



KANNUR UNIVERSITY
കണ്ണൂർ സർവകലാശാല

(Abstract)

FYUG Microbiology Programme - Defects in the Third Semester Scheme and Syllabus - Rectified and Implemented with effect from 2024 Admission - Orders Issued

ACADEMIC C SECTION

ACAD C/ACAD C3/21878/2024

Dated: 14.10.2025

- Read:-1. U.O. No. FYUGPSC/FYSC-II/5074/2024, dated: 18/04/2024
2. U.O No. ACAD C/ACAD C3/21878/2024 dated 25/10/2024
3. U.O No. ACAD C/ACAD C3/21878/2024 dated 30/12/2024
4. E-mail of the Chairperson, Board of Studies in Microbiology (Cd) dated 02.08.2025
5. Minutes of the Meeting of the Standing Committee on Academic Council, held on 29.09.2025
6. Orders of the Vice Chancellor in the file of even number dated 14.10.2025

ORDER

- 1.The Regulations of the Kannur University Four Year UG Programmes (KU-FYUGP Regulations 2024) for affiliated Colleges was implemented with effect from 2024 admission onwards, vide paper read as(1) above.
- 2.The Scheme and Syllabus of First to fourth Semesters of the B.Sc. Microbiology Programme in tune with KU-FYUGP Regulations 2024 was approved and implemented with effect from 2024 Admission as per the paper read as (2) above
3. The Modified Scheme (All semesters) & Syllabus (four semesters) of the FYUG Microbiology Programme was approved & implemented w. e. f. 2024 Admission vide paper read as (3) above.
- 4.On verification of the approved Scheme & Syllabus during the course registration of Third semester, some errors were noticed in the scheme & syllabus part and the matter was intimated to the Chairperson, Board of Studies in Microbiology(Cd) for necessary action.
- 5.The Chairperson, Board of Studies in Microbiology(Cd) ,vide paper read as (4) above, forwarded the error corrected scheme and Syllabus of the third Semester FYUG Microbiology Programme for approval and implementation w.e.f 2024 admission and the same was placed before the Standing Committee of the Academic Council for consideration, as ordered by the Vice-Chancellor.
6. The Standing Committee of the Academic Council, held on 29.09.2025, vide paper read as 5 above recommended to approve the error rectified third semester scheme and syllabus of the FYUG Microbiology programme.



7.The Vice Chancellor after considering the recommendation of the Standing Committee of the Academic Council 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 with has approved the error rectified scheme and syllabus of the Third semester FYUG Microbiology Programme for implementation w.e.f 2024 admission, subject to reporting to the Academic Council.

8.The approved Syllabus is appended with this U.O. and uploaded in the University website.

Orders are issued accordingly.

Sd/-

Bindu K P G

DEPUTY REGISTRAR (ACADEMIC)

For REGISTRAR

To: The Principals of Arts and Science Colleges affiliated to Kannur University

Copy To: 1. The Examination Branch (through PA to CE)

2. The Chairperson, Board of Studies in Microbiology (Cd)

3. PS to VC/PA to R

4. DR/AR (Academic)

5. The IT Cell (For uploading in the website)

6. SF/DF/FC

Forwarded / By Order



SECTION OFFICER





(w.e.f. 2024 Admission)

Board of Studies in Microbiology (UG & PG Combined)

Chairperson

Dr. Soorej M Basheer (Associate Professor, Dept. of Molecular Biology, Dr. Janaki Ammal Campus, Palayad, Kannur University)

Members

1. Dr. Sabu Abdulhameed (Professor, Dept. of Biotechnology & Microbiology, Dr. Janaki Ammal Campus, Palayad, Kannur University)
2. Ramesan. C.K.V (Assistant Professor in Microbiology, Sree Narayana College, Kannur)
3. Dr. Sinosh Skariyachan (Assistant Professor in Microbiology, St. Pius X College, Rajapuram)
4. Dr. N.V. Vinod (Assistant Professor in Microbiology, St. Pius X College, Rajapuram)
5. Dr. Sarala Gopalakrishnan (Retd. Associate Professor, Dept. of Microbiology, St. Pius X College, Rajapuram)
6. Dr. Ayana N. (Assistant Professor, Dept. of Microbiology, Sree Narayana College, Kannur)
7. Dr. Suboj Babykutty (Assistant Professor, Dept. of Zoology, Mar Ivanios College, Thriuvananthapuram)
8. Dr. Sunish K.S. (Assistant Professor, Dept. of Zoology, Maharajas College, Ernakulam)
9. Dr. Krishnakumar B. (Senior Principal Scientist, NIIST-CSIR, Thiruvananthapuram)
10. Dr. Beena P.S. (Director, Omics Gen Life Sciences Pvt Ltd. Kalamassery)

university Order# 60ADCF6EAD43C218C8D202A2107612024/ADPUPY BYRHSSTRAP0627ASFM0250150 PM - Page 6

About the program:

Microbiology is the scientific study of microorganisms, a diverse group of microscopic entities that include bacteria, viruses, fungi, and protozoa. This field is fundamental to understanding the biological processes that govern life on Earth, as well as the roles microorganisms play in health, disease, agriculture, and industry.

The four-year Bachelor of Science (B.Sc.-Hons) program in Microbiology at Kannur University is designed to provide students with a comprehensive understanding of the theoretical and practical aspects of microbiology. The curriculum is structured to equip students with the necessary knowledge and skills to pursue careers in research, healthcare, pharmaceuticals, environmental science, and biotechnology, or to continue their studies at the postgraduate level or research.

Graduate Attributes

Kannur University is fundamentally dedicated to nurturing well-rounded individuals with a comprehensive set of graduate attributes. Graduates from Kannur University emerge equipped with a multidisciplinary approach, allowing them to integrate knowledge across various domains for a holistic understanding of complex issues. With a strong emphasis on critical thinking and effective problem-solving skills, Kannur University's graduates demonstrate intellectual curiosity and the ability to tackle challenges creatively. Proficient in communication and social interaction, they engage adeptly in diverse settings, fostering collaboration and effective interpersonal connections. Moreover, the graduates embody effective citizenship and leadership, showcasing a sense of responsibility, community engagement, and leadership qualities. With a global perspective, ethical grounding, and a commitment to environmental sustainability, our students are well-prepared for active participation in an interconnected world. Embracing self-directed and lifelong learning, they continually adapt to evolving challenges, embodying the university's commitment to producing resilient, knowledgeable, and socially responsible individuals.

Program Outcomes (POs) serve as a foundational framework defining the skills, knowledge, and attributes that students at Kannur University are expected to acquire upon completion of a specific academic program. Tailored to the unique goals of each program, POs articulate the overarching learning objectives that guide curriculum design and assessment. These outcomes encompass a diverse range of competencies, including critical thinking, problem-solving, effective communication, and discipline-specific expertise. POs play a crucial role in shaping educational experiences, ensuring alignment with academic standards and industry expectations. By articulating clear and measurable expectations, POs contribute to the continuous improvement of academic programs and provide a roadmap for students to develop into well-rounded, competent professionals within their chosen fields.

- Kannur University FYUGP Microbiology Syllabus 2024 Admission onwards

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	5	30	70	100
14	VII	KU7DSCMBG401	MANAGEMNET 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	30	70	100
18		KU7DSCMBG405	ADVANCED BIOPROCESS TECHNOLOGY	3	0	1	4	3	0	2	5	35	65	100
19	VIII	KU8DSCMBG406	BIOBUSINESS AND ENTREUPRENURSHIP	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	30	70	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	FLAVOURS 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	KU7DSEMBG401	PHAGE THERAPY AND ADVANCED ANTIMICROBIAL AGENTS	4	0	0	4	4	0	0	4	30	70	100
11		KU8DSEMBG402	COMPUTATIONAL SYSTEMS BIOLOGY	4	0	0	4	4	0	0	4	30	70	100
12		KU8DSEMBG403	ANTIMICROBIAL STEWARDSHIP	4	0	0	4	4	0	0	4	30	70	100
13		KU8DSEMBG404	MEDICINAL CHEMISTRY AND	4	0	0	4	4	0	0	4	30	70	100



			MOLECULAR DYNAMIC SIMULATIONS											
14		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		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

University Order#enfield_A0A03C18082023/A0A03EPM025072302M202509150150 PM - Page 12

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



University Order# 661116 AONADCTAG ADAT3/C18C28/D023/21076/2024/ADP/PURV INVERGIS/RAIRO/AZ/ASE/M02502230250150 PM - Page 14



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	2

This course provides a comprehensive outlook of the fundamentals of Microbiology such as the historical perspectives, developments and scope. The course emphasises on the working principles and applications of various types of microscopes for the visualisation of microorganisms. The course also illustrates the applications of various staining techniques for the study of the morphological features of microorganisms. Students will also study the structural features of bacteria and will gain hands-on experiments on handling and care of microscope and various staining techniques for the visualisation of microorganisms. In a nutshell, the course provides an overview of the fundamentals of microbiology and role in understanding the scope and applications of microorganisms.

Course outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the history, development, scope of microbiology and how microbiology has developed an important scientific discipline.	U
2	Familiarize the working principle, methodology and applications of various type of microscopes for the study of the morphological and structural features of microorganisms.	U
3	Apply various staining techniques for the visualization of microorganisms and study the structural components of bacterial cell.	A
4	Apply the fundamental concepts of microbiology and acquire the technical skills in basic protocols in Microbiology.	A

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

	4	Differential staining - Gram staining and acid-fast staining. Special staining for capsule, flagella and endospore. Fungal staining (LPCB), Wet mount for bacterial motility- Hanging drop technique	
3	Ultra structure of bacterial cell		10
	1	Ultra structure of bacterial cell - cell wall and its types- Gram positive and Gram negative	
	2	Cell membrane, Flagella, Pili, Capsule/glycocalyx/slime layer, Protoplasts and spheroplast.	
	3	Internal structures of bacteria- Ribosome, inclusion bodies, vacuoles, nuclear material (Nucleoid and plasmids) and mesosomes	
	4	Dormant resistant forms– endospore- structure and composition.	
4	Practical applications of Basic Microbiology		30
	1	General rules and regulations of Microbiology lab. Handling and care of Microscope, Demonstration of various types of microscopes and elucidation of the structural components of light microscope.	
	2	Simple staining and negative staining	
	3	Differential staining- Gram staining and acid-fast staining	
	4	Special staining- Capsule staining, endospore staining, fungal staining using LPCB	
	5	Bacterial motility using hanging drop technique	
5	Teacher Specific Module		5
	<i>Directions/Suggestions</i>		
	Activity		

Essential Readings:

1. Atlas RM (1997), Principles of Microbiology, Mosby Publishers.
2. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
3. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
4. Ananthanarayan and Paniker's (2020) Textbook of Microbiology 11th edition, Universities Press publishes
5. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood and Chris Wolvertton
6. Dubey R.C. and Maheswary A K., (2018) A textbook of Microbiology, S. Chand Publications
7. Aneja K.R. 2020 Experiments in Microbiology, Plant Pathology and Biotechnology sixth edition, New Age International Publications Private Limited



Suggested Readings:

1. Daniel Lim, (1997), Microbiology Brown (William C.) Co, U.S.; 2nd edition.
2. Topley & Wilson's Microbiology and Microbial Infections (1998), 8 volumes, sixth edition, Hodder Arnold, 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

KU1DSCMBG102: MIGHTY WORLD OF MICROBES

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
I	DSC B1	100-199	KU1DSCMBG102	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	2

Course description:

This course offers a thorough introduction to the world of microbes, providing students with the fundamental knowledge and skills necessary to appreciate the complexities of microbial world. The course focuses the historical developments and scope of microbiology and the contributions of various pioneers in Microbiology. The course also emphasizes on the basics of staining techniques and their applications in studying the morphological features of bacteria with the aids of various types of microscopes. The course further illustrates the ultrastructure of bacterial cells and various cell components. The course also covers the technical skills required for understanding various concepts in microbiology.

Course prerequisite: Nil

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the history and scope of microbiology and their development as a major scientific discipline.	U
2	Familiarize the methodology and working principles of various microscopes and their utility in visualizing microorganisms using staining techniques.	U
3	Apply the concepts of microscopy and understand the morphological and structural characteristics of bacteria	A
4	Apply various techniques in microbiology and enrich the practical skills for various applications in biology.	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	HOURS
1	History and scope of Microbiology		15
	1	History and Development of Microbiology - Spontaneous generation versus biogenesis, Germ theory of disease	
	2	Contributions of Louis Pasteur, Robert Koch, Anton Van Leeuwenhoek and Alexander Fleming towards the development of Microbiology	
	3	Major branches of Microbiology	
	4	Scope and applications of Microbiology	

2	Microscopy and staining techniques		10
	1	Microscopy – Basic principles of light microscopy. Types of light Microscopy- Bright field, dark field, phase contrast and fluorescent	
	2	Electron microscopy-Scanning and Transmission electron microscopy	
	3	Morphological forms of bacteria. Visualization of microorganisms - Staining –stains-components of stains. Types of stains.	
	4	Staining techniques - Simple, Negative, Differential (Gram and Ziehl Neelsen), Hanging drop technique, Fungal staining	

3	Structural features of bacterial cells		15
	1	Ultra structure of bacterial cell – Gram positive and Gram negative	

	2	Cell membrane, mesosome, flagella, capsule, protoplasts and spheroplast	
	3	Internal structures of bacteria- ribosome, inclusion bodies, nuclear material - nucleoid and plasmids	
	4	Dormant forms– endospore structure. Process of sporogenesis.	
4	Practical concepts of Basic Microbiology		30
	1	General rules and regulations of Microbiology lab. Handling and care of Microscope- Structural parts and usage.	
	2	Simple and negative staining	
	3	Differential staining- Gram staining and acid-fast staining	
	4	Bacterial motility-Hanging drop techniques.	
5	Teacher Specific Module		5
	<i>Directions/Suggestions</i>		
	Activity		

Essential Readings:

1. Atlas RM (1997), Principles of Microbiology, Mosby Publishers.
2. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
3. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
4. Ananthanarayan and Paniker's (2020) Textbook of Microbiology 11th edition, Universities Press publishes
5. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood and Chris Wolverton
6. Dubey R.C. and Maheswary A K., (2018) A textbook of Microbiology, S. Chand Publications
7. Aneja K.R. 2020 Experiments in Microbiology, Plant Pathology and Biotechnology sixth edition, New Age International Publications Private Limited

Suggested Readings:

1. Daniel Lim, (1997), Microbiology Brown (William C.) Co, U.S.; 2nd edition.
2. Topley & Wilson's Microbiology and Microbial Infections (1998), 8 volumes, sixth edition, Hodder Arnold, 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

KU1DSCMBG103: MICROBES AND MAN

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
I	DSC C1	100-199	KU1DSCMBG103	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	2

Course description:

This course provides an in-depth understanding of the intricate relationship between humans and microbes, highlighting both beneficial interactions and potential threats. This course delves into the fascinating beginnings of life and its evolutionary journey, understand the diverse microbes associated with the human body and their vital roles. This course provides an opportunity to learn about various infections and the virulence factors that contribute to microbial pathogenicity. Also examine the role of microbes in warfare and their potential use as bioweapons.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the history, origin of life and evolution	U
2	Understand various human microbiome and their significance	U
3	Understand various types of infection and virulence factors associated	U
4	Demonstrate various microflora of human body	A

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



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

Contents for Classroom Transaction:

Kannur University FYUGP Microbiology Syllabus 2024 Admission onwards

	3	Bacterial toxins and other virulence factors	
	4	Bioweapons and bioterrorism – Anthrax as example	
4	Practicals		30
	1	Demonstration of isolation of bacterial flora of mouth	
	2	Demonstration of isolation of skin flora	
	3	Microscopic observation of different bacterial flora of human	
	4	Observation of different fungi	
5	Teacher Specific Module		5
	<i>Directions/Suggestions</i>		
	Activity		

Essential readings:

1. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
2. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.
3. Ananthanarayan and Paniker's (2020) Textbook of Microbiology 11th edition, Universities Press publishes
4. Prescott/Harley/Klein's Microbiology by Joanne Willey, Linda Sherwood and Chris Wolvertton
5. Dubey R.C. and Maheswary A K., (2018) A textbook of Microbiology, S. Chand Publications
6. Aneja K.R. 2020 Experiments in Microbiology, Plant Pathology and Biotechnology sixth edition, New Age International Publications Private Limited

Suggested readings:

1. Daniel Lim, (1997), Microbiology Brown (William C.) Co, U.S.; 2nd edition.
2. Topley & Wilson's Microbiology and Microbial Infections (1998), 8 volumes, sixth edition, Hodder Arnold, London.



[illegible]

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1.5

The course provides an overview of the essence of microorganisms in various filed of biological sciences. The course initially focuses on various groups of prokaryotes and eukaryotic microorganisms and their role in ecosystems, environment, and other allied fields. The course further illustrates the scope of microorganisms in various applications in food, agriculture, biopharma, and healthcare sectors. The course also outlines the recent emerging infectious diseases and scope of microbiology principles in tackling the pandemics. The course also narrates the role and applications of various microorganisms to produce sustainable energy products for better tomorrow. The course investigates various beneficial and detrimental impacts of microorganisms in various fields with relevant examples.

Course Prerequisite: Nil

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Comprehend various kinds of microorganisms and their role in environment, ecosystem and other applied fields	U
2	Familiarize the impact and relevance of microorganisms in various applications in food industry.	U
3	Understand the scope of microorganisms in agriculture and healthcare.	U
4	Familiarize the major emerging microbial infections and the role of microorganisms in sustainable energy production.	U

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

University Order# en0167 AD-AT3/C18C8/D023/A16876/E001A/ADPUBEN IN HERBSTER ARRO (VZ) ASDM025012280M02501280 PM - Page 28

University Order# en0167 AD-AT3/C18C8/D02A/16876/E0014/ADPUBEN IN HERBSTERAROI (VZASSEM) 02501228 PM - Page 28

University Order# en0167 AD-AT3/C18C&D/2024/A16876/EOP/ADPUBEN IN HERBSTER ARRO (A27ASSEM) 02501228 PM - Page 28

University Order# en0167 AD-AT3/C18C&D/2024/A16876/EOP/ADPUBEN IN HERBSTER ARRO (A27ASSEM) 02501228 PM - Page 28

University Order# en0167 AD-AT3/C18C8/D02A/16876/E0014/ADPUBEN IN HERBIS TERARO (VZASSEM) 02501228 PM - Page 28

4	Medical aspects of microorganisms and the role of microbes in sustainable energy		10
	1	Detrimental impact of microorganisms- Infections and disease-causing microorganisms- bacteria and viruses (any four examples each)	
	2	Emerging viral infections of 21 th century- COVID, Nipah	
	3	Importance of microbiology practices for tackling pandemics – Hygienic practices and vaccines	
	4	Microorganisms as a source of bioenergy- Biogas, biohydrogen, bioethanol (brief)	

5	Teacher Specific Module	5
	<i>Directions/Suggestions</i>	
	Activity	

Suggested readings:

1. Atlas, R. M. (1997). Principles of microbiology (2nd ed). Wm. C. Brown Publishers.
2. Black, J. G., & Black, L. J. (2018). Microbiology: Principles and explorations (10th edition). Wiley.
3. Frobisher, M. (Ed.). (1974). Fundamentals of microbiology (9th ed). W. B. Saunders Co.
4. Pommerville, J. (2014). Alcamo's fundamental of microbiology (Tenth edition). Jones and Bartlett India Pvt. Ltd
5. Michael J. Pelczar, Chan, E. C. S., Noel R. Krieg, & Merna Foss Pelczar. (2024). Microbiology (5th edition). Affiliated East-West Press Private Limited

Essential readings:

1. Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., Stahl, D. A., & Brock, T. D. (2022). Brock biology of microorganisms (Sixteenth edition, global edition). Pearson.
2. Tortora, G. J., Funke, B. R., & Case, C. L. (2019). Microbiology: An introduction (Thirteenth edition). Pearson.
3. Willey, J. M., Sandman, K., Wood, D. H., & Prescott, L. M. (2023). Prescott's Microbiology (Twelfth edition, international student edition). McGraw Hill.

KU2DSCMBG104- PERSPECTIVES OF MICROBIOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
II	DSC A2	100-199	KU2DSCMBG104	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	2

Course Description:

This course offers a comprehensive exploration of the methods employed to manage microbial growth, cultivate diverse microorganisms & preserve their viability. From understanding different culture media and growth conditions to employing aseptic techniques, students will gain skills in isolating and propagating bacteria, viruses, fungi and algae. Students will also learn about culture preservation techniques ranging from routine periodic transfer techniques employed in the laboratory to more advanced preservation techniques like cryopreservation, lyophilization and other techniques used to maintain the stability of microbial strains ensuring their availability for future studies.

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

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the principle and methods for controlling microorganisms and apply this knowledge in controlling microbes in day today life.	U/A
2	Understand and familiarize various culture media and components for cultivation of different microorganisms	U
3	Utilize various culture methods for the isolation and cultivation pure cultures and for the enumeration of microbial cells.	A
4	Understand and apply the various methods for the short term and long-term preservation of microbial cultures.	U/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	HOURS
1	Control of microorganisms		15
	1	Fundamentals of microbial control – Definition – sterilization, disinfection, Antisepsis, Sanitization, Microbistatic and microbicidal agents	
	2	Factors influencing the effectiveness of antimicrobial agents.	
	3	Physical agents of microbial control – Heat – TDP, TDT, D-value, Z-value, F-value, Moist heat and dry heat – Autoclave, Pasteurization, Tyndallisation, Inspissation, Incineration, Hot air oven. Filtration and Irradiation (Ionizing and non-ionizing).	
	4	Chemical antimicrobial agents – Phenolics, alcohols, halogens, heavy metals, quaternary ammonium compounds, aldehydes, sterilizing gases, characteristics of an ideal chemical agent, evaluation of antimicrobial potency of disinfectants- phenol coefficient – Rideal Walker and Chick	

		Martin tests. Antibiotics – classes with example and mode of action, antimicrobial resistance mechanisms in brief	
--	--	---	--

	Media and components	10
2	1	Culture media – major components- agar, peptone, beef extract, yeast extract.
	2	Solid, semi solid and liquid cultures - Types of media – defined, basal, complex, enriched, enrichment, selective, indicator, differential, transport and anaerobic culture media
	3	Media for the cultivation of bacteria, fungi, algae and protozoans – examples
	4	Cultivation of viruses – brief account.

3	Culture methods		15
	1	Pure culture- definition, culture methods – streak plate, spread plate, pour plate, lawn culture, stroke culture, stab culture, liquid cultures.	
	2	Anaerobic culture methods – anaerobic jar, roll tube, Rosenthal method.	
	3	Enumeration of microbial cells – CFU.	
	4	Fungal culture – Slide culture	

	Practicals in basic microbiology	30
4	1	Demonstration of the most common laboratory equipment used in microbiology practical- Autoclave, Hot air oven, Laminar airflow, Bacteriological incubator, Colony counter, etc. Sterilization by autoclave and hot air oven
	2	Culture media preparation - Broth and agar- Nutrient broth, nutrient agar, Special media - Mac Conkey agar, Mannitol Salt agar, Blood agar and Mueller Hinton agar, Fungal media- SDA/PDA/MRBA
	3	Culture methods – Streak plate, pour plate and spread plate methods



		Isolation and enumeration of viable bacteria (CFU) from various samples (soil / water / fruits / vegetables)	
	4	Demonstration of fungal cultures - Slide culture technique	

	Teacher Specific Module	5
5	<i>Directions</i>	
	Activity	

Essential Readings:

1. Michael J Pelczar, JR., E C S Chan, Noel R Krieg; Microbiology; 5th edition.
2. Joanne Willey, Kathleen Sandman, Dorothy Wood; Prescott's Microbiology; Eleventh edition; Mc Graw Hill publishers.
3. Ananthanarayan, C K Jayaram Paniker; Textbook of Microbiology; 8th edition
4. Jacquelyn G Black, Laura J Black; Microbiology- Principle and Explorations; 9th edition; Wiley publishers.
5. Gerald J Tortora, Berdell R Funke, Christine L Case; Microbiology- An Introduction; Ninth edition; Pearson publishers.

Suggested Readings:

1. Michael J Pelczar, JR., E C S Chan, Noel R Krieg; Microbiology; 5th edition.
2. Joanne Willey, Kathleen Sandman, Dorothy Wood; Prescott's Microbiology; Eleventh edition; Mc Graw Hill publishers.
3. Ananthanarayan, C K Jayaram Paniker; Textbook of Microbiology; 8th edition
4. Jacquelyn G Black, Laura J Black; Microbiology- Principle and Explorations; 9th edition; Wiley publishers.
5. Gerald J Tortora, Berdell R Funke, Christine L Case; Microbiology- An Introduction; Ninth edition; Pearson publishers.



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

KU2DSCMBG105- BASIC TECHNIQUES IN MICROBIOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
II	DSC B2	100-199	KU2DSCMBG105	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	2

Course Description

This course offers a comprehensive exploration of the methods employed to manage microbial growth, cultivate diverse microorganisms & preserve their viability. From understanding different culture media and growth conditions to employing aseptic techniques, students will gain skills in isolating and propagating bacteria, viruses, fungi and algae. Students will also learn about culture preservation techniques ranging from routine periodic transfer techniques employed in the laboratory to more advanced preservation techniques like cryopreservation, lyophilization and other techniques used to maintain the stability of microbial strains ensuring their availability for future studies.

Course Prerequisite: Basic knowledge on Microbiology gained during +2 level and first semester of this programme

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the physical and chemical methods for controlling microorganisms	U/A
2	Understand various culture media for the cultivation of bacteria, fungi, algae and viruses.	U
3	Understand methods for isolation and cultivation of pure cultures of microorganisms and also the enumeration of microbial cells.	A
4	Understand various preservation methods for short- and long-term preservation of microbial cultures under laboratory conditions	U/A

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



	2	Solid, semisolid and liquid cultures - Types of media – defined, basal, complex, enriched, enrichment, selective, indicator, differential, transport and anaerobic culture media.	
	3	Media for the cultivation of bacteria, fungi, algae and protozoans– examples.	
	4	Cultivation of viruses – brief account	

3	Culture methods		15
	1	Pure culture- definition, culture methods – streak plate, spread plate, pour plate methods, lawn culture, stroke culture, stab culture, liquid cultures.	
	2	Anaerobic culture methods – anaerobic jar, roll tube, Rosenthal method	
	3	Enumeration of microbial cells – CFU	
	4	Fungal culture methods	

4	Practicals in basic Microbiology		30
	1	Sterilization techniques – autoclave and hot air oven	
	2	Culture media preparation – Liquid and solid -Nutrient agar, Mac Conkey agar and media for fungi (SDA/PDA)	
	3	Culture methods for bacteria – Streak plate, spread plate and pour plate method	
	4	Demonstration of culture method for fungi – Slide culture	

5	Teacher Specific Module		5
	<i>Directions</i>		
	Activity		

Essential Readings:

1. Michael J Pelczar, JR., E C S Chan, Noel R Krieg; Microbiology; 5th edition.
2. Joanne Willey, Kathleen Sandman, Dorothy Wood; Prescott's Microbiology; Eleventh edition; Mc Graw Hill publishers.
3. R Ananthanarayan, C K Jayaram Paniker; Textbook of Microbiology; 8th edition

Suggested Readings:

1. Jacquelyn G Black, Laura J Black; Microbiology- Principle and Explorations; 9th edition; Wiley publishers.



University Order#entitled A0A0C7AE AD A03/C21808/2023/A19076/2024/APPEAL BY REGISTRATION NO XZASERV0250223024-PM - Page 40

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

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

Kannur University FYUGP Microbiology Syllabus 2024 Admission onwards

university Order# ADATG0CFAEADATG/C218076/2022/APRIL 19/2022/2:28 PM - Page 41



Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8
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	HOURS
1	Microbial control		15
	1	Fundamentals of microbial control – Definition – sterilization, disinfection, microbistatic and microbicidal agents	
	2	Conditions influencing the effectiveness of antimicrobial agents.	
	3	Physical agents of microbial control – Heat – TDP, TDT, Moist heat and dry heat – autoclave, pasteurization, tyndallisation, inspissation, hot air oven, filtration and irradiation (Ionizing and non-ionizing).	
	4	Chemical antimicrobial agents – Phenolics, alcohols, halogens, heavy metals, quaternary ammonium compounds, aldehydes, sterilizing gases, characteristics of an ideal chemical agent, evaluation of antimicrobial potency of disinfectants- phenol coefficient – Rideal Walker, Antibiotics (Brief account)	

2	Culture media		10
	1	Culture media – major components- agar, peptone, beef extract, yeast extract	
	2	Types of media - Solid, semisolid and liquid, simple and complex, defined and undefined, special - enriched, enrichment, selective, indicator, differential, transport and anaerobic culture media.	



		Media for Specific Applications- Clinical microbiology, Food microbiology, Environmental microbiology, Industrial applications	
	3	Media for the cultivation of bacteria and fungi – examples	
	4	Cultivation of viruses – brief account	

		Culture methods	15
3	1	Pure culture- definition, culture methods – streak plate, spread plate, pour plate methods	
	2	Lawn culture, stroke culture, stab culture, liquid cultures	
	3	Anaerobic culture methods	
	4	Enumeration of microbial cells	

		Practicals	30
4	1	Demonstration of sterilization	
	2	Demonstration of culture media, cultures of bacteria and fungi	
	3	Demonstration of culture methods	
	4	Demonstration of enumeration of bacteria	

		Teacher Specific Module	5
5		<i>Directions</i>	
		<i>Activity</i>	

Essential Readings

1. Michael J Pelczar, JR., E C S Chan, Noel R Krieg; Microbiology; 5th edition.
2. Joanne Willey, Kathleen Sandman, Dorothy Wood; Prescott's Microbiology; Eleventh edition; Mc Graw Hill publishers.
3. R Ananthanarayan, C K Jayaram Paniker; Textbook of Microbiology; 8th edition.
4. Jacquelyn G Black, Laura J Black; Microbiology- Principle and Explorations; 9th edition; Wiley publishers.
5. Gerald J Tortora, Berdell R Funke, Christine L Case; Microbiology- An Introduction; Ninth edition; Pearson publishers.
6. Joanne Willey, Kathleen Sandman, Dorothy Wood; Prescott's Microbiology; Eleventh edition; Mc Graw Hill publishers.
7. Michael J Pelczar, JR., E C S Chan, Noel R Krieg; Microbiology; 5th edition.

Suggested Readings

- University Order# 661116 AONADCTAG ADAT3/C18C28/M0223/21076/2024/ADP/PURV INJER8G15RAIR06AZ7ASE/M025022302501:50 PM - Page 44



University Order# 690786 / ADP PURV INTRASERIAL PZASERIAL 5072302N202501450 PM - Page 45



Semester	Course Type	Course Level	Course Code	Credits	Total Hours
II	MDC 2	100-199	KU2MDCMBG102	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1.5

Explore the fascinating world of fermentation in this comprehensive course designed for food enthusiasts, culinary professionals, and anyone interested in the science and art of fermenting foods and beverages. This course delves into the history, techniques, and health benefits of fermentation, providing both theoretical knowledge and practical skills.

Course outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the Fundamentals of Fermentation.	U/A
2	Identify Microorganisms Involved in Fermentation	U
3	Produce Fermented Dairy, Vegetable, Fruit, Cereal,	A
4	Assess the Health Benefits and Safety of Fermented Products	U/A

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

	3	Production of Wine and its types	
	4	Beer brewing and types	

	Benefits of fermented foods		10
4	1	Probiotics and their health benefits	
	2	Nutritional changes during fermentation	
	3	Traditional fermentation methods from around the world	
	4	Case studies of regional fermented foods and beverages	

	Teacher Specific Module		5
5	<i>Directions</i>		
	Activities		

Essential Readings:

1. Food Microbiology. MO Adam, MO Moss. New Age International Publishers.
2. Food Microbiology. William C Frazier. Dennis C Westhoff. Mac Graw Hill Education.
3. Fermented foods in Health and Disease Prevention Juana Frías, Cristina Martinez-Villaluenga, Elena Peñas

Suggested Readings:

1. Microbiology- A laboratory Manual. James G Cappuccino & Chad Welsh. Pearson
2. Handbook of Food and Fermentation beverage Technology Y. H. Hui, Lisbeth Meunier-Goddik, Jytte Josephsen
3. Microbiology of Fermented foods BJ Wood



KU3DSCMBG201- MICROBIAL HETEROGENEITY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC A3	200-299	KU3DSCMBG201	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	2

Course Description:

The course introduces the students to the enormous taxonomic, metabolic and ecological diversity of microorganisms on Earth. The course helps to inculcate the basic microbial structure and study the comparative characteristics of prokaryotes and eukaryotes. This makes aware about diversity of microorganism Impact of microbes on earth atmosphere, health and technology development and recognize the scope of microbiology in all spheres of life and industrial sector. The course explains the ways to classify the living system Understand the taxonomy and comprehend the various approaches of microbial taxonomy. The course also deals with the nutritional diversity among microorganisms, the different macro and micronutrients required for microbial growth and, the physical factors affecting microbial growth. And describes the pattern of growth, reproduction, death and growth kinetics of microbes and measure population growth by different methods. This also involves demonstration of theory and practical skills for identification of microorganisms.

Course Prerequisite: Basic knowledge in Microbiology gained during first semester of this programme

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Perceive the basics and tools in Microbial taxonomy	U/A
2	Understand the characters, classification and importance of Prokaryotic and Eukaryotic microbes, and acellular microbes	U
3	Understand the nutritional diversity among microorganisms and describe the pattern of growth, reproduction, death and growth kinetics of microbes	A
4	Comprehend the various methods for identification of microorganisms	U/A

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



	Archaeobacteria, Eubacteria- Major classifications with examples. Major groups of Gram positive and Gram-negative bacteria. Archaeobacteria- Classification with examples.	
3	Classification of Fungi - flagellated lower and higher fungi, Classification of microscopic algae - green algae, Diatoms and Golden-brown Algae, Dinoflagellates, euglenoids. Classification of Protozoa - Flagellates, Ciliates, Sarcodina and Sporozoa	
4	Taxonomy of animal, plant and bacterial viruses with representing examples.	

	Nutrition and growth of microbes	15
3	1	Nutritional types of microorganisms. Nutritional requirements for microbial growth - Carbon, Nitrogen. Sulphur, Oxygen, Phosphorus, Hydrogen, microelements and energy sources; Vitamins and growth factors.
	2	Factors influencing microbial growth - temperature, gaseous atmosphere, pH, osmotic pressure and hydrostatic pressure
	3	Reproduction and growth of microorganisms: Binary fission, budding, cyst and spore formation
	4	Kinetics of growth -multiplication, and death of microbial cell. Growth curve in a closed system, continuous culture and synchronous culture. Measurement of population growth.

	Practical of microbial heterogeneity	30
4	1	Effect of temperature and pH on microbial growth
	2	Determination of the size of microbial cells - bacteria/yeast- Micrometry
	3	Demonstration of bacterial growth curve Measurement of turbidity/cell density- Calorimetry/ spectrophotometry
	4	Biochemical tests for the identification of Bacteria- IMViC test, Catalase, Oxidase, Coagulase, Urease, Amylase, Sugar Fermentation (GLSM), TSI, Nitrate reduction, Gelatin liquefaction.

5	Teacher Specific Module	5
	<i>Directions</i>	
	Activity	

Essential Readings:

1. Brock Biology of Microorganisms by M.T. Madigan, Iyer'd. Buckley, W. Sattley and D. Stahl.

2	Compound lipids (Phospholipids, glycolipids), Derived lipids (Steroids, Terpenoids, Carotenoids)
3	Nucleic acids: History, structure and properties of nucleic acids, Structural components of nucleic acids, types of DNA-A, B, Z forms.
4	Double helical structure of DNA and forces stabilizing the structure of DNA, Types of RNA- rRNA, tRNA and mRNA

3	Proteins and enzymes		15
	1	Proteins: Amino acids and classification, Structural organization of proteins. Forces that stabilize structural organization.	
	2	Primary structure- Peptide bonds - structure, and properties, Secondary structure- Helices (right-handed, left-handed, 3_{10} , Pi helices), Beta sheet (Parallel & antiparallel), Ramachandran Plot. Super secondary structures, Tertiary structure- Motifs and domains- Structure of Myoglobin, Quaternary structure- Structure of Haemoglobin. Structural aspects of protein folding.	
	3	Enzymes: IUB classification of enzyme, Mechanism of enzyme action- Enzyme kinetics- Factors influencing enzyme action, Concentration of substrate- Michaelis Menten equation, Temperature and pH	
	4	Regulation of enzymatic activity – feed back inhibition, zymogen activation, covalent modification, competitive, non-competitive and uncompetitive inhibition	

	Metabolism of biomolecules	20
4	1	Metabolism of carbohydrates- Mechanism of aerobic respiration in bacteria - Glycolysis, Krebs cycle, Electron transport chain, Overview of sugar fermentation. Disorders in carbohydrate metabolism in brief
	2	Metabolism of lipid- Beta oxidation pathway, disorders in lipid metabolism in brief
	3	Metabolism of protein-deamination, transamination and decarboxylation, Disorders in protein metabolism in brief
	4	Metabolism of nucleic acids- Metabolism of purines and pyrimidines – de novo and salvage pathways. Disorders in nucleic acid metabolism in brief

5	Teacher Specific Module	5
	Directions	
	Activity	

Essential Readings:

1. Nelson D, Cox M. Lehninger Principles of Biochemistry. New York, 2005, 1216 pp., ISBN 0-7167-4339-6
2. Jain JL, Nitin Jain, Sunjay Jain. Fundamentals Of Biochemistry. S. Chand Publishing, ISBN-9352838300
3. Satyanarayana U, Chakrapani, U. Biochemistry. Elsevier. ISBN-8131264351
4. James G. Cappuccino, Natalie Sherman, Microbiology: A Laboratory Manual. Pearson Benjamin Cummings. ISBN-9780137546527

Suggested Readings:

1. Donald Voet, Judith G. Voet. Biochemistry. Wiley. ISBN: 0470917458
2. Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto. Biochemistry. WH Freeman ISBN-1464126100
3. Eric E Conn, Paul K Stumpf, George Bruening and Roy H Doi. Outlines of biochemistry. Wiley. ISBN: 9788126509300
4. Deb AC. Fundamentals of Biochemistry. New Central Book Agency. ISBN: 817381144X
5. Amita Jain, Jyotsna Agarwal, Vimala Venkatesh. Microbiology Practical Manual. Elsevier India. ISBN-8131253538

Assessment Rubrics:

Theory

Evaluation Type		Marks
End Semester Evaluation		70
Continuous Evaluation		30
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		100

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

KU3DSCMBG203- MICROBES IN DAILY LIFE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC B3	200-299	KU3DSCMBG203	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	2

Course Description:

This course offers a thorough understanding on the various techniques used for the preservation of food while exploring the science behind spoilage. It also incorporates concepts of microbiology in learning the art and science behind fermented foods providing insights and experience into the diverse world of fermented foods. Emphasizing the applications of microbiology in diverse such as agriculture, industry & medicine. The aim is to learn basic concepts and practical applications of food preservation and spoilage and to provide a solid background to fermentation technology. It also aims to develop deep analytical skills to assess the use of microbes in agriculture, food, bioenergy production and their potential for innovation and sustainability.

Course Prerequisite: Basic knowledge on Microbiology gained during +2 level and first semester of this programme

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the importance of food preservation with a focus on food spoilage and sustainable food production.	U/A
2	Understand and harness the skill of microbes for developing functional foods and nutraceuticals	U/A
3	Apply the knowledge and skills needed to address challenges in food safety, shelf-life extension and sustainable food systems.	A
4	Gain practical skill in the respective field	U/A

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



1	Nitrogen fixation - Microbes as Biofertilizers: Rhizobium, Mycorrhiza - types, Azolla- Anabaena system and its benefits.	
2	Microbiology of Municipal sewage: sewage treatment- primary – sedimentation, coagulation, secondary - septic tank, trickling filters, Imhoff tank, activated sludge, oxidation pond, rotating bio discs, anaerobic sludge digestion. Tertiary – Halogenation, radiation	
3	Solid waste disposal: Sanitary landfills, composting – Vermicompost, Biogas, Microbiology of methane production, water quality analysis – MPN	
4	Soil microorganisms and pesticide degradation - microbial decomposition of herbicides, insecticides and fungicides, Effect of pesticides on soil microorganisms.	

	Practicals	30
4	1 Production of pickles, Production of jams & jellies, Production of Yoghurt, Production of Sauerkraut	
	2 Production of Probiotic ice-cream, Production of Wine	
	3 Determination of Antibiotic sensitivity test	
	4 Water quality analysis – MPN, Mesophilic count of fish & milk sample, MBRT	

	Teacher Specific Module	5
5	<i>Directions</i>	
	<i>Activity</i>	

Essential Readings:

1. Soil Microbiology. Rao Subbha. Rao. CBS Publishers
2. Food Microbiology. MO Adam, MO Moss. New Age International Publishers.
3. Nutraceuticals and Functional Foods. Robert EC Wildman. CRC Press New York.
4. Food Microbiology. William C Frazier. Dennis C Westhoff. Mac Graw Hill Education.

Suggested Readings:

1. Microbial Ecology. Fundamentals and Applications. Ronald M Atlas. Pearson education.
2. Principles and Applications of Soil Microbiology, David M Sylvia, Pearson Prentice Hall.
3. Microbiology- A laboratory Manual. James G Cappuccino & Chad Welsh. Pearson



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

KU3DSCMBG204- FLAVOURS OF MICROBES

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC B3	200-299	KU3DSCMBG204	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	2

Course Description:

This course offers a flavourful journey into the world of microbes; it delves into the fascinating interplay between microorganisms and creation of Flavors in various foods and beverages. It also enables a better understanding of microbes involved in the production of these characteristic tastes and aromas, as well as their influence on food quality, safety and sensory experience. The aim is to feature a dynamic blend of tastings and laboratory experiments. Explore the cultural, economic and environmental impacts of fermentation processes on society. Consider the historical significance of fermented foods and beverages, their role in global cuisine and their potential contributions to sustainability and food security.

Course Prerequisite: Basic knowledge on Microbiology gained during +2 level and first semester of this programme

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the role of microbes in the production of fermented foods and their flavour development.	U/A
2	Understand the role of microbes in the production of fermented beverages and their flavour development.	U
3	Understand the role of microbes in preservatives and pigment production	A
4	Gain practical skill in various techniques in fermentation	U/A

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



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



KU3DSCMBG205- MICROBIAL GENETICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC C3	200-299	KU3DSCMBG205	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	2

Course Description:

This course provides an in-depth understanding of microbial genetics, focusing on the genetic mechanisms that drive the diversity and adaptability of microorganisms. Key topics include: the processes of transformation, transduction, and conjugation, and their impact on genetic diversity. This course equips students with a robust understanding of microbial genetics, preparing them for advanced studies and careers in microbiology, biotechnology, and related fields.

Course Prerequisite: Basic knowledge on Microbiology gained during +2 level and first semester of this programme

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the genetic make-up of microorganisms	U/A
2	Understand the conjugation	U
3	Understand the transformation and transduction	A
4	Gain practical skill in various techniques in microbial genetics	U/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	HOURS
1		Introduction to microbial genetics	10
	1	The genetic elements in bacteria	
	2	Plasmids and its classification	
	3	Genetics elements in Viruses	
	4	Transposable elements	

	Conjugation	15
2	1	Conjugation in bacteria – the role of F plasmid
	2	Conjugation mechanism and types
	3	Applications of Conjugation
	4	Role of conjugation in antibiotic resistance

3	Transformation and transduction		15
	1	Mechanism of transformation	
	2	Applications of Transformation	
	3	Mechanism of Transduction and its types	
	4	Applications of transduction	

4	Practicals		30
	1	Demonstration of Conjugation	
	2	Demonstration of transduction	
	3	Demonstration of Transformation	
	4	Isolation of Plasmid DNA	

5	Teacher Specific Module	5
	<i>Directions</i>	
	<i>Activity</i>	5

Essential Readings:

1. Ananthanarayan and Paniker's Textbook of Microbiology, 12th edition (2022). Universities Press (India) Pvt Ltd.
2. Microbial Genetics (1994) Maloy, Cronan and David Freifelder. Jones and Bartlett Publishers, Inc
3. Principles of Genetics, 8th edition (2006). Gardner, Simmons and Snustad. John Wiley & Sons

Suggested Readings:

1. Microbiology- A laboratory Manual. James G Cappuccino & Chad Welsh.
Pearson
2. Snyder and Champness Molecular Genetics of Bacteria, 5th Edition. Joseph E. Peters, Tina M. Henkin (2020) Wiley.

University Order# 691116 ACAD CHG AD ACT 3/21/2023 10:50 AM - Page 74

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

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

KU3VACMBG201- MICROBES IN SOLID WASTE MANAGEMENT

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	VAC 1	200-299	KU3VACMBG201	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1.5

Course Description:

This course is provided as value addition course of microbiology aimed to provide knowledge in waste management and the role of microbes in managing waste. By completing this course, the student will gain knowledge in waste management. This syllabus explains different types of waste and their management strategies by using the power of microbes

Course Prerequisite: Nil

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Outline Solid Waste Management & Disposal Methods for Solid Waste	U/A
2	Explain the Bioprocessing of organic wastes	U
3	Understand the basics and application of microbes in bioremediation	A
4	Demonstrate various methods of composting	U/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	HOURS
1	Types of waste and its management		10
	1	Introduction – Best practices in waste disposal, colour codes used for waste segregation, Waste management strategies - Refuse, Reduce, Reuse, Repurpose and Recycle	
	2	Solid waste – Sources, generation of solid waste	
	3	Types of solid waste, Need for solid and hazardous waste management	
	4	Role of microbes in waste management	

2	Disposal methods		10
	1	Incineration – methods, types and applications	
	2	Landfilling – methods and applications	
	3	Composting – types- aerobic, anaerobic, vermicomposting	
	4	Biogas – principles of methanogenesis, design of biogas plant	



3	Bioremediation		10
	1	Introduction, major approaches to bioremediation – <i>in situ</i> and <i>ex situ</i>	
	2	Other approaches – biosparging, bioaugmentation, biopiling, biodegradation and bioleaching	
	3	Myco and phytoremediation – brief account	
	4	Management of plastic waste – novel microbial techniques – application of co - cultures and microbial consortia	

4	Best practices – demonstrations		10
	1	Waste composting – vermi composting	
	2	Bin composting and pit composting, tube composting	
	3	Biogas production	
	4	Demonstration of plastic degradation	

5	Teacher Specific Module		5
	<i>Directions</i>		
	<i>Activity</i>		

Essential Readings:

1. Bhide A.D and Sundaresan B.B, “Solid waste management – collection, processing and Disposal”, Mudrashilpa Offset Printers 2001.
2. Dubey, R.C. and Maheswari, D.K.” A Textbook of microbiology”. S. Chand & Company Ltd, New Delhi. 2005.
3. Hagerty, D. Joseph, Joseph L. Pavoni, and John E. Heer. "Solid waste management." Van Nostrand Reinhold, (1973).
4. Manual on Solid Waste Management, CPHEEO, Ministry of Urban Development, GOI, New Delhi, 2000.
5. Alexander M. “Introduction to soil microbiology”, Wiley, New York; London. 2nd ed. 1977
6. Atlas, R. M., & Bartha, R. “Microbial ecology: Fundamentals and applications”. 6th ed Menlo Park, Calif: Benjamin/Cummings 1998.

Suggested Readings:

1. Shukla S. K. & Srivastava P. R. In: Waste Management and Control. Commonwealth Publishers, New Delhi 1992.



2. R. E. Landrefh and P. A. Rebers, Municipal Solid Wastes-Problems & Solutions, Lewis, 1997.
3. Blide A.D.& Sundaresan, B. B, Solid Waste Management in Developing Countries, INSDOC, 1993. 4. Georges E. Ekosse, Rogers W'O Okut-Uma, Pollution control & Waste management in Developing Countries, Commonwealth Publishers, New Delhi, 2000

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	10
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



Semester IV



KU4DSCMBG206 – DATA SCIENCE AND COMPUTATIONAL BIOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	DSC A5	200-299	KU4DSCMBG206	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	2	0	25L+10P	50L+15P	100	2

Course Description:

This an important discipline-specific course that enables the graduate to tackle various biological problems with the help of computational biology and data sciences-driven approaches. The course aims to provide essential knowledge on the applications of computational biology and data sciences in integration, management, and analysis of various data in biological sciences and other interdisciplinary applied sciences. The course covers the introduction to data science and computational biology, various databases, in silico tools and their applications, similarity searching and alignment techniques by various computational biology tools. The course also provides knowledge on the scope and applications of molecular phylogenetics, gene and structure prediction in various exercises in biological sciences. Further, the course covers the basics of molecular Modeling and interaction studies of protein-protein and protein-ligands and the applications of various computational tools for the prediction of various exercises in life sciences.

Course Prerequisite: Basic knowledge in Microbiology gained during the previous semesters of this programme

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the fundamentals concepts of data sciences, computational biology and their applications in modern biology.	U/A
2	Comprehend the scope and applications of various biological databases, sequence alignment and similarity searching tools biological science.	U
3	Predict the three-dimensional structure of protein and design molecular targets for drug development and validation	A
4	Evaluate and analyze the data for various sequence, structural and functional information useful for Life Sciences and R & D.	U/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	HOURS
1	Data science, computational biology and database		10
	1	Fundamentals of data sciences- Major scope and applications. Major disciplines of computational biology.	
	2	Introduction to computational biology and Bioinformatics.	
	3	Classification of data bases- Primary, secondary, composite and specialized databases. File format - GenBank Flat File and PDB flat file	
	4	Similarity searching tools: BLAST and FASTA. Major algorithms available in BLAST.	

		Sequence alignment and molecular phylogenetics	15
2	1	Sequence alignment methods - Global and local alignment - Gap penalties, Substitution matrices - PAM and BLOSUM. Pairwise and multiple sequence alignment. Progressive alignment	
	2	Molecular phylogenetics: Structural component of phylogenetic tree, Types of phylogenetic trees, molecular clock hypothesis.	
	3	Phylogenetic data analysis - Multiple sequence alignment, substitution models, tree building- Distance based and character based, and tree evaluation methods	
	4	Major bioinformatics tools and software for phylogenetic data analysis.	

		Computational gene prediction and structure prediction	15
3	1	Computational gene prediction - Introduction, steps, Bioinformatics tools for gene prediction. Prediction of secondary structure of RNA.	
	2	Computational Prediction of protein structure - Secondary structure prediction, Tertiary structure prediction - Major Approaches - Homology modeling- Steps, principles, and associated bioinformatics tools.	
	3	Molecular visualization tools – Rasmol and Pymol	
	4	Study of protein-protein and protein - ligand interaction- Molecular docking, principle, methodology of molecular docking. Computational biology tools for molecular docking	

	Practicals	30
4	1	Retrieval of nucleic acid and protein sequences from GenBank and Uniport data bases. Retrieval of structure of PDB and molecular visualization of protein structures.
	2	Pair wise alignment of sequences using any Bioinformatics tools. Multiple sequence alignment using Clustal Omega. Phylogenetic analysis and visualization of phylogenetic trees.
	3	Prediction of the structure of gene using any Bioinformatics tools. Secondary structure prediction of protein by Bioinformatics tools.
	4	Homology modeling of protein using amino acid sequences and computational validation of modelled structures. Demonstration of molecular docking - Protein-protein and protein-ligand docking

5	Teacher Specific Module	5
	Directions	
	Activity	

Essential Readings:

1. Xinog J, Essentials of Bioinformatics, Texas A & M University, Cambridge University press. 2006. ISBN: 9780521600828
2. Baxevanis AD, Ouellette BFF. Bioinformatics. A practical guide to the analysis of genes and Proteins. Third edition. John Wiley & Sons. 2006. ISBN: 978-0-471-47878-2

University Order# 66116 AD-CHN-6 AD-AT3/21808/2023/218076/2024/APPF RVTYR BY HERGIS ISRAELI 6VZ7AS SEP 25 01:50 PM - Page 84



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

KU4DSCMBG207 - ESSENTIAL MOLECULAR BIOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	DSC A6	200-299	KU4DSCMBG207	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	2

Course Description:

This course "Essential Molecular Biology" provides a comprehensive introduction to the fundamental principles of molecular biology, including the structure and function of nucleic acids, the mechanisms of DNA replication, transcription, and translation, and the regulation of gene expression. This course also provides hands-on expertise on basic molecular biology techniques.

Course Prerequisite: Nil

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the structure and function of DNA, RNA, and proteins	U
2	Describe the molecular mechanisms underlying DNA replication, transcription, and translation	An
3	Explain the regulation of gene expression in prokaryotic and eukaryotic systems	U/A
4	Acquire hand-on experience in isolation, quantification and visualization of DNA and RNA	A

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



5	Teacher Specific Module	5
	Directions	
	Activity	

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

KU4DSCMBG208 - BASICS OF IMMUNOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	DSC A7	200-299	KU4DSCMBG208	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	2

Course Description:

The course acts as one of the major discipline specific courses in the Fourth Semester for undergraduate program in Microbiology. Basics of Immunology for Undergraduates is an introductory course designed to provide students with a comprehensive understanding of the fundamental principles and mechanisms of the immune system. Through a combination of lectures, laboratory sessions, and interactive discussions, students will explore the structure, function, and regulation of the immune system in health and disease. The course begins by introducing the basic components of the immune system, including innate and adaptive immunity, and explores the cellular and molecular mechanisms underlying immune responses. Students will learn about the key cells involved in immunity, such as T cells, B cells, macrophages, and dendritic cells, and their roles in recognizing and eliminating pathogens. Throughout the course, students will also examine the processes of antigen recognition, antigen presentation, and immune activation, as well as the generation of immune memory and the development of immunological tolerance. In addition to theoretical knowledge, students will gain practical skills through laboratory sessions focused on techniques commonly used in immunological research. These hands-on experiences will complement the theoretical concepts covered in lectures and help students develop critical thinking and analytical skills essential for understanding and interpreting immunological data.

Course Prerequisite: Basic knowledge in Microbiology gained during +2 level and first, second and third semester of this programme

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand various immune mechanisms	U/A
2	Describe various immune cells and organs involved in immunity	U
3	Understand the basis of allergy reactions, auto immune mechanisms, transplantation and cancer immunity	A
4	Understand and practice different immunological techniques used and serological diagnosis of infectious diseases	U/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	HOURS
1		Types of immunity, organs and immune response	10
	1	Immunity – types – Innate and acquired, active and passive immune response	
	2	Organs and cells of immune system- central and peripheral lymphoid organs, leucocytes, lymphocytes, macrophages and plasma cells	
	3	Immune responses - primary and secondary. Mechanism of immunity, barriers and phagocytosis	
	4	Mechanism of inflammation	



2	Antigens and antibodies		15
	1	Antigens – types, antigenic determinants. Properties of antigen	
	2	Immunoglobulins - basic structure and classes (IgA, IgG, IgM, IgD and IgE) and their functions	
	3	Theories of antibody synthesis - instructive and selection theory, clonal selection theory. Monoclonal antibodies – hybridoma technology	
	4	Antigen - antibody reactions – principles, agglutination, precipitation, complement fixation, ELISA and its types, RIA, immunofluorescence	

3	Hypersensitivity, autoimmunity, transplantation and cancer immunity		15
	1	Hypersensitivity reactions – types and mechanisms Type 1 - Anaphylaxis, atopy, type 2, type 3 and type 4	
	2	Autoimmunity and autoimmune diseases (Pernicious anemia and Rheumatoid arthritis as example)	
	3	Transplantation and tumor immunity – types of transplants, allograft reactions – allograft rejection – primary and secondary rejection reactions, Graft versus Host (GVH) reactions.	
	4	Cancer immunology – introduction, Tumor antigens and mechanism of immune response to tumors	

4	Practicals in Immunology		30
	1	Precipitation – immuno diffusion, and agglutination reaction (Tube / slide)	
	2	Complement fixation test	
	3	Enzyme Linked immuno Sorbent Assay (ELISA) / Immuno Fluorescence	
	4	Widal, VDRL, ASO, RPR, CRP, ELISA – HIV / Western blot – HIV, HBsAg test	

5	Teacher Specific Module		5
	<i>Directions</i>		
	<i>Activity</i>		



Essential Readings:

1. Kuby Immunology by Thomas J. Kindt (2006) Publisher: W H Freeman & Co
2. Immunology: An Introduction by Ian R Tizard (2006) Publisher: Cengage Learning
3. Immunology and Immuno technology by Chakravarty (2006)
4. Elements of Immunology (2009) by Khan Publisher: Dorling Kindersley (India)
5. Immunology by K.R. Joshi (2007)
6. Ananthanarayan and Paniker, Text book of microbiology

Suggested Readings:

1. Basic Immunology, 3ed by: Abbas Publisher: Elsevier
2. Immunology by P.R. Yadav (2004) Publisher: Discovery Publishing House
3. Immunology by David A. Marcus, Richard A. Goldsby, Barbara A. Osborne (2003)
Publisher: WH. Freeman & Company

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

University Order# 66116 AD-CHN-6-AD-AT3/21876/2023/APP/PUVTER BY HERGISTRAIR 6VZ7ASAPV0250222820E02504530 PM - Page 93



Kannur University FYUGP Microbiology Syllabus 2024 Admission onwards

KU4VACMBG202 - MICROBES FOR SUSTAINABLE LIFE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	VAC 2	200-299	KU4VACMBG202	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1.5

Course Description:

The course named “Microbes for sustainable life” is a 3-credit lecture and interdisciplinary engaged learning experience for undergraduate students with no science background required. The course explores the science and culture of microbial agricultural products through readings, lectures, group projects. This course explores the diverse roles of microorganisms in promoting sustainability across different fields, including agriculture, environmental management, and biotechnology. Students will learn about the beneficial interactions between microbes and their environments and how these interactions can be harnessed to address global challenges.

Course Prerequisite: Nil

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Appreciate the importance of microbial diversity for sustainable practices.	U/A
2	Understand the role of soil microbiota in environment sustainability	U
3	Learn about microorganism’s role in renewable energy production	A
4	Understand the role of microbes in medicine and biotechnology	U/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	HOURS
1	Microbial Diversity and Bioprospecting		10
	1	The role of various microorganisms and how they impact humans, agriculture and environment	
	2	Introduction to Agriculture and Sustainable Farming Practices - An overview of agriculture, its significance in food production, and the need for sustainable farming practices.	
	3	Bioprospecting for novel microbial strains	
	4	Potential applications in sustainable practices	

2	Microbes in Environmental Sustainability		10
	1	Microbes in environmental management: Biosensors – types and its structural components	
	2	Microbial remediation in oil spills – Construction of superbugs	
	3	Soil mineralization of cellulose, hemicelluloses, lignocelluloses and lignin	
	4	Microbial contributions to nutrient cycling – nitrogen, carbon, phosphorus and sulfur	



5	Teacher Specific Module	5
	<i>Directions</i>	
	Activity	

- University Order number: A0ADbCfAeADbC3c218d9D0242A19078f2024 / DPFWUy NjE6BjSTRARo(AZ7ASfM0250150 PM - Page 97

Theory

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

KU4VACMBG203 - PUBLIC HEALTH AND HYGIENE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	VAC 3	200-299	KU4VACMBG203	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1.5

Course Description:

This course aims to provide microbiology students with a comprehensive understanding of public health and hygiene. It will cover the fundamental concepts of epidemiology, disease prevention, health promotion, sanitation, and the role of microbiology in public health. The syllabus is designed to integrate theoretical knowledge with practical applications in public health practices

Course Prerequisite: Nil

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand public health	U/A
2	Understand various infectious diseases	U
3	Gain knowledge in environment health	A
4	Understand the role of microbiology in public health and apply the microbiological hygienic practices in day today life	U/A

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



4	Occupational health and safety, infection control protocol in hospitals
---	---

4	Public health Microbiology		10
	1	Personal hygiene practices	
	2	Food hygiene, safety, standards – national and international	
	3	Microbiological practices in maintaining hygiene	
	4	Role of microbiologists in outbreak response	

5	Teacher Specific Module	5
	<i>Directions</i>	
	Activity	

Essential Readings:

1. "Public Health: A Very Short Introduction" by Virginia Berridge
2. "Epidemiology: An Introduction" by Kenneth J. Rothman
3. "Control of Communicable Diseases Manual" by David L. Heymann
4. WHO and CDC websites for up-to-date information and guidelines
5. Research articles and case studies from scientific journals

Suggested Readings:

1. Vijaya Khader (2000) Food, nutrition & health, Kalyan Publishers, New Delhi
2. Srilakshmi, B., (2010) Food Science, (5th Edition) New Age International Ltd., New Delhi
3. Bamji, M.S., K. Krishnaswamy & G.N.V. Brahmam (2009) Textbook of Human Nutrition (3rd edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
4. Swaminathan (1995) Food & Nutrition (Vol I, Second Edition) The Bangalore Printing & Publishing Co Ltd., Bangalore

University Order# 0698717
Account# 100ADATCNE AD AT3/C18C8/D02Z/A1P176/E02A/PXZASSEP/O25O1Z28DEN/02509 SMPM - Page 101



Kannur University FYUGP Microbiology Syllabus 2024 Admission onwards

KU4SECMBG201- MUSHROOM CULTIVATION

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	SEC1	200-299	KU4SECMBG201	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1.5

Course Description:

Mushroom cultivation course enables the students to identify edible and poisonous mushrooms and also to understand the nutritive and medicinal values of mushrooms. The course provides the students to get complete understanding of the procedures in spawn production, cultivation methods. The course also provides the students to get enough knowledge in managing various diseases of mushroom and also to get an idea about the post-harvest processing. After completing this course, the students will understand various value-added products from mushroom. After successful completion of this course the students can start self-earning small-scale business in mushroom production.

Course Prerequisite: Nil

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand different types of mushrooms and its nutritional values	U/A
2	Understand spawn production and management	U
3	Gain knowledge in mushroom cultivation methods	A
4	Understand the management of diseases of mushrooms and its processing techniques	U/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	HOURS
1	Types of mushrooms and health benefits		10
	1	Introduction to mushroom cultivation. History and scope of mushroom cultivation.	
	2	Edible and poisonous mushrooms, common Indian mushrooms,	
	3	Nutritional and medicinal value of mushrooms.	
	4	Morphology and structure of Agaricus.	
2	Spawn production and management		10
	1	Pure culture preparation of mushroom, Media used, Maintenance of culture	
	2	Mushroom spawn and its types.	
	3	Substrates used for spawn production. Mother spawn production, Multiplication of bed spawn from mother spawn. Sterilization of substrate	
	4	Ideal characteristics of good spawn, spawn preservation methods.	
3	Mushroom cultivation methods		10

	1	Mushroom cultivation – oyster mushroom, paddy straw mushroom and white button mushroom.	
	2	Preparation of substrate. Construction of Mushroom houses, Sterilization of substrate and other materials	
	3	Method of cultivation and harvesting.	
	4	Factors influencing mushroom growth. Post harvest handling of mushrooms	

	Management of diseases and processing of mushrooms		10
4	1	Identification and management of different pests and diseases of mushrooms. Bacterial diseases – Bacterial blotch, Bacterial rot and Brown spot.	
	2	Fungal diseases – wet bubble, dry bubble, green molds and cobweb disease.	
	3	Insect pests – Phorid flies, Sciarid flies, Beetle. Damage by nematodes.	
	4	Post harvest processing and value-added products from mushrooms	

	Teacher Specific Module		5
5	<i>Directions</i>		
	<i>Activity</i>		

Essential Readings:

1. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
2. Pandey R.K, S. K Ghosh, 1996. A Hand Book on Mushroom Cultivation. Emkey Publications.
3. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
4. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.

Suggested Readings:

1. Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. PVT.LTD, New Delhi.
2. V.N. Pathak, Nagendra Yadav and Maneesha Gaur, Mushroom Production and Processing Technology/ Vedams Ebooks Pvt Ltd., New Delhi (2000)

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