton [Glycolysis]; fermentation and Photosynthesis [Cyclic & Non-cyclic]. Photosynthetic bacteria.

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	General Microbiology	Robert F. Boyd	Times/Missor/Mosby College Publishers	1998
02	Fundamental Principles of Bacteriology	Salle A.J	McGraw Hill Publishers	1992
03	Microbiology	Pelczar JR M.J., Chan E.C.S. and Kreig N.R	McGraw Hill Publishers	2006
04	Brock – Biology of Microorganisms	Michael T. Madigan, John M. Martin K, Jack Parker	Prentice Hall, Pearson Education	2003
05	Microbial Physiology	Albert G. Moat, John W. Foster and Michael P. Spector	John Wiley and Sons	2002

REFERENCE BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Manual for identification of Medical Bacteria	Cowan and Steel	Cambridge University Press	1995
02	Introduction to Microbiology	John L.Ingraham & Catherine A	Ingraham. Book/Cole Thomson Learning	2000
03	Fundamentals of Microbiology	Edward Alcamo I	Jones and Barlett Publishers	2001
04	Biology of Microorganisms	Brock	Prentice Hall, Pearson education	2000

05	Bergey's Manual of Determinative Bacteriology	John G. Holt, Noel R. Krieg, Peter H.A, James T. Staley and Stanely T. Williams	Lippincott Williams and Wilkins Publishers	2000
06	Microbiology	Prescott.M, JP Harley and D.A. Klein	Brown Publishers	1993

WEB SOURCES:

http;//gsbs.utmb.edu/microbook/toc.htm

http://www.sci-eng.mmu.ac.uk/biology/useful/27.htm.

http://www.microbes.info./resources/general_Microbiology/

www.microbiologyplace.com

http://www.med.umich.edu/tamc/links.html

SYLLABUS DESIGNER:

1. Mrs. A. Barathi Assistant Professor
2. Dr. A.Vidhya HOD & Assistant Professor

I – SEMESTER: PRACTICALS

BASIC TECHNIQUES IN MICROBIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
I		Practical	0	0	0	0	45	3	6

1. Cleaning of glass wares.
2. Sterilization principle and methods – moist heat, dry heat and filtration methods.
3. Media preparation – Liquid medium, solid medium, slants, deeps, agar plates. Preparation of basal, enriched, selective and differential media.
4. Pure culture techniques – serial dilution, pour plate, spread plate and streak plate techniques.
5. Cultural and biochemical characteristics of bacteria – Growth on different media, colony characteristics on Nutrient agar, Blood agar, Mac Conkey agar. Catalase, oxidase and IMVIC tests.
6. Microscopy – light microscopy & dark field microscopy.
7. Motility demonstration – Hanging drop technique.
8. Staining techniques – simple staining, Gram's staining, Acid fast staining, capsule staining (Negative staining), Lactophenol cotton blue staining techniques.
9. Antibiotic sensitivity testing – Disc diffusion method.

CORE II

CELL BIOLOGY AND GENETICS

Semester	Subject Code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
II		Core	75	5	75	5	0	0	5

COURSE OBJECTIVES

To enable the students to understand the basics of Cell Biology and Genetics

COURSE OUTCOMES

On the successful completion of the course, students will be able to acquire a sound knowledge about generating, processing and understanding biological genetic information.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand about the anatomy, cell division & Cell differentiation of the microorganisms.	K2
CO2	To understand about the properties and functions of genes through Mendelian inheritance studies.	K2
CO3	To understand about the methods of gene transfer.	K2
CO4	To understand about the plasmids, their functions & uses in microbiology.	K2
CO5	To understand about the occurrence of mutation & its detection in microorganisms.	K2

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	S	S
CO2	M	S	M	S	M	M
CO3	M	M	S	S	M	M
CO4	M	S	S	M	S	S
CO5	S	M	M	S	S	M

S- Strong; M- Medium; L- Low

Unit-I: Cell biology **(15 Hrs)**

Structure and function of cells and intracellular organelles of both prokaryotes and eukaryotes. Mechanism of cell division (Mitosis) - cell differentiation - cell interaction - microbial cell membrane & its functions – bacteria [Gram positive & Gram negative].

Unit- II: Microbial Genitics **(15 Hrs)**

Genetic inheritance; Microbial genome – structure and function; Linkage and Crossing over; Extra chromosomal inheritance (mitochondria). Epigenesis; Genotypic and phenotypic characteristics – bacteria.

Unit III: Microbial Gene transfer mechanisms **(15 Hrs)**

Gene transfer mechanisms: Transformation – Griffith experiment; Conjugation – F^+, F' & Hfr methods; Transduction – Generalized and specialized.

Unit-IV: Plasmids and Genetic recombination **(15 Hrs)**

Plasmids – general properties: size, copy number, compatibility, origin of replication, conjugation and amplification. Classification of Plasmid – Col plasmids, resistant plasmids, degradative plasmids, virulent plasmids (Ti plasmid) & cryptic plasmids. Episomes , Transposons. Molecular mechanism of genetic recombination

Unit-V: Mutagenesis and mutation **(15 Hrs)**

Mutagenesis – mutation and its molecular basis – types of mutation – Addition, deletion, reversion, lethal, transition, transversion, frameshift, point and non-sense mutations. Mutation repair mechanisms – excision repair, post replication repair, recombinational repair and SOS repair. Detection and isolation of mutants - Isolation of auxotropic mutants; Carcinogenecity testing – Ames test.

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

Sl no:	Book name	Author	Publisher	Year of publication
02	DNA repair and mutagenesis	Friedberg E.C., Walter GC, Sied. W	ASM press	1995
03	The Genetics of Bacteria and their Viruses	William Hayes	Blackwell Scientific Publishers	1985
04	Principles of Genetics	Gardner, E.J. Simmons, M.J and D.P Snustard	John Wiley & Sons	1991
05	Principles of Genetics	Robert H. Tamarin	Tata McGraw Hill Publication	2004
06	Cell and Molecular Biology	Gerald Karp	John Wiley & Sons	2002
07	Genetics	Peter J Russell	Benjamin Cummings	2002
08	Principles of Genetics	Peter Snustard D., Michael J. Simmons	John Wiley & Sons	2003
09	Genetics	Ahluwalia, K.B	New Age International Pvt., Ltd	1996

REFERENCE BOOKS:

Sl No:	Book name	Author	Publisher	Year of publication
01	Molecular Biotechnology	Glick, B.R. and Pasternak, J.J.	ASM Press	1994
02	Molecular Cloning – A Laboratory Manual	Sambrook, J. and Ruseell, D.W.	Cold Spring Laboratory Press	2001

WEB SOURCES:

http://www.molgen.mpg.de/

http://www.cellbio.com/

http://restools.sdsc.edu/

http://www.mcb.harvard.edu/biolinks.html

http://www.horizonpress.com/gateway

SYLLABUS DESIGNER:

1. Mrs. A. Barathi, Assistant Professor
2. Dr. A.Vidhya HOD & Assistant Professor

CORE III

IMMUNOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
III		Core	60	4	60	4	0	0	4

COURSE OBJECTIVES

To enlighten the students to understand the basics of Immunity and Immune system

COURSE OUTCOMES

On the successful completion of the course, students will have deep insight knowledge in immune techniques in therapeutic and diagnostic field.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand about the various basic cells, organs and its function involved in immune system	K2
CO2	To expertise about the knowledge on antigen and antibody .	K2
CO3	To understand the therapeutic and diagnostic application and its importance of antigen antibody reaction.	K3
CO4	To gain insight on various immune components like complement, MHC and monoclonal antibody.	K2
CO5	To categorize the different types of hypersensitivity reaction and its immune background	K2

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	S	S	S
CO2	S	M	S	S	S	S
CO3	S	M	M	S	S	S
CO4	S	M	M	S	S	S
CO5	S	M	S	S	S	S

S- Strong; M- Medium; L- Low

Unit-I: Basics of Immunology **(12 Hrs)**

History of Immunology, Immunity - Innate immunity, acquired immunity active and passive immunity, Components of immune system – Primary and secondary lymphoid organ structure and function, Cells of immune system, hematopoiesis, B cells, T cells, granulocyte and agranulocytes, phagocytosis.

Unit-II: Antigen and Antibody **(12 Hrs)**

Antigens- types, properties, antigenicity and immunogenicity, haptens, adjuvant - Vaccines- live, attenuated, subunit, toxoids, recombinant and DNA vaccine- Immunoglobulin – structures, types and properties- Interferons, Interleukin, cytokines.

Unit-III: Immunological techniques **(12 Hrs)**

Antigen – Antibody reactions – *in vitro* methods – Agglutination, Immunodiffusion, Electrophoresis, Precipitation, Passive agglutination , Complement fixation, Immunofluorescence, ELISA, RIA, Immunohaematology – Blood groups.

Unit-IV: Components of Immune system **(12 Hrs)**

Complement - structure properties and functions- Classical and alternate pathways - MHC complex – structures, functions- Hybridoma Technology and its applications- Host Parasite relationship.

Unit- V Hypersensitivity **(12 Hrs)**

Hypersensitivity: antibody mediated –Type I anaphylaxis, Type II antibody dependent and cytotoxicity, Type III – Immune complex mediated, Type IV – Delayed Type - *Invivo* methods – Skin tests, Immune complex tissue demonstrations.

DISTRIBUTION OF MARKS: Theory **-** 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

S.No	Title	Author	Publisher	Year of Publication
1	Immunology	D.M. Weir and J Steward	ELBS, London.	1997
2	Cellular and Molecular Immunology	A K Abbas, A H Lichtman, Shiv Pillai	8th Edition Philadelphia: M.B. Sounders	2014

REFERENCE BOOKS:

S.No	Title	Author	Publisher	Year of Publication
1	Immunology	J Kuby	W. H. Freeman and Company, New York	2019
2	Essential Immunology	I.M Riott	Blackwell scientific publication, London	2017
3	Immunology- An Introduction	Tizard K	Sauders College Publishing, Philadelphia	1994
4	Immunology for students	J H Humphrey, R G White.	5th edition ELBS London	1995
5	Hand book of Lunar Immunology	Lefell, Donnenberg, Rose H Maurice R.G. O'Gorman (Editor), Albert D. Donnenberg (Editor)	BOCA Raton Fla; 2nd EditionCRC Press	2008

WEB SOURCES:

- http://www.immuno.path.cam.ac.uk/~immuno/part1.html
- http:/www.lclark.edu/~reiness/immuno/lectures.html
- http://www.hhmi.org/biointeractive/immunology/lectures.html
- http://immuneweb.xxmc.edu.cn/immunology/immunology/html
- http://www.cehs.siu.edu/fix/medmicro/index.html
- http://www.biotech.ubc.ca/teaching resources/microbiologyimmunology/immunesystemnotes.html

SYLLABUS DESIGNER:

1. Dr.S.Ramya Assistant Professor
2. Dr. A.Vidhya HOD & Assistant Professor

PRACTICAL II: IMMUNOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
III		Practical	0	0	0	0	45	3	3

1. Blood grouping and typing

2. Precipitation reactions in gel: Outchterlony double diffusion, SRID. Agglutination reactions- Widal, RA, CRP, ASO, HCG, RPR card test and trust antigen.

