

DEPARTMENT OF MICROBIOLOGY

COURSE STRUCTURE & SYLLABI
(For the students admitted from year 2023-2024 onwards)

Programme : B.Sc. Microbiology



JAMAL MOHAMED COLLEGE (AUTONOMOUS)
Accredited with A++ Grade by NAAC (4th Cycle) with CGPA 3.69 out of 4.0
(Affiliated to Bharathidasan University)
TIRUCHIRAPPALLI – 620 020

B.Sc. MICROBIOLOGY

Sem	Course Code	Part	Course Category	Course Title	Ins. Hrs/Week	Credit	Marks		Total
							CIA	ESE	
I	23U1LT1/LA1/LF1/LH1/LU1	I	Language - I		6	3	25	75	100
	23UCN1LE1	II	English - I	English for Communication - I	6	3	25	75	100
	23UMB1CC1	III	Core - I	Fundamentals of Microbiology	5	5	25	75	100
	23UMB1CC2P		Core - II	Fundamentals of Microbiology - Practical	3	3	20	80	100
	23UMB1AC1		Allied - I	General Biochemistry	5	4	25	75	100
	23UMB1AC2P		Allied - II	General Biochemistry - Practical	3	2	20	80	100
	23UCN1AE1	IV	AECC - I	Value Education	2	2	-	100	100
Total					30	22			700
II	23U2LT2/LA2/LF2/LH2/LU2	I	Language - II		6	3	25	75	100
	23UCN2LE2	II	English - II	English for Communication - II	6	3	25	75	100
	23UMB2CC3	III	Core - III	Bacteriology	5	5	25	75	100
	23UMB2CC4P		Core - IV	Bacteriology - Practical	3	3	20	80	100
	23UMB2AC3		Allied - III	Haematology	5	4	25	75	100
	23UMB2AC4P		Allied - IV	Haematology - Practical	3	2	20	80	100
	23UCN2SS	IV	Soft Skills Development	Soft Skills Development	2	2	-	100	100
	23UCN2CO	V	Community Outreach	JAMCROP	-	@	-	-	@
	23U2BT1 / 23U2AT1		Basic Tamil - I / Advanced Tamil - I	எழுத்தும் இலக்கியமும் அறிமுகம் - I / தமிழ் இலக்கியமும் வரலாறும் - I	-	-	-	100 #	-
Total					30	22			700
*Only grades will be given									
III	23U3LT3/LA3/LF3/LH3/LU3	I	Language - III		6	3	25	75	100
	23UCN3LE3	II	English - III	English for Communication - III	6	3	25	75	100
	23UMB3CC5	III	Core - V	Microbial Physiology	4	4	25	75	100
	23UMB3CC6P		Core - VI	Microbial Physiology - Practical	3	3	20	80	100
	23UMB3AC5		Allied - V	Basics of Immunology	4	4	25	75	100
	23UMB3AC6P		Allied - VI	Basics of Immunology - Practical	3	2	20	80	100
	23UMB3GE1	IV	Generic Elective - I		2	2	-	100	100
	23UCN3AE2		AECC - II	Environmental Studies	2	2	-	100	100
Total					30	23			800
IV	23U4LT4/LA4/LF4/LH4/LU4	I	Language - IV		6	3	25	75	100
	23UCN4LE4	II	English - IV	English for Communication - IV	6	3	25	75	100
	23UMB4CC7	III	Core - VII	Medical Microbiology	6	6	25	75	100
	23UMB4CC8P		Core - VIII	Medical Microbiology - Practical	3	3	20	80	100
	23UMB4AC7		Allied - VII	Soil and Agricultural Microbiology	4	4	25	75	100
	23UMB4AC8P		Allied - VIII	Soil and Agricultural Microbiology - Practical	3	2	20	80	100
	23UMB4GE2	IV	Generic Elective - II		2	2	-	100	100
	23UCN4EL		Experiential Learning	Internship	-	2	-	100	100
	23UCN4EA	V	Extension Activities	NSS, NCC, etc.	-	1	-	-	-
23U4BT2 / 23U4AT2		Basic Tamil - II / Advanced Tamil - II	எழுத்தும் இலக்கியமும் அறிமுகம் - II / தமிழ் இலக்கியமும் வரலாறும் - II	-	-	-	100 #	-	
Total					30	26			800
V	23UMB5CC9	III	Core - IX	Microbial Genetics	6	6	25	75	100
	23UMB5CC10		Core - X	Molecular Biology	5	5	25	75	100
	23UMB5CC11		Core - XI	Enzyme Technology	5	5	25	75	100
	23UMB5CC12P		Core - XII	Microbial Genetics, Molecular Biology and Enzyme Technology - Practical	5	5	20	80	100
	23UMB5DE1A/B		Discipline Specific Elective - I		5	4	25	75	100
	23UMB5SE1	IV	Skill Enhancement Course - I	Biotechniques	2	1	-	100	100
	23UMB5SE2		Skill Enhancement Course - II	Bioinoculant Technology	2	1	-	100	100
	23UMB5EC1		Extra Credit Course - I*	Online Course	-	*	-	-	-
Total					30	27			700
VI	23UMB6CC13	III	Core - XIII	Environmental Microbiology	6	6	25	75	100
	23UMB6CC14		Core - XIV	Food Microbiology	6	6	25	75	100
	23UMB6CC15P		Core - XV	Environmental Microbiology and Food Microbiology - Practical	5	5	25	75	100
	23UMB6PW		Project Work	Project Work	3	2	-	100	100
	23UMB6DE2A/B		Discipline Specific Elective - II		5	4	25	75	100
	23UMB6DE3A/B		Discipline Specific Elective - III		4	4	25	75	100
	23UCN6AE3	IV	AECC - III	Gender Studies	1	1	-	100	100
	23UMB6EC2		Extra Credit Course - II*	Online Course	-	*	-	-	-
23UMB6CA		Extra Credit Course for all**	Online Course	-	**	-	-	-	
Total					30	28			700
Grand Total						148			4400

GENERIC ELECTIVE COURSES

Semester	Course Code	Course Title
III	23UMB3GE1	Food Process Technology
IV	23UMB4GE2	Dairy Microbiology

Self-Study Course – Basic and Advanced Tamil

(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Semester	Course Code	Course Title
II	23U2BT1	Basic Tamil – I (எழுத்தும் இலக்கியமும் அறிமுகம் - I)
	23U2AT1	Advanced Tamil – I (தமிழ் இலக்கியமும் வரலாறும் - I)
IV	23U4BT2	Basic Tamil – II (எழுத்தும் இலக்கியமும் அறிமுகம் - II)
	23U4AT2	Advanced Tamil – II (தமிழ் இலக்கியமும் வரலாறும் - II)

Mandatory

Basic Tamil Course - I and II are offered for the students who have not studied Tamil Language in their schools and college.

Advanced Tamil Course - I and II are offered for those who have studied Tamil Language in their schools but have opted for other languages under Part - I.

DISCIPLINE SPECIFIC ELECTIVES

Semester	Course Code	Course Title
V	23UMB5DE1A	Introduction to Virology
	23UMB5DE1B	Textile Microbiology
VI	23UMB6DE2A	Fermentation Technology
	23UMB6DE2B	Medical Entomology
	23UMB6DE3A	Recombinant DNA Technology
	23UMB6DE3B	Bioinformatics and Biostatistics

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UMB1CC1	Core – I	5	5	25	75	100
Course Title		FUNDAMENTALS OF MICROBIOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Introduction- Definition, Scope and Landmark discoveries relevant to the field of microbiology; *Germ theory of disease*, Theory of spontaneous generation. Biogenesis and abiogenesis. Microscopy: Introduction, Principle – Bright field, dark field, phase contrast, confocal, fluorescent and electron microscope-TEM and SEM. Specimen preparation of Electron Microscopy.	15
II	Taxonomy: Types of classification (artificial, natural, phylogenetic); #binomial nomenclature#. Haeckel's three kingdom, Whittaker's five kingdom concept – merits, demerits and status of virus in five kingdom concept. Carl Woes's three kingdom classification systems and their utility. *Eight kingdom concept*. Outline classification based on Bergey's manual of systemic Bacteriology (9th edition). Difference between the prokaryotic and eukaryotic microorganisms.	15
III	Characterization of microbes: Fungi: General characteristics, classification, reproduction and its economic importance. Algae: General characteristics and Classification basic knowledge on its reproduction and its economic importance. Actinomycetes: General characteristics and their importance. Protozoa: *General characteristics*, classification, reproduction and its economic importance.	15
IV	Measurement of Microbes: Microscopic measurements of microorganisms and spores using stage and ocular micrometer. Quantitative Measurement – Direct Microscopic Count, Electronic Enumeration of Cell Numbers, *Plate count method*, Membrane – Filter Count, Turbidometric methods and determination of dry weight of the cell.	15
V	Sterilization and disinfection techniques: Definition and concept of Sterilization, Physical methods- Moist heat (Tyndallisation, Pasteurization), Dry heat (incineration, hot air over) and Moist heat under pressure (Autoclave), Filtration (Membrane filter, HEPA filter) Radiation (UV- rays, X- rays, ultrasonic rays). Chemical methods- disinfection, sterilants sanitization, antisepsis and fumigation. *Phenol coefficient of disinfectant*.	15
VI	Current Trends (For CIA only) - Burping bacteria: Identifying Arctic microbes that produce greenhouse gases.	

..... Self Study

Text Book(s):
<ol style="list-style-type: none"> 1. Michael J. Pelczar, Chan E.C.S., Noel Krieg, Microbiology, 5thedition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2006. 2. Lansing M. Prescott, John P. Harley and Donald A. Klein's, Microbiology, 7thedition, McGrawHill, 2008. 3. Roger Y. Stainer, John L. Ingraham, Mark L, Wheelis and Page R. Painter, General Microbiology, 5th Edition, Macmillan Press Ltd, London,1992. 4. Dubey R.C. and Maheswari D.K, A Textbook of Microbiology (Revised edition), S. Chand and Company Ltd, New Delhi, 2012.

Reference Book(s):

1. Ananthanarayan R. and Jayaram Paniker C.K., Textbook of Microbiology, 8th edition, Universities Press (India) Private Limited, 2009.
2. Jeffrey C. Pommerville, Alcamo's Fundamentals of Microbiology, 9th edition, Jones and Bartlett publishers, Massachusetts, 2011.
3. Purohit S.S, Microbiology- Fundamentals and Applications, 7th Edition, Agrobios (India) Jodhpur, 2008.

Web Resource(s):

1. <https://www.studyandscore.com/studymaterial-detail/phylum-protozoa-general-characters-and-classification>
2. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=5205>
3. <https://microbeonline.com/maintenance-and-preservation-of-pure-cultures-of-bacteria/>

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the knowledge on historical inventions, scope and Principles of Microscopy.	K1
CO2	Explain the classification and nomenclature of bacterial taxonomy.	K2
CO3	Determine the characterization and their economic importance of microbes.	K3
CO4	Analyze the microbes by using various measurement techniques.	K4
CO5	Summarize the methods of sterilization and disinfection techniques.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	2	3	1	2	2	3	1	1	2.1
CO2	2	2	2	2	1	3	2	1	2	2	1.9
CO3	3	2	3	1	2	3	2	2	3	1	2.2
CO4	2	2	2	1	2	1	1	2	1	2	1.6
CO5	2	3	2	2	2	2	1	2	2	1	1.9
Mean Overall Score											9.7/5=1.94
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: A. SWEDHA

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UMB1CC2P	Core - II	3	3	20	80	100
Course Title		FUNDAMENTALS OF MICROBIOLOGY- PRACTICAL					

SYLLABUS		
S. No	Contents	Hours
1.	Laboratory practice and precautions. Antiseptics and disinfectants.	45
2.	Cleaning and sterilization of glass wares.	
3.	Culture media preparation –Solid, semi-solid and liquid medium.	
4.	Pure culture techniques- Streak, Spread and Pour plate method.	
5.	Isolation of Bacteria.	
6.	Isolation of Fungi.	
7.	Isolation of Actinomycetes.	
8.	Isolation of Cyanobacteria.	
9.	Enumeration of bacteria by viable count and total count.	
10.	Staining of bacteria- Simple and Gram staining technique.	
11.	Staining of Fungi –Lacto phenol cotton blue method.	
12.	Microscopic examination of the Amoeba and <i>Plasmodium</i> using permanent mounts	

Text Book(s):
<ol style="list-style-type: none"> 1. James G. Cappuccino, Natalie Sherman, Microbiology – A laboratory manual, The Benjamin Cummings Publishing Company, Inc, 1996. 2. Mackie and McCartney, Practical Medical Microbiology, Churchill Livingstone, 1989.
Reference Book(s):
<ol style="list-style-type: none"> 1.K.R. Aneja, Experiments in Microbiology Plant Pathology and Biotechnology, New Age International Limited, 2005. 2.B.K. Khuntia, Basic Microbiology – An Illustrated Laboratory Manual, 2nd Edition, Daya Publishing House, New Delhi, 2013.
Web Reference:
<ol style="list-style-type: none"> 1. https://www.pharmaguideline.com/2007/02/isolation-and-preservation-methods-for-pure-cultures.html 2. https://ocw.ehu.eus/file.php/253/Temas/2_BASIC_METHODS_FOR_THE_ENUMERATION_OF_MICROORGANISMS.pdf 3. https://microbiologyinfo.com/gram-staining-principle-procedure-interpretation-examples-and-animation/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the biosafety measures and aseptic techniques.	K1
CO2	Illustrate the methods of sterilization, media preparation and pure culture techniques.	K2
CO3	Determine the microorganisms from various samples.	K3
CO4	Analyze the bacteria by counting methods.	K4
CO5	Summarize the various staining techniques.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	2	2	2	2	3	3	1	1	2.1
CO2	3	2	2	2	1	3	2	2	1	1	1.9
CO3	2	3	2	2	2	3	2	2	1	1	2.0
CO4	3	3	2	2	1	3	2	2	2	1	2.1
CO5	3	3	2	2	2	3	2	2	1	1	2.1
Mean Overall Score											10.2/5= 2.04
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: A. SWEDHA

Semester	Course Code	Course Category	Hours/Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UMB1AC1	Allied - I	5	4	25	75	100
Course Title		GENERAL BIOCHEMISTRY					

SYLLABUS

Unit	Contents	Hours
I	Basics in Biochemistry: Structure of atoms, molecules and chemical bonds. Units of measurement of solutes- Normality, molality and molarity. Water as a biological solvent. Acids and bases, * pH, pK *and Preparation of buffers and their importance in biological systems.	15
II	Carbohydrates: Structure, Classification and functions of carbohydrates- Monosaccharides-Glucose, Fructose and Galactose. Disaccharides -Maltose, Lactose and Sucrose. Trisaccharides- *Raffinose*. Polysaccharides- Homo and Heteropolysaccharides.	15
III	Amino acids and proteins: Structure, Classifications and types of amino acids. Proteins- Classification, Structure of Primary, Secondary, Tertiary and Quaternary Structure. *Biological functions of Fibrous and Globular proteins* - forces stabilizing the structure of proteins.	15
IV	Lipids: Structure and classification and function of lipids. Simple lipids- Fats and Waxes. Compound lipids- Phospholipids, Glycolipids and *Lipoproteins*. Derived lipids- Fatty acid-saturated and unsaturated.	15
V	Nucleic acid and Vitamins: Nucleic acid: Structure, Types and composition of nucleic acids- *Nucleotides and Nucleosides* and its importance. Vitamins: Sources, structure and physiological functions of Fat soluble and Water soluble vitamins.	15

..... Self Study

Text Book(s):
<ol style="list-style-type: none"> David L. Nelson and Michael M.Cox, Lehniger Principles of Biochemistry, 7th Edition, W.H. Freeman and Company, New York, 2017. Eric E. Conn, Paul K. Stumpf, George Bruening and Roy H. Doi, Outlines of Biochemistry, 5th Edition, John Wiley and Sons, New Delhi, 2006. Ambika shanmugam, Fundamentals of Biochemistry for Medical students 8th Edition, Kartik offset Printers, Chennai, 2016. Satyanarayana U, and Chakrapani U. Biochemistry, 5th edition, Elsevier, New Delhi, 2020.
Reference Book(s):
<ol style="list-style-type: none"> Jeremy M. Berg, Joghnl.Tymoczko and Lubert Stryer, Biochemistry, 8th Edition, W.H. Freeman and Company, New York, 2015. Donald voet and Judith voet, Biochemistry, John Wiley and Sons, New York, 2010. Dawn, B. Markus, Biochemistry, Harwal Publishing, New York, 1998.
Web Resource(s):
<ol style="list-style-type: none"> https://www.onlinebiologynotes.com/biological-significance-of-water/ https://biologydictionary.net/polysaccharide/ https://studymind.co.uk/notes/protein-structures-globular-and-fibrous-proteins/#: https://www.britannica.com/science/lipoprotein https://www.toppr.com/guides/chemistry/biomolecule/nucleic-acids/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Relate the structure of atoms, unit concentrations and stabilizing interactions of Biomolecules.	K1
CO2	Explain the structure, classification, function and sources of Carbohydrates.	K2
CO3	Articulate the classification, structure, properties of Amino acids and Proteins.	K3
CO4	Analyse the classification, structure and functions of Lipids.	K4
CO5	Evaluate the structure and functions of Vitamins and Nucleic acids.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	2	2	2	2	3	3	1	1	2.1
CO2	3	2	2	2	1	3	2	2	1	1	1.9
CO3	2	3	2	2	2	3	2	2	1	1	2.0
CO4	3	3	2	2	1	3	2	2	2	1	2.1
CO5	3	3	2	2	2	3	2	2	1	1	2.1
Mean Overall Score											10.2/5= 2.04
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: K. Vijayalakshmi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UMB1AC2P	Allied - II	3	2	20	80	100
Course Title		GENERAL BIOCHEMISTRY- PRACTICAL					

SYLLABUS		
S.No	Contents	Hours
1.	Preparation of Normal, Molar and Percentage solutions.	45
2.	Preparation of Buffers.	
3.	Qualitative Analysis of sugars- Fehling's Test and Benedict's Test.	
4.	Estimation of Glucose – Anthrone method.	
5.	Qualitative Analysis of Amino acids- Millon's test	
6.	Estimation of Amino acid - Ninhydrin test.	
7.	Estimation of Protein by Lowry's method.	
8.	Qualitative Analysis of Fats - Huble's test.	
9.	Estimation of Ascorbic acid from biological sample - Biuret method.	
10	Qualitative Analysis of Vitamins- Spectrophotometric method.	

Text Book(s):
1. Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, 4 th Edition, Cambridge University press, Britain, 1995. 2. Strolv B.A and Makavora V.C, Laboratory manual in Biochemistry, MIR Publisher, Moscow, 1989.
Reference Book(s):
1. Joy P P, Surya S and Aswathy C, Laboratory manual of Biochemistry, Pineapple Research Station (Kerala Agricultural University), Vazhakulam, Ernakulam, Kerala, 2015. 2. Vasudevan DM, Subir Kumar Das, Practical Textbook of Biochemistry for Medical Students, 2 nd Edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, 2013.
Web Reference:
1. https://www.egyankosh.ac.in/bitstream/123456789/68524/1/Exercise-2.pdf 2. http://chem.boun.edu.tr/wp-content/uploads/2014/04/Chem-415-Experiment-2.pdf 3. https://www.iitg.ac.in/biotech/BTechProtocols/Ascorbic.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Prepare different Buffers.	K1
CO2	Perform qualitative analysis of sugars and Amino acids.	K2
CO3	Demonstrate the qualitative analysis of Vitamins and Fats.	K3
CO4	Estimate the amino acid and ascorbic acid quantitatively.	K4
CO5	Predict the amount of proteins	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	2	2	2	2	3	3	1	1	2.1
CO2	3	2	2	2	1	3	2	2	1	1	1.9
CO3	2	3	2	2	2	3	2	2	1	1	2.0
CO4	3	3	2	2	1	3	2	2	2	1	2.1
CO5	3	3	2	2	2	3	2	2	1	1	2.1
Mean Overall Score											10.2/5= 2.04
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: K. VIJAYALAKSHMI

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCN1AE1	AECC - I	2	2	-	100	100
Course Title		Value Education for Women					

SYLLABUS		
Unit	Contents	Hours
I	VALUES IN LIFE: Purpose and philosophy of life – Need for values –five fold moral culture - Imbibing values: truth, loyalty, integrity, humility, trustworthy, considerate, not being greedy, clean habits, punctuality, kindness, gratitude, patience, respect and character building.	6
II	FAMILY: Nuclear – cluster – significance - social functions - changing trend - role of women in family - obedient daughter - purposeful youth- dedicated wife - caring mother.	6
III	PUBERTY: Need of knowledge of menstruation- menstrual symptoms – handling – menstrual disorder - maintaining good personal hygiene - motherhood- Stages of pregnancy- post pregnancy care.	6
IV	MARRIAGE: Types of marriage - purpose of marriage- love and infatuation – need for marital preparation - pre and post marital counselling - conflicts in marital life - divorce single parenthood.	6
V	HARMONY WITH SPOUSE: Husband and wife relationship - fidelity towards spouse-relationship among the family members. Tenets of bride for healthy family – kindness, respect, patience, care, love.	6

Hours of Teaching: 5 hours and Hours of Activity: 25 hours

Textbook(s):
1. Value Education for health, Happiness and harmony, the world community service centre, Vethathri Publications 2. N. Venkataiah, Value Education, APH Publishing Corporation, New Delhi, 1998 3. Betty, Carten and Meg Goldric, The Changing family life style - A Framework for Family Therapy, 2 nd Edition, 2000. 4. Marie, Madearentas, Family Life Education, CREST-Centre for research education service training for family promotion, Bangalore, 1999.
Web References:
1. https://www.slideshare.net/humandakakayilongranger/values-education-35866000 2. https://www.ananda.org/blog/5-secrets-to-a-harmonious-marriage/ 3. https://www.nap.edu/read/2225/chapter/14

Activity:

- Assignment on Values (not less than 20 Pages)
- Multiple Choice Questions and Quiz
- Elocution - (Manners and good Habits for 3 to 5 minutes)
- Field Visit
- Debating - Current issues
- Essay writing: Proper use of e-gadgets, Ethics, Cyber ethics, Social media, etc.,
- Case Study / Album Making / Poster Presentation / Documentary- Celebrating National Days, Drug abuse & illicit trafficking, Independence Day, Secularism, Teachers Day, National Youth Awakening Day, Father's Day / Mother's Day and etc.,

EVALUATION COMPONENT: TOTAL: 100 MARKS**Component I:**

Documentary (or) Poster Presentation (or) Elocution - 25 marks

Component II:

Quiz (or) Multiple choice questions Test - 25 marks

Component III:

Album Making (or) Case Study on a topic (or) Field visit - 25 marks

Component IV:

Assignment (or) Essay Writing (or) Debating - 25 marks

Course Coordinator: Dr. M. Purushothaman

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UMB2CC3	Core - III	5	5	25	75	100
Course Title		BACTERIOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Cell structure and Subcellular organelles of Bacteria: Morphology and Ultra-structure of Bacterial cells - cell wall, cell membrane, ribosomes, capsule, flagella, pili, fimbriae plasmid, mesosomes and cytoplasmic inclusions, Mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, *peroxisomes*, chloroplast and endospore formation.	15
II	Stains and Staining reactions – Types of stains – Acid, base and Neutral. Principles of staining – Simple staining, Differential staining – Grams and acid fast staining, Special staining - Endospore, negative, Capsule staining, *Nuclear and Flagella staining*.	15
III	Cultivation of Bacteria: Types of growth media. Definition and examples of natural, synthetic, complex, enriched, selective media, Pure culture techniques – pour plate, spread plate, *streak plate, stab and slant culture*. Anaerobic culture techniques– Wright’s tube, Roll tube, McIntosh Fildes jar method.	15
IV	Bacterial nutrition and Reproduction: Nutritional requirements, Nutritional Types of bacteria- Phototrophs, Chemotrophs, Autotrophs, Heterotrophs and *Obligate parasites*. Bacteria reproduction- Fission, Budding, endospore formation and Fragmentation. Maintenance and preservation of pure cultures of bacteria.	15
V	Archaeobacteria & Extremophiles: General characteristics, Diversity, Structure, cell wall, types, evolutionary developments, and economic importance of Archaeobacteria. Metabolism and energetics of Archaea- <i>Thermoplasma</i> , <i>Sulfolobus</i> . Growth of Bacteria under extreme condition- Psychrophiles, acidophiles, *thermophiles* and halophiles.	15
VI	Current Trends (For CIA only) – Shining a light on how Bacteria interact	

..... Self Study

Text Book(s):
1. Michael, J. R. Pelczar, Chan Jr.E.C.S and Kreig N. R., Microbiology, 5 th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2006.
2. Bilgrami K. S and Sinha R. K, Essentials of Microbiology, SK Jain for CBS publishers and distributors, 1 st edition, 2005.
3. Prescott L. M, Harley J. P and AKlein D., Microbiology, Mc Grow Hill, 7 th edition,2007.
Reference Book(s):
1. Holt J.G, Kreig N.R, Sneath P.H.A, and Williams S.T., Bergey's Manual of Systematic Bacteriology, 9 th edition, Williams and Wilkins, Baltimore, 1994.
2. Madigan M.T, Martinko J.M and Parker J, Brock Biology of microorganisms, 11 th edition, Pearson Education international, USA, 2006.
3. Tortora G. J, Funke B.R and Case C. L, Microbiology an Introduction, 8 th edition, LPE-Pearson Education, Inc, 2005.

Web Resource(s):

1. <http://www.scientistcindy.com/ex-12--8203-pure-culture-technique.html>
2. <https://courseware.cutm.ac.in/wp-content/uploads/2020/06/isolation-preservation-.pdf>
3. <https://microbenotes.com/microbiology-of-extreme-environments/>

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the structure and organelles of bacterial cell	K1
CO2	Identify the bacteria using different staining techniques	K2
CO3	Illustrate different types of media and pure culture techniques used for bacterial cultivation	K3
CO4	Categorize the nutritional types of bacteria, their reproduction and preservation	K4
CO5	Summarize about the diversity of Archaeobacteria and extremophiles	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	1	1	2	2	2	2	2	3	1	1	1.7
CO2	2	3	2	3	2	2	3	3	3	2	2.5
CO3	3	2	1	2	1	1	2	3	3	1	1.9
CO4	3	2	2	2	2	3	2	3	3	1	2.3
CO5	2	2	2	1	2	3	1	3	2	2	2.0
Mean Overall Score											10.4/5= 2.08
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Ms. A. Fasila Begum

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UMB2CC4P	CORE - IV	3	3	20	80	100
Course Title		BACTERIOLOGY - PRACTICAL					
SYLLABUS							
S.No	Contents						Hours
1.	Preparation of culture media for bacterial cultivation.						45
2.	Enumeration of bacteria from soil and water sample.						
3.	Isolation of bacteria from air by settle plate method.						
4.	Isolation of pure cultures of bacteria by streak plate method.						
5.	Negative staining.						
6.	Capsule staining.						
7.	Endospore staining						
8.	Measurement of size of microbes using micrometry method.						
9.	Determination of bacterial growth by turbidity method.						
10.	Preservation of bacterial cultures by mineral oil.						
11.	Examination of bacterial motility by Hanging drop method						

Text Book(s):
1. James G. Cappuccino, Natalie Sherman. Microbiology – A laboratory manual, The Benjamin (Cummings Publishing Company, Inc.). 1996.
2. Aneja K.R. Experiments in Microbiology Plant Pathology and Biotechnology. New Age International Limited. 2005.
Reference Book(s):
1. Jeffrey Pommerville, Laboratory Fundamentals of Microbiology 11th Edition, Jones and Bartlett Learning, 2017.
2. Davis W. Pritchett, Pritchett-Gilbert, Microbiology: A PET Based Approach Introductory Laboratory Manual, 2nd Edition, Kendall Hunt Publishing Company, 2007.
Web Reference:
1. https://www.sigmaldrich.com/IN/en/technical-documents/technical-article/microbiological-testing/microbial-culture-media-preparation/media-preparation
2. https://microbiologynote.com/isolation-of-microorganism-from-air/
3. https://www.biologydiscussion.com/micro-biology/preserving-microbial-cultures-top-5-methods/17821

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the methods of sterilization, media preparation and pure culture techniques.	K1
CO2	Identify microorganisms from various samples.	K2
CO3	Illustrate the different staining techniques and preservation of culture.	K3
CO4	Analyse the bacterial growth by different methods.	K4
CO5	Predict the motility of bacteria.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	2	2	1	1	2	3	3	2	2.2
CO2	2	3	2	2	2	3	3	3	2	1	2.3
CO3	2	3	2	2	2	2	3	2	1	1	2.0
CO4	2	3	1	2	1	2	3	2	2	1	1.9
CO5	2	2	2	1	1	2	3	2	2	1	1.8
Mean Overall Score											10.2/5= 2.04
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Ms. A. Fasila Begum

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UMB2AC3	Allied - III	5	4	25	75	100
Course Title		HAEMATOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Haematology: Definition, History and discovery of blood group system. ABO and Rhesus blood group system. Formation of Blood. Composition and functions of blood. Normal hematological indices (MCV, MCH, MCHC, PCV) and methods of estimation -Hb and *ESR*.	15
II	Blood Processing and preservation of blood: Different methods of collection and Preservation, changes in stored blood. Blood Banking and Process of blood transfusion. Various anticoagulants, their uses, mode of action * their merits and demerits*.	15
III	Erythrocytes and Leucocytes: Erythropoiesis: structure and function of RBCs: formation of Haemoglobin. Leukopoiesis: General characteristics, properties of WBCs: classification and functions of each type of WBC. *Normal and absolute values*	15
IV	Blood Smear and Culture: Different types, Methods of preparation, Theory of staining – Physical and Chemical, Types of Stains- Acidic, Basic and Neutral. Mechanism of staining, Dyes: Natural, mordents, metachromatic and *metachromatic dyes*.	15
V	Hematologic diseases: RBC Disorders- Anaemia, and Sickle Cell Disease. WBC Disorders- Leukemia and Leukopenia, Coagulopathy- Hemophilia and Thrombocytopenia, Hematologic malignancies- leukemia, lymphoma and *multiple myeloma*.	15

..... Self Study

Text Book(s):
<ol style="list-style-type: none"> Mary Lou Turgeon, Clinical Hematology, Theory and Procedures, Jones & Bartlett Learning, Massachusetts, 6th edition 2020. Andrew Blann, Gavin knight and Gray Moore, Haematology, Oxford University Press,2010. Shirish M Kawthalkar, Essentials of Haematology, Jaypee Brothers Medical Publishers Pvt. Limited, India, 2012. Ian Todd and Gavin Spickett, Immunology, Blackwell Publishing Ltd, Hoboken, New Jersey, 5th edition, 2005.
Reference Book(s):
<ol style="list-style-type: none"> Rao C.V., Immunology-A Text book, Narosa Publishing House Pvt.Ltd,2007. Abul K. Abbas and Andrew H. Lichtman, Basic Immunology-Functions and Disorders of the Immune System, Reed Elsevier India Pvt Limited, New Delhi, India,2005. Yadav P.R., Immunology, Discovery Publishing House, New Delhi,2004.

Web Resource(s):
1. https://www.vedantu.com/biology/blood-cell-formation 2. https://pathlabs.ufl.edu/client-services/specimen-shipping/blood-collection-process-venipuncture/ 3. https://my.clevelandclinic.org/health/articles/24407-erythropoiesis 4. https://stainsfile.info/theory/metachromasia.htm 5. https://my.clevelandclinic.org/health/diseases/14430-thrombocytopenia

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recite the historical inventions in Immunohematology and blood grouping.	K1
CO2	Extend the knowledge on collection, preservation, storage of blood and its normal values.	K2
CO3	Articulate the structure and function of erythrocytes and leucocytes.	K3
CO4	Assess the methods for preparation and staining of blood films.	K4
CO5	Explain the causes and treatment of various hemolytic diseases.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	2	2	2	2	1	3	3	2	2.2
CO2	2	3	2	2	2	3	3	3	2	1	2.3
CO3	2	3	2	2	2	2	3	2	1	1	2.0
CO4	2	3	1	2	1	2	3	2	2	1	1.9
CO5	2	2	2	1	1	2	3	2	2	1	1.8
Mean Overall Score											10.2/5= 2.04
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: K.Vijayalakshmi

Semester	Course Code	Course Category	Hours/Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UMB2AC4P	Allied - IV	3	2	20	80	100
Course Title		HAEMATOLOGY - PRACTICAL					

SYLLABUS		
S.No	Contents	Hours
1.	Blood collection – Vein puncture, Finger stick and Heel stick procedure.	45
2.	Separation of serum and plasma from whole blood.	
3.	Preparation of Peripheral blood smear.	
4.	Determination of bleeding time and clotting time.	
5.	Total count of Red Blood Cells.	
6.	Total count of White Blood Cells.	
7.	Differential count of White Blood Cells.	
8.	Total Platelet count.	
9.	Estimation of hemoglobin content.	
10.	Erythrocyte Sedimentation Rate.	
11.	Separation of Hemoglobin by Cellulose Acetate Electrophoresis.	
12.	Visit to nearby Hematology laboratory.	

Text Book(s):
1. Myer's and Koshy's Manual of diagnostic procedures in medical microbiology and immunology/serology. Published by department of clinical microbiology, CMC Hospital, Vellore, Tamil Nadu.
2. Rajan S and Selvi Christy, Experimental procedures in life sciences, Anjana Book House publishers and distributors, Chennai, 2011.
Reference Book(s):
1. Sri Nageswari, K and Anamika Kothari, Practical Manual of Haematology, Jaypee Brothers Medical Publishers Pvt. Limited, 2007.
2. Kamat Girish, Practical Manual of Hematology, Jaypee Brothers Medical Publishers Pvt. Limited, 2010.
Web Reference:
1. https://pathlabs.ufl.edu/client-services/specimen-shipping/blood-collection-procedure-capillary/
2. https://labpedia.net/white-blood-cell-part-2-total-leukocytes-count/#:~:text=Number%20of%20WBC%20in%201%20C%20B5L,x%2050%20%3D%20TLC%20Fcm.
3. https://tmc.gov.in/tmh/PDF/Hemato%20Pathology%20Course/Rashida%20Ansari%20ESR.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Quote the collection and separation of components of blood.	K1
CO2	Discuss the methods for counting of blood cells.	K2
CO3	Determine the amount of hemoglobin in blood.	K3
CO4	Illustrate the Peripheral blood smear preparation.	K4
CO5	Evaluate the Hemoglobin by Electrophoresis.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	2	2	1	1	2	3	2	2	2.1
CO2	2	3	2	2	2	1	1	3	2	1	1.9
CO3	2	3	1	2	2	1	1	3	2	1	1.8
CO4	2	3	2	1	2	2	3	2	1	1	1.9
CO5	3	2	2	2	2	1	2	2	2	2	2.0
Mean Overall Score											9.7/5= 1.94
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Ms. A. Fasila Begum

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCN2SS	Soft Skills Development	2	2	-	100	100
Course Title		Soft Skills Development					

SYLLABUS		
Unit	Contents	Hours
I	Communication Skills: Verbal and Non - Verbal communication - The active vocabulary - Conversational Etiquette - KOPPACT syndrome	6
II	Emotional Skills: Emotional Intelligence - The five steps to Emotional Quotient - Self Awareness and Regulation - Empathy - Social Intelligence - stress management - coping with failures	6
III	Functional Skills: Using the tools of communicatory and emotional skills - Resume writing - Preparation of Curriculum Vitae - interview skills - Acing the interview - Group dynamics - Mock interviews and Group discussions	6
IV	Interpersonal Skills: Synergising relationships - SWOT analysis - SOAR analysis - The social skills - Time Management - Decision making - problem solving - prioritising and Implementation	6
V	Personality Skills: Leadership skills - Attributes and Attitudes - Social leader Vs The Boss - critical and creative thinking	6

Hours of Teaching : 5 hours and Hours of Activity: 25 hours

Textbook(s):
<ol style="list-style-type: none"> 1. Social intelligence: The new science of human relationships - Daniel Goleman; 2006. 2. Body Language in the workplace - Allan and Barbara Pease; 2011. 3. Student's Hand Book: Skill Genie - Higher education department, Government of Andhra Pradesh.
Web References:
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/109105110

EVALUATION CRITERIA

Work Book (Each unit carries 10 marks)	-	50 Marks
Examination	-	50 Marks

1. Teacher who handles the subject will award 50 marks for work book based on the performance of the student.
2. On the day of examination the examiners (Internal & External) will jointly award the marks for the following categories:
 - Self-Introduction - 20 Marks
 - Resume - 10 Marks
 - Mock Interview - 20 Marks

To assess the self-introduction, Examiners are advised to watch the video presentation submitted by the students. If they failed to submit the video presentation, the Examiners may direct the student to introduce himself orally and a maximum 10 marks only will be awarded.

Mock Interview Marks Distribution

(20-Marks)

Attitude (self interest, confidence etc.) (4 Marks)	Physical appearance including dress code (4 Marks)	Communication Skills (6 Marks)	Answering questions asked from the resume and work book (6 Marks)
--	--	--------------------------------------	---

Course Coordinator:
Dr. M. Syed Ali Padusha

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMB3CC5	Core - V	4	4	25	75	100
Course Title		MICROBIAL PHYSIOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Transport of nutrients and biosynthesis: Bacterial motility, Diffusion – Passive and facilitated, Primary active and secondary active transport, Group translocation phosphotransferase system, symport, antiport and uniport, electrogenic and *electro neutral transport*, Structure and Biosynthesis of a cell-wall Peptidoglycan.	12
II	Microbial growth: Definitions of growth and generation time, measurement of microbial growth and specific growth rate. Batch and continuous culture. Factors influencing microbial growth – *temperature*, pH, pressure, salt concentration.	12
III	Metabolism: Anabolism, catabolism, primary and secondary metabolites. Sugar degradation pathways - Embden–Meyerhof pathway, *Entner–Doudoroff pathway* and Pentose phosphate pathway, Krebs’s cycle (TCA) - Electron transport system and ATP production. Photosynthesis-Light and dark reaction.	12
IV	Metabolism of proteins and lipids: Metabolic pathways of nitrogen utilization, Biosynthesis of amino acids, peptides, and proteins. *Degradation of amino acids*. Anabolic and catabolic processes of lipids.	12
V	Anaerobic respiration and Nitrogen fixation: Nitrate, sulphate and methane respiration – Fermentations- alcohol, mixed acid, lactic acid fermentation – Nitrogen Fixation – Physiology of nitrogen cycle. *Nitrogen fixers*.	12
VI	Current Trends (For CIA only) – Therapeutics applications of pigment producing microbes.	

..... Self Study

Text Book(s):
1. A.G. Moat, J.W. Foster and M.P. Spector, Microbial Physiology. 4th edition, A Johan Wiley and sonsinc., publication, 2002.
2. B.H. Kim and G.M. Gadd. Bacterial Physiology and Metabolism. Cambridge University Press, Cambridge. 2008.
3.J. Michael J.R. Pelczar, E.C.S. Chan, Noel Krieg. Microbiology, 5 th Edition, Tata McGraw Hill, 2010.
4. L.M. Presscott, J.P. Harley and C.A. Klein’s. Microbiology, 10th edition, McGraw Hill, ,2017.
Reference Book(s):
1. J.M. Willey, L.M. Sherwood and C.J. Woolverton, Prescott’s Principles of Microbiology. McGraw-Hill Higher Educationp.969, 2009.
2. D.R. Caldwell. Microbial Physiology and Metabolism. Star Publishing Company. Belmont, CA, 2000.
3. B.H. Kim and G.M. Gadd. Bacterial physiology and Metabolism Cambridge University Press. The Edinburgh Building, Cambridge CB2 8RU, UK, 2008.
Web Resource(s):
1. https://spot.colorado.edu/~schmidts/Teaching/EPOB3400/microPhys.html
2. https://courses.lumenlearning.com/microbiology/chapter/introduction-to-microbial-metabolism/
3. https://www.wur.nl/en/research-results/chair-groups/agrotechnology-and-food-sciences/biomolecular-sciences/laboratory-of-microbiology/thesis-projects/thesis-projects-microbial-physiology.htm

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the knowledge on biosynthesis of bacterial structural components and their nutrition's transport.	K1
CO2	Explain the microbial growth and generation time.	K2
CO3	Determine the characterization of carbohydrates metabolism.	K3
CO4	Analyze the biosynthesis of proteins.	K4
CO5	Assess the anaerobic respiration and nitrogen fixation.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	1	3	2	2	3	1	3	1	3	2.2
CO2	3	3	1	1	3	3	3	1	2	2	2.2
CO3	2	1	3	1	3	3	1	3	2	1	2.0
CO4	1	2	3	1	1	3	2	2	3	1	1.9
CO5	1	1	1	2	3	3	1	2	3	3	2.0
Mean Overall Score											10.3/5= 2.06
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: A. Swedha

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMB3CC6P	Core - VI	3	3	20	80	100
Course Title		MICROBIAL PHYSIOLOGY - PRACTICAL					

SYLLABUS		
Unit	Contents	Hours
1.	Bacterial growth curve: Cell count, Viable count and absorbance method	45
2.	Effect of temperature on bacterial growth.	
3.	Effect of pH on bacterial growth.	
4.	Isolation of Photosynthetic bacteria	
5.	Indole production test.	
6.	Methyl red test.	
7.	Voges-Proskauer test.	
8.	Citrate utilization test.	
9.	Catalase test.	
10.	Oxidase test.	
11.	TSI test.	
12.	ONPG Test.	

Text Book(s):

1. G. Cappuccino and James, Microbiology a laboratory manual. Addison Wesley Publishing Company Inc., England, California. 2013.
2. K.R. Aneja. Experiments in Microbiology, Plant pathology and Biochemistry, New age International publishers, India. (4th Edition). 2003.
3. M. Abid Nordin and Liana A.B. Samad, Microbial Physiology Manual, Biological Sciences Department of California State Polytechnic University, Pomona 2003.

Reference Book(s):

1. K.R. Aneja., Experiments in Microbiology Plant Pathology and Biotechnology, New Age International Limited, 2005.
2. B.K. Khuntia., Basic Microbiology – An Illustrated Laboratory Manual, 2nd Edition. Daya Publishing House, New Delhi, 2013.
3. Amita Jain, Jyotsna Agarwal and Vimala Venkatesh. Microbiology Practical Manual, 2018.

Web Resource(s):

1. <https://cevre.erciyes.edu.tr/upload/M6Z30UUmicrobiology-laboratory-manual.pdf>
2. <http://site.iugaza.edu.ps/mwhindi/files/Laboratory Manual And Workbook In Microbiology.pdf>
3. <https://www.teachmint.com/tfile/studymaterial/bsc/microbiology/isemestermicrobiologylabmanual/9016452f-c940-43ec-8815-2afb78a04f9b>

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the bacterial growth and their cell count by standard method.	K1
CO2	Illustrate the mechanism of photosynthetic bacteria.	K2
CO3	Determine the effect of pH and temperature on bacterial growth.	K3
CO4	Analyze the biochemical methods to identify the bacterial species.	K4
CO5	Summarize the thermal death time and decimal reduction time of <i>E. coli</i> .	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	1	3	3	2	3	1	3	1	1	2.1
CO2	2	3	1	3	3	2	1	1	2	2	2.0
CO3	1	1	2	2	3	3	2	2	1	1	1.8
CO4	1	2	3	1	2	2	1	1	1	3	1.7
CO5	2	3	2	3	2	2	1	1	2	1	1.9
Mean Overall Score											9.5/5=1.9
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: A. Swedha

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMB3AC5	Allied - V	4	4	25	75	100
Course Title		BASICS OF IMMUNOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Immune cells and organs of immune system: Historical Perspective, Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, *Dendritic cell*. Organs of Immune system- primary and secondary lymphoid organs.	12
II	Immune Response: Types of immunity-innate (non-specific) and adaptive immunity (specific). Antibody mediated immunity and Cell mediated immunity. Antigens- Properties of antigen, Immunoglobulins- Structure, types and clinical significance.	12
III	Hypersensitivity: Hypersensitivity reactions (Type I: reaction mediated by IgE antibodies. Type II: cytotoxic reaction mediated by IgG or IgM antibodies. Type III: reaction mediated by immune complexes. Type IV: delayed reaction mediated by cellular response).	12
IV	Transplantation and Tumor Immunology: Structure, function of Major histocompatibility complex and HLA system. Transplantation- organ transplantations in humans, Xenotransplantation HLA typing methods, Graft rejection Graft disease (GVHD). Tumor- Types, *Tumor antigens*, causes and therapy for cancers.	12
V	Immunoprophylaxis: Vaccine-Types – Killed, Live attenuated (bacterial and viral) Toxoid and mRNA vaccines. Principles of Precipitation, Agglutination, Immunodiffusion, Immunoturbidity, Immunoelectrophoresis, *RIA*, Immunofluorescence, ELISA, ELISPOT, Western blotting, Flow cytometry, Immunoelectron microscopy.	12

..... Self Study

Text Book(s):
1. R.A. Goldsby, T.J. Kindt and B.A. Osborne. Kuby's Immunology, 8th edition, WH Freeman and Company, New York, 2019. 2. R. Ananthanarayan and C.K.J. Paniker. Textbook of Microbiology. (Edited by CKJ Paniker). 9th edition, University Press Publication, 2013. 3. David male, Jonathan Brostoff, D.B. Roth and Ivan Roitt. Immunology, (8th edition), Mosy Elsevier publication, Canada. 2013. 4. E. Benjamin, R. Coico and G. Sunshine. Immunology. (7th edition) Wiley Publication, USA., 2015.
Reference Book(s):
1. Ivan M. Roit. Essential Immunology. Blackwell Scientific Publications 13th Edition, Oxford, 2017. 2. J. Kuby. Immunology, 7th edition, WH Freeman and Company, New York, 2013. 3. Richard M. Hyde. Microbiology and Immunology. National Medical series, Williams and Wilkins, Harward Publishing company, 2011.
Web Resource(s):
1. https://www.sciencedirect.com/topics/medicine-and-dentistry/transplantation 2. https://vk.ovg.ox.ac.uk/vk/types-of-vaccine 3. https://www.sciencedirect.com/topics/medicine-and-dentistry/immunoturbidimetry 4. https://biotechhealth.com/xenotransplantation/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the immune cells and organs of immune system.	K1
CO2	Compare the knowledge on different types of the immune response.	K2
CO3	Examine the mechanism of transplantation and its immunological significance.	K3
CO4	Conclude the knowledge on hypersensitivity reactions and tumor immunology.	K4
CO5	Evaluate the applications of vaccine in various immunological methods .	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	2	2	2	2	3	3	1	1	2.1
CO2	3	2	2	2	1	3	2	2	1	1	1.9
CO3	2	3	2	2	2	3	2	2	1	1	2.0
CO4	3	3	2	2	1	3	2	2	2	1	2.1
CO5	3	3	2	2	2	3	2	2	1	1	2.1
Mean Overall Score											10.2/5= 2.04
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: N. Vennila

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMB3AC6P	Allied - VI	3	2	20	80	100
Course Title		BASICS OF IMMUNOLOGY - PRACTICAL					

SYLLABUS		
S.No.	Contents	Hours
1.	Preparation of serum and plasma.	45
2.	Identification of human blood group and Rh-factor	
3.	Latex agglutination-CRP Test.	
4.	Anti Streptolysin O (ASO) test.	
5.	WIDAL Test.	
6.	VDRL Test.	
7.	Radial Immuno-diffusion.	
8.	Ouchterlony Double Immunodiffusion technique.	
9.	Demonstrations of Immuno-electrophoresis.	
10.	Demonstration of ELISA (Antigen/Antibody detection).	

Text Book(s):

Practical Manual:

1. Barbara Detrick, Robert G. Hamilton, John L. Schmitz. Manual of Molecular and Clinical Laboratory Immunology, 8th Edition, 2016.

Reference Book(s):

1. K.R. Aneja, Experiments in Microbiology Plant Pathology and Biotechnology, New Age International Limited, 2005.
2. B.K. Khunti. Basic Microbiology – An Illustrated Laboratory Manual, 2nd Edition, Daya Publishing House, New Delhi, 2013.
3. Amita Jain, Jyotsna Agarwal and Vimala Venkatesh Microbiology Practical Manual 2018.

Web Resource(s):

1. <https://cevre.erciyes.edu.tr/upload/M6Z30UUmicrobiology-laboratory-manual.pdf>
2. <https://microbiologynote.com/rapid-plasma-reagin-rpr-test-principle-procedure-result-applications/>
3. <https://microbiologyinfo.com/widal-test-introduction-principle-procedure-interpretation-and-limitation/>
4. <https://microbiologynote.com/latex-agglutination-test-procedure-principle-inhibition-limitation-uses/>

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Identify the human blood group.	K1
CO2	Estimate the antibodies against the target pathogen.	K2
CO3	Examine the immunodiffusion technique.	K3
CO4	Analyze the process of immune-electrophoresis.	K4
CO5	Conclude the interactions of antigen and antibody reactions.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	2	2	1	1	2	3	3	2	2.2
CO2	2	3	2	2	2	2	3	3	2	2	2.3
CO3	2	3	2	2	2	2	3	2	1	1	2.0
CO4	2	3	1	1	1	2	3	2	2	2	1.9
CO5	2	2	2	2	2	2	3	2	2	1	1.8
Mean Overall Score											10.2/5= 2.04
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: N. Vennila

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMB3GE1	Generic Elective - I	2	2	-	100	100
Course Title		FOOD PROCESS TECHNOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Food Processing: Definition, scope and Principles of Food Processing. Food preservation- Physical (low and high temperature), Chemical (salt, sugar, propionates and benzoates). Food colour and flavouring agents.	6
II	Harvesting and storage of fruits and vegetables: Post-harvest processing of fruits and vegetables: Peeling, sizing, blanching, *Canning of fruits* and vegetables, Drying and freezing of fruits and vegetables.	6
III	Juice processing: General steps in juice processing, Juice extraction, preservation of fruit juices, fruit juice clarification, concentration of fruit juices, *fruit juice powders*.	6
IV	Production of Jam and Jelly : Preparation of fruit jams and jellied fruit products. Tomato based products: Juice, puree, paste, sauce, *ketchup*. Principle and Production of pickles .	6
V	Beverages: Coffee- Production practices, Coffee processing including roasting, grinding, brewing, extraction, dehydration, aromatization, instant coffee. Tea leaf processing, green, red, yellow,* instant tea*.	6

*.....*Self Study

Text Book(s):
<ol style="list-style-type: none"> 1. P.J. Fellow. "Food Processing Technology Principles and Practice". 5th Edition, Wood head Publishing Series in Food Science, Technology and Nutrition, 2022. 2. M. Penchalaraju Yadav, B. Channabasamma, and Lakshmi Jagarlamudi. "Food Processing Technology". Pointer Publishers, Jaipur,2017. 3. A.S. Bawa, P.S. Raju, O.P. Chauhan. "Food Science". New India Publishing agency, 2013.
Reference Book(s):
<ol style="list-style-type: none"> 1. Mudambi, Sumati Rajagopal., Rao, M. Shalini., M V Rajagopal, "Food Science". India: New Age International Pvt Ltd, Publishers, 2015. 2. S. Roday, "Food Science", Oxford publication, 2011. 3. Mridula Mirajkar, Menon Sreelata, S. Mridula Menon Mirajkar, "Food Science and Processing Technology". Kanishka Publishing House.2010.
Web Resource(s):
<ol style="list-style-type: none"> 1. https://ebooks.inflibnet.ac.in/ftp1/chapter/principles-of-food-processing-and-preservation/ 2. https://en.wikipedia.org/wiki/Maillard_reaction#:~:text=Caramelization 3. https://www.onlinebiologynotes.com/food-borne-disease-food-poisoning-and-food-infection

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the fundamental concepts of food processing .	K1
CO2	Explain the processing of fruits and vegetable.	K2
CO3	Illustrate the preparation and preservation of juice .	K3
CO4	Analyze the production of fruit jams, jelly and pickles .	K4
CO5	Predict the production process of coffee and tea.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	2	1	3	3	2	3	2	1	2	2.1
CO2	1	3	2	2	1	2	2	3	2	1	1.9
CO3	2	2	3	1	2	3	2	1	2	2	2.0
CO4	2	2	2	3	1	3	2	2	2	2	2.1
CO5	3	1	2	2	2	3	2	2	1	2	2.0
Mean Overall Score											10.1/5= 2.02
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: K. Vijayalakshmi

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UCN3AE2	AECC - II	2	2	-	100	100
Course Title		Environmental Studies					

Unit	Contents	Hours
I	The multidisciplinary nature of environmental studies Definition, scope, importance, awareness and its consequences on the planet.	6
II	Ecosystems: Definition, structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	6
III	Natural Resources: Renewable and Non-renewable Resources: Land Resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Heating of earth and circulation of air; air mass formation and precipitation. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. renewable energy resources significance of wind, solar, hydal, tidal, waves, ocean thermal energy and geothermal energy.	6
IV	Biodiversity and Conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns biodiversity hot spots. mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: <i>In situ</i> and <i>Ex situ</i> conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	6
V	Environmental Pollution & Conservation: Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution Waste to wealth - Energy from waste, value added products from waste, fly ash utilization and disposal of garbage, solid waste management in urban and rural areas, Swachh Bharat Abhiyan, recent advances in solid waste management, modern techniques in rain water harvesting and utilization.	6

Text books:

1. Asthana DK and Meera A, Environmental studies, 2nd Edition, Chand and Company Pvt Ltd, New Delhi, India, 2012.
2. Arumugam N and Kumaresan V, Environmental studies, 4th Edition, Saras Publication, Nagercoil, Tamil Nadu, India, 2014.

Activity – I:

1. Assignments – Titles on Environmental awareness to be identified by teachers from the following (scripts not less than 20 pages)
2. Elocution – (Speech on “Environment beauty is the fundamental duty” of citizen of the country for 3 to 5 minutes)
3. Environment issues – TV, Newspaper, Radio and Medias messages – Discussion π Case Studies/Field Visit/Highlighting Day today environmental issues seen or heard
4. Debating/Report Submission – Regarding environment issues in the study period Activity II
5. Environmental awareness through charts, displays, models and video documentation.

Celebrating Nationally Important Environmental DaysNational Science Day – 28th FebruaryWorld wild life Day – 3rd MarchInternational forest Day – 21st MarchWorld Water Day – 22nd MarchWorld Meteorological Day – 23rd MarchWorld Health Day – 7th AprilWorld Heritage Day – 18th AprilEarth / Planet Day – 22nd AprilPlants Day – 26th MayEnvironment Day – 5th June Activity III Discipline specific activities**EVALUATION COMPONENT:**

Component I: (25 Marks) Document (or) Poster presentation or Elocution

Component II: (25 Marks) Album making (or) case study on a topic (or) field visit

Component III: (25 Marks) Essay writing (or) Assignment submission

Component IV: (25 Marks) Quiz (or) multiple choice question test

Course Outcomes**Course Outcomes:** Upon successful completion of this course, the student will be able to:

CO No.	CO Statement	Cognitive Level (K-level)
CO1	To understand the multi-disciplinary nature of environmental studies and its importance	K1
CO2	To obtain knowledge on different types of ecosystem	K2
CO3	To acquire knowledge on Renewable and non-renewable resources, energy conservation	K3
CO4	To understand biodiversity conservation	K4
CO5	To analysis impact of pollution and conversion waste to products	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	02	02	02	02	02	03	03	03	03	03	2.5
CO2	02	03	03	02	03	03	03	03	03	03	2.8
CO3	02	03	03	03	03	03	03	03	03	03	2.9
CO4	02	02	03	03	03	03	03	03	03	03	2.8
CO5	02	03	03	03	03	03	03	02	03	03	2.8
Mean Overall Score											2.7
Correlation											High

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. B. Balaguru

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMB4CC7	Core - VII	6	6	25	75	100
Course Title		MEDICAL MICROBIOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Medical Microbiology: Scope and applications. Disease prevalence and incidence. Epidemiology and Infection – stages and transmission. Normal microflora of human body. Host defense against microbial invasion and *Nosocomial infections*.	15
II	Bacterial pathogens: Morphology, cultural characteristics, pathogenesis, diagnosis and prophylaxis of Gram positive bacteria: <i>Staphylococcus</i> , <i>Streptococcus</i> , <i>Bacillus</i> , <i>Mycobacterium</i> and <i>Corynebacterium</i> . Gram negative bacteria: <i>E.coli</i> , <i>Klebsiella</i> , <i>Bordetella pertussis</i> , <i>Vibrio</i> , <i>Salmonella</i> , <i>Neisseria</i> and * <i>Proteus</i> *.	15
III	Fungal pathogens: General characteristics, morphology, pathogenesis, laboratory diagnosis and prophylaxis of Superficial- Dermatophytes- <i>Microsporum</i> , <i>Trichophyton</i> and * <i>Epidermophyton</i> *. Subcutaneous- <i>Sporothrix</i> and Mycetoma. Systemic- <i>Histoplasma</i> , <i>Coccidioides</i> and <i>Blastomyces</i> . Opportunistic fungal infections- <i>Candida</i> , <i>Cryptococcus</i> and <i>Aspergillus</i> .	15
IV	Viral disease: Characteristics, morphology, pathogenesis, clinical manifestations, diagnosis and prophylaxis of Measles, Mumps, Herpes virus, Pox virus, *Polio virus*, Rabies, Chikungunya, Ebola, Dengue, Swine flu, Hepatitis B and HIV, Corona and Nipah Virus.	15
V	Parasitic infections: General characteristics, structure, life cycle, pathogenesis, epidemiology, clinical manifestations and laboratory diagnosis of Amoebiasis, *Giardiasis*, Trypanosomiasis, Leishmaniasis, Malaria, Ascariasis and Filariasis, Cryptosporidiosis.	15
VI	Current Trends (For CIA only) – Opportunistic infections, Daily news and research paper collection and recording of recent outbreak of bacterial, fungal, viral, protozoan diseases.	

**Self Study

Text Book(s):
1. David Greenwood, Richard Slack, Mike Barer and Will Irving, Medical Microbiology A guide to microbial infections: Pathogenesis, immunity, laboratory investigation and control, 18th edition, Church Hill Living stone Elsevier, 2012. 2. C.K. Jeyaram Paniker, Text Book of Parasitology Jay Pee Brothers, New Delhi, (2006). 3. S. Rajan, Medical microbiology, MJP publisher, (2007).
Reference Book(s):
1. J. Michael J.R. Pelczar, E.C.S. Chan, Noel R. Krieg, Microbiology, 5th edition, Tata Mc Graw-Hill Publishing Company Limited, New Delhi, 2010. 2. Mark Gladwin, William Trattler, and C. Scott Mahan, Clinical Microbiology made ridiculously simple, 6th edition, Med Master, Inc., USA, 2014. 3. S.M. Finegold, Diagnostic Microbiology. 10th Edition. CV Mosby Company, St. Louis. 2000.
Web Resource(s):
1. https://www.microrao.com/micronotes/hpylori.htm 2. https://www.onlinebiologynotes.com/nipah-virus-structure-and-genome-mode-of-transmission-pathogenesis-symptoms-prevention-and-treatment/ 3. https://my.clevelandclinic.org/health/diseases/24885-parasitic-infection

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the normal microflora of the human body and host pathogen interaction.	K1
CO2	Summarize the pathogenesis and laboratory diagnosis of several human diseases caused by bacteria .	K2
CO3	Illustrate the pathogenesis, laboratory diagnosis of fungal pathogens.	K3
CO4	Explain the knowledge on pathogenicity, treatment, and prevention of viral diseases.	K4
CO5	Conclude the pathogenesis, laboratory diagnosis of parasitic infections.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	2	1	3	2	2	3	1	2	2.1
CO2	3	2	3	1	2	1	2	1	2	2	1.9
CO3	2	2	1	2	2	3	2	2	2	1	1.9
CO4	2	3	1	2	2	2	2	3	2	1	2.0
CO5	2	1	2	3	1	3	3	1	2	2	2.0
Mean Overall Score											9.9/5= 1.98
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: K. Vijayalakshmi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMB4CC8P	Core - VIII	3	3	20	80	100
Course Title		MEDICAL MICROBIOLOGY - PRACTICAL					

SYLLABUS		
S.No.	Contents	Hours
1.	Isolation of bacterial flora of skin by swab method.	45
2.	Isolation and identification of microorganisms from sputum sample.	
3.	Isolation and identification of microorganisms from wound sample.	
4.	Antimicrobial susceptibility test against specific pathogens – Kirby-Bauer method	
5.	Examination of medically important fungi by lactophenol cotton blue stain.	
6.	Demonstration of blood parasites by Giemsa staining and Leishman staining.	
7.	Estimation of serum sugar.	
8.	Estimation of serum cholesterol.	
9.	Estimation of AST.	
10.	Estimation of ALT.	

Text Book(s):

1. James G. Cappuccino, Natalie Sherman, Microbiology – A laboratory manual, The Benjamin Cummings Publishing Company, Inc, 2005.
2. H.J. Benson, Microbiological Applications: A Laboratory Manual in General Microbiology, The McGraw– Hill Companies, 2015.
3. C.P. Prince, Practical Manual of Medical Microbiology, 1st edition, Jaypee digital publishing, ,2009.

Reference Book(s):

1. R. Ananthanarayan and C.K.J. Paniker, Textbook Of Microbiology, 11th edition, Universities Press Pvt. Ltd, 2020.

Web Resource(s):

1. [https://bio.libretexts.org/Learning_Objects/Laboratory_Experiments/Microbiology_Labs/Microbiology_Labs_I/09%3A_Kirby-Bauer_\(Antibiotic_Sensitivity\)](https://bio.libretexts.org/Learning_Objects/Laboratory_Experiments/Microbiology_Labs/Microbiology_Labs_I/09%3A_Kirby-Bauer_(Antibiotic_Sensitivity))
2. <https://paramedicsworld.com/hematology-practicals/leishman-staining-principle-procedure-interpretation/medical-paramedical-studynotes>
3. <https://microbeonline.com/giemsa-stain-principle-procedure-and-results/>

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Examine the clinical samples collected from patients.	K1
CO2	Interpret the knowledge on antimicrobial susceptibility test .	K2
CO3	Report the medically important fungi by lacto phenol cotton blue stain.	K3
CO4	Focus the blood parasites by giemsa stain and leishman stain.	K4
CO5	Estimate the level of AST and ALT in bloodstream.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	2	1	3	3	2	3	2	1	2	2.1
CO2	1	3	2	2	1	2	2	3	2	1	1.9
CO3	2	2	3	1	2	3	2	1	2	2	2.0
CO4	2	2	2	3	1	3	2	2	2	2	2.1
CO5	3	1	2	2	2	3	2	2	1	2	2.0
Mean Overall Score											10.1/5= 2.02
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: K. Vijayalakshmi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMB4AC7	Allied - VII	4	4	25	75	100
Course Title		SOIL AND AGRICULTURAL MICROBIOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Soil Microbiology: Soil as Microbial Habitat, Soil profile and properties, Soil formation, Diversity, and distribution of major group of microorganisms in soil. Quantification of soil microflora, *role of microorganism in soil fertility*. Mineralization of organic and Inorganic Matter in Soil.	12
II	Nutrient Cycling Processes: Carbon cycle, Phosphorous cycle, Nitrogen cycle Oxygen cycle, Sulphur cycle and *Iron cycle*. Biological nitrogen fixation – nitrogen fixer, root nodule formation, nitrogenase and hydrogenase.	12
III	Microbial Interaction: Neutralism, Commensalism, Synergism, Mutualism, Amensalism, Competition, Parasitism, *Predation*. Interaction of microbes with plants – Rhizosphere, Phyllosphere, Spermosphere, Mycorrhizae. Rumen flora. Insect symbiosis.	12
IV	Plant Diseases: Types , transmission and control measures. Bacterial diseases – Bacterial blight of paddy ,Citrus canker and Bacterial wilt - Fungal diseases – Red rot of sugar cane; Powdery mildew of cucurbits and *Blast of Rice*- Viral diseases –TMV, Cauliflower mosaic, Vein clearing disease of Bhendi (<i>Abelmoschus esculentus</i>).	12
V	Plant Growth Promoting Bacteria: Plant growth promoting Rhizobacteria – *Disease suppressive soils*. Bioinoculants in Agriculture, Application technology: Standards and quality control, application for field and tree crops, nursery plants and seedlings.	12

**Self Study

Text Book(s):
1. N.S. Subba Rao..Soil Microbiology. 4th Edition, Oxford & Ibh Publishing Co Pvt Ltd, 2020. 2. Jan Dirk van Elsas, Jack T. Trevors, Alexandre Soares Rosado, Paolo Nannipieri, Modern Soil Microbiology, Third Edition, CRC Press, ,2019. 3. Singh Tanuja, S.S. Purohit, P. Parihar. Soil Microbiology (PB). Student Edition, 2018.
Reference Book(s):
1. N.S. Subba Rao. Soil Microbiology, 5th Edition, Med Tech Publishers. 2017. 2. P.D. Sharma. Microbiology and Plant pathology. 2 nd Edition, Rastogi Publications, 2010. 3. G. Rangaswami, and D.J. Bhagyaraj, Agricultural Microbiology. 2nd Edition, Prentice, Hall, New Delhi, 2009.
Web Resource(s):
1. https://microbenotes.com/microorganisms-in-soil/ 2. https://en.wikipedia.org/wiki/Oxygen_cycle 3. https://www.onlinebiologynotes.com/biofertilizer

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe diversity and significance of soil microbes .	K1
CO2	Explain the role of microbes in nutrient cycle.	K2
CO3	Illustrate the mechanism of microbial interactions .	K3
CO4	Analyze the plant diseases and their control measures.	K4
CO5	Conclude the knowledge on production and applications of plant growth promoting bacteria.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	3	2	3	3	3	2	3	1	2.5
CO2	3	2	3	2	2	3	2	2	1	2	2.2
CO3	3	2	2	3	1	3	2	2	3	2	2.3
CO4	3	3	2	2	2	3	3	2	3	2	2.5
CO5	3	2	2	2	3	2	2	1	2	3	2.2
Mean Overall Score											11.7/5 =2.34
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: K. Vijayalakshmi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMB4AC8P	Allied - VIII	3	2	20	80	100
Course Title		SOIL AND AGRICULTURAL MICROBIOLOGY - PRACTICAL					

SYLLABUS		
S. No	Contents	Hours
1.	Determination of soil pH.	45
2.	Isolation of microorganisms from Rhizosphere soil.	
3.	Isolation of microorganisms from Phyllosphere.	
4.	Isolation and testing of antagonistic microorganisms from soil.	
5.	Isolation and culturing of <i>Rhizobium</i> from root nodules.	
6.	Isolation of cellulase producing microbes from soil.	
7.	Isolation and staining of AM fungi colonization in plant root.	
8.	Isolation of phosphate solubilizing bacteria.	
9.	Isolation of potassium solubilizing bacteria.	
10.	Demonstration of the plant diseases: a) Bacterial blight of paddy b) Citrus cancer c) Red rot of sugar cane d) Powdery mildew of cucurbits.	

Text Book(s):
<ol style="list-style-type: none"> Hanuman Prasad Pandey and Rajendra Krishna Pathak- A Practical Manual on Techniques of Agricultural Microbiology, Scripown Publications, 2021. James G. Cappucino and Natalie Sherman. Microbiology – A laboratory manual. 5th Edition, The Benjamin publishing company. New York, 2016 K.R. Aneja. Experiments in Microbiology, Plant pathology and Biochemistry. 4th Edition, New age International publishers, India, 2003.
Reference Book(s):
<ol style="list-style-type: none"> Dhruti Amin, Natarajan Amaesan, Pritesh Patel-Practical Handbook on Agricultural Microbiology, Springer US Publishers, 2021. Bharti Arora, D.R. Arora, Practical Microbiology, CBS Publishers and Distributors, 2020. R.C. Dubey, and D.K. Maheswari. Practical Microbiology. S Chand Publishing, 2012.
Web Resource(s):
<ol style="list-style-type: none"> https://www.ncbi.nlm.nih.gov/pmc/articles https://www.biotechnologynotes.com/soil/isolation-of-azotobacter-species-from-soil- https://www.aloki.hu/pdf/0602_101109.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Identify the microorganisms from rhizosphere and phyllosphere.	K1
CO2	Examine the microorganisms from soil.	K2
CO3	Report the cellulase producing microorganism from soil.	K3
CO4	Focus the phosphate and potassium solubilizers.	K4
CO5	Conclude the plant diseases caused by various microorganisms and their control measures.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	2	2	2	3	2	2	2	2	2	2.2
CO2	3	2	3	2	2	2	2	1	2	2	2.1
CO3	3	2	2	3	1	3	2	2	3	2	2.3
CO4	2	3	2	2	2	2	3	2	1	2	2.1
CO5	3	2	2	2	3	2	2	1	2	3	2.2
Mean Overall Score											10.9/5= 2.18
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: K. Vijayalakshmi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMB4GE2	Generic Elective - II	2	2	-	100	100
Course Title		DAIRY MICROBIOLOGY					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Dairy Microbiology: Definition, Concept of dairy microbiology. Role of Microbes in dairy industry. Significance of dairy products and their Health benefits. Milk Hygiene and production-clean milk management, animal management, Milking management, *hygiene of milking utensils and environment*.	6
II	Microbiology of Milk: Composition of milk -sources of contamination. Biochemical changes of milk- souring, *gassy fermentation*, proteolysis, lipolysis, ropiness, discolouration and abnormal flavour. Microbiological changes in milk during production, processing and mastitis milk and significance. Preservation of milk and milk products.	6
III	Starter Culture: Definition, history, characterization of dairy of starter organisms and role of starter culture in dairy industries. Starter types- single, mixed and multiple strain starter culture. Preparation of starter culture-commercial, concentrated and *super concentrated*.	6
IV	Dairy Processing: Milk Processing –Storage, Separating, Homogenizing, Pasteurizing/heat treatment, Filling. Microbiological process and therapeutic values of fermented milk and milk products- *dahi*, lassi, yoghurt, acidophilus milk, butter milk, cream and chesses. Health benefits and regulation of probiotics .	6
V	Microbiological Methods: Qualitative and quantitative methods of milk testing. Methylene Blue Reduction Test (MBRT) and Resazurin Reduction Test (RRT). Standard Plate Count, *Coliform count*, Psychrophiles, Thermophilic count, Direct microscopic count and efficiency of pasteurization (phosphatase test).	6

..... Self Study

Text Book(s):
1. W.C. Frazier and D.C. West off. Food microbiology, TATA McGraw Hill Publishing Company Ltd. New Delhi, 1988. 2. M.R. Adams and M.O. Moss. Food Microbiology, The Royal Society of Chemistry, Cambridge. 3. Biotechnology by R.C. Dubey, S Chand publishers 1995.
Reference Book(s):
1. J.M. Jay, M.J. Loessner and D.A. Golden. Modern Food Microbiology. 7th edition, CBS Publishers and Distributors, Delhi, India 2005. 2. R.K. Robinson, Dairy Microbiology Handbook - The Microbiology of Milk and Milk Products. 3rd ed. Wiley-Interscience, New York 2002. 3. G.W. Gould. New Methods of Food Preservation. Blackie Academic and Professional, London. 4. J.M. Jay, M.J. Loessner and D.A. Golden. (2005). Modern Food Microbiology.7th edition, CBS Publishers and Distributors, Delhi, India 1995.

Web Resource(s):

1. <https://microbiologynotes.org/milk-composition-processing-pasteurization-pathogens-and-spoilage/>
2. <http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=101481>
3. <https://www.onlinebiologynotes.com/microbial-spoilage-of-milk-and-milk-products/>

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the significance of dairy Microbiology.	K1
CO2	Explain the biochemical changes in the dairy products.	K2
CO3	Examine the characterization and role of starter culture in dairy products.	K3
CO4	Analyse the microbiological process and therapeutic values of dairy products.	K4
CO5	Conclude the various test used for detecting microorganisms in dairy products.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	1	3	1	1	3	1	3	1	3	2.0
CO2	3	2	2	2	3	1	2	2	2	1	2.0
CO3	3	1	1	2	1	1	2	3	2	2	1.8
CO4	2	2	3	1	2	2	1	2	2	3	2.0
CO5	1	1	2	1	1	3	3	1	3	1	1.7
Mean Overall Score											9.5/5=1.9
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: A. Swedha