B.Sc., MICROBIOLOGY

Syllabus

Program Code: UMB

2023-2024 onwards

MANNAR THIRUMALAI NAICKER COLLEGE

(AUTONOMOUS)

Re-accredited with "A" Grade by NAAC

PASUMALAI, MADURAI – 625 004

GUIDLINESS FOR OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

(FOR UG PROGRAM FROM 2023 -2024 ONWARDS)

ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the UG Degree program must have passed the Higher Secondary Education (respective groups – Arts / Science) of the Government of Tamil Nadu or any other state or its equivalent qualification.

DURATION OF THE COURSE

The duration of the course shall be three academic years comprising six semesters with two semesters in each academic year.

Subjects of Study

Part I : Tamil / Hindi /

Part II : English

Part III :

1.Core Subjects
2.Allied Subjects
3.Electives

Part IV:

1.Non Major Electives (I Year)
2.Skill Based Subjects
3.Environmental Studies - Mandatory Subject
4.Value Education - Mandatory Subject

Part V :

Extension Activities

ARTS & SCIENCE

CBCS COURSE STRUCTURE FOR UG PROGRAMS

Sem I	Credit	Sem II	Credit	Sem III	Credit	Sem IV	Credit	Sem V	Credit	Sem VI	Credit
1.1. Language - Tamil	3	2.1. Language - Tamil	3	3.1. Language - Tamil	3	4.1. Language - Tamil	3	5.1 Core Course – \CC IX	4	6.1 Core Course – CC XIII	4
1.2 English	3	2.2 English	3	3.2 English	3	4.2 English	3	5.2 Core Course – CC X	4	6.2 Core Course – CC XIV	4
1.3 Core Course – CC I	4	2.3 Core Course – CC III	4	3.3 Core Course – CC V	4	4.3 Core Course – CC VII Core Industry Module	4	5. 3.Core Course CC -XI	4	6.3 Core Course – CC XV	4
1.4 Core Course – CC II	4	2.4 Core Course – CC IV	4	3.4 Core Course – CC VI	4	4.4 Core Course – CC VIII	4	5. 3.Core Course –/ Project with viva-voce CC - XII	4	6.4 Elective -VII Generic/ Discipline Specific	3
1.5 Elective I Generic/ Discipline Specific	3	2.5 Elective II Generic/ Discipline Specific	3	3.5 Elective III Generic/ Discipline Specific	3	4.5 Elective IV Generic/ Discipline Specific	3	5.4 Elective V Generic/ Discipline Specific	3	6.5 Elective VIII Generic/ Discipline Specific	3
1.6 Skill Enhancement Course SEC-1 (NME)	2	2.6 Skill Enhancement Course SEC-2 (NME)	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	4.6 Skill Enhancement Course SEC-6	2	5.5 Elective VI Generic/ Discipline Specific	3	6.6 Extension Activity	1
1.7Ability Enhancement Compulsory Course (AECC) Soft Skill-1	2	2.7 Skill Enhancement Course – SEC-3(NME)	2	3.7 Skill Enhancement Course SEC-5	2	4.7 Skill Enhancement Course SEC-7	2	5.6 Value Education	2	6.7 Professional Competency Skill	2
1.8 Skill Enhancement - (Foundation Course)	2	2.8 Ability Enhancement Compulsory Course (AECC) Soft Skill-2	2	3.7 Ability Enhancement Compulsory Course (AECC) Soft Skill-3	2	4.7 7Ability Enhancement Compulsory Course (AECC) Soft Skill-4	2	5.5 Summer Internship /Industrial Training	2		
				3.8 E.V.S	-	4.8 E.V.S	2				
	23		**23**		**22**		**25**		**26**		**21**
	Total Credit Points										**140**

QUESTION PAPER PATTERN FOR THE CONTINUOUS INTERNAL ASSESSMENT

Note: Duration – 1 hour

(FOR PART I, PART II & PART III)

The components for continuous internal assessment are:

Part –A

Four multiple choice questions (answer all) 4 x01= 04 Marks

Part –B

Two questions (‘either …. or ‘type) 2 x05= 10 Marks

Part –C

Two questions (‘either …. or ‘type) 2 x 08=16 Marks

Total 30 Marks

THE COMPONENTS FOR CONTINUOUS INTERNAL ASSESSMENT ARE:

(60 Marks of two continuous internal assessments will be converted to 15 marks)

Two tests and their average --15 marks

Seminar /Group discussion / Quiz Test --5 marks

Assignment --5 marks

Total 25 Marks

QUESTION PAPER PATTERN FOR THE SUMMATIVE EXAMINATIONS:

Note: Duration- 3 hours

Part –A

Ten multiple choice questions	10 x01	= 10 Marks

No Unit shall be omitted: not more than two questions from each unit.)

Part –B

Five Paragraph questions (‘either …. or ‘type)	5 x 05	= 25 Marks

(One question from each Unit)

Part –C

Five Paragraph questions (‘either …. or ‘type)	5 x 08	= 40 Marks

(One question from each Unit)

Total	75 Marks

PART-IV- SKILL BASED PAPERS / NME:

The Scheme of Examination for Skill Based Papers: (Except Practical Lab Subjects)

QUESTION PAPER PATTERN FOR THE CONTINUOUS INTERNAL ASSESSMENT (SKILL BASED AND NME COURSES) DURATION – 1 HOUR

- 50 MCQs will be asked for each internal assessment tests (50 x 1=50 Marks) and converted for 15 marks

THE COMPONENTS FOR CONTINUOUS INTERNAL ASSESSMENT ARE:

Two tests and their average	--15 marks
Seminar /Group discussion / Quiz Test	-- 5 marks
Assignment	-- 5 marks
Total	25 Marks

SUMMATIVE EXAMINATION PATTERN (SKILL BASED AND NME COURSES) DURATION – 3 HOURS

Pattern of the Question Paper for Skill Based and Non-Major Elective courses (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)

(15MCQ's from each unit)

PART-IV- ENVIRONMENTAL STUDIES AND VALUE EDUCATION

QUESTION PAPER PATTERN (INTERNAL ASSESSMENT)

Pattern of the Question Paper for Environmental Studies & Value Education (Internal)

50 MCQs will be asked for each internal assessment tests (50 x 1=50 Marks) and converted for 15 marks

Two tests and their average	--	15 marks
Project	--	10 marks

Total		25 Marks
		---

* The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

SUMMATIVE EXAMINATION PATTERN

Pattern of the Question Paper for Environmental Studies & Value Education only) (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)

(15MCQ's from each unit)

PART V EXTENSION ACTIVITIES: (MAXIMUM MARKS: 100)

1. NCC
2. NSS
3. Physical Education
4. YRC
5. RRC
6. Health & Fitness Club
7. Eco Club
8. Human Rights Club

Internal Examinations - - 25 Marks

Summative Examinations - - 75 Marks

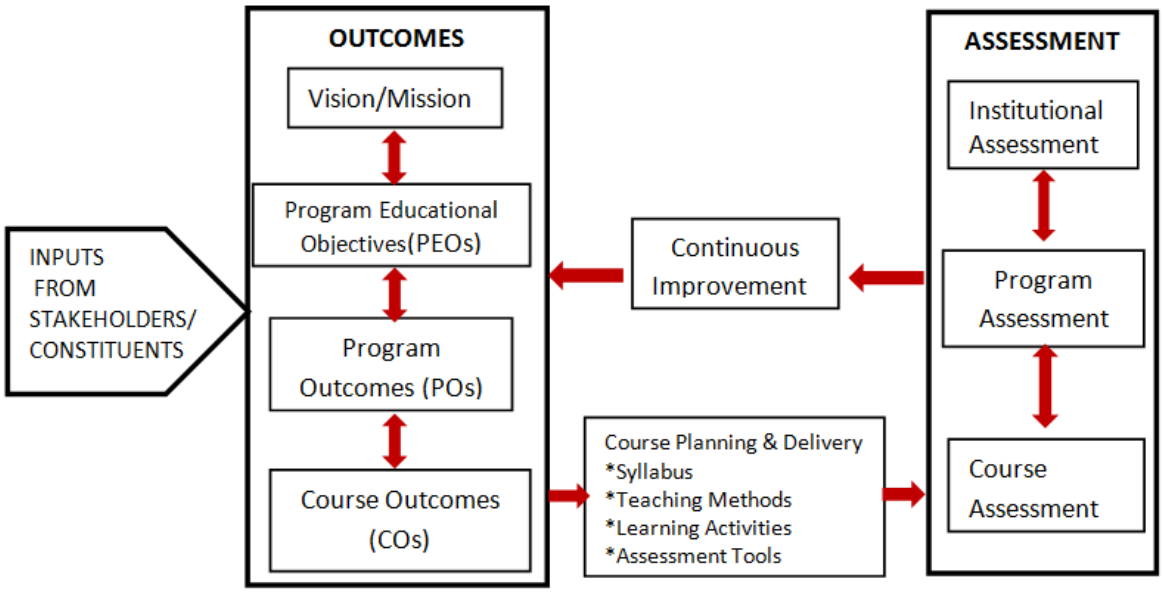
100

OUTCOME BASED EDUCATION:

OBE starts with the identification and articulation of clear and measurable learning outcomes for each course or program. These outcomes describe the skills, knowledge, and abilities that students are expected to acquire. The curriculum, instructional methods, and assessments are aligned with the defined learning outcomes. This ensures that everything taught and evaluated is directly related to what students are expected to learn.

The Learning Outcomes-Based Approach to curriculum planning and transaction in our institution ensures whether the teaching-learning processes are oriented towards enabling students to attain the defined learning outcomes relating to the courses within a programme. The outcome based approach, particularly in the context of undergraduate studies, requires a significant shift from teacher-centric to learner-centric pedagogies and from passive to active/participatory pedagogies.

Assessment Method: The students are assessed with 2 internal examination and the summative examination which includes problem based assignments; practical assignment laboratory reports; observation of practical skills; individual project reports ,case-study reports; team project reports; oral presentations, including seminar presentation; viva voce interviews; computerized adaptive testing; etc. and any other pedagogic approaches as per the context.



INSTITUTIONAL VISION

To Mould the learners into accomplished individuals by providing them with a stimulus for social change through character, confidence and competence.

INSTITUTIONAL MISSION

1. Enlightening the learners on the ethical and environmental issues.

2. Extending holistic training to shape the learners in to committed and competent citizens.

3. Equipping them with soft skills for facing the competitive world.

4. Enriching their employability through career oriented courses.

5. Ensuring accessibility and opportunity to make education affordable to the underprivileged.

Highlights of the Revamped Curriculum:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.

- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS),
MADURAI – 625 004
B.SC MICROBIOLOGY CURRICULUM
(For the student admitted during the academic year 2023-2024 onwards)

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
FIRST SEMESTER						
Part – I	**Tamil / Alternative Course**					
23UTAGT11	தமிழ் இலக்கிய வரலாறு - I	6	3	25	75	100
Part – II	**English**					
23UENGE11	GENERAL ENGLISH - I	6	3	25	75	100
Part - III	**Core Courses**					
23UMBCC11	FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY	5	5	25	75	100
23UMBCP11	FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY - PRACTICAL	5	5	25	75	100
Part - III	**Elective Course**					
23UMBEC11	BASIC AND CLINICAL BIOCHEMISTRY	4	3	25	75	100
Part IV	**Non Major Elective**					
23UMBNM11	SOCIAL AND PREVENTIVE MEDICINE	2	2	25	75	100
Part IV	**Foundation Course**					
23UMBFC11	MICROBIAL TAXONOMY	2	2	25	75	100
	Total	30	23	175	525	700
SECOND SEMESTER						
Part – I	**Tamil / Alternative Course**					
23UTAGT21	தமிழ் இலக்கிய வரலாறு – II	6	3	25	75	100
Part – II	**English**					
23UENGE21	GENERAL ENGLISH - II	6	3	25	75	100
Part - III	**Core Courses**					
23UMBCC21	MICROBIAL PHYSIOLOGY AND METABOLISM	5	5	25	75	100
23UMBCP21	MICROBIAL PHYSIOLOGY AND METABOLISM - PRACTICAL	5	5	25	75	100
Part - III	**Elective Course**					
23UMBEC21	BIOINSTRUMENTATION	4	3	25	75	100
Part IV	**Non Major Elective**					
23UMBNM21	NUTRITION AND HEALTH HYGINE	2	2	25	75	100
Part IV	**Skill Enhancement course**					
23UMBSC21	SERICULTURE	2	2	25	75	100
	Total	30	23	175	525	700


FIRST SEMESTER

Course Name	FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY			
Course Code	23UMBCC11	**L**	**P**	**C**
Category	CORE	5	-	5

COURSE OBJECTIVES:

- Learn the fundamental principles about different aspects of Microbiology including recent developments in the area
- Describe the structural organization, morphology and reproduction of microbes.
- Explain the methods of cultivation of microbes and measurement of growth
- Understand the microscopy and other basic laboratory techniques – culturing, disinfection and sterilization in Microbiology.
- Compare and contrast the different methods of sterilization.

UNIT - I HISTORY OF MICROBIOLOGY **12**

History and Evolution of Microbiology, Classification – Three kingdom, five kingdom, six kingdom and eight kingdom. Microbial biodiversity: Introduction to microbial biodiversity- ecological niche. Basic concepts of Eubacteria, Archaebacteria and Eucarya. Conservation of Biodiversity.

UNIT - II GENERAL CHARACTERISTICS OF MICROORGANISMSM **12**

General characteristics of cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) and acellular microorganisms - (Viruses, Viroids, Prions), Differences between prokaryotic and eukaryotic microorganisms Structure of Bacterial cell wall, cell membrane, capsule, flagella, pili, mesosomes, chlorosomes, phycobilisomes, spores, and gas vesicles. Structure of fungi (Mold and Yeast), Structure of microalgae.

UNIT - III PURE CULTURE TECHNIQUES **12**

Bacterial culture media and pure culture techniques. Mode of cell division, Quantitative measurement of growth. Anaerobic culture technique.

UNIT - IV MICROSCOPY **12**

Microscopy – Simple, bright field, dark field, phase contrast, fluorescent, electron microscope – TEM & SEM, Confocal microscopy, and Atomic Force Microscopy. Stains and staining methods.

UNIT - V STERILIZATION **12**

Sterilization–moist heat - autoclaving, dry heat – Hot air oven, radiation – UV, Ionization, filtration – membrane filter and disinfection, antiseptic; Antimicrobial agents.

Total Lecture Hours **60**

BOOKS FOR STUDY:

- Pelczar.M. J., Chan E.C.S. and Noel. R.K. (2007). Microbiology. 7th Edition.,McGraw –Hill, New York
- Willey J., Sherwood L., and Woolverton C. J., (2017). Prescott's Microbiology. 10th
- Edition., McGraw-Hill International edition.
- Tortora, G.J., Funke, B.R., Case,C.L. (2013). Microbiology. An Introduction 11th Edition., A La Carte Pearson.
- Salle. A.J (1992). Fundamental Principles of Bacteriology. 7th Edition., McGraw Hill Inc. New York.
- Boyd, R.F. (1998). General Microbiology,2nd Edition., Times Mirror, Mosby College Publishing, St Louis.

BOOKS FOR REFERENCES:

- Jeffrey C. Pommerville., Alcamo's Fundamentals of Microbiology (9th Edition). Jones &Bartlett learning 2010
- Stanier R.Y, Ingraham J. L., Wheelis M. L., and Painter R. R. (2010). General Microbiology, 5th Edition. MacMillan Press Ltd
- Tortora, G.J., Funke, B.R. and, Case, C.L (2013). Microbiology-An Introduction, 11th Edition., Benjamin Cummings
- Nester E., Anderson D., Roberts C. E., and Nester M. (2006). Microbiology-A Human Perspective, 5th Edition., McGraw Hill Publications.
- Microorganisms, 13th Edition Benjamin-Cummings Publishing Co.

WEB RESOURCES:

- **https://www.cliffsnotes.com/study-guides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology**
- **https://www.keyence.com/ss/products/microscope/bz-x/study/principle/structure.jsp**
- **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6604941/#**
- **https://bio.libretexts.org/@go/page/9188**
- **https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial- nutrition/**

Nature of Course	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓		

***Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Learn the fundamental principles about different aspects of Microbiology including recent developments in the area.	K1 to K4
CO2	Gain Knowledge of detailed structure and functions of prokaryotic cell organelles.	K1 to K4
CO3	Understand the various microbiological techniques, different types of media, and techniques involved in culturing microorganisms.	K1 to K4
CO4	Explain the principles and working mechanism of different microscopes/Microscope, their function and scope of application	K1 to K4
CO5	Understand the concept of asepsis and modes of sterilization and disinfectants.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	M	M	S	M			
CO2	M	S	M	M	S	M	M			
CO3	M	M	S	M	S	M	M			
CO4	M	M	S	M	M	M	S			
CO5	M	S	M	M	M	M	M			

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	2	1	2	2
CO 2	2	1	2	2	1
CO 3	2	2	1	2	1
CO 4	2	2	1	2	2
CO 5	2	1	2	2	2
WEITAGE	10	8	7	10	8
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	History and Evolution of Microbiology: Classification – Three kingdom, five kingdom, six kingdom and eight kingdom. Microbial biodiversity: Introduction to microbial biodiversity- ecological niche.	12	Chalk & Talk, PPT

	Basic concepts of Eubacteria, Archaebacteria and Eucarya. Conservation of Biodiversity.		
II	General characteristics of Microorganisms: General characteristics of cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) Acellular microorganisms - (Viruses, Viroids, Prions) Differences between prokaryotic and eukaryotic microorganisms. Structure of Bacterial cell wall, cell membrane, capsule, flagella, pili, mesosomes, chlorosomes, phycobilisomes, spores, and gas vesicles. Structure of fungi (Mold and Yeast), Structure of microalgae.	**12**	**Chalk & Talk, PPT**
III	Pure Culture Techniques: Bacterial culture media and pure culture techniques. Mode of cell division.Quantitative measurement of growth. Anaerobic culture techniques.	**12**	**Chalk & Talk, PPT**
IV	Microscopy: Microscopy – Simple, bright field, dark field, phase contrast, fluorescent, electron microscope.TEM & SEM, Confocal microscopy, and Atomic Force Microscopy. Stains and staining methods.	**12**	**Chalk & Talk, PPT**
V	Sterilization: Sterilization–moist heat - autoclaving, dry heat – Hot air oven, radiation – UV, Ionization, filtration – membrane filter and disinfection, antiseptic; Antimicrobial agents.	**12**	**Chalk & Talk, PPT, Assignment**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	**Cos**	**K Level**	**Section A**		**Section B Either or Choice**	**Section C Either or Choice**
			MCQs			
			No. of. Questions	**K - Level**		
CI AI	**CO1**	**K1 – K4**	2	K1, K2	2(K2, K2)	2(K3, K3)
	CO2	**K1 – K4**	2	K1, K2	2(K3, K3)	2(K4, K4)
CI AII	**CO3**	**K1 – K4**	2	K1, K2	2(K2, K2)	2(K3, K3)
	CO4	**K1 – K4**	2	K1, K2	2(K3, K3)	2(K4, K4)
Question Pattern CIA I & II		**No. of Questions to be asked**	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	25
	K2	2	10		12	21.4	
	K3		10	16	26	46.4	46.4
	K4			16	16	28.6	28.6
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2	10		12	3.6	
	K3		10	16	26	46.4	46.4
	K4			16	16	46.4	46.4
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1, K2	2(K2, K2)	2(K3, K3)
2	CO2	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
3	CO3	K1-K4	2	K1, K2	2(K2, K2)	2(K3, K3)
4	CO4	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
5	CO5	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	**Section A (Multiple Choice Questions)**	**Section B (Either or Choice**	**Section C (Either/ or Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	**5**			**5**	**3.6**	**4**
K2	**5**	**20**		**25**	**17.8**	**18**
K3		**30**	**32**	**62**	**44.3**	**44**
K4			**48**	**48**	**34.3**	**34**
Marks	**10**	**50**	**80**	**140**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	**Unit**	**CO**	**K-level**		
Answer **ALL** the questions				**PART – A**	**(10 x 1 = 10 Marks)**
1.	**Unit - I**	**CO1**	**K1**		
				a)	b)
				c)	d)
2.	**Unit - I**	**CO1**	**K2**		
				a)	b)
				c)	d)
3.	**Unit - II**	**CO2**	**K1**		
				a)	b)
				c)	d)
4.	**Unit - II**	**CO2**	**K2**		
				a)	b)
				c)	d)
5.	**Unit - III**	**CO3**	**K1**		
				a)	b)
				c)	d)
6.	**Unit - III**	**CO3**	**K2**		
				a)	b)
				c)	d)
7.	**Unit - IV**	**CO4**	**K1**		
				a)	b)
				c)	d)
8.	**Unit - IV**	**CO4**	**K2**		
				a)	b)
				c)	d)
9.	**Unit - V**	**CO5**	**K1**		
				a)	b)
				c)	d)
10.	**Unit - V**	**CO5**	**K2**		
				a)	b)
				c)	d)

Answer **ALL** the questions		**PART – B**		**(5 x 5 = 25 Marks)**
11. a)	**Unit - I**	**CO1**	**K2**	
		OR		
11. b)	**Unit - I**	**CO1**	**K2**	
12. a)	**Unit - II**	**CO2**	**K3**	
		OR		
12. b)	**Unit - II**	**CO2**	**K3**	
13. a)	**Unit - III**	**CO3**	**K2**	
		OR		
13. b)	**Unit - III**	**CO3**	**K2**	
14. a)	**Unit - IV**	**CO4**	**K3**	
		OR		
14. b)	**Unit - IV**	**CO4**	**K3**	
15. a)	**Unit - V**	**CO5**	**K3**	
		OR		
15. b)	**Unit - V**	**CO5**	**K3**	

Answer **ALL** the questions		**PART – C**		**(5 x 8 = 40 Marks)**
16. a)	**Unit - I**	**CO1**	**K3**	
		OR		
16. b)	**Unit - I**	**CO1**	**K3**	
17. a)	**Unit - II**	**CO2**	**K4**	
		OR		
17. b)	**Unit - II**	**CO2**	**K4**	
18. a)	**Unit - III**	**CO3**	**K3**	
		OR		
18. b)	**Unit - III**	**CO3**	**K3**	
19. a)	**Unit - IV**	**CO4**	**K4**	
		OR		
19. b)	**Unit - IV**	**CO4**	**K4**	
20. a)	**Unit - V**	**CO5**	**K4**	
		OR		
20. b)	**Unit - V**	**CO5**	**K4**	

Course Name	FUNDAMENTALS OF MICROBIOLOGY AND MICROBIAL DIVERSITY-PRACTICAL			
Course Code	23UMBCP11	**L**	**P**	**C**
Category	CORE PRACTICAL	-	5	5

COURSE OBJECTIVES:

- Learn the fundamental principles about different aspects of Microbiology including recent developments in the area.
- Describe the structural organization, morphology and reproduction of microbes.
- Explain the methods of cultivation of microbes and measurement of growth.
- Understand the microscopy and other basic laboratory techniques – culturing, disinfection and sterilization in Microbiology.
- Compare and contrast the different methods of sterilization.

1. Cleaning of glass wares, Microbiological good laboratory practice and safety.
2. Sterilization and assessment of sterility– Autoclave, hot air oven, and membrane filtration
3. Media preparation: liquid media, solid media, semi-solid media, agar slants, agar deeps, agar plates
Preparation of basal, differential, enriched, enrichment, transport, and selective media preparation- quality control of media, growth supporting properties, sterility check of media.
4. Pure culture techniques: streak plate, pour plate, decimal dilution
5. Culture characteristics of microorganisms: growth on different media, growth characteristics, and description
6. Demonstration of pigment production
7. Microscopy: light microscopy and bright field microscopy**.**
8. Staining techniques: smear preparation, simple staining.
9. Gram's staining and endospore staining.
10. Study on Microbial Diversity using Hay Infusion Broth – Wet mount, hanging drop.

Total Lecture Hours	**60**

BOOKS FOR STUDY:

- James G Cappucino and N. Sherman MB(1996). A lab manual Benjamin Cummins, New York 1996.
- Kannan. N (1996). Laboratory manual in General Microbiology. Palani Publications.
- Sundararaj T (2005). Microbiology Lab Manual (1st edition) publications.
- Gunasekaran, P. (1996). Laboratory manual in Microbiology. New Age International Ld., Publishers, New Delhi
- R C Dubey and D K Maheswari (2002). Practical Microbiology. S. Chand Publishing.

BOOKS FOR REFERENCES:

- Atlas.R (1997). Principles of Microbiology, 2nd Edition, Wm.C.Brown publishers
- Amita J, Jyotsna A and Vimala V (2018). Microbiology Practical Manual. (1st Edition). Elsevier India.
- Wheelis M, (2010). Principles of Modern Microbiology, 1st Edition. Jones and Bartlett Publication.
- Handbook Medical Laboratory Technology. (2nd Edition). CBS
- Lim D. (1998). Microbiology, 2nd Edition, WCB McGraw Hill Publications.

WEB RESOURCES:

- **http://www.biologydiscussion.com/micro-biology/sterilisation-and-disinfection-methods-and-principles-microbiology/24403.**
- **https://www.ebooks.cambridge.org/ebook.jsf?bid=CBO9781139170635**
- **https://microbiologyinfo.com/top-and-best-microbiology-books/**
- **https://www.cliffsnotes.com/studyguides/biology/microbiology/introduction to-microbiology/a-brief-history-of-microbiology**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓		

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Practice sterilization methods; learn to prepare media and their quality control.	K1 to K4
CO2	Learn streak plate, pour plate and serial dilution and pigment production of microbes.	K1 to K4
CO3	Understand Microscopy methods, different Staining techniques and motility test.	K1 to K4
CO4	Observe culture characteristics of microorganisms.	K1 to K4
CO5	Study on Microbial Diversity using Hay Infusion Broth-Wet mount	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	L	L	S	L	M	S	L	M
CO2	M	L	L	M	M	M	M	S	L	L
CO3	M	M	L	M	L	M	M	S	M	M
CO4	M	L	L	M	M	M	S	S	S	L
CO5	M	L	L	M	M	M	M	S	M	L

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	3	2	2	3
CO 2	2	2	2	2	2
CO 3	2	2	3	2	1
CO 4	2	2	3	2	2
CO 5	2	1	2	2	2
WEITAGE	10	10	12	10	10
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	Cleaning of glass wares, Microbiological good laboratory practice and safety. Sterilization and assessment of sterility– Autoclave, hot air oven, and membrane filtration.	12	Chalk & Talk, PPT, Demonstration
II	Media preparation: liquid media, solid media, semi-solid media, agar slants, agar deeps, agar plates.	12	Chalk & Talk PPT, Demonstration

III	Preparation of basal, differential, enriched, enrichment, transport, and selective media preparation- quality control of media. Growth supporting properties, sterility check of media. Pure culture techniques: streak plate, pour plate, decimal dilution.	**12**	**Chalk & Talk PPT, Demonstration**
IV	Culture characteristics of microorganisms: growth on different media, growth characteristics, and description. Demonstration of pigment production. Microscopy: light microscopy and bright field microscopy.	**12**	**Chalk & Talk PPT, Demonstration**
V	Staining techniques: smear preparation, simple staining, Gram's staining and endospore staining. Study on Microbial Diversity using Hay Infusion Broth-Wet mount to show different types of microbes, hanging drop.	**12**	**Chalk & Talk PPT, Demonstration**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

INTERNAL	COs	K LEVEL	MAJOR	MINOR	SPOTTERS	RECORD	VIVA
CI AI	CO1	K1					5
	CO2	K2				5	
	CO3	K3			5		
	CO4	K4		5			
	CO5	K4	5				
Question Pattern		No. of Questions to be asked	2 (A-Written B-Practical Demo)	2 (A-Written B-Practical Demo)	2	1	5
		No. of Questions to be answered	2	2	4	1	5
		Marks for each question	A-3 B-2	A-3 B-2	5	10	1
		Total Marks for each section	5	5	5	5	5

Distribution of Marks with K Level									
	K Level	**Major**	**Minor**	**Spotters**	**Record**	**Viva**	**Total Marks**	**% of Marks without choice**	**Consolidated %**
CIA	**K1**	**-**	**-**	**-**	**-**	**5**	**5**	**6.66**	**6.66**
	K2	**-**	**-**	**-**	**5**	**-**	**5**	**6.66**	**6.66**
	K3	**-**	**-**	**5**	**-**	**-**	**5**	**6.66**	**6.66**
	K4	**-**	**5**	**-**	**-**	**-**	**5**	**6.66**	**6.66**
	K4	**5**					**5**	**6.66**	**6.66**

Summative Examination – Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)							
EXTERNAL	**COs**	**K LEVEL**	**MAJOR**	**MINOR**	**SPOTTERS**	**RECORD**	**VIVA**
CIAI	**CO1**	**K1**					5
	CO2	**K2**				5	
	CO3	**K3**			20		
	CO4	**K4**		20			
	CO5	**K4**	25				
Question Pattern		**No. of Questions to be asked**	2 (A-Written B-Practical Demo)	2 (A-Written B-Practical Demo)	2	1	5
		No. of Questions to be answered	2	2	4	1	5
		Marks for each question	A-20 B-5	A-15 B-5	5	10	1
		Total Marks for each section	25	20	20	5	5

Distribution of Marks with K Level CIA									
	K Level	**Major**	**Minor**	**Spotters**	**Record**	**Viva**	**Total Marks**	**% of Marks without choice**	**Consolidated %**
CIA	**K1**					**5**	**5**	**6.6**	**6.6**
	K2				**5**		**5**	**6.6**	**6.6**
	K3			**20**			**20**	**26.6**	**26.6**
	K4		**20**				**20**	**26.6**	**26.6**
	K4	**25**					**25**	**33.3**	**33.3**
	Marks	**25**	**20**	**20**	**5**	**5**	**75**	**100**	**100**

Course Name	BASIC AND CLINICAL BIOCHEMISTRY			
Course Code	23UMBEC11	**L**	**P**	**C**
Category	ELECTIVE	4	-	3

COURSE OBJECTIVES:

- Attain thorough knowledge on carbohydrates and lipids, their characteristic properties and organization in carrying out all the living functions which constitute the life.
- Explain the biological activity of amino acids and proteins.
- Identify the metabolic errors in enzymes of carbohydrates and lipids.
- Describe the disorders in amino acid metabolism.
- Interpret the consequences, biochemical, clinical features, diagnosis and treatment of metabolic diseases of day today life.

UNIT-I Biomolecules -Carbohydrate: 12

Biomolecules -Carbohydrate – General properties, function, structure, classification– monosaccharides (Glucose, Fructose, Galactose), Oligoaccharides (Sucrose, Maltose, Lactose) and polysaccharides (Starch, Glycogen,) and biological significance. Lipids – General properties, functions, structure, classification (Simple, Derived and Complex), Cholesterol, LDL, HDL – biological significance.

UNIT-II Biomolecules - Amino acids: 12

General properties, functions, structure, classification and biological significance. Proteins– General structure, Properties, functions, classification and biological significance.

UNIT-III Disorders of Metabolism - Disorders of carbohydrate metabolism: 12

Diabetes mellitus, ketoacidosis, hypoglycemia, glycogen storage diseases, galactosemia and lactos intolerance. Disorders of lipid metabolism: hyperlipidemia, hyperlipoproteinemia, hypercholesterolemia hypertriglyceridemia, sphingolipidosis.

UNIT- IV Disorders of Metabolism: Disorders of amino acid metabolism: 12

Alkaptonuria, phenylketonuria, phenylalaninemia, homocystineuria, tyrosinemia, aminoaciduria.

UNIT - V Evaluation of organ function tests: 12

Assessment and clinical manifestations of renal, hepatic, pancreatic, gastric and intestinal functions. Diagnostic enzymes: Principles of diagnostic enzymology. Clinical significance of aspartate aminotransferase, alanine aminotransferase, creatine kinase, aldolase and lactate dehydrogenase.

Total Lecture Hours 60

BOOKS FOR STUDY:

- Satyanarayana, U. and Chakrapani, U(2014).Biochemistry,4th Edition, Made Simple Publisher
- Jain J L, Sunjay Jain and Nitin Jain (2016). Fundamentals of Biochemistry, 7th Edition, S Chand Company.
- Ambika Shanmugam's (2016). Fundamentals of Biochemistry for Medical Students, 8th Edition. Wolters Kluwer India Pvt Ltd.
- Vasudevan. D.M.Sreekumari.S, Kannan Vaidyanathan (2019). Textbook Of Biochemistry For Medical Students. Kindle edition, Jaypee Brothers Medical Publishers.
- Jeremy M. Berg,LubertStryer, John L. Tymoczko, Gregory J. Gatto (2015). Biochemistry, 8th edition. WH Freeman publisher.

BOOKS FOR REFERENCES:

- Amit Kessel & Nir Ben-Tal (2018). Introduction to Proteins: structure, function and motion. 2nd Edition, Chapman and Hall.
- David L. Nelson and Michael M. Cox (2017).Lehninger Principles of Biochemistry, 7th Edition W.H. Freeman and Co., NY.
- LupertStyrer, Jeremy M. Berg, John L. Tymaczko, Gatto Jr., Gregory J (2019). Biochemistry. 9th Edition ,W.H.Freeman& Co. New York.
- Donald Voet, Judith Voet, Charlotte Pratt (2016). Fundamentals of Biochemistry: Life at the Molecular Level, 5th Edition, Wiley.
- Joy PP, Surya S. and AswathyC (2015). Laboratory Manual of Biochemistry, Edition 1.,Publisher:Kerala agricultural university.

WEB RESOURCES:

- **www.abebooks.com**
- **www.kau.in/document/laboratory-manual-biochemistry**
- **www.metacyc.org**
- **www.medicalnewstoday.com**
- **www.journals.indexcopernicus.com**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓		

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Explain the structure, classification, biochemical functions and significance of carbohydrates and lipids	K1 to K4
CO2	Differentiate essential and non-essential amino acids, biologically important modified amino acids and their functions, Illustrate the role, classification of Proteins and recognize the structural level organization of proteins, its functions and denaturation.	K1 to K4
CO3	Assess defective enzymes and Inborn errors. Recognize diseases related to carbohydrate and lipid metabolism.	K1 to K4
CO4	Discuss and evaluate the pathology of aminoacid metabolic disorders.	K1 to K4
CO5	Appraise the imbalances of enzymes in organ function and relate the role of Clinical Biochemistry in screening and diagnosis.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M									
CO2	M									
CO3				S	S	S				
CO4				S	S	S				
CO5					S	S			S	

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	1	3	3	3	3
CO 4	3	2	3	2	3
CO 5	2	2	1	2	1
WEITAGE	12	13	13	13	13
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	3	3	3	3	3

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	Biomolecules -Carbohydrate – General properties, function, structure, classification– monosaccharides (Glucose, Fructose, Galactose), Oligoaccharides (Sucrose, Maltose, Lactose) and polysaccharides (Starch, Glycogen,) and biological significance. Lipids – General properties, functions, structure, classification (Simple, Derived and	12	Chalk & Talk

	Complex), Cholesterol, LDL, HDL – biological significance.		
II	General properties, functions, structure, classification and biological significance. Proteins– General structure, Properties, functions, classification and biological significance.	**12**	**Chalk & Talk**
III	Diabetes mellitus, ketoacidosis, hypoglycemia, glycogen storage diseases, galactosemia and lactose intolerance. Disorders of lipid metabolism: hyperlipidemia, hyperlipoproteinemia, hypercholesterolemia, hypertriglyceridemia, Sphingolipidosis.	**12**	**Chalk & Talk**
IV	Alkaptonuria, phenylketonuria, phenylalaninemia, homocystineuria, tyrosinemia, aminoacidurias.	**12**	**Chalk & Talk**
V	Assessment and clinical manifestations of renal, hepatic, pancreatic, gastric and intestinal functions. Diagnostic enzymes: Principles of diagnostic enzymology. Clinical significance of aspartate aminotrasferase, alanine aminotransferase, creatine kinase, aldolase and lactate dehydrogenase.	**12**	**Chalk & Talk**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	**Cos**	**K Level**	**Section A**		**Section B Either or Choice**	**Section C Either or Choice**
			MCQs			
			No. of. Questions	**K - Level**		
CI AI	CO	K1 – K4	2	K1, K2	2(K2, K2)	2(K3, K3)
	CO	K1 – K4	2	K1, K2	2(K3, K3)	2(K4, K4)
CI AII	CO	K1 – K4	2	K1, K2	2(K2, K2)	2(K3, K3)
	CO	K1 – K4	2	K1, K2	2(K3, K3)	2(K4, K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	25
	K2	2	10		12	21.4	
	K3		10	16	26	46.4	46.4
	K4			16	16	28.6	28.6
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2	10		12	3.6	
	K3		10	16	26	46.4	46.4
	K4			16	16	46.4	46.4
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1, K2	2(K2, K2)	2(K3, K3)
2	CO2	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
3	CO3	K1-K4	2	K1, K2	2(K2, K2)	2(K3, K3)
4	CO4	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
5	CO5	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	**Section A (Multiple Choice Questions)**	**Section B (Either or Choice**	**Section C (Either/ or Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	**5**			**5**	**3.6**	**4**
K2	**5**	**20**		**25**	**17.8**	**18**
K3		**30**	**32**	**62**	**44.3**	**44**
K4			**48**	**48**	**34.3**	**34**
Marks	**10**	**50**	**80**	**140**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	**Unit**	**CO**	**K-level**		
Answer **ALL** the questions			**PART – A**	**(10 x 1 = 10 Marks)**	
1.	**Unit - I**	**CO1**	**K1**		
				a)	b)
				c)	d)
2.	**Unit - I**	**CO1**	**K2**		
				a)	b)
				c)	d)
3.	**Unit - II**	**CO2**	**K1**		
				a)	b)
				c)	d)
4.	**Unit - II**	**CO2**	**K2**		
				a)	b)
				c)	d)
5.	**Unit - III**	**CO3**	**K1**		
				a)	b)
				c)	d)
6.	**Unit - III**	**CO3**	**K2**		
				a)	b)
				c)	d)
7.	**Unit - IV**	**CO4**	**K1**		
				a)	b)
				c)	d)
8.	**Unit - IV**	**CO4**	**K2**		
				a)	b)
				c)	d)
9.	**Unit - V**	**CO5**	**K1**		
				a)	b)
				c)	d)
10.	**Unit - V**	**CO5**	**K2**		
				a)	b)
				c)	d)

Answer **ALL** the questions		**PART – B**		**(5 x 5 = 25 Marks)**
11. a)	**Unit - I**	**CO1**	**K2**	
		OR		
11. b)	**Unit - I**	**CO1**	**K2**	
12. a)	**Unit - II**	**CO2**	**K3**	
		OR		
12. b)	**Unit - II**	**CO2**	**K3**	
13. a)	**Unit - III**	**CO3**	**K2**	
		OR		
13. b)	**Unit - III**	**CO3**	**K2**	
14. a)	**Unit - IV**	**CO4**	**K3**	
		OR		
14. b)	**Unit - IV**	**CO4**	**K3**	
15. a)	**Unit - V**	**CO5**	**K3**	
		OR		
15. b)	**Unit - V**	**CO5**	**K3**	

Answer **ALL** the questions		**PART – C**		**(5 x 8 = 40 Marks)**
16. a)	**Unit - I**	**CO1**	**K3**	
		OR		
16. b)	**Unit - I**	**CO1**	**K3**	
17. a)	**Unit - II**	**CO2**	**K4**	
		OR		
17. b)	**Unit - II**	**CO2**	**K4**	
18. a)	**Unit - III**	**CO3**	**K3**	
		OR		
18. b)	**Unit - III**	**CO3**	**K3**	
19. a)	**Unit - IV**	**CO4**	**K4**	
		OR		
19. b)	**Unit - IV**	**CO4**	**K4**	
20. a)	**Unit - V**	**CO5**	**K4**	
		OR		
20. b)	**Unit - V**	**CO5**	**K4**	

Course Name	SOCIAL AND PREVENTIVE MEDICINE			
Course Code	23UMBNM11	L	P	C
Category	SKILL ENHANCEMENT COURSE	2	-	2

COURSE OBJECTIVES:

- To describe the concepts of health and disease and their social determinants.
- To summarize the health management system
- To know about the various health care services.
- To outline the goals of preventive medicine.
- To gain knowledge about alternate medicine.

UNIT - I INTRODUCTION TO SOCIAL MEDICINE **6**

History of social medicine-concepts of health and disease-social determinants of health and disease-Health and quality of life-Health information system- measures of population health-health policies.

UNIT - II HEALTH MANAGEMENT **6**

Applications of behavioral sciences and psychology in health management- nutritional programs for health management-water and sanitation in human health-national programs for communicable and non-communicable diseases- environmental and occupational hazards and their control.

UNIT -III HEALTH CARE AND SERVICES **6**

Health care of the community-information, education, communication and training in health-maternal & child health-school health services- Geriatrics-care and welfare of the aged-mental health-health services through general practitioners.

UNIT -IV PREVENTIVE MEDICINE **6**

Introduction- role of preventive medicine- levels of prevention-Risk assessment in communities and vulnerable population –surveillance, monitoring and reporting of disease outbreaks - forecasting and control measures in community setting – early detection methods.

UNIT - V PREVENTION THROUGH ALTERNATE MEDICINE **6**

Unani, Ayurveda, Homeopathy, Naturopathy systems in epidemic and pandemic outbreaks. International health regulations. Infectious disease outbreak case studies and precautionary response during SARS and MERS coronavirus, Ebola and novel SARS-COV2 outbreaks.

Total Lecture Hours **30**

BOOKS FOR STUDY:

- Park.K (2021). Textbook of preventive and social medicine, 26th edition. Banarsidas Bhanot publishers.
- Mahajan& Gupta (2013). Text book of preventive and social medicine, 4th edition. Jaypeebrothers medical publishers.
- Chun-Su Yuan, Eric J. Bieber, Brent Bauer (2006). Textbook of Complementary and Alternative Medicine. Second Edition. Routledge publishers.
- Vivek Jain (2020). Review of Preventive and Social Medicine: Including Biostatics.12th edition, Jaypee Brothers Medical Publishers.
- Lal Adarsh Pankaj Sunder (2011). Textbook of Community Medicine: Preventive and Social Medicine, CBS publisher.

BOOKS FOR REFERENCES:

- Howard Waitzkin, Alina Pérez, Matt Anderson (2021). Social Medicine and the coming Transformation. First Edition. Routledge publishers.
- GN Prabhakara (2010). Short Textbook of Preventive and Social Medicine. Second Edition. Jaypee publishers.
- Jerry M. Suls, Karina W. Davidson, Robert M. Kaplan (2010).Handbook of Health Psychology and Behavioral Medicine. Guilford Press.
- Marie Eloïse Muller, Marie Muller, Marthie Bezuidenhout, KarienJooste (2006).Health Care Service Management. Juta and Company Ltd.
- Geoffrey Rose (2008). Rose's Strategy of Preventive Medicine: The Complete. OUP Oxford.

WEB RESOURCES:

- **https://www.omicsonline.org/scholarly/social--preventive-medicine-journals-articles-ppts-list.php**
- **https://www.teacheron.com/online-md_preventive_and_social_medicine-tutors**
- **https://www.futurelearn.com**
- **https://www.healthcare-management-degree.net**
- **https://www.conestogac.on.health-care-administration-and-service-management**

Nature of Course	EMPLOYABILITY			SKILL ORIENTED	✓		ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL			GLOBAL		✓
Changes Made in the Course	Percentage of Change			No Changes Made			New Course			✓

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Identify the health information system	K1 to K2
CO2	Associate various factors with health management system	K1 to K2
CO3	Choose the appropriate health care services	K1 to K2
CO4	Appraise the role of preventive medicine in community setting	K1 to K2
CO5	Recommend the usage of alternate medicine during outbreaks	K1 to K2

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S				S	S				
CO2	S	S		M	S	S				
CO3				M	S	S			M	
CO4	S			S	S	M				
CO5	S				S	S				

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	2	1	2	2
CO 2	2	1	1	2	1
CO 3	2	2	1	2	1
CO 4	2	2	1	2	2
CO 5	2	1	2	2	2
WEITAGE	10	8	6	10	8
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	INTRODUCTION TO SOCIAL MEDICINE: History of social medicine-concepts of health and disease-social determinants of health and disease-Health and quality of life-Health information system-measures of population health-health policies.	6	PPT/CHALK AND TALK
II	HEALTH MANAGEMENT: Applications of behavioral sciences and psychology in health management-nutritional programs for health management-water and sanitation in human health-national programs for communicable and non-communicable diseases-	6	PPT/CHALK AND TALK

	environmental and occupational hazards and their control.		
III	HEALTH CARE AND SERVICES: Health care of the community-information, education, communication and training in health-maternal & child health-school health services- Geriatrics-care and welfare of the aged-mental health-health services through general practitioners.	**6**	**PPT/CHALK AND TALK**
IV	PREVENTIVE MEDICINE: Introduction- role of preventive medicine- levels of prevention-Risk assessment in communities and vulnerable population –surveillance, monitoring and reporting of disease outbreaks - forecasting and control measures in community setting – early detection methods.	**6**	**PPT/CHALK AND TALK**
V	PREVENTION THROUGH ALTERNATE MEDICINE: Unani, Ayurveda, Homeopathy, Naturopathy systems in epidemic and pandemic outbreaks. International health regulations. Infectious disease outbreak case studies and precautionary response during SARS and MERS coronavirus, Ebola and novel SARS-COV2 outbreaks.	**6**	**PPT/CHALK AND TALK**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)				
Internal	**Cos**	**K Level**	**Section A**	
			MCQs	
			No. of. Questions	**K - Level**
CI AI	**CO1**	**K1 – K2**	**25**	**K1,K2**
	CO2	**K1 – K2**	**25**	**K1,K2**
CI AII	**CO3**	**K1 – K2**	**25**	**K1,K2**
	CO4	**K1 – K2**	**25**	**K1,K2**
Question Pattern CIA I & II		**No. of Questions to be asked**	**50**	
		No. of Questions to be answered	**50**	
		Marks for each question	**1**	
		Total Marks for each section	**50**	

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	**Section A (Multiple Choice Questions)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	**40**	**40**	**53**	**100**
K2	**35**	**35**	**47**	
K3				
K4				
Marks		**75**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

Course Name	MICROBIAL TAXONOMY			
Course Code	23UMBFC11	**L**	**P**	**C**
Category	FOUNDATION COURSE	2	-	2

COURSE OBJECTIVES:

- To identify and discover the general methods in the classification of microorganisms.
- To demonstrate the techniques involved in the classification of bacteria.
- To illustrate the different factors that can be used for viral classification.
- To analyze and distinguish the factors used in algal classification.
- To design the taxonomy of Lichens.

UNIT -I BASICS OF TAXONOMY **06**

Taxonomy-Definition, systematics, Identification, Classification and Nomenclature. Taxonomical hierarchy- Family, Genera, Species and Type strain. Basics of classification-physiological, Morphological and biochemical tests, Genetic basics of classification-definitions with brief descriptions only.

UNIT -II BACTERIAL CLASSIFICATION **06**

General characteristics of bacteria, archaea and actinomycetes. Classification of bacteria based on - Nutrition, O_2 requirement and Chemotaxonomy of bacterial cell wall (Gram positive and Gram negative), Bergey's manual - definition and difference between Systematic and Determinative bacteriology only – Bergey's Manual of Systematics of Archaea and Bacteria – Introduction only.

UNIT -III VIRAL CLASSIFACATION **06**

General structure of a virus – T4, Classification of viruses based on life cycle -Lytic and lysogenic phages, capsid symmetry – Helical, Icosahedral and complex. Nucleic acids-DNA viruses and RNA viruses - (+) sense and (-) sense; segmented and non-segmented, ICTV - (Brief description only).

UNIT -IV ALGAL CLASSIFICATION **06**

General characteristics of algae - Short notes on Classification of algae by Fritsch and Smith. Classification of algae based on habitats-Fresh water, marine water, aquatic and unusual habitat, Economic importance of algae.

UNIT -V LICHENS CLASSIFICATION **06**

General characteristics of Lichens, classification based on fungal partners-Ascolichens, Basidiolichens & Hymenolichens. Classification based on growth (definition only), Economic importance of Lichens.

Total Lecture Hours **30**

BOOKS FOR STUDY:

- Michael T. Madigan, John M. Martinko, David A. Stahl and David P. Clark, 2012, Brock Biology of Microorganisms, Library of Congress Cataloging-In-publication data, NY.
- Trivedi P. C., Sonali Pandey and Seema Bhadauria, 2010, Textbook of Microbiology, Aavishkar Publishers, India.
- Joane M. Willey, L:inda M. Sherwood and Christopher J. Woolverton, 2017, Prescott's Microbiology, 10th Ed., Library of Congress Cataloging-in-Publication Data, NY.
- Pommerville C., Jeffrey, 2011, Alcamo's Fundamental's of Microbiology, 9th Ed., Jones and Bartlett, Publishers, Massachusetts.
- Kathleen Park Talaro and Barry Chess,2012, Foundations in Microbiology, 8th Ed., Library of Congress Cataloging-in-Publication Data, NY.

BOOKS FOR REFERENCES:

- Cindy H. Nakatsu, Robert V. Miller and Suresh D. Pillai, 2016, Ed., Manual of Environmental Microbiology, 4th Ed., Library of Congress Cataloging-In-publication data, NY.
- Tortora J. Gerard, Funke R. Berdell and Case L. Christine, 2016, Microbiology – An Introduction, 12th Ed., Library of Congress Cataloging-in-Publication Data, NY.
- Black G. Jacqueline and Black J. Laura, 2015, Microbiology – Principles and Explorations, 9th Ed., Library of Congress Cataloging-In-publication data, NY.
- Pelczar J. Michael, Chan E. C. S and Krieg R. Noel, 2008, Microbiology, 5th Ed., Tata McGraw-Hill Publishing Company Ltd., New Delhi.
- Marjorie Kelly Cowan and Heidi Smith, 2018, Microbiology – A Systems Approach, 5th Ed., Library of Congress Cataloging-in-Publication Data, NY.

WEB RESOURCES:

- **https://britishlichensociety.org.uk/learning/what-is-a-lichen**
- **https://www.bartleby.com/subject/science/biology/concepts/microbial-taxonomy**
- **https://www.biologydiscussion.com/microbial-taxonomy/notes-on-microbial-taxonomy-major-characteristics-and-principles/86773**
- **http://web.biosci.utexas.edu/psaxena/bio226r/pdf/ch_19sp06.pdf**
- **https://cshperspectives.cshlp.org/site/misc/microbial_evolution.xhtml**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓		

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Study the fundamentals for grouping of Microorganisms.	K1 to K2
CO2	Gain Knowledge of the divisions or groups in which microorganisms may be placed based on specific criteria.	K1 to K2
CO3	Understand the various methods of classifying microorganisms.	K1 to K2
CO4	Explain the principles for the taxonomic positioning of microorganisms.	K1 to K2
CO5	Understand the characteristic types and features of taxonomical groups of microorganisms.	K1 to K2

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M				
CO2	S	M	S	S	S	M				
CO3	S	L	S	S	L	S				
CO4	S	S	S	S	S	M				
CO5	S	S	S	S	S	M				

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	3	3	3	2
CO 2	3	3	3	3	2
CO 3	3	3	3	3	2
CO 4	3	3	3	3	2
CO 5	2	3	3	3	2
WEITAGE	14	15	14	15	10
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	BASICS OF TAXONOMY Taxonomy-Definition, systematics, Identification, Classification and Nomenclature. Taxonomical hierarchy- Family, Genera, Species and Type strain. Basics of classification-physiological, Morphological and biochemical tests, Genetic basics of classification-definitions with brief descriptions only.	06	Chalk & Talk

II	BACTERIAL CLASSIFICATION General characteristics of bacteria, archaea and actinomycetes. Classification of bacteria based on - Nutrition, O2 requirement and Chemotaxonomy of bacterial cell wall (Gram positive and Gram negative), Bergey's manual - definition and difference between Systematic and Determinative bacteriology only – Bergey's Manual of Systematics of Archaea and Bacteria – Introduction only.	**06**	**Chalk & Talk**
III	VIRAL CLASSIFACATION General structure of a virus – T4, Classification of viruses based on life cycle -Lytic and lysogenic phages, capsid symmetry – Helical, Icosahedral and complex. Nucleic acids-DNA viruses and RNA viruses - (+) sense and (-) sense; segmented and non-segmented, ICTