



KANNUR UNIVERSITY
കണ്ണൂർ സർവകലാശാല

(Abstract)

FYUG BSc Microbiology Programme - Scheme and Syllabus of the Fifth Semester - Approved and implemented w.e.f 2024 Admission - Orders Issued

ACADEMIC C SECTION

ACAD C/ACAD C3/21878/2024

Dated: 18.08.2026

- Read:-1. U.O No. ACAD C/ACAD C3/21878/2024 dated 25/10/2024
2. U.O No. ACAD C/ACAD C3/21878/2024 dated 30/12/2024
3. U.O No. ACAD C/ACAD C3/21878/2024 dated 14/10/2025
4. U.O No. ACAD C/ACAD C3/21878/2024 dated 18/06/2026
5.E-mail from the former Chairperson, Board of Studies in Microbiology (Cd) dated 25.05.2026
6.E-mail from the Dean, Faculty of Science dated 02.06.2026
7. Order of the Hon'ble Vice Chancellor in the file of even no.dated 13.08.2026

ORDER

- The Scheme and Syllabus of the First to Fourth Semesters of the FYUG B.Sc. Microbiology Programme, in accordance with the KU-FYUGP Regulations, 2024, were approved and implemented with effect from the 2024 admission, as per the paper read as (1) above.
- The Modified Scheme for all Semesters and the Modified Syllabus for the First to Fourth Semesters of the FYUG B.Sc. Microbiology Programme were approved and implemented with effect from the 2024 admission, vide paper read as (2) above.
- The Modified Scheme and Syllabus of the Third Semester of the FYUG B.Sc. Microbiology Programme were approved and implemented with effect from the 2024 admission, vide paper read as (3) above.
- The Scheme and Syllabus of the Fourth Semester of the FYUG B.Sc. Microbiology Programme, incorporating the rectification of the typographical error, were approved and implemented with effect from the 2024 admission, vide paper read as (4) above.
- The former Chairperson, Board of Studies in Microbiology (Cd), vide paper read as (5) above, submitted the Scheme and Syllabus of the Fifth Semester of the FYUG B.Sc. Microbiology Programme for approval.
- The Scheme and Syllabus of the Fifth Semester of the FYUG B.Sc. Microbiology Programme so submitted were forwarded to the Dean, Faculty of Science. After verification, the Dean recommended approval of the same, vide paper read as (6) above.



- The Vice Chancellor, after considering the recommendation of the Dean, Faculty of Science, and in exercise of the powers of the Academic Council conferred under Section 11(1), Chapter III of the Kannur University Act, 1996, and all other enabling provisions read together, has approved the Scheme and Syllabus of the Fifth Semester of the FYUG B.Sc. Microbiology Programme for implementation with effect from the 2024 admission, subject to reporting to the Academic Council.
- Orders are issued accordingly.
- The Scheme and Syllabus of the Fifth Semester of the FYUG B.Sc. Microbiology Programme are appended to this U.O. and uploaded on the University website.

Sd/-

Bindu K P G

Joint Registrar (Acad)

For REGISTRAR

- To:
1. The Principals of Affiliated colleges
 2. The Controller of Examinations (Through P A)
 3. The Chairperson, Board of Studies in Microbiology (Cd)

- Copy To:
1. PA to CE (to circulate the same among the sections concerned under Examination Branch)
 2. PS to VC/PA to R
 2. PS to VC/PA to R
 3. JR II (Exam)
 4. JR/AR (Academic)
 5. Web manager (to uploading on the website)
 6. Computer Programmer
 7. SF/DF/FC



Forwarded / By Order


SECTION OFFICER





List of Courses (Category-wise)

Discipline Specific Core (DSC) courses (Major):

Sl. No	Semester	Course Code	Course Title	Credit				Hours/week				Marks		
				L*	T*	P*	Total	L	T	P	Total	CE	ESE	Total
1	I	KU1DSCMBG101	EXCITING WORLD OF MICROBES	3	0	1	4	3	0	2	5	35	65	100
2	II	KU2DSCMBG104	PERSPECTIVES OF MICROBIOLOGY	3	0	1	4	3	0	2	5	35	65	100
3	III	KU3DSCMBG201	MICROBIAL HETEROGENIETY	3	0	1	4	3	0	2	5	35	65	100
4		KU3DSCMBG202	ESSENTIALS OF BIOCHEMISTRY	4	0	0	4	4	0	0	4	30	70	100
5	IV	KU4DSCMBG206	DATA SCIENCE AND COMPUTATIONAL BIOLOGY	3	0	1	4	3	0	2	5	35	65	100
6		KU4DSCMBG207	ESSENTIAL MOLECULAR BIOLOGY	3	0	1	4	3	0	2	5	35	65	100
7.		KU4DSCMBG208	BASICS OF IMMUNOLOGY	3	0	1	4	3	0	2	5	35	65	100
8	V	KU5DSCMBG301	MEDICAL BACTERIOLOGY	3	0	1	4	3	0	2	5	35	65	100
9		KU5DSCMBG302	HUMAN VIRAL, FUNGAL & PARASITIC DISEASES	3	0	1	4	3	0	2	5	35	65	100
10		KU5DSCMBG303	MICROBES IN INDUSTRY	4	0	0	4	4	0	0	4	30	70	100
11	VI	KU6DSCMBG304	FOOD AND DAIRY MICROBIOLOGY	3	0	1	4	3	0	2	5	35	65	100
12		KU6DSCMBG305	ENVIRONMENTAL MICROBIOLOGY AND SANITATION	3	0	1	4	3	0	2	5	35	65	100
13		KU6DSCMBG306	MICROBES IN AGRICULTURE	4	0	0	4	4	0	0	4	30	70	100
14	VII	KU7DSCMBG401	MANAGEMENT OF PLANT DISEASES	3	0	1	4	3	0	2	5	35	65	100
15		KU7DSCMBG402	BIOPHYSICAL TECHNIQUES AND BIOINSTRUMENTATION	3	0	1	4	3	0	2	5	35	65	100
16		KU7DSCMBG403	CHEMO INFORMATICS AND COMPUTER AIDED DRUG DISCOVERY	3	0	1	4	3	0	2	5	35	65	100
17		KU7DSCMBG404	MICROBIAL OMICS AND METAGENOMICS	3	0	1	4	3	0	2	5	35	65	100
18		KU7DSCMBG405	ADVANCED BIOPROCESS TECHNOLOGY	3	0	1	4	3	0	2	5	35	65	100
19	VIII	KU8DSCMBG406	BIOBUSINESS AND ENTREPRENEURSHIP	3	0	1	4	3	0	2	5	35	65	100
20		KU8DSCMBG407	MICROBIAL NANOTECHNOLOGY	3	0	1	4	3	0	2	5	35	65	100
21		KU8DSCMBG408	RESEARCH METHODOLOGY & BIOSTATISTICS	3	0	1	4	3	0	2	5	35	65	100



Discipline Specific Core (DSC) courses (Minor):

Sl. No	Semester	Course Code	Course Title	Credit				Hours/week				Marks		
				L*	T*	P*	Total	L	T	P	Total	CE	ESE	Total
1	I	KU1DSCMBG102	MIGHTY WORLD OF MICROBES	3	0	1	4	3	0	2	5	35	65	100
2		KU1DSCMBG103	MICROBES AND MAN	3	0	1	4	3	0	2	5	35	65	100
3	II	KU2DSCMBG105	BASIC TECHNIQUES IN MICROBIOLOGY	3	0	1	4	3	0	2	5	35	65	100
4		KU2DSCMBG106	HANDLING OF MICROBES	3	0	1	4	3	0	2	5	35	65	100
5		KU2DSCMBG107	PHYSIOLOGY AND METABOLISM OF MICROORGANISMS	3	0	1	4	3	0	2	5	35	65	100
6	III	KU3DSCMBG203	MICROBES IN DAILY LIFE	3	0	1	4	3	0	2	5	35	65	100
7		KU3DSCMBG204	FLAVOUR OF MICROBES	3	0	1	4	3	0	2	5	35	65	100
8		KU3DSCMBG205	MICROBIAL GENETICS	3	0	1	4	3	0	2	5	35	65	100

Discipline Specific Elective (DSE) courses:

Sl. No	Semester	Course Code	Course Title	Credit				Hours/week				Marks		
				L*	T*	P*	Total	L	T	P	Total	CE	ESE	Total
1	V	KU5DSEMBG301	PHYSIOLOGY AND GENETICS OF MICROORGANISMS	4	0	0	4	4	0	0	4	30	70	100
2		KU5DSEMBG302	DIAGNOSTIC MICROBIOLOGY	4	0	0	4	4	0	0	4	30	70	100
3		KU5DSEMBG303	AQUATIC MICROBIOLOGY	4	0	0	4	4	0	0	4	30	70	100
ANY TWO ELECTIVES SHOULD BE STUDIED IN V SEM														
5	VI	KU6DSEMBG304	GENETIC ENGINEERING AND RECOMBINANT DNA TECHNOLOGY	4	0	0	4	4	0	0	4	30	70	100
6		KU6DSEMBG305	PHARMACEUTICAL MICROBIOLOGY & ALGAL BIOTECHNOLOGY	4	0	0	4	4	0	0	4	30	70	100
7		KU6DSEMBG306	BIOSAFETY, BIOETHICS & IPR	4	0	0	4	4	0	0	4	30	70	100
8		KU6DSEMBG307	MICROBIAL ECOLOGY AND BIODIVERSITY	4	0	0	4	4	0	0	4	30	70	100
ANY TWO ELECTIVES SHOULD BE STUDIED IN VI SEM														
9	VIII	KU8DSEMBG401	PHAGE THERAPY AND ADVANCED ANTIMICROBIAL AGENTS	4	0	0	4	4	0	0	4	30	70	100
10		KU8DSEMBG402	COMPUTATIONAL SYSTEMS BIOLOGY	4	0	0	4	4	0	0	4	30	70	100
11		KU8DSEMBG403	ANTIMICROBIAL STEWARDSHIP	4	0	0	4	4	0	0	4	30	70	100
12		KU8DSEMBG404	MEDICINAL CHEMISTRY AND	4	0	0	4	4	0	0	4	30	70	100



			MOLECULAR DYNAMIC SIMULATIONS											
13		KU8DSEMBG405	BIOCONTROL AGENTS IN AGRICULTURE	4	0	0	4	4	0	0	4	30	70	100
ANY THREE ELECTIVES CAN BE STUDIED IN VIII SEM OR ANY THREE MOOC COURSES														

GENERAL FOUNDATION COURSES (MDC, VAC, SEC)

Multi-Disciplinary Courses (MDC):

Sl. No	Semester	Course Code	Course Title	Credit				Hours/week				Marks		
				L*	T*	P*	Total	L	T	P	Total	CE	ESE	Total
1	I	KU1MDCMBG101	ESSENCE OF MICROBIOLOGY	3	0	0	3	3	0	0	3	25	50	75
2	II	KU2MDCMBG102	FERMENTED FOODS AND BEVERAGES	3	0	0	3	3	0	0	3	25	50	75

Value Added Courses (VAC):

Sl. No	Semester	Course Code	Course Title	Credit				Hours/week				Marks		
				L*	T*	P*	Total	L	T	P	Total	CE	ESE	Total
1	III	KU3VACMBG201	MICROBES IN SOLID WASTE MANAGEMENT	3	0	0	3	3	0	0	3	25	50	75
2	IV	KU4VACMBG202	MICROBES FOR SUSTAINABLE LIFE	3	0	0	3	3	0	0	3	25	50	75
3		KU4VACMBG203	PUBLIC HEALTH AND HYGIENE	3	0	0	3	3	0	0	3	25	50	75

Skill Enhancement Courses (SEC):

Sl. No	Semester	Course Code	Course Title	Credit				Hours/week				Marks		
				L*	T*	P*	Total	L	T	P	Total	CE	ESE	Total
1	IV	KU4SECMBG201	MUSHROOM CULTIVATION	2	0	1	3	2	0	2	4	25	50	75
2	V	KU5SECMBG301	VALUE ADDED MICROBIAL PRODUCTS	2	0	1	3	2	0	2	4	25	50	75
3	VI	KU6SECMBG302	ADVANCED TECHNIQUES IN MICROBIOLOGY	2	0	1	3	2	0	2	4	25	50	75



Internship & Dissertation:

Sl. No	Semester	Course Code	Course Title	Credit				Hours/week				Marks		
				L*	T*	P*	Total	L	T	P	Total	CE	ESE	Total
1.	IV/V	KU4INTMBG201	INTERNSHIP	0	0	2	2	0	0	4	4	15	35	50
2.	VIII	KU8RPHMBG301	RESEARCH PROJECT	0	0	12	12	0	0	24	24	30	70	100

*L-Lecture, T-Tutorial, P-Practicals



Semester V



KU5DSCMBG301: MEDICAL BACTERIOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSC	300-399	KU5DSCMBG301	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	25L+10P	50L+15P	100	1.5

Course description:

Medical Bacteriology is a comprehensive course designed to provide students with an in-depth understanding of the characteristics, pathogenesis, diagnosis, treatment, and prevention of major bacterial infections in humans. Through a combination of lectures, laboratory sessions, case studies, and discussions, students will explore the diverse array of pathogenic bacteria, their interactions with the human host, and the clinical manifestations of bacterial diseases. Building upon this knowledge, students will delve into the mechanisms by which bacteria cause disease, including virulence factors, host-pathogen interactions, and immune evasion strategies.

Throughout the course, students will examine the epidemiology of bacterial infections, including the modes of transmission, risk factors, and global burden of bacterial diseases. Emphasis will be placed on understanding the principles of infection control and antimicrobial stewardship to mitigate the spread of antibiotic-resistant bacteria and prevent nosocomial infections.

In addition to theoretical learning, students will gain practical skills through laboratory sessions focused on the isolation, identification, and antimicrobial susceptibility testing of clinically relevant bacteria. They will learn to interpret laboratory results and apply microbiological techniques to diagnose bacterial infections accurately.

Course prerequisite:

Students who have completed the 1st and 2nd years in FYUGP Microbiology

Course outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand details of infection and disease caused by important gram-positive cocci and gram-negative cocci	U
2	Understand different bacterial diseases which are important to humans caused by gram positive bacilli and Mycobacteria	U
3	Understand important diseases caused by gram negative bacilli	U
4	To attain skills in various methods of lab diagnosis of bacterial infections in humans	A

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8
CO 1	✓		✓		✓	✓		✓
CO 2		✓	✓		✓			
CO 3		✓	✓			✓		
CO 4			✓			✓		



COURSE CONTENTS

Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION	H O U R S
1	Infection & disease caused by gram positive & gram-negative cocci		10
	1	Infection – types of infection, sources of infection, modes of transmission, predisposing factors of infection – virulence and pathogenicity, adhesion, toxins, bacteriophages, enzymes, communicability and invasiveness, Types of diseases – endemic, epidemic and pandemic diseases. Management of pandemic infections (brief).	
	2	Morphology, cultural features, biochemistry, resistance, pathogenicity, virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Staphylococcus aureus</i> .	
	3	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Streptococcus pyogenes</i> .	
	4	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Neisseria gonorrhoea</i> .	
2	Diseases caused by Gram Positive bacilli and Mycobacterium		10
	1	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Bacillus anthracis</i> .	
	2	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Clostridium tetani</i> .	
	3	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Corynebacterium diphtheriae</i> .	
	4	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment,	



	epidemiology and prevention of diseases caused by <i>Mycobacterium tuberculosis</i> & <i>Mycobacterium leprae</i> .	
3	Diseases caused by Gram Negative Bacilli	20
1	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Salmonella typhi</i> , <i>E. coli</i> , <i>Yersinia pestis</i> , <i>Hemophilus influenzae</i> and <i>Bordetella pertussis</i> .	
2	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Leptospira icterohaemorrhagiae</i> , <i>Treponema pallidum</i> .	
3	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Rickettsia prowazekii</i> .	
4	Morphology, cultural features, biochemistry, resistance, pathogenicity and virulence factors, clinical features, diagnosis, treatment, epidemiology and prevention of diseases caused by <i>Chlamydia trachomatis</i> .	
4	Practicals in medical bacteriology	30
1	Isolation and identification of normal bacterial flora of skin and mouth	
2	Isolation and identification of bacteria from clinical sample (urine, pus, sputum, csf)	
3	Blood culture	
4	Antibiotic sensitivity testing	
5	Serological methods of diagnosis - ELISA, VDRL, RA, Widal (slide and tube), RPR	
5	Teacher Specific Module	5
	<i>Directions/Suggestions</i>	
	Activity	



Essential Readings:

1. Ananthanarayan, R., and Paniker, C.K.J. (2006). Textbook of microbiology (Orient Blackswan)
2. Greenwood, D., Slack, R.C.B., Peutherer, J.F., and Barer, M.R. (2007). Medical Microbiology: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. Elsevier Health Sciences UK
3. Mackie, T.J., McCartney, J.E., and Collee, J.G. (1989). Mackie & McCartney practical medical microbiology. Churchill Livingstone,
4. Wilson's principles of bacteriology, virology and immunology. Edward Arnold.
5. Mukherjee, K.L. (2010) Medical Laboratory Technology. Tata McGraw-Hill Education.

Suggested Readings:

1. Greenwood, D., Slack, R.C.B., Peutherer, J.F., and Barer, M.R. (2007). Medical Microbiology: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. Elsevier Health Sciences UK
2. Mackie, T.J., McCartney, J.E., and Collee, J.G. (1989). Mackie & McCartney practical medical microbiology. Churchill Livingstone,
3. Wilson's principles of bacteriology, virology and immunology. Edward Arnold.
4. Mukherjee, K.L. (2010) Medical Laboratory Technology. Tata McGraw-Hill Education.
5. Forbes, B.A., Sahm, D.F., Weissfeld, A.S., and Bailey, W.R.D.m. (2007). Bailey & Scott's diagnostic microbiology. Elsevier, Mosby, London.



Assessment Rubrics:

Theory

Evaluation Type		Marks
End Semester Evaluation L		50
Continuous Evaluation L		25
a)	Test Paper- 1	5
b)	Test Paper-2	5
c)	Assignment	5
d)	Seminar	10
e)	Book/ Article Review	-
f)	Viva-Voce	5
g)	Field Report	-
Total L		75

Any components from the above table can be taken for CE not exceeding 25 Marks

Practicals

Evaluation Type		Marks
End Semester Evaluation P		15
Continuous Evaluation P		10
a)	Test Paper- 1	5
b)	Test Paper-2	5
c)	Record	5
d)	Lab skill	10
e)	Regularity	5
f)	Viva-Voce	5
g)	Report writing	5
Total		25

Any components from the above table can be taken for CE not exceeding 10 Marks



KU5DSCMBG302: HUMAN VIRAL, FUNGAL AND PARASITIC DISEASES

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSC	300-399	KU5DSCMBG302	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	25L+10P	50L+15P	100	1.5

Course Description:

This course provides a comprehensive introduction to human viral, fungal, and protozoan diseases, focusing on their causative agents, modes of transmission, pathogenesis, clinical manifestations, diagnosis, prevention, and control. Students will study the biology and life cycles of major human pathogens, host-pathogen interactions, immune responses, and epidemiology of infectious diseases of global health importance. The course also highlights emerging and re-emerging infections, public health perspectives, and basic therapeutic and preventive strategies, equipping students with foundational knowledge essential for further studies in microbiology, biotechnology, medicine, and allied life sciences.

Course Prerequisite:

Basic knowledge in Microbiology, Immunology and Molecular Biology

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the etiology, pathogenesis, clinical features, diagnosis, prevention and control of major viral diseases affecting human beings and to introduce emerging and re-emerging viral infections and their public health significance.	U
2	Familiarise with superficial, subcutaneous , systemic and opportunistic fungal infections affecting humans	U
3	Understand medically important human parasites with emphasis on morphology, life cycle, pathogenesis, treatment, prevention and control.	U



4	Gain skills in handling specimens and identifying common viral, parasitic and fungal infections using standard diagnostic techniques.	A
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***Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)**

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓			✓		✓	
CO 2		✓			✓		
CO 3			✓				✓
CO 4		✓	✓	✓		✓	

COURSE CONTENTS

Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION	H O U R S
1	HUMAN VIRAL DISEASES		15
	1	Fundamentals of Human Virology: General characteristics and structure of animal viruses, classification and replication of animal viruses, cultivation of animal viruses, antiviral agents.	
	2	Etiology, pathogenesis, clinical features, diagnosis, prevention and control of important human viral diseases: Polio, Herpes simplex, Influenza, Rabies, Mumps, Measles, Rubella and Arboviruses	
	3	Etiology, pathogenesis, clinical features, diagnosis, prevention and control of important human viral diseases: HIV and Hepatitis. Oncogenic viruses and mechanism of oncogenesis	
	4	Concepts and factors contributing to emerging and re-emerging viral diseases. Corona viruses (SARS, MERS, COVID -19), Ebola, Marburg infections, Lassa Fever, Crimean- Congo Hemorrhagic fever, Nipah virus infection.	

	HUMAN FUNGAL INFECTIONS	15
2	1	General characteristics of medically important fungi- Classification of fungal infections based on the site of infection- Superficial mycoses, subcutaneous, systemic and opportunistic mycosis.
	2	Superficial Mycoses : Dermatophytosis, Tinea nigra, black piedra, white piedra.
	3	Subcutaneous Mycoses and Systemic mycoses: Chromoblastomycosis, Mycetoma and Sporotrichosis, Systemic Mycoses : Histoplasmosis, Blastomycosis, Coccidiomycosis and Paracoccidiomycoses,
	4	Opportunistic Mycoses: Concept of opportunistic fungal infection, predisposing factors. Major opportunistic mycosis, Coccidiosis, Cryptococcosis and Aspergillosis
	HUMAN PARASITIC DISEASES	10
3	1	Introduction to medical parasitology, host - parasite relationship, mode of transmission of parasitic diseases.
	2	Morphology, etiology, life cycle, pathogenesis, clinical manifestations, treatment, prevention and control of important protozoan infections: Amoebiasis, Giardiasis.
	3	Morphology, etiology, life cycle, pathogenesis, clinical manifestations, treatment, prevention and control of important hemoflagellate protozoan infections: Malaria, Toxoplasmosis.
	4	Morphology, etiology, life cycle, pathogenesis, clinical manifestations, treatment, prevention and control of important helminth infection: Filariasis
	PRACTICALS IN VIROLOGY, MYCOLOGY AND PARASITOLOGY	30
4	1	Demonstration of ELISA to detect viral antigen or antibody
	2	Demonstration of rapid card test for viral infection.
	3	Preparation of LPCB mount to study fungal morphology.
	4	Identification of protozoan parasites from permanent slides
	Teacher Specific Module	5
5	<i>Directions</i>	
		5

Essential Readings:

- 1) Ananthanarayan & Paniker's Textbook of Microbiology
- 2) Jawetz, Melnick & Adelberg's Medical Microbiology
- 3) Textbook of Medical Mycology by Jagdish Chander
- 4) Textbook of Medical Parasitology (Subhash Chandra Parija)
- 5) Bailey & Scott's Diagnostic Microbiology

Suggested Readings:

1. Principles and Practice of Infectious Diseases (Mandell, Bennett & Dolin)
2. Human Fungal Diseases: Diagnostics, Pathogenesis, Drug Resistance and Therapeutics
3. K.D. Chatterjee Parasitology (Protozoology & Helminthology)
4. Mackie & McCartney Practical Medical Microbiology — practical microbiology techniques



Assessment Rubrics:

Theory

Evaluation Type		Marks
End Semester Evaluation		50
Continuous Evaluation		25
a)	Test Paper- 1	5
b)	Test Paper-2	5
c)	Assignment	5
d)	Seminar	5
e)	Book/ Article Review	-
f)	Viva-Voce	5
g)	Field Report	-
Total		75

Any components from the above table can be taken for CE not exceeding 25 Marks

Practicals

Evaluation Type		Marks
End Semester Evaluation P		15
Continuous Evaluation P		10
a)	Test Paper- 1	5
b)	Test Paper-2	5
c)	Record	5
d)	Lab skill	10
e)	Regularity	5
f)	Viva-Voce	5
g)	Report writing	5
Total		25

Any components from the above table can be taken for CE not exceeding 10 Marks



KU5DSCMBG303 – MICROBES IN INDUSTRY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSC	300-399	KU5DSCMBG303	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

The course, Microbes in Industry, introduces the fundamentals of industrial fermentation, covering upstream processes such as selection of microorganisms, raw materials, inoculum development, and scale-up. It examines various fermentation techniques, fermenter design, and sterilization methods. The course also addresses downstream processing, including product recovery, purification, protein separation, and enzyme immobilization. Key industrial products such as antibiotics, organic acids, enzymes, ethanol, and amino acids are discussed. Environmental aspects like waste management are briefly covered. A field visit to fermentation or microbial product industries provides practical exposure, linking theoretical knowledge with real-world applications.

COURSE OUTCOMES

CO No.	Expected Outcome	Learning Domains
1	Understand the basic concepts of industrial Microbiology & Explain the different stages of a fermentation process	U/A
2	Differentiate different Fermentation processes & different parts of a fermenter and their functions	U
3	List the various stages of down streaming & summarize different methods of Immobilization.	U
4	Explain the production of different industrially important products	U

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*



Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓			✓			
CO 2		✓			✓		
CO 3			✓				✓
CO 4			✓			✓	

COURSE CONTENTS

Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION	H O U R S
1		Introduction to Industrial Fermentation Process	15
	1.1	Introduction to fermentation processes- Upstream process	
	1.2	Industrially important Microorganisms and their products	
	1.3	Fermentation raw materials, inoculum development. Scale up	
	1.4	Industrial strains– characteristics-Isolation techniques- primary and secondary screening techniques - Preservation of industrial strains	
2		Fermentation	15
	2.1	Fermentation media, formulation and modification	
	2.2	Fermentation Types- batch, continuous, dual or multiple, Fed-batch, solid- state and submerged fermentation.	
	2.3	Design and Parts of a fermenter (CSTF)- Basic Functions of a fermenter and parts	
	2.4	Principles of Industrial Sterilization-Sterilization of Equipment, Sterilization of production Sterilization of air	
3		Down Streaming and Immobilization Methods	15
	3.1	Product recovery and purification- Solid Liquid Separation Cell disruption, Concentration techniques	
	3.2	Separation of Proteins- Protein Precipitation, Dialysis, Chromatography	



	3.3	Immobilization methods- Adsorption; covalent linkages, membrane entrapment. Advantages and disadvantages of each method. Applications of immobilized enzymes-Biosensor as example	
	3.4	Disposal of industrial wastes-Importance and methods(brief)	
	Industrial products from microorganisms		15
4	4.1	Antibiotics-Penicillin production	
	4.2	Organic acids- citric acid, acetic acid	
	4.3	Enzymes- amylase and Protease; Ethanol production	
	4.4	Amino acids- glutamic acid and vitamin B ₁₂	
5	Teacher Specific Module		5
	<i>Directions</i>		
	Visit to fermentation units/Microbial product Industry		5

Core Compulsory Readings (Books, Journals, E-sources Websites/ weblinks)

1. Hiroshi Nikaido, Alexander N Glazer- Microbial Biotechnology: Fundamentals of Applied microbiology
2. L E Casida- Industrial microbiology
3. Stanbury P. F., A. Whitaker, S. J. Hall. Principles of Fermentation Technology
4. W. Crueger and A. Crueger: Biotechnology. A Textbook of Industrial Microbiology
5. Website: Journal of Applied Microbiology

Core Suggested Readings (Books, Journals, E-sources Websites/ weblinks)

1. Prescott & Dunns- Industrial Microbiology
2. Patel A.H. Industrial Microbiology
3. K R Aneja. Manual of Practical Biotechnology
4. P. Gunasekaran. Laboratory Manual in Industrial Microbiology
5. Website: Applied Microbiology and Biotechnology
6. Website: World Journal of Microbiology and Biotechnology



Assessment Rubrics:

Theory

Evaluation Type		Marks
End Semester Evaluation L		70
Continuous Evaluation L		30
a)	Test Paper- 1	5
b)	Test Paper-2	5
c)	Assignment	5
d)	Seminar	10
e)	Book/ Article Review	-
f)	Viva-Voce	5
g)	Field Report	-
Total L		100

Any components from the above table can be taken for CE not exceeding 30 Marks



KU5DSEMBG301: PHYSIOLOGY AND GENETICS OF MICROORGANISMS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSE	300-399	KU5DSEMBG301	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30L	70L	100	2

Course description:

This course provides an integrated understanding of the physiological and genetic principles governing microorganisms, with emphasis on their growth, survival, and inheritance. It covers microbial nutrition, nutrient uptake, growth, respiration, growth kinetics, and environmental adaptations, along with the molecular basis of genetic organization, and gene transfer mechanisms in microorganisms. The interplay between physiology and genetics is emphasized to illustrate how microorganisms respond to environmental stresses and evolve adaptive traits. Overall, the course builds a strong conceptual foundation for understanding microbial processes relevant to medical microbiology, biotechnology, environmental microbiology, and microbial research.

Course prerequisite: Nil

Course outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the nutritional diversity among microorganisms, the different macro and micronutrients required for microbial growth and understand the physical factors affecting microbial growth.	U
2	Describe the pattern of growth, reproduction, death and growth kinetics of microbes and measure population growth by different methods. Understand the nutrient transport and respiration in microorganisms.	U
3	Familiarize the genetics of different microorganisms	U



4	Understand and apply various methods of gene transfer in microorganisms	U/A
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***Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)**

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8
CO 1	✓		✓		✓	✓		✓
CO 2		✓	✓		✓			
CO 3		✓	✓			✓		
CO 4			✓			✓		

COURSE CONTENTS

Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION	H O U R S
1		Physiology of Microorganisms	
	1	Nutritional requirements and nutritional types - Basic nutritional requirements of microorganisms - Macronutrients and micronutrients, Growth factors: vitamins, amino acids, purines, and pyrimidines Nutritional classification of microorganisms: Autotrophs and heterotrophs, Phototrophs and chemotrophs, Lithotrophs and organotrophs.	10
	2	Concept of microbial growth, Measurement of microbial growth Growth curve and phases, Generation time, Synchronous and continuous culture, Reproductive strategies in bacteria, fungi, and yeast	
	3	Environmental factors affecting microbial physiology- Effect of temperature (psychrophiles, mesophiles, thermophiles), Effect of pH (acidophiles, alkaliphiles), Effect of osmotic pressure (halophiles, osmophiles), Effect of oxygen (obligate aerobes, anaerobes, facultative anaerobes, microaerophiles), Influence of radiation and pressure	
	4	Starvation and nutrient limitation - Heat shock and cold shock responses, Oxidative stress and detoxification mechanisms, Osmotic stress response, Formation of spores and cysts, Viable but non-culturable (VBNC) state	

	4	Applications of conjugation, transformation and transduction (Brief)	
5	Teacher Specific Module		5
	<i>Directions/Suggestions</i>		
	Activity		

Essential Readings:

1. Prescott, Harley and Kleins Microbiology- Prescott
2. Microbiology: Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg
3. Microbial Genetics by Stanley R. Maloy, John E. Cronan Jr. & David Freifelder
4. *Genetics: A Conceptual Approach* : Benjamin A. Pierce
5. *Genetics: A Molecular Approach*: Peter J. Russell

Suggested Readings:

1. Principles of Microbiology: Atlas R M
2. Brock Biology of Microorganisms: Madigan M T and Martinko J M
3. Microbiology - Principles and explorations: Jacquelyn G Black, Laura J black
4. Microbiology: An introduction- Tortora GJ, Funke BR, Case CL
5. Microbial Genetics and Molecular Biology (Randhir Kumar, Annu Choudhary, Shreya Sahu)
6. Microbial Genetics (edited by Sylwia Okoń, Beata Zimowska, Mahendra Rai)

Theory

Evaluation Type		Marks
End Semester Evaluation L		70
Continuous Evaluation L		30
a)	Test Paper- 1	5
b)	Test Paper-2	5
c)	Assignment	5
d)	Seminar	10
e)	Book/ Article Review	-
f)	Viva-Voce	5
g)	Field Report	-
Total L		100

Any components from the above table can be taken for CE not exceeding 30 Marks



KU5DSEMBG302-DIAGNOSTIC MICROBIOLOGY

Semester	Course Type	Course Level	Course Code		Credits	Total Hours
V	DSE	300-399	KU5DSEMBG302		4	60
Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description

The Diagnostic Microbiology syllabus encompasses the advanced study of diagnostic tools for the identification of pathogens. It includes detailed coursework on bacteriology, virology, mycology, and parasitology, along with practical training in modern diagnostic techniques such as identification of pathogens by traditional methods, molecular diagnostics, immunological methods, and antimicrobial susceptibility testing. The course also covers the principles of laboratory management, quality control, and the interpretation of clinical microbiological data, preparing students for careers in clinical laboratories, research institutions, and healthcare settings.

Course Prerequisite: Basic knowledge in Microbiology gained during +2 level and first four semesters of this programme

Course Outcomes:

CO1	Understand the general procedures in diagnostic microbiology and understanding the basics of Clinical laboratory protocols	U/A
CO2	Developing insights into clinical practices and serological techniques in identifying bacterial infection	U
CO3	Apply the skill in diagnosis of viral infections	A
CO4	Analyse the skill in diagnosis of fungal and parasitic infections and also to get skills in advanced microbiological testing methods	U/A

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*



Mapping of Course Outcomes to PSOs

CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO8
CO 1	✓							
CO 2	✓		✓					
CO 3	✓	✓		✓	✓	✓	✓	
CO 4	✓	✓	✓	✓	✓	✓	✓	✓

COURSE CONTENTS

M O D U L E	U N I T	DESCRIPTION	H O U R S
1	Specimen collection and processing		25
	1	Specimen collection, processing and storage - Methods of collection of urine, blood, sputum, stool etc. The techniques of preservation of samples. Separation of blood plasma and serum. Blood smear preparations, E.S.R, P.C.V	
	2	Examination of urine: Sample collection, microscopic examination-crystals, casts, sediments	
	3	Examination of Stool - Indication, Collection, Microscopic examination and its significance	
	4	Biosafety in the Microbiology Laboratory, Quality Control and Assurance in Microbiological Testing	

2	Diagnostic methods in bacteriology		20
	1	Culture and Sensitivity Testing	
	2	Molecular Techniques (PCR), Serological Methods Antimicrobial Susceptibility Testing – MIC and MBC, disc diffusion, well diffusion and microdilution, CLSI standards	
	3	Diagnosis of respiratory Tract Infection and Urinary Tract Infections	
	4	Diagnosis of gastrointestinal Infections, Skin and Soft Tissue Infection	
	Diagnostic Virology techniques		15



3	1	Cell Culture, egg inoculation	
	2	Serology, Molecular Methods (RT-PCR, ELISA)	
	3	Diagnosis of respiratory Viruses and Hepatitis Viruses	
	4	Diagnosis of HIV and Retroviruses	
Diagnostic Techniques in Mycology & Parasitology and advanced diagnostic tools			
4	1	Diagnostic Parasitology Techniques - Microscopy, Concentration Methods	25
	2	Molecular Methods	
	3	Laboratory Diagnosis of Parasitic Infections -Malaria, Amoebiasis, Helminth Infections	
	4	Advanced Diagnostic Techniques, Next-Generation Sequencing, Mass Spectrometry (MALDI-TOF), Automation in Microbiology, Interpretation and Clinical Correlation of Diagnostic Results, Emerging Infectious Diseases and Diagnostic Challenges	
5	Teacher Specific Module		5
	<i>Directions</i>		
	Activity		

Essential Reading

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
3. Virology, Sawant, K.C., 2005, First edition, Dominant Publishers and distributors Delhi.
4. Subash O. Panija Textbook of Medical Parasitology, 1996. First edition. All India Publishers and Distributors Regd. 920 Poonamallee High Road, Chennai.

Suggested Reading:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication



3. Virology, Sawant, K.C., 2005, First edition, Dominant Publishers and distributors, Delhi.
4. Rajesh Karyakarte and Ajith Damle (2005) Medical Parasitology, books and Allied (P)Ltd. Kolkata.

Assessment Rubrics:

Theory

Evaluation Type		Marks
End Semester Evaluation L		70
Continuous Evaluation L		30
a)	Test Paper- 1	5
b)	Test Paper-2	5
c)	Assignment	5
d)	Seminar	10
e)	Book/ Article Review	-
f)	Viva-Voce	5
g)	Field Report	-
Total L		100

Any components from the above table can be taken for CE not exceeding 30 Marks



	3.2	Primary productivity and microbial loop	
	3.3	Decomposition and mineralization processes	
	3.4	Biofilms in water distribution systems	
4	Module 4: Aquatic Pollution and Microbial Indicators		15
	4.1	Sources and types of water pollution (organic, inorganic, biological)	
	4.2	Eutrophication and its microbial implications- harmful algal blooms	
	4.3	Microbial indicators of water quality (e.g., coliforms, Enterococcus), Microbial assessment of drinking water and waste water	
	4.4	Microbial bioremediation of polluted water bodies	
5	Teacher Specific Module		5
	<i>Directions</i>		
			5

Core Compulsory Readings (Books, Journals, E-sources Websites/ weblinks)

1. "Aquatic Microbiology" – H.W. Jannasch & R.Y. Morita
2. "Microbiology of Waterborne Diseases" – Steven L. Percival et al.
3. "Environmental Microbiology" – R.M. Maier, I.L. Pepper, & C.P. Gerba
4. "Wastewater Microbiology" – Gabriel Bitton
5. Maier, R. M., Pepper, I. L., & Gerba, C. P. Environmental Microbiology. Academic Press.
6. Madigan, M. T., et al. Brock Biology of Microorganisms. Pearson.
7. Wetzel, R. G. Limnology: Lake and River Ecosystems. Academic Press.
8. Atlas, R. M., & Bartha, R. Microbial Ecology: Fundamentals and Applications



Theory

Evaluation Type		Marks
End Semester Evaluation L		70
Continuous Evaluation L		30
a)	Test Paper- 1	5
b)	Test Paper-2	5
c)	Assignment	5
d)	Seminar	10
e)	Book/ Article Review	-
f)	Viva-Voce	5
g)	Field Report	-
Total L		100

Any components from the above table can be taken for CE not exceeding 30 Marks



KU5SECMBG301 VALUE ADDED MICROBIAL PRODUCTS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	SEC	400-499	KU5SECMBG301	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	2	0	25	50	75	1.5

Course Description:

This course offers an in-depth exploration of value-added products derived from microorganisms, focusing on their production, applications, and significance across pharmaceutical, industrial, agricultural, and environmental sectors. Students will learn about various microbial metabolites such as antibiotics, enzymes, organic acids, biofuels, probiotics, bioplastics, and biopesticides. The course emphasizes the biotechnological processes and microbial systems used to generate these products and highlights their impact on health, industry, and sustainability. Practical sessions provide hands-on training in isolating and analyzing microbes that produce these compounds, helping students connect theoretical knowledge with real-world applications.

Course Prerequisite:

Basic Knowledge in Microbiology, Microbial fermentation technology

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain the types, sources, and applications of value-added microbial products across pharmaceutical, industrial, and agricultural sectors.	U
2	Describe the microbial processes involved in the production of antibiotics, enzymes, organic acids, biofuels, bioplastics, and probiotics.	U
3	Demonstrate practical skills in isolating, culturing, and assessing microorganisms involved in the production of key bio-products.	A
4	Demonstrate practical skills for the production of some fermented foods.	A

***Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)**



Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓			✓			
CO 2		✓			✓		
CO 3			✓				✓
CO 4			✓			✓	

COURSE CONTENTS

Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION	H O U R S
1	VALUE ADDED MICROBIAL PRODUCTS IN PHARMA, HEALTH, INDUSTRY AND ENVIRONMENT		15
	1	Antibiotics and their microbial sources (<i>Penicillium</i> , <i>Streptomyces</i>). Production of microbial enzymes (amylases and proteases)	
	2	Microbial vaccines and recombinant proteins (e.g., Hepatitis B) Probiotics and prebiotics: Types, health benefits, and microbial strains.	
	3	Organic acid production (citric acid and lactic acid) Biofuels – ethanol, biogas, biodiesel (microbial sources & technology)	
	4	Bioplastics – PHAs Enzymes in industry – textile, food, and detergent applications	
2	VALUE ADDED PRODUCTS IN AGRICULTURAL AND FOOD INDUSTRY SECTOR		15
	1	Biofertilizers – Nitrogen-fixing and phosphate-solubilizing microbes	
	2	Biopesticides – <i>Bacillus thuringiensis</i> and entomopathogenic fungi	
	3	Fermented foods – microbial starters and traditional practices, Significance of fermented foods, examples	
	4	Exopolysaccharides – production and application (e.g., Xanthan gum)	



Assessment Rubrics:

Theory

Evaluation Type		Marks
End Semester Evaluation		35
Continuous Evaluation		15
a)	Test Paper- 1	5
b)	Test Paper-2	5
c)	Assignment	5
d)	Seminar	5
e)	Book/ Article Review	-
f)	Viva-Voce	5
g)	Field Report	-
Total		50

Any components from the above table can be taken for CE not exceeding 15 Marks

Practicals

Evaluation Type		Marks
End Semester Evaluation P		15
Continuous Evaluation P		10
	Test Paper- 1	5
	Test Paper-2	5
	Record	5
	Lab skill	10
	Regularity	5
	Viva-Voce	5
	Report writing	5
Total		25

Any components from the above table can be taken for CE not exceeding 10 Marks