3. Enumeration of different cell types, peripheral blood cell counts, absolute cell counts.

Demonstration practical.

4. Preparation of Bacterial antigens by Homogenization

5. Skin tests

6. Dot ELISA.

7. Immunoelectrophoresis.

8. Antibody production and its titration.

9. Visit to Immunological institute.

ALLIED III

BIOINSTRUMENTATION

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
IV		Allied	60	4	60	4	0	0	4

COURSE OBJECTIVES

To enable the students to understand the basics of Bioinstrumentation

COURSE OUTCOMES

On the successful completion of the course, students will be able to know the basics in Bioinstrumentation.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To remember about the basic principles of centrifugation methods	K1
CO2	To understand concept of Spectroscopy	K2
CO3	To understand the principles of Chromatographic techniques	K2
CO4	To understand the Electrophoretic techniques	K2
CO5	To analyze about the radio isotopes ad its applications	K4

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	S	M
CO2	S	M	M	M	S	M
CO3	S	M	M	M	S	M
CO4	S	M	M	M	S	M
CO5	S	M	M	M	S	M

S- Strong; M- Medium; L- Low

Unit-I Centrifugation methods **(12Hrs)**

Basic principles of sedimentation, centrifugal force, sved berg constant. Types of centrifuges. Application in molecular weight determination of proteins and nucleic acids.

Unit-II Spectroscopy **(12Hrs)**

Calorimetric, spectrophotometer-UV, Fluorescence spectroscopy, spectrofluorimetry, turbidometry, nephelometry, illuminometer – principle, operation and maintenance.

Unit-III Chromatographic techniques **(12Hrs)**

General principles of chromatography; adsorption, partition, gas, ion-exchange, gel filtration, affinity, HPLC.

Unit-IV Electrophoretic techniques **(12Hrs)**

Electrophoretic techniques: Proteins - SDS-PAGE, Nucleic acids - Gel Electrophoresis.

Unit-V Radioisotope techniques **(12Hrs)**

Radioisotope techniques: nature of radioactivity, detection, measurements, counters, safety aspects, applications

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Bioinstrumentation	L. Veerakumari	MJP Publisher	2017
02	Fundamentals of Bioanalytical Techniques and Instrumentation	Sabari Ghosal , Anupama Sharma Avasthi	PHI Learning	2018
03	Modern Physics: Physics of Modern Science	Priyanka Jangid	Kindle Edition	2019

REFERENCE BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Bioinstrumentation	John G. Webster	John Wiley & Sons	2008
02	Bioinstrumentation and Biosensors	Donald L. Wise	CRC Press; 1 edition	1991
03	Principles of Applied Biomedical Instrumentation	L. A. Geddes, L. E. Baker	John Wiley & Sons	1991
04	Instrumental Methods of Chemical Analysis	Chatwal, G. R and S. K. Anand.	Himalaya Publishing House	2011
05	Introduction to Biomedical Instrumentation	Mandeep Singh	Paperback publishers	2014
06	Principles and Techniques of Biochemistry and Molecular Biology	Wilson, K. and J. Walker	Cambridge University Press, UK.	2018

WEB SOURCES:

https://www.vidyarthiplus.com

https://searchworks.stanford.edu ›

https://biomedikal.in ›

https://nptel.ac.in

SYLLABUS DESIGNER:

3. Dr.J.Hemapriya, Assistant Professor
4. Dr. A.Vidhya HOD & Assistant Professor

ALLIED PRACTICALS-BIOINSTRUMENTATION & BIOSTATISTICS

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
IV		Practical	0	0	0	0	45	3	2

BIOINSTRUMENTATION

1. Colorimeteric Experiments

2. Electrophoresis.

3. Bioseperation of components using Centrifuge.

4. Chromatographic techniques – TLC & Paper chromatography.

BIO-STATISTICS

1. Diagrams and Graphs

2. Mean, Median and Mode

3. Correlation and Regression

4. Chi – Square test and F – test.

5. One Way and Two Way Classifications.

SKILL BASED SUBJECT I

MEDICAL LABORATORY TECHNOLOGY

GENERAL PRINCIPLES OF LABORATORY, ANATOMY & PHYSIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
III		Skill based	30	2	30	2	0	0	2

COURSE OUTCOMES

To enable the students to understand the basic techniques in Medical laboratory and the anatomy of human.

COURSE OUTCOMES

On the successful completion of the course, students will be able to develop strong and potential skills to work in the clinical laboratories.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the basic needs of a clinical laboratory and the records maintained in the laboratory.	**K3**
CO2	To understand the lab accidents and first aid.	**K2**
CO3	To understand the anatomy and physiology of Skeletal system, Muscular system, Circulatory system, Endocrine System	**K2**
CO4	To understand the anatomy and physiology of Lymphatic system, Digestive system, Respiratory system, Urinary system.	**K2**
CO5	To understand the anatomy and physiology of Reproductive system, sense organs, Nervous system. Skin & its appendages	**K3**

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	M	M
CO2	S	S	M	M	M	M
CO3	S	S	S	S	M	M
CO4	S	M	S	S	S	S
CO5	S	S	S	S	S	S

S- Strong; M- Medium; L- Low

Unit I:Components of clinical laboratories (6Hrs)

Functional components of clinical laboratories – Basic needs of a clinical laboratory – Maintenance of laboratory records.

Unit II: Lab accidents and first aid (6Hrs)

Common types of laboratory accidents – Basic cause and first aid in laboratories – Safety regulation in health laboratories.

Unit III: Anatomy and Physiology (6Hrs)

` Anatomy and Physiology – Skeletal system, Muscular system, Circulatory system, Endocrine System.

Unit IV: Anatomy and Physiology (6Hrs)

Digestive system, Respiratory system, Urinary system.

Unit V: Anatomy and Physiology (6Hrs)

Reproductive organ & system, sense organs, Nervous system. Skin & its appendages

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	Kanai L. Mukherjee, Anuradha ChakravarthyRoss and Willson	Medical Laboratory Technology, Procedure Manual for Routine Diagnostic Tests	MCGraw- Hill Medical	2017
2.	Joseph Robert McClintic	Basic Anatomy and Physiology of human body	John Wiley & Sons, Inc.	1980
3.	Robert K. Clark	Anatomy and Physiology: Understanding the human body	Jones and Bartlett Learning	2005

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	Jenkins, Gail W, Kemnitz, Christopher P. Tortora, Gerard J	Anatomy and physiology:from science to life	3rd Edition John Willey & Sons	2012
2.	Marieb, Elaine Nicpon	Essentials of Human Anatomy and Physiology	9th Edition Pearson	2016
3.	Frank Firkin, C. Chesterman, D. Penington, B. Rush	de Gruchy′s Clinical Haematology in Medical Practice	Wiley-Blackwell	1989
4.	Ramniksood	Medical Laboratory Technology	6th Edition JAYPEE	2009
5.	William. F.Ganong Barrett (Author)	Review of Medical physiology	MCGraw- Hill Medical	2019
6.	Guyton	Human Physiology and Mechanisms of Disease	Saunders Publications	1996

WEB REFERENCE:

https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology
https://www.slideshare.net/dryuktisharma/chapter-1-introduction-to-anatomy-and-physiology
https://en.wikipedia.org/wiki/List_of_systems_of_the_human_body
https://study.com/academy/lesson/what-are-the-organ-systems-of-the-human-body.html
https://en.wikipedia.org/wiki/Medical_laboratory

SYLLABUS DESIGNER

1. Dr.A.Vidhya, Assistant Professor and Head

NON MAJOR ELECTIVE I

MUSHROOM CULTIVATION

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
III		Non major	30	2	30	2	0	0	2

COURSE OUTCOMES

To enable the students to understand the concepts of Mushroom cultivation and its disease control

COURSE OUTCOMES

On the successful completion of the course, students will be able to develop strong and potential skills in mushroom cultivation

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To know about the different types of mushrooms.	K4
CO2	To understand about the cultivation of button mushrooms.	K2
CO3	To understand about the cultivation of paddy straw mushrooms.	K2
CO4	To obtain a good understanding of Mushroom cultivation and its disease control.	K4
CO5	To remember the precautions to be taken while cultivating the mushroom and the products based on mushroom.	K1

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	M	M
CO2	S	S	M	M	M	M
CO3	S	S	S	S	M	M
CO4	S	M	S	S	S	S
CO5	S	S	S	S	S	S

S- Strong; M- Medium; L- Low

Unit I: Types of mushrooms **(6Hrs)**

Edible and non – edible mushroom (Historical account, most commonly cultivated mushrooms in the world, distribution and production in various countries).

Unit II: **Button Mushrooms** **(6Hrs)**

Cultivation of button mushroom – morphology raising a pure culture & spawn preparation. Preparation of compost & cultivation of *A. bitowquis* Harvest.

Unit III: Paddy straw mushrooms **(6Hrs)**

Cultivation of Oyster and Paddy straw mushroom – preparation of pure culture & spawn cultivation methods, Harvest.

Unit IV: Pests and diseases of mushrooms **(6Hrs)**

Pests and diseases of Edible mushrooms (Environmental,Fungal, Bacterial, Viral Insect pests and Nematode diseases and Competitor moulds).

Unit V: Importance of mushroom cultivation **(6Hrs)**

Economic Importance of mushroom cultivation. Precautions in mushroom cultivation (Precaution to be taken while selecting the area, spawn preparation, spawn run, during cropping harvesting etc). Mushroom recipes (Western and Indian recipes, Pickles, Powders, Jams etc).

DISTRIBUTION OF MARKS: Theory **-** 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Handbook of Edible Mushrooms.	Kannaiyan	TNAU Publication, Coimbatore, India.	2001
02	Mushroom Culture	Alice, D., K. Muthusamy and M. Yesuraja.	Agricultural College, Research Institute Publications, Madurai, Tamil Nadu, India.	1999

REFERENCE BOOKS

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Oyster Mushroom	Marimuthu, T.	Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.	1991
2	Handbook on Mushrooms	Nita Bhal	2nd Edition, Volume - I and II, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.	2000.
3	Mushroom Cultivation	Tripathi, D. P.	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India.	2017
4.	The Mushroom Handbook.	Krieger, L. C.	Sufi Press.	2015
5.	Mushroom Cultivation.	Oei, P	Backhuys Publishers ECO Consult Foundation publishers	2016

WEB REFERENCE

https://extension.psu.edu/six-steps-to-mushroom-farming

https://en.wikipedia.org/wiki/Fungiculture

https://www.biologydiscussion.com/fungi/cultivation-of-mushrooms-2-methods/58454

https://homeguides.sfgate.com/mushroom-cultivation-techniques-71046.html

https://www.krishisewa.com/articles/production-technology/46-technology-for-mushroom-cultivation.html

SYLLABUS DESIGNER

1. Ms. R. Sangeetha, Assistant Professor
2. Dr. A.Vidhya, Assistant Professor and Head

CORE IV

MOLECULAR BIOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
IV		Core	60	4	60	4	0	0	4

COURSE OBJECTIVES

To enable the students to understand the basics of Molecular biology

COURSE OUTCOMES

On the successful completion of the course, students will be able understand the concept of genetic material and the importance of central dogma in process of evolution.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand about the evidence for genetic material and its structure.	K2
CO2	To understand about the process of replication and repair mechanism.	K2
CO3	To understand about the detailed process of synthesis of RNA from DNA.	K2
CO4	To understand about the synthesis of protein from RNA.	K2
CO5	To understand about the genetic code and mechanism of gene expression and its control.	K2

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	S	S
CO2	M	M	M	M	M	M
CO3	S	M	S	S	S	S
CO4	M	S	S	M	S	S
CO5	S	S	S	S	S	S

S- Strong; M- Medium; L- Low

Unit-I: Introduction to Molecular biology (12 Hrs)

History of Molecular biology, Structure of Nucleic acids – types and forms. Physical and Chemical properties of DNA. Proof for DNA as genetic material (Griffith experiment, Avery experiment, Hershey and Chase experiments).

Unit- II: DNA replication and repair mechanism (12 Hrs)

DNA Replication – Enzymology – mechanism of prokaryotic replication. Differences in prokaryotic and eukaryotic replication. DNA repair – mechanism of base excision repair, nucleotide repair, SOS repair and mismatch repair.

Unit -III: Transcription (12 Hrs)

RNA Polymerases – Structure and function - Process of transcription – initiation, elongation – termination - rho dependent and rho independent.

Unit- IV: Translation (12 Hrs)

Genetic code, Translation system – Ribosomes, Transfer RNA, Amino acyl tRNA synthetases and translation factors. Process of translation – initiation, elongation and termination.

Unit -V: Regulation of gene expression (12 Hrs)

Regulation of gene expression - Operon concept – Inducible and repressible - lac and trp operons – Structural genes, promoters, operators and repressors.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

Sl no:	Book name	Author	Publisher	Year of publication
1	Microbial Genetics	Stanley R, Maloy, John E, Cronan, JR, David Freifelder	2nd Edition. Jones and Barlett Publishers, London 2th edition New delhi : Narosa publishing house	2012
2	Genetics	Peter J Russell	Benjamin Cummings	2002
3	Principles of Genetics	Peter Snustard D, Michael J. Simmons	Eight Edition, John Wiley & Sons. Inc.	2006
4	Principles of Genetics	Robert H Tamarin	7th Edition, Tata McGraw Hill Publication, New Delhi	2017
5	Cell and Molecular Biology	Gerald Karp	9th Edition. John Wiley & Sons, Inc	2019

REFERENCE BOOKS:

Sl No:	Book name	Author	Publisher	Year of publication
1	DNA repair and mutagenesis	Friedberg EC, Walter GC, Sied. W	ASM press	1995
2	Genetics	Ahluwalia K B	New Age International Pvt., Ltd	2009
3	Principles of Genetics	Peter Snustard D, Michael J. Simmons	Eight Edition, John Wiley & Sons. Inc.	2006
4	Principles of Genetics	Robert H Tamarin	7th Edition, Tata McGraw Hill Publication, New Delhi	2017
5	Cell and Molecular Biology	Gerald Karp	9thEdition. John Wiley & Sons, Inc	2019

WEB SOURCES:

http://www.molgen.mpg.de/

http://www.cellbio.com/

http://restools.sdsc.edu/

http://www.mcb.harvard.edu/biolinks.html

http://www.horizonpress.com/gateway

SYLLABUS DESIGNER:

1. Dr.S.Ramya Assistant Professor
2. Dr. A.Vidhya HOD & Assistant Professor

SKILL BASED SUBJECT II

CLINICAL PATHOLOGY & HEMATOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
IV		Skill based	30	2	30	2	0	0	2

COURSE OUTCOMES

To enable the students to understand the concepts of Laboratory techniques in diagnosis

COURSE OUTCOMES

On the successful completion of the course, students will be able to develop strong and potential skills to work in the clinical laboratories.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To apply appropriate microbiology laboratory techniques for the examination of blood and urine	**K3**
CO2	To apply appropriate microbiology laboratory techniques for the examination of body fluids	**K2**
CO3	To understand Haematology	**K2**
CO4	To understand the blood counts	**K2**
CO5	To understand the salient features of blood disorders	**K3**

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	M	M
CO2	S	S	M	M	M	M
CO3	S	S	S	S	M	M
CO4	S	M	S	S	S	S
CO5	S	S	S	S	S	S

S- Strong; M- Medium; L- Low

Unit I: Examination of blood and urine **(6Hrs)**

Collection and Preservation of blood and urine. Microscopic examination of urine, crystals, uric acids, amorphous urates, cystine, crystalline urates, phosphates, calcium carbonates, microbes.

Unit II: Examination of body fluids **(6Hrs)**

Examination of miscellaneous body fluids, CSF, Serous fluid, Synovial fluid. Gastric juice.

Unit III: **Hematology** **(6Hrs)**

Components of blood & their function. Routine hematological tests – Bleeding time, Clotting time, Determination of Hemoglobin concentration, Haematocrit value.

Unit IV: Blood count **(6Hrs)**

PCV, ESR, Differential leukocyte count, RBC, WBC count

Unit V: Blood Disorders **(6Hrs)**

Blood coagulations Mechanism, Fibrinolysis, Collection & Processing of blood for transfusion. Anemia's, leukemia's. Miscellaneous disorders.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	Kanai L. Mukherjee	Medical Labty Technology	Tata McGraw-Hill	2017

WEB REFERENCE:

https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology
https://www.slideshare.net/dryuktisharma/chapter-1-introduction-to-anatomy-and-physiology
https://en.wikipedia.org/wiki/List_of_systems_of_the_human_body
https://study.com/academy/lesson/what-are-the-organ-systems-of-the-human-body.html
https://en.wikipedia.org/wiki/Medical_laboratory

SYLLABUS DESIGNER:

1. Dr. A.Vidhya, Assistant Professor and Head

NON MAJOR ELECTIVE II

VERMITECHONOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
IV		Non major	30	2	30	2	0	0	2

COURSE OUTCOMES

To enable the students to understand the concepts of vermicomposting.

COURSE OUTCOMES

On the successful completion of the course, students will be able to develop strong and potential skills to work with vermicomposting.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To study about the types and properties of soil.	**K3**
CO2	To understand the biology of Earthworms and its role in Vermicomposting.	**K2**
CO3	To learn the ability of Earthworms in Organic farming and Solid waste reclamation.	**K2**
CO4	To provide the knowledge to the students about Organic farming through Composting and Vermicomposting.	**K2**
CO5	To understand the advantages of using Vermicompost.	**K3**

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	M	M
CO2	S	S	M	M	M	M
CO3	S	S	S	S	M	M
CO4	S	M	S	S	S	S
CO5	S	S	S	S	S	S

S- Strong; M- Medium; L- Low

Unit I: Types and properties of soil **(6Hrs)**

Soil general properties of the soil – structure of the soil – sand, clay, silt, types of soils – soil organisms. Properties of soil.

Unit II: **Earthworm Biology** **(6Hrs)**

Earthworms – Ecological classification of earth worms as Epigenesists – Introduction to earthworm biology – physical and chemical effects of earth worms on soils – Role of earthworms in soil – classification of earthworms based on ecological strategies – Burrowing activity of earthworms – Drilospheres – Microorganisms and their relationship with earthworms.

Unit III: **Composting** **(6Hrs)**

Composting – types of composting, Vermicompost - Earthworm species used in vermicompost production; Materials used for Vermicomposting; Vermicomposting methods – Small scale and Large scale; Packaging, marketing and Cost benefit analysis of Vermicompost.

Unit IV: Vermicomposting **(6Hrs)**

Vermiculture; Vermiculture unit – Materials required and maintenance; Vermiwash and its applications; Feeding habits and food for Composting worms; Importance of microorganisms as food for Earthworms; Problems in Vermiculture units and remedial suggestions. Pests, parasites and pathogens affecting Earthworms.

Unit V: Benefits of Vermicompost **(6Hrs)**

Applications of Vermicomposting in Agriculture and Horticulture practices; Earthworms in recycling of various solid wastes; Benefits of Earthworms other than Vermicomposting. Advantages of Vermicompost over Chemical inputs.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS

SL NO:	BOOK NAME	AUTHOR	PUBLISHER	YEAR OF PUBLICATION
01	Biotechnology	Satyanarayana, U.	12th Edition Books and Allied (P) Ltd., Kolkata, India.	2018
02	Soil Microbiology	Subba Rao N.S.	4th Edition Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.	2020

REFERENCE BOOKS

SL NO:	BOOK NAME	AUTHOR	PUBLISHER	YEAR OF PUBLICATION
01	Biology and Ecology of Earthworms.	Edwards, C. A and Bohlen, P. J.	Chapman and Hall, London.	1996
02	Earthworm Ecology: From Darwin to Agriculture.	Satchell, J. E.	Chapman and Hall, London Stephenson J., 1923. The fauna of British India - Oligo.	1983
03	Earthworm: Cinderella of organic farming.	Kale Radha, D.	Prism Books Pvt. Ltd., Bangalore, India.	2004
04	Vermicology: The Biology Earth worm.	Ismail, S. A.	Orient Longman, United Kingdom.	1997

SYLLABUS DESIGNER

1. Dr. A.Vidhya, Assistant Professor and Head

ALLIED IV- BIO-STATISTICS

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
III		Allied	60	4	60	4	0	0	4

COURSE OBJECTIVES:

The students will be able to apply statistical techniques in real life situations and to understand the basic concepts of statistical techniques.

COURSE OUTCOMES:

On the successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	Acquire basic knowledge of collection, classification, tabulation and diagrammatic representation of data and calculate various statistical measures	K2
CO2	Determine Arithmetic mean, median, mode, geometric mean, harmonic mean their properties and standard deviation able to solve many mathematical problems	K3
CO3	Gain the important features of range, Quartile and mean deviation and coefficient of variation	K2
CO4	Analyze difference between correlation and regression analysis and solve problems on correlation and regression analysis	K3
CO5	Apply the parametric test for small and large sample test the fields of scientific experimentation	K3

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	S	M
CO2	S	M	S	S	M	S
CO3	S	M	M	M	S	M
CO4	M	M	S	S	M	S
CO5	S	M	S	S	M	S

S – Strong; M – Medium; L - Low

UNIT I: BIO - STATISTICS INTRODUCTION (12Hrs)

Introduction - Scope and limitations of statistical methods – Types of Biological data- Classification of data - Tabulation of data - Diagrammatic and Graphical presentation of data.

UNIT II: MEASURES OF CENTRAL VALUE (12Hrs)

Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean and their properties - Standard deviation.

UNIT III: MEASURES OF DISPERSION (12Hrs)

Range, Quartile deviation, Mean deviation, Co-efficient of Variation.

UNIT IV: RELATION BETWEEN TWO OR MORE VARIABLES (12Hrs)

Karl Pearson Correlation- Regression Analysis: Simple Regression equations - Simple Problems only.

UNIT V: TESTS OF SIGNIFICANCE (12Hrs)

Small test based on Chi – Square test and F- test Distribution - ONE and TWO way classification.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOK

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	S.P.Gupta	Statistical Methods	Sultan Chand & Sons	2017

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	S.C.Gupta&V .K.Kapoor	Fundamental of Mathematical Statistics	Sultan Chand & Sons, New Delhi	2000
2.	Snedecor G.W. & Cochran W.G. Oxford	Statistical methods	Oxford and IBH Publishing Co., New Delhi	1967
3.	Mode - E.B. Elmer Beneken	Elements of statistics, 3rd Edition	Englewood cliffs, N.J. Prentice Hall	1961
4.	S.P.Gupta	Practical Statistics	Sultan Chand & Company	1979
5.	P.R.Vital	Business Mathematicsand Statistics	Margham Publications	2013

WEB RESOURCES

1. www.researchgate.net/publication/272237355_probability_and_mathematical_statistics.pdf
2. http://www.math.louisville.edu/~pksaho01/teaching/Math662TB-09S.pdf
3. https://www.coconina.edu>academics>Sabbatical_reports>kate_kozak
4. https://www.stat.pitt.edu/stoffer/tsa3/intro_prob.pdf
5. https://www.cavin.edu/~scofield/courses/m143/mateials/handouts/anova1And2.pdf

SYLLABUS DESIGNER:

1. Dr. A.Vidhya HOD & Assistant Professor

ALLIED MICROBIOLOGY - I

Semester	Subject Code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
III		Allied	60	4	60	4	0	0	4

COURSE OBJECTIVES

To enable the students to understand the basics of Microbiology

COURSE OUTCOMES

On the successful completion of the course, students will be able to know the basics in Microbiology.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the knowledge about the microscopes & the contributions of various scientists to the microbial world.	K2
CO2	To understand the nomenclature & classification of microorganisms.	K2
CO3	To understand the sterilization techniques & the role of antibiotics in the control of microorganisms.	K2
CO4	To understand the staining & cultivation techniques of different microorganisms.	K2
CO5	To understand about the growth pattern & nutrient uptake mechanisms of different microorganisms.	K2

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	S	S	S
CO2	S	S	M	M	S	M
CO3	S	M	M	S	M	M
CO4	S	S	S	S	S	S
CO5	S	M	S	M	S	M

S- Strong; M- Medium; L- Low

Unit -I: History and Microscopy (12hrs)

History and recent developments in Microbiology: Spontaneous generation, Biogenesis, Contributions of Louis Pasteur, Leewenhoek, Lazzaro Spallanzani, John Tyndall, Joseph Lister and Robert Koch. Microscopy – Simple, Compound – Bright field, Dark field, Phase contrast, Fluorescence and Electron microscopy.

Unit -II: Classification and anatomy of Microorganisms (12Hrs)

Binomial nomenclature of microbes, Five kingdom concept, Anatomy of Procaryotes and Eucaryotes.

Unit -III: Culture and Identifiation methods (12Hrs)

Culture techniques – Media preparation, Aerobic and anaerobic culture techniques. Staining methods – Dyes, Simple, Differential (Gram staining) and Special staining (Spore staining) methods. Development of laboratory techniques for pure and mixed cultures, Preservation of cultures. Microbial identification methods – morphological, physiological and biochemical methods.

Unit -IV: Antimicrobial Chemotherapy (12Hrs)

Antibiotics, its classification, mode of action, antimicrobial resistance and testing methods (Disc diffusion method).

Unit -V: Measurement of microbial growth (12Hrs)

Growth determination – Growth curve, Measurement of microbial growth. Structural characteristics of Algae – Chlorella, Fungi – Mucor and Protozoa – Entamoeba.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	General Microbiology	Robert F. Boyd	Times/Missor/Mosby College Publishers	1998
02	Fundamental Principles of Bacteriology	Salle A.J	McGraw Hill Publishers	2007
03	Microbiology	Pelczar JR M.J., Chan E.C.S. and Kreig N.R	McGraw Hill Publishers	2006
04	Brock – Biology of Microorganisms	Michael T. Madigan, John M. Martin K, Jack Parker	Prentice Hall, Pearson Education	2003
05	Microbial Physiology	Albert G. Moat, John W. Foster and Michael P. Spector	John Wiley and Sons	2008

REFERENCE BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Manual for identification of Medical Bacteria	Cowan and Steel	Cambridge University Press	2004
02	Introduction to Microbiology	John L.Ingraham & Catherine A	Ingraham. Book/Cole Thomson Learning	2000
03	Fundamentals of Microbiology	Edward Alcamo I	Jones and Barlett Publishers	2006
04	Biology of Microorganisms	Brock	15th Edition Prentice Hall, Pearson education	2017
05	Bergey's Manual of Determinative Bacteriology	John G. Holt, Noel R. Krieg, Peter H.A, James T. Staley and Stanely T. Williams	Lippincott Williams and Wilkins Publishers	2000
06	Microbiology	Prescott.M, JP Harley and D.A. Klein	Brown Publishers	2007

WEB SOURCES:

http;//gsbs.utmb.edu/microbook/toc.htm

http://www.sci-eng.mmu.ac.uk/biology/useful/27.htm.

http://www.microbes.info./resources/general_Microbiology/

www.microbiologyplace.com

http://www.med.umich.edu/tamc/links.html

SYLLABUS DESIGNER:

1. Mrs. A. Barathi Assistant Professor
2. Dr. A.Vidhya HOD & Assistant Professor

ALLIED MICROBIOLOGY - II

Semester	Subject Code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
IV		Allied	60	4	60	4	0	0	4

COURSE OBJECTIVES

To enable the students to understand the basics in various fields of Microbiology

COURSE OUTCOMES

On the successful completion of the course, students will be able to identify & isolate microorganisms from different samples and develop potential skills to execute their responsibilities in various research fields like gene cloning, medicine, etc.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the deep insight on methods to identify & culture microorganisms from different samples.	K2
CO2	To develop extreme skills & confidence about the diagnostic techniques in the field of medical microbiology.	K2
CO3	To attain extreme knowledge & responsibilities to the mankind & others in the world.	K2
CO4	To acquire an in-depth knowledge & potential skills in microbiology, the students are able to create an innovative world against deadly organisms.	K2
CO5	To acquire good, deep knowledge and strong skills to work in the various disciplines of Biotechnology.	K2

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	S	S
CO2	M	S	M	S	M	M
CO3	M	M	S	S	M	M
CO4	M	S	S	M	S	S
CO5	S	M	M	S	S	M

S- Strong; M- Medium; L- Low

Unit -I: Soil Microbiology (12Hrs)

Soil Microorganisms, soil structure, soil formation, soil types, soil characterization, importance & uses of soil.

Unit -II: Aquatic and Air Microbiology (12Hrs)

Aquatic microorganisms, Factors affecting microbial growth in aquatic environments. Sewage treatment – Physical, Chemical & Biological methods. Microbes in air, Distribution and source of Air borne organisms, Air borne diseases.

Unit -III: Food Microbiology (12Hrs)

Food microbiology – Microbial spoilage of foods, Food Preservation techniques, Microbes in milk and their source, Pasteurization techniques.

Unit -IV: Medically important pathogens (12Hrs)

Morphology, Cultural characteristics, Pathogenicity, Laboratory diagnosis and Prevention of infections caused by – Mycobacterium tuberculosis, Dermatophytes, Hepatitis and Entamoeba histolytica. Antigen-Antibody reactions.

Unit -V: Biotechnology (12Hrs)

Biotechnology – Definition of a gene, its structure, Cloning techniques, Genomic library, Gene therapy methods. Nanotechnology, SCP Production.

DISTRIBUTION OF MARKS: Theory **-** 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**
- **Seminars**

TEXT BOOKS:

S.no	Authors	Title	Publishers	Year of publication
1	Frazier WC and Westhoff DC	Food Microbiology.	Tata McGraw Hill Publishing Company LTD . New Delhi.	2013
2	Adams M.R and MO	Food Microbiology.	The Royal Society of Cambridge.	2015
3	EC Eldowrley S,Hardman OJ and Waite S.	Pollution :Ecology and Biotreatment.	Longman Scientific Technical.	1993

REFERENCE BOOKS:

S.no	Authors	Title	Publishers	Year of publication
1	Robinson RK	Dairy Microbiology,	John Wiley and Sons, Inc., United Kingdom.	2002
2	Banwart G.J.	Basic Food Microbiology.	Chapman & Hall ,New York.	1989
3	Stanbury. P.F, A. Whittakker & S.J. Hall	Principals of fermentation technology.	Pergmon Press.	2016
4	Baker KH and Herson OS.	Bioremediation	McGraw Hill , Inc. New York.	1994

WEB SOURCES

http://www.fsis.usda.gov/
http://www.microbes.info/
http://www.epa.gov/nerlcwww/

SYLLABUS DESIGNER:

1. Mrs. A. Barathi Assistant Professor
2. Dr. A.Vidhya HOD & Assistant Professor

ALLIED MICROBIOLOGY – PRACTICALS

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
IV		Practical	0	0	0	0	45	3	2

10. Cleaning of glass wares.
11. Sterilization principle and methods – moist heat, dry heat and filtration methods.
12. Media preparation – Liquid medium, solid medium – Nutrient agar slants, Nutrient agar deeps & Nutrient agar agar plates. Preparation of basal, enriched, selective and differential media.
13. Pure culture techniques – Serial dilution techniques (Pour plate & Spread plate) and Streak plate techniques,
14. Isolation of microorganisms from air – Open plate method.
15. Isolation of microorganisms from Soil, Sewage – Serial dilution methods
16. Microscopy – light microscopy & dark field microscopy.
17. Motility demonstration – Hanging drop technique.
18. Staining techniques – Simple staining, Gram's staining, Spore staining.
19. Fungal identification by Lacto phenol cotton blue staining technique.
20. Determining the quality of the milk sampe – Methylene Blue Reduction Test.

CORE V

MEDICAL BACTERIOLOGY

Semester	Subject code	Subject name	Category	Lecture		Theory		Practical		Credit
				Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
V		Medical Bacteriology	Core	75	5	75	5	0	0	5

COURSE OBJECTIVES

On the successful completion of the course students will be able to acquire knowledge about common agents and its causes

COURSE OUTCOMES

CO Number	CO Statement	Knowledge level (K1-K4)
CO1	To understand the procedures in collection and transportation of specimens by which an infectious agent causes disease	K1
CO2	To describe the normal flora and virulence factors of microbes.	K2
CO3	To remember the microbial pathogenesis ,transmission ,diagnosis, treatment of respiratory and pathogenic organisms	K3
CO4	To remember the microbial pathogenesis ,transmission ,diagnosis, treatment of intestinal and pathogenic organisms	K3
CO5	To understand the hospital borne infections and infection control programs.	K2

MAPPING

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	S	S
CO2	M	S	S	S	M	M
CO3	S	S	S	S	S	M
CO4	M	S	M	M	S	S
CO5	S	M	S	M	S	S

S- Strong; M- Medium; L- Low

Unit I: Collections and transport of specimens (15 Hrs)

Recommendation for Collections and transport of specimens. Primary Media for isolation and their quality control. Antibiotic sensitivity testing procedure.

Unit II: Host Parasite Relationships (15 Hrs)

Normal microbial flora of human body, Virulence factors of bacterial pathogens, Microbial infections-transmission of infections, carriers and their types. Host Parasite Relationships.

Unit III: Bacterial pathogens and associated diseases part I (17 Hrs)

Morphology, classification, cultural characteristics, pathogenicity, Lab diagnosis epidemiology, treatment, prevention and control of disease caused by *Staphylococcus aureus, Streptococcus pyogenes, Neisseriae gonorrhoea, Mycobacterium tuberculosis Corynebacterium diphtheriae, Bacillus anthracis, Clostridium botulinum, Clostridium tetani*

Unit IV: Bacterial pathogens and associated diseases part II (16 Hrs)

E.coli, Salmonella typhi Shigella dysenteriae, Vibrio cholerae, Pseudomonas aeruginosa, Treponema pallidum, Rickettisiae, Chlamydiae, Mycoplasmas and *Ureoplasmas***.**

Unit V: Nosocomial and Zoonotic diseases (12 Hrs)

Hospital acquired infection – infection control committee, Zoonotic diseases.

DISTRIBUTION OF MARKS: Theory **-** 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

S.NO	AUTHOURS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Collee JC, Duguid, JP, Fraser A.C., Marimon B.P. "Mackie and McCartny .	Textbook of Microbiology	Churchill Livingstone	1996
2.	Ananthanarayanan R and Jayaram Panicker, C.K.	Textbook of Microbiology	Orient Longman	2017
3.	.David Greenwood, Richard C.B, Slack, John Forest Peuthere	Medical Microbiology"	ELBS with Churchill Livingstone.	2003

REFERENCE BOOKS:

S.NO	AUTHOURS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Topley, Wilsons	Principles of Bacteriology, Virology and Immunology,	Edward Arnold, London	1995
2.	Patricia Tille	Bailey and Scott diagnostic Microbiology	Elesevier Health Science Division.	2013
3.	Jawetz L., J.L. Melnic and L.A. Adelberg	Medical Microbiology	Tata McGraw Hill.	2019
4.	David Greenwood, Richard C.B., Slark, John Forest Penthere	Medical Microbiology	Churchill Livingstone	2012
5.	Zinsser ,Wolfgang, Joklik and David T. Smith	Microbiology,	Appleton, Century Grafts, New York.	1995
6.	Cowan and Steel	Manual for Identification of Medical Bacteria,	Cambridge University Press, London.	2004
7.	John G. Holt, Noel R. Krieg, Peter H.H, Sneath, James T. Staley and Stanely T. Williams	Bergy's Manual of Determinative Bacteriology	Lippincott Williams and Wilkins Publishers	2013

WEB REFERENCE:

http://www.microbeworld.org/

http://www.microbes.info/

http://www.protocol-online.org/

http://www..microbiologyonline.org.uk/

http://microbiology.mtsinai.on.ca/manual/default.asp

SYLLABUS DESIGNER:

1. Mrs. S.Arunadevi Assistant Professor
2. Dr. A.Vidhya HOD, Assistant Professor

CORE VI

FOOD AND DAIRY MICROBIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
V		Core	60	4	60	4	0	0	4

COURSE OBJECTIVES

To enable the students to understand the aspects of microbial processes applicable in industries and scale up processes

COURSE OUTCOMES

On the successful completion of the course, students will be able to develop strong and potential skills in the various aspects of microbial processes in industries.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To identify microorganisms of relevance to food microbiology.	**K3**
CO2	To enable the students obtain the advanced knowledge on various food preservation methods	**K2**
CO3	To make the students to understand the sources of contamination and spoilage of various food and food products.	**K2**
CO4	To impart knowledge of various food borne diseases and its prevention.	**K2**
CO5	To understand the Microorganisms associated with milk and milk products and about the fermented foods.	**K3**

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	S	S
CO2	M	S	M	S	S	S
CO3	S	S	S	S	S	S
CO4	S	M	M	S	S	S
CO5	S	M	M	S	S	S

S- Strong; M- Medium; L- Low

Unit I: Food Microbiology **(12Hrs)**

Food as a substrate for microorganisms. Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, Microbial Foods: Mushrooms – *Agaricus bisporus*, *Volvariella* sp. – Cultivation – Nutritional value.

Unit II: Preservation of food **(14Hrs)**

Principles, physical methods of food preservation: temperature (low, high, canning, drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO_2, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins.

Unit III: Contamination and spoilage **(10Hrs)**

Sources of food contamination. Spoilage of vegetables, fruits, meat, fish, eggs, milk, bread and canned foods

Unit IV: Food borne diseases and intoxication **(12Hrs)**

Food borne disease – Food borne infections and intoxication – laboratory testing – preventing measures - Food sanitation – - Food sanitation and control – HACCP. Employee's health standards.

Unit V: Dairy Microbiology **(12Hrs)**

Microbiology of milk – Fermented dairy products – cheese – yoghurt. Nutritive value, method of production. Milk borne diseases. Bread – vinegar – Fermented Vegetables – Sauerkraut.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**

- **Group discussion**
- **Group assignments**

TEXT BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Frazier WC and Westhoff DC	Food Microbiology.	Tata McGraw Hill Publishing Company LTD . New Delhi.	2014
2	Adams M.R and Moss	Food Microbiology.	The Royal Society of Cambridge.	2015
3	Cassida, J.E	Industrial Microbiology	New Age International	2007
4	Patel A H	Industrial Microbiology.	Laxmi Publications, New Delhi; Second edition	2016

REFERENCE BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Robinson RK	Dairy Microbiology,	John Wiley and Sons, Inc., United Kingdom.	2002
2	Banwart G.J.	Basic Food Microbiology.	New Delhi : CBS Publishers & Distributors Pvt. Ltd.	2004
3	Stanbury. P.F, A. Whittakker & S.J. Hall	Principals of fermentation technology.	Pergmon Press.	2005
4	Peppler, H. J. and Pearlman, D.	Microbial Technology	Academic press.	2014
5	Demain, A. L. and Soloman INA	Manual of Industrial Microbiology and Biotechnology	American society for Microbiology, Washington DC.	1986

WEB REFERENCES

http://www.fsis.usda.gov/

http://www.microbes.info/

http://www.epa.gov/nerlcwww/

SYLLABUS DESIGNER

1. Dr. A.Vidhya, Assistant Professor and Head

CORE VII

MEDICAL MYCOLOGY AND PARASITOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
V		Core	60	4	60	4	0	0	4

COURSE OBJECTIVES

To enable the students to understand the fungi and parasite that cause infections to human beings and how it diagnosed and its preventive measures.

COURSE OUTCOMES

On the successful completion of the course, students will be able to understand the disease caused by fungi and parasite and its mode of transmission, diagnosis and prevention.

CO Number	CO Statement	Knowledge Level K1 – K4)
CO1	To understand the taxonomic of fungi, diagnosis of infections, antifungal agents	K2
CO2	To understand how the different types of fungi that cause different type of skin infections and its diagnosis	K2
CO3	To understand the diseases caused by systemic mycosis and its allergic reaction.	K2
CO4	To understand the classification of parasites and the protozoan diseases	K2
CO5	To understand the diseases that was caused by the metazoan parasites.	K2

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	L	M	S	M
CO2	S	M	L	M	S	S
CO3	S	M	M	M	S	S
CO4	S	S	M	M	S	S
CO5	S	M	M	M	S	S

S- Strong; M- Medium; L- Low

Unit-I: Introduction to Mycology **(12 Hrs)**

General Introduction: Morphology and Taxonomy of fungi of medical importance. Detection and recovery of Fungi from clinical specimens - Immunity to fungal infections - Antifungal agents - sensitivity tests - Mycotoxins.

Unit-II: Superficial, cutaneous and subcutaneous mycosis **(12 Hrs)**

Superficial mycosis: Tenia, Piedra, Cutaneous mycosis: Sporotrichosis. Mycetoma.

Unit-III: **Systemic and opportunistic mycosis** **(12 Hrs)**

Systemic mycosis: Coccidiosis, Histoplasmosis, opportunistic mycosis: Candidiosis, Aspergillosis. Allergic fungal diseases: Bronchial asthma, Maple Bark Stripper's disease

Unit-IV: **Protozoan diseases** **(12 Hrs)**

General properties, Classification, Morphology, Pathogenesis, Lab diagnosis of common Protozoan diseases – Amoebiasis, Giardiasis, Leishmaniasis, Trypanosomiasis, Balantidiosis.

Unit-V: **Parasitic metazoan diseases** **(12 Hrs)**

Classification, Morphology, Pathogenicity, Lab diagnosis of common parasitic metazoan diseases - Ascariasis, Filariasis, Hydatididosis, Taenia, Fasciola infection.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	Karyakarte RP and AS Damle	Medical Parasitology Revised edition	Books and Allied Pvt Ltd	2012
2.	Alexopoulos C.J and C.W. Mims	Introduction to Mycology	Wiley Eastern Ltd.	2007

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	Subhash Chandra Parija.	Textbook of Medical Parasitology	All India Publishers and Distributors, India.	2013
2.	Mehrotra RS and Aneja KR	An Introduction to Mycology	New age International Pvt Ltd.	2015
3.	Easwari Nayar	Handbook On Medical Entomology	Kalpana printing house, LHI	1974
4.	W.R.Arora	Medical Parasitology	CBS Publishers & Distributers. New Delhi.	2015
5.	Jagdish Chander	Textbook of Medical Mycology	Jaypee Brothers Medical Publishers, India	2017

WEB REFERENCE

http://pathmicro.med.sc.edu/book/mycol.sta.htm.

http://www.mycology adelaide.edu.au/fungal jungle/master class.html.

http://classes.plant path.Wsu.edu/plp521/

http:/www.k-state.edu/book/parasit-sta.htm.

http://www.dpd.cdc.gov/dpdx/.

http://www.who.int/tdr/media/default.html

SYLLABUS DESIGNER:

1. Ms. R.Sangeetha Assistant Professor
2. Dr. A.Vidhya HOD &Assistant Professor

ELECTIVE I - RECOMBINANT DNA TECHNOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
V		Elective	45	3	45	3	-	-	3

COURSE OBJECTIVES

To enable the students to understand the basics of Recombinant DNA Technology

COURSE OUTCOMES

On the successful completion of the course, students will be able to know the basics of Recombinant DNA Technology

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand tools of r-DNA technology	K2
CO2	To understand and get familiarized about Cloning vectors	K2
CO3	To understand about Cloning Strategies	K2
CO4	To understand about Molecular Techniques in R-DNA Technology	K2
CO5	To understand about the Applications of genetic engineering	K2

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	M	M	M	M
CO2	M	M	M	S	M	M
CO3	M	M	M	M	M	M
CO4	M	M	M	M	M	M
CO5	M	M	M	S	S	S

S- Strong; M- Medium; L- Low

UNIT-I: Tools for r-DNA technology (8 hours)

DNA modifying enzymes and their uses in recombinant DNA technology: Restriction endonucleases, DNA ligases, Reverse Transcriptase, Alkaline Phosphatase, Taq polymerase.

UNIT-II: Cloning Vectors (9 hours)

Bacterial vectors for Prokaryotes – pBR322, pUC, Bacteriophage Vectors - Lambda (insertion & replacement vectors) and M13, Cosmids, Artificial chromosomes (YAC), Vectors for plant and animal cells (Ti plasmids and Viral vector - SV 40). Specialized vectors – Shuttle vectors.

UNIT-III: Cloning Strategies (10 hours)

Steps involved in Gene cloning, Construction of genomic DNA libraries (shotgun cloning) and cDNA libraries. Screening of recombinants - Antibiotic resistance, lac Z, α complementation (Blue-white selection). Colony Hybridization and Immunological screening for expressed genes.

UNIT-IV: Molecular Techniques (8 hours)

Techniques: PCR - Principle, types and applications. Nucleic acid and protein hybridization techniques - Southern blotting, Western blotting and Northern blotting.

UNIT-V: Applications of genetic engineering (10 hours)

Biotechnological applications of r DNA technology: Therapeutic products for use in human health care- insulin, Hepatitis B vaccine using rDNA technology- Gene therapy for ADA and cystic fibrosis. Forensic applications - DNA Profiling.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**

- **Group assignments**

TEXT BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Molecular Biology	Freifedler	Narosa Publishing House New Delhi	2004
02	Gene cloning	Brown T.A.	Wiley & Sons	2010
03	Introduction to Genetic Engineering	Old, R.S and Primrose	Blackwell Scientific Publications,	2001

REFERENCE BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Gene targeting protocols	Eric B Kmiee	Human Press Inc	2013
02	Recombinant DNA Technology	Watson JD, Gilman M,Witkoski J, Zoller. M	2nd Ed. Scientific American Books.	1992
03	Recombinant DNA Technology	Keya Chaudhuri	The Energy and Resources Institute, TERI	2015
04	Principles of Gene Manipulation	Old, R.S and Primrose	Blackwell Scientific Publications,	2006

WEB SOURCES:
www.nature.com

www,sciencedirect,com

www.springer.com

www.nptel.com

SYLLABUS DESIGNER:

1. Dr.J.Hemapriya, Assistant Professor
2. Dr. A.Vidhya HOD & Assistant Professor

ELECTIVE II - PRINCIPLES OF BIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
V		Elective	45	3	45	3	-	-	3

COURSE OBJECTIVES

To enable the students to understand the basics of biology and its principle

COURSE OUTCOMES

On the successful completion of the course, students will be able to understand the basics of various branches of biology related to human development and acquire sound knowledge on evolution and environmental biology.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To remember the process involved in cell signaling and its structural organization	K1
CO2	To understand about the steps involved in the developmental biology	K2
CO3	To understand the basic concepts of physiology and its regulation	K2
CO4	To understand about the origin of life in earth and theories behind evolution.	K2
CO5	To understand about population ecology, food chain and environmental biology	K2

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	M	M	M	M	M
CO2	M	M	M	S	M	M
CO3	M	M	M	M	M	M
CO4	M	M	M	M	M	M
CO5	M	M	M	S	S	S

S- Strong; M- Medium; L- Low

Unit I: Cellular Organization & Cell signaling (9 Hrs)

Cell membrane – Chemical composition & its functions, Cell signaling – Hormones and their receptors – Intracellular Receptor & Cell surface receptor, Cell Communication – General Principles – Cell adhesion and roles of different adhesion molecules (integrins – Selectins) – gap junctions – extracellular Matrix.

Unit II: Developmental Biology (9 Hrs)

Gametogenesis, fertilization and Early development: Production of gametes, Cell Surface molecules in sperm-egg recognition in animals; embryo sac development and double fertilization in plants; Zygote formation, cleavage, blastula formation, gastrulation and formation of germ layers in animals; embryogenesis.

Unit III: Physiology (9 Hrs)

Physiology: Response to stress; Active transport across the membranes; Plant and animal hormones; Nutrition; Reproduction in Plants, Microbes and animals.

Unit IV: Evolutionary Biology (9 Hrs)

Evolutionary Biology: Origin of life (including aspects of prebiotic environment and molecular evolution); Lamarck; Darwin - Concepts of variation, adaptation, struggle, fitness and natural selection.

Unit V: Environmental Biology (9 Hrs)

Environmental Biology: Concept and dynamics of ecosystem, Components, food chain, energy flow and productivity; Types of ecosystems, Population ecology and biological control.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**

❖ **Group assignments**

TEXT BOOKS:

S.No	Authors	Title	Publishers	Year of Publication
1.	Maloy SR, Cronan JR , JE. Friedfelder	Microbial Genetics	Narosa Publications	2008
2	Lodish H,Baltimore O,Berk A,Zipursky S L,Matsudaira P, Darnell L	Molecular Cell Biology	New York W.H.Freeman	2000

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year of Publication
1.	Vijaya Ramesh K	Environmental Microbiology	MJP Publishers	2019
2.	Benjamin Lewin	Genes VIII	Pearson Prentice Hall, USA	2004
3.	Mitcheli Reed	Environmental Microbiology	John Wiley & Sons, New York.	1992
4.	Lewin	Genes VII	Oxford University Press	2000
5.	Brown. T.A	Essentials of Molecular Biology	Freeman Publishing House	2003

WEB REFERENCES

http://www.molgen.mpg.de/

http://www.cellbio.com/

http://restools.sdsc.edu/

SYLLABUS DESIGNER:

1. Dr. J.Hemapriya, Assistant Professor
2. Dr. S.Ramya Assistant Professor

PRACTICAL III: MEDICAL MICROBIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
V		Practical	0	0	0	0	60	5	3

1. General requirements of collection, transport of clinical specimens – Direct Examination – staining of specimens methods of Enriched, Selective and Enrichment culture techniques.

2. KOH and Lactophenol preparations for skin scrapings of fungi.

3. Enumeration of Bacteria in urine. Quantitative urine culture.

4. Germ tube, Assimilation, fermentation tests for yeasts.

5. Isolation and identification of Bacterial pathogens from clinical specimens, their biochemical reactions.

6. Antimicrobial sensitivity testing - Kirby bauer method – MIC - broth dilution method and quality control.

7. Wet mount preparation of stool samples for the identification of ova and cysts.

8. Blood smear preparation for Malarial Parasite

PRACTICAL IV: APPLIED MICROBIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
V		Practical	0	0	0	0	60	4	3

1. Isolation of microorganisms from different spoiled food samples

2. Detection of bacteria in milk by SPC, Dye reduction test. Detection of numbers of bacteria in milk

3. Isolation of Lactobacillus and Staphylococcus from curd.

4. Litmus milk reaction

5. Lipase and Phosphates test

6. Microbial spoilage of refrigerated food.

7. Microbiology of fermented milk product – yogurt, curd.

8. Water analysis by MPN technique

    Presumptive coliform test

    Confirmed coliform test

    Completed coliform test

9. Isolation of microorganisms from Air – Air samples technique and settle plate method.

10. Isolation and counting of fecal bacteria from water.

11. Azolla – Morphological study; seed inoculation with Rhizobia.

12. Isolation of fungi from Molted leaves

SKILL BASED SUBJECT III

BIOCHEMISTRY, HISTOPATHOLOGY & CYTOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
V		Skill based	30	2	30	2	0	0	2

COURSE OBJECTIVES

To enable the students to understand the concepts of Laboratory techniques in diagnosis

COURSE OUTCOMES

On the successful completion of the course, students will be able to develop strong and potential skills to work in laboratories.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To apply appropriate biochemical laboratory techniques and methodologies in accordance with current laboratory safety protocols	**K3**
CO2	To characterize the bacterial pathogenesis, transmission, diagnosis and its susceptibility.	**K2**
CO3	To understand the functions of liver and kidney	**K2**
CO4	To understand the salient features of Histopathology.	**K2**
CO5	To understand the salient features of cytology.	**K3**

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	M	M
CO2	S	S	M	M	M	M
CO3	S	S	S	S	M	M
CO4	S	M	S	S	S	S
CO5	S	S	S	S	S	S

S- Strong; M- Medium; L- Low

Unit I: Biochemical Estimation (6Hrs)

Estimation of Chloride, Serum Calcium, Sodium, Potassium, Urinary Calcium, Urinary Protein, Chyle etc., and its clinical significance

Unit II: Biochemical Estimation (6Hrs)

Detection of Bile pigments – bilirubin, Urobilin, Cocobilinogen. Detection of blood urea, blood cholesterol, serum creatinine.

Unit III: Organ Function tests (6Hrs)

Liver functions test. Renal function test, Estimation of blood sugar. Glucose tolerance test.

Unit IV: Histopathological Examinations (6Hrs)

Method of examination of Tissues, Fixation, Tissue processing, Sectioning ,Staining decalcification of tissues.

Unit V: Cytology (6Hrs)

Cytology – Collection of specimens, Staining. Study of normal and abnormal cells.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	Kanai L. Mukherjee	Medical Laboratory Technology	Tata McGraw-Hill	2017

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	H. Varley	Practical Clinical Biochemistry	CBS Publishers	2006
2	Ranjna Chawla	Practical Clinical Biochemistry	Jaypee Brothers Medical Publishers	2014
3	N.Blau	Physician's Guide to the Laboratory Diagnosis of Metabolic Diseases	Springer	2012
4	David L.Williams	Scientific Foundations of Biochemistry in Clinical Practice	Butterworth-Heinemann	2014
5	Robert H. Glew	Clinical studies in Medical Biochemistry	Oxford University Press	2006

WEB REFERENCE:

https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology
https://www.slideshare.net/dryuktisharma/chapter-1-introduction-to-anatomy-and-physiology
https://en.wikipedia.org/wiki/List_of_systems_of_the_human_body
https://study.com/academy/lesson/what-are-the-organ-systems-of-the-human-body.html
https://en.wikipedia.org/wiki/Medical_laboratory

SYLLABUS DESIGNER:

1. Dr. A.Vidhya HOD & Assistant Professor

CORE VIII

MEDICAL VIROLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
VI		Core	75	5	75	5	0	0	5

COURSE OBJECTIVES

To enable the students to understand the causative agents and pathogenicity of virus that causes infection.

COURSE OUTCOMES

On the successful completion of the course, students will be able to understand the viral diseases and how it prevents or control with different antiviral agents.

CO Number	CO Statement	Knowledge Level K1 – K4)
CO1	To remember the classification of virus based on several criteria and about subviral particles	K1
CO2	To understand how the replication of virus was happened, cultivation and its diagnostic methods	K2
CO3	To understand the diseases caused by DNA containing viruses and its diagnosis	K2
CO4	To understand the disease caused by RNA containing viruses and its diagnosis	K2
CO5	To remember the preventive measures like antiviral therapy and vaccines for viral diseases	K1

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	S	M	M
CO2	S	M	M	S	M	S
CO3	S	S	M	M	S	S
CO4	S	S	M	M	S	S
CO5	S	M	S	M	S	S

S- Strong; M- Medium; L- Low

Unit- I: Introduction to Virology **(15 Hrs)**

General properties and classification of viruses based on their hosts, nucleic acid. Structure and properties of viroids, prions, satellite RNAs and virusoids. Viral replication.

Unit-II: General lab diagnosis and cultivation of viruses **(10 Hrs)**

Diagnosis of virus infections – isolation, serology, electron microscopy and hybridization techniques. Cultivation of viruses – Animal inoculation, egg and tissue culture.

Unit-III: **DNA Viruses** **(17 Hrs)**

Structure, Pathogenesis, Epidemiology, diagnosis, prevention and treatment of Pox, Adeno and Herpes viruses, Hepatitis. Introduction to oncogenic viruses.

Unit-IV: **RNA Viruses** **(18 Hrs)**

Structure, Pathogenesis, Epidemiology, diagnosis, prevention and treatment of Rabies viruses, Picorna viruses, Orthomyxo and Paramyxo viruses, Arthropod borne viral diseases, Reo, Rota, Nido, Filo and AIDS viruses

Unit-V: **Prevention and treatment of viral diseases** **(15 Hrs)**

Transmission of viral diseases. Prevention and treatment of viral diseases - Antiviral drugs, viral vaccines – Recombinant vaccines and interferons.

DISTRIBUTION OF MARKS: Theory **-** 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	David Greenwood, Richard C. B.,	"Medical Microbiology."	ELBS with Churchill Livingstone	2003
2.	Ananthanarayanan R. and Jayaram Panicker C.K.	"Textbook of Microbiology".	Orient Longman	2017

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	Balow S. A., Hauser. W.J, Ohauhi. M.,and Turano.A	Laboratory diagnosis of infectious diseases. Principles and Practice (Vol 1)	Springer – Vertag, New York	2011
2.	Morag C & Timbury M C	Medical Virology	Churchill Livingston, London	1994
3.	Calender R	The Bacteriophages	Oxford University Press	2005
4.	Jawetz, E., J. L. Melnic and E. A. Adelberg.	Review of Medical Microbiology,	Lange Medical Publishers, New York.	2013.

WEB REFERENCE:

http://web.uct.aqc.za/depts/mmj/jmoodie/welcome1.html

http://vm.cfsan.fda.gov/~mow/intro.html

http://medicine.wustl.edu/virology/

http://www.virilogy.net/garryfavwebaids.html

SYLLABUS DESIGNER:

1. Ms. R.Sangeetha Assistant Professor
2. Dr. A.Vidhya HOD &Assistant Professor

CORE IX

ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
VI		Core	60	4	60	4	0	0	4

COURSE OBJECTIVES

To enable the students to understand the concepts of Environmental and Agricultural Microbiology.

COURSE OUTCOMES

On the successful completion of the course students will be able to acquire knowledge about common agents and its causes

CO Number	CO Statement	Knowledge level (K1-K4)
CO1	To learn the diversity of microorganism and microbial communities inhabiting at a multitude of habitats and occupying a wide range of ecological habitats.	K3
CO2	To know the Microorganisms responsible for Air pollution especially Air-borne pathogenic microorganisms and their transmission	K3
CO3	To comprehend the various methods to determine the Sanitary quality of water and sewage treatment methods and Water-borne pathogenic microorganisms and their transmission	K3
CO4	To understand various plant microbes interactions especially rhizosphere, phyllosphere and mycorrhizae and their applications especially the biofertilizers and various biogeochemical cycles – Carbon, Nitrogen, Phosphorus cycles etc. and microbes involved	K3
CO5	To understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems – waste water treatment and bioremediation .	K3

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	S	S
CO2	M	S	S	S	M	M
CO3	S	S	S	S	S	M
CO4	M	S	M	M	S	S
CO5	S	M	S	M	S	S

S- Strong; M- Medium; L- Low

Unit I: Microbial ecology **(12 Hrs)**

Introduction : structure and function of ecosystem , Natural habitats of microorganisms. Microbial communities in aquatic & terrestrial habitats, Extreme habitats in environment Microorganisms as components of ecosystems as producers & decomposers.

Unit II: Microbiology of air **(12 Hrs)**

Microbiology of air - Composition, Distribution and sources of air borne organisms, Droplet and droplet nuclei, Assessment of air quality; Air sanitation, Air borne disease.

Unit III: Aquatic microbiology **(12 Hrs)**

Aquatic microbiology – Microbial assessment of water quality, purification. Waterborne disease. Microbiological analysis of water purity, Indicator organisms, ground water quality.

Unit IV: Soil microbiology **(12 Hrs)**

Soil microbiology – Physiochemical properties of soil and interaction of microorganisms with – plants – rhizosphere – phyllosphere Microbial interactions – symbiosis, mutualism, commensalisms, competition, ammensalism, synergism, parasitism and predation –Major Biogeochemical cycles – carbon, nitrogen, phosphorus, sulfur.

Unit V: Waste water Microbiology **(12 Hrs)**

Waste water treatment – liquid wastes, solid wastes. Bioremediation- Degradation of xenobiotic compounds. bio manure ,- advantages and processing parameters.

DISTRIBUTION OF MARKS: Theory **-** 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**

❖ **Group assignments**

TEXT BOOKS:

Sl No:	Book name	Author	Publisher	Year of publication
01	Biofertilizers in Agriculture and Forestry,	Subba Rao. N.S	Medtech	2017
02	Environmental aspects of Microbiology	Joseph C. Daniel	MFJ Publications	1998
03	Environmental Microbiology	Vijaya Ramesh, K.	MJP Publishers, Chennai, India.	2019
04	Soil Microbiology	Subba Rao N.S.	Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.	2020

REFERENCE BOOKS:

Sl no:	Book name	Author	Publisher	Year of publication
01	Microbial Ecology.	Campbell R	2nd Ed. Blackwell Scientific Publications. London	1983
02	Aquatic Microbiology,	Reinheimer, G	2nd Ed. John Wiley andSons, hichestes, London.	2001
03	Introduction to Soil Microbiology.	Alexander M	John Wiley and Sons N.Y.press	2000
04	Introduction to Environmental Microbiology.	Mitchell R	Prentice – Hall. Inc. Englewood Clifs – New Jerry.	1994
05	Environmental Microbiology	Maier, R. M., I. L. Pepper and C. P. Gerba.	Edition, Academic Press, United States.	2014

WEB SOURCES:

http://www.environmentalmicrobiology.mpg.de/

http://www.wastewater.com/

http://aquatis dcsc.edu/

http://www.env.harvard.edu/biolinks.html

http://www.horizonpress.com/gateway

SYLLABUS DESIGNER:

1. Mrs. S.Arunadevi Assistant Professor
2. Dr. A.Vidhya HOD, Assistant Professor

CORE X

INDUSTRIAL AND PHARMACEUTICAL MICROBIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
VI		Core	60	4	60	4	0	0	4

COURSE OBJECTIVES

To enable the students to understand the aspects of microbial processes applicable in industries and scale up processes

COURSE OUTCOMES

On the successful completion of the course, students will be able to develop strong and potential skills in the various aspects of microbial processes in industries.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To identify microorganisms of relevance to healthcare and the pharmaceutical industry and their sources.	**K3**
CO2	To enable the students obtain the advanced knowledge in Industrial productions and to work in fermentation industries.	**K2**
CO3	To make the students self reliance in the pharmaceutical industry. Entrepreneurship can be established with the gained knowledge.	**K2**
CO4	To impart knowledge of various methods of disease control. With the knowledge students can work in hospitals, pharmacy and industries.	**K2**
CO5	To demonstrate and understand microbiological assays of growth promoting, growth inhibiting substances and acquire knowledge of GMP practices.	**K3**

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	S	S
CO2	M	S	M	S	S	S
CO3	S	S	S	S	S	S
CO4	S	M	M	S	S	S
CO5	S	M	M	S	S	S

S- Strong; M- Medium; L- Low

Unit- I Industrially important microorganisms **(12 Hrs)**

General concepts of Industrial Microbiology – Principles of exploitation of microorganisms and their products, Improvement of strains – Development of inoculum for various fermentation process – Media for Industrial fermentation – formulation – sterilization.

Unit-II: **Industrial productions** **(12 Hrs)**

Microbial production of Solvent - Ethanol, Organic acids-Citric Acid, Amino acids – Glutamic acid, Antibiotics – Penicillin, Enzymes – Protease, Vitamins – B12.

Unit-III: **Pharmaceutical Microbiology** **(12 Hrs)**

Ecology of Microorganism affecting Pharmaceutical Industries– atmosphere –water, raw materials- packaging equipment. Hygiene and protective clothing.

Unit-IV: Pharmaceutical productions and standardization **(12 Hrs)**

Production of bacterial and viral vaccines, toxoid, antisera and their standardization. Antiseptics and disinfectants- types, mode of action and their standardization.

Unit V: Sterility testing and Quality control **(12 Hrs)**

Sterilization types - sterilization monitor - sterility test – pyrogen testing. Disinfectants and its evaluation – Ridel walker method, Chick – martin test. Microspoilage and preservation of pharmaceutical products. Quality control of pharmaceutical products.

DISTRIBUTION OF MARKS: Theory **-** 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**
- **Seminars**

TEXT BOOKS:

Sl No:	Book Name	Author	Publisher	Year of Publication
01	Industrial Microbiology	Casida, J.E	New Age International	2007
02	Industrial Microbiology.	Patel A H	Laxmi Publications, New Delhi; Second edition	2016
03	Industrial Microbiology.	Presscott and Dunn, S.,	The AVI Publishing Company Inc., USA; 4th edition.	1982

REFERENCE BOOKS:

Sl No:	Book Name	Author	Publisher	Year of Publication
01	Principles of fermentation technology,	Stanbury, P.F., Whittaker, A and Hall, S.J.,	Pergmon Press.	2005
02	Microbial Technology	Peppler, H. J. and Pearlman, D.	Academic press.	2014
03	Manual of Industrial Microbiology and Biotechnology	Demain, A. L. and Soloman INA	American society for Microbiology, Washington DC.	1986
04	Encyclopedia of Bioprocess Technology, Vol. 5,	Chisti, Y., Fermentation, Biocatalysis and bioseparation,.	John Wiley and Sons, N. Y	2000
05	Industrial Microbiology. Published by Student Edition,	Agarwal AK & Pradeep Parihar (2006).	Agrobios, India	2016
06	A text book of Industrial Microbiology and Biotechnology	Crueger and Crueger	Medtech.	2017

WEB REFERENCES:

http://www.biocarta.com/pathfites/h.glycolysis pathway.asp

http://www.pinkmonkey.com/studyguides/subjects/biology-edited/chap5/b0505601.asp.

http://wwww.sp uconn.edu/v ferry/229 spo3/lecturers/catabolism.html

http:// mcb berkely:edu/labs/kustu/mcb110/lecturer-notes.htm

http//www. Nuigelway.ie/microbiology/ cpoblab/teaching.html

SYLLABUS DESIGNER:

1. Dr. A.Vidhya HOD &Assistant Professor

ELECTIVE III

MICROBIAL BIOTECHNOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
VI		Core	45	3	45	3	0	0	3

COURSE OBJECTIVES

To provide the first- line knowledge of utilizing microbes for the industrial production of an array of economically viable products possessing a variety of human applications.

COURSE OUTCOMES

On the successful completion of the course, students will be able to develop strong and potential skills in the various aspects of microbial processes in industries.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To enable the students to acquire knowledge in Microbial Biotechnology and Fermentation.	**K3**
CO2	To enable the students obtain the advanced knowledge in Industrial productions and to work in fermentation industries.	**K2**
CO3	To impart knowledge in producing SCP and Biofuels. Entrepreneurship can be established with the gained knowledge.	**K2**
CO4	To impart knowledge of various biofertilizers, biopesticides and transgenic animals. With the knowledge students can acquire interest in doing research in agricultural Microbiology.	**K2**
CO5	To understand and acquire knowledge of IPR and Biological ethics.	**K3**

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	S	S
CO2	M	S	M	S	S	S
CO3	S	S	S	S	S	S
CO4	S	M	M	S	S	S
CO5	S	M	M	S	S	S

S- Strong; M- Medium; L- Low

MICROBIAL BIOTECHNOLOGY

UNIT- I: Fermentation Technology (12Hrs)

Basic design and construction of fermenter - Mode of operation – instrumentation and control, Fermentation- general concepts, Applications of fermentation; Types of fermentation- Submerged and solid state fermentation, Antifoams, Downstream processing.

UNIT-II: Microbial Biotechnology (12Hrs)

Biotechnology: Definition – Milestones in History - Scope of microbial biotechnology and its applications. Microbial production of streptokinase, Edible vaccine, Xanthan, Dextran, Biosurfactants, Microbial production of bioplastics.

UNIT-III: Algal Biotechnology (12Hrs)

Single cell protein (algae and yeast). Microalgal technology – Industrial cultivation methods of *Spirulina* – biotechnological potentials of *Spirulina* as: food and feed – fuel production from microalgae – pharmaceutically valuable compounds from microalgae. Commercial production of bio-ethanol and bio-diesel using lignocellulosic waste, Biogas.

UNIT-IV: Plant and Animal Biotechnology (12Hrs)

Microbial production of biofertilizers – (*Rhizobia, Azospirillum, Frankia* and VAM). Microbial production of bio-pesticides (*Bacillus thuriengiensis*) – Development of insect, virus and herbicide resistant plants. Transgenic animals: methods of creating transgenic mice and sheep.

UNIT-V: IPR and Bioethics (12Hrs)

Intellectual Property Rights (IPR) - different types of IPRs - Principles of Bioethics (IB) - Definition of Ethics and Bioethics. - Ethics committee - Brief account on risks and ethics of modern biotechnology - Ethical concerns in human gene therapy - Ethical limits of animal use.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS

Sl No:	Book Name	Author	Publisher	Year of Publication
01	Molecular Biotechnology	Glick BR. and Pasternak JJ	ASM press, Washington DC	2010
02	Biotechnology	Satyanarayana U.	Books and Allied Pvt. Ltd.	2013
03	A textbook of Biotechnology.	Dubey RC. 2013.	S. Chand and Company Ltd.	2014
04	Elements of Biotechnology	Gupta PK. 2nd edition.	Rastogi Publications.	2015

REFERENCES

Sl No	Book Name	Author	Publisher	Year of Publication
01	Principles of Gene Manipulation,	Old RW and Primrose SB.	Blackwell Scientific Publications, London.	2006
02	An Introduction to Genetic Engineering	Desmond ST Nicholl.	Cambridge university press.	2012
03	Biotechnology – The basic principles	Trevan MD, Boffey S, Coulding KH and Stanbury P edition.	Tata McGraw Hill	1995
04	Recombinant DNA-	Watson JD, Gilman M, Witkowski J, Zoller M.	Scientific American Books.	1992

SYLLABUS DESIGNER:

1. Dr. A.Vidhya HOD & Assistant Professor

ELECTIVE IV

MARINE MICROBIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
VI		Core	45	3	45	3	0	0	3

COURSE OBJECTIVES

To enable the students to understand the basics of Marine Microbiology

COURSE OUTCOMES

On the successful completion of the course, students will be able to know the basics of Marine Microbiology

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the significance of Marine Ecosystem	K2
CO2	To understand and get familiarized with Marine Biodiversity	K2
CO3	To understand about Marine Pollution and Bioremediation	K2
CO4	To understand about Marine Microbial Diseases and Marine Research Centers	K2
CO5	To understand about Marine Microbial Technology	K2

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	M	M
CO2	S	S	M	M	M	M
CO3	S	S	S	S	M	M
CO4	S	M	S	S	S	S
CO5	S	S	S	S	S	S

S- Strong; M- Medium; L- Low

Unit-I: Marine Ecosystem **(9Hrs)**

Marine environment–properties of seawater, Ecology of benthic & littoral zone, saltpan, mangroves and estuarine microbes, Marine microbial symbionts –Seaweeds - microbial interactions, coral-microbial association, sponge-microbial interactions.

Unit-II: Marine Biodiversity **(9Hrs)**

Marine Extremophiles - Thermophiles, Halophiles, Alkaliphiles, Barophiles, Psychrophiles. Adaptation strategies of Halophiles. Hydrothermal vents, Biotechnological applications of extremozymes from extremophilic organisms.

Unit- III: Marine Pollution & Bioremediation **(9Hrs)**

Microbial consortia and genetically engineered microbes in bioremediation of polluted marine sites – heavy metals and crude oil. Biofouling on marine structures and their control, Marine algal blooms and its control

Unit-IV: **Marine Microbial Diseases and Marine Research Centers** **(9Hrs)**

Marine food borne pathogens –*Aeromonas, Vibrio, Salmonella, Pseudomonas,* and algal toxins. Marine research centers in India- National Institute of Oceanography (Goa), National Institute of Ocean Technology (Chennai), Central Institute of Fisheries Technology (Kerala).

Unit- V: Marine Microbial Technology **(9Hrs)**

Production and applications of marine microbial products – Carrageenan - agar-agar – pigments (Astaxanthin, β carotene) – enzymes – antibiotics – polysaccharides – Biosurfactants.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**

- **Group discussion**
- **Group assignments**

TEXT BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Microbiology	Prescott, L.M., Harley J.P. Klein	McGraw Hill Publications	2008
02	Marine Biology	Peter Castro	McGraw-Hill Education; 9 edition	2018
03	Marine Biology: Function, Biodiversity, Ecology	Jeffrey S. Levinton	Oxford University Press Inc	2017

REFERENCE BOOKS:

Sl no:	Book Name	Author	Publisher	Year of Publication
01	Marine Pollution	R.B. Clark,	Oxford University Press	2001
02	Marine Microbiology Bioactive Compounds And Biotechnological Applications	Kim	John Wiley	2013
03	Marine Microbiology	John Paul	Academic Press	2001

WEB SOURCES:

www.studocu.com

www.nature.com

https://marine microbiology

https://nptel.ac.in

SYLLABUS DESIGNER:

1. Dr.J.Hemapriya, Assistant Professor

2. Dr. A.Vidhya HOD & Assistant Professor

SKILL BASED SUBJECT IV

CLINICAL MICROBIOLOGY

Semester	Subject code	Category	Lecture		Theory		Practical		Credit
			Total hrs	Hrs/ week	Total hrs	Hrs/ week	Total hrs	Hrs/ week	
VI		Skill based	30	2	30	2	0	0	2

COURSE OUTCOMES

To enable the students to understand the concepts of Laboratory techniques in diagnosis

COURSE OUTCOMES

On the successful completion of the course, students will be able to develop strong and potential skills to work in the clinical laboratories.

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To apply appropriate microbiology laboratory techniques, methodologies, instruments and equipment in accordance with current laboratory safety protocols	**K3**
CO2	To characterize the bacterial pathogenesis, transmission, diagnosis and its susceptibility.	**K2**
CO3	To know about the important fungal specimen collection ,processing and diagnostics.	**K2**
CO4	To examine the human parasites in fecal samples which are medically important.	**K2**
CO5	To understand the salient features of antigen antibody reaction and it's uses in diagnostics.	**K3**

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	M	M
CO2	S	S	M	M	M	M
CO3	S	S	S	S	M	M
CO4	S	M	S	S	S	S
CO5	S	S	S	S	S	S

S- Strong; M- Medium; L- Low

UnitI: Introduction to Diagnostic Microbiology (6Hrs)

Introduction to Diagnostic Microbiology: Role of microbiology laboratory, Basic procedures of Microbiology. Quality Control. Specimen collection handling & processing .

Unit II: Diagnosis of Bacterial infections (6Hrs)

Systematic grouping& characteristics of Pathogenic bacteria. Identification of infectious agents & disease. Antimicrobial susceptibility test.

Unit III: Diagnosis of Mycotic infections (6Hrs)

Introduction to fungi. Specimen collection processing & diagnosis of Mycotic infections.

Unit IV: Diagnosis of Parasitic infections (6Hrs)

Collection and Handling of fecal specimens. Parasitological examination of Stool & Laboratory identification of human parasites.

Unit V: Serology (6Hrs)

Principle and Procedures of common serological /immunological tests in the laboratory.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- **Lectures**
- **Power point presentation**
- **Charts**
- **Models**
- **Group discussion**
- **Group assignments**

TEXT BOOKS:

S. No	Authors	Title	Publishers	Year Of Publication
1.	Kanai L. Mukherjee	Medical Labty Technology	Tata McGraw-Hill	2017
2.	Ananthanarayanan R. and Jayaram Panicker	"Text book of Microbiology".	Orient Longman	2017

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year Of Publication
1.	BalowS. A., Hauser. W.J, Ohauhi. M.,and Turano.A	Laboratory diagnosis of infectious diseases. Principles and Practice (Vol 1)	Springer –Vertag, New York	2012
2.	David Greenwood, Richard C. B.,	"Medical Microbiology."	ELBS with Churchill Livingstone	2012
3.	Jawetz, E., J. L. Melnic and E. A. Adelberg.	Medical Microbiology,	Tata McGraw Hill	2019

WEB REFERENCE:

https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology
https://www.slideshare.net/dryuktisharma/chapter-1-introduction-to-anatomy-and-physiology
https://en.wikipedia.org/wiki/List_of_systems_of_the_human_body
https://study.com/academy/lesson/what-are-the-organ-systems-of-the-human-body.html
https://en.wikipedia.org/wiki/Medical_laboratory

SYLLABUS DESIGNER:

1. Mrs. S.Arunadevi, Assistant Professor

2. Dr. A.Vidhya HOD & Assistant Professor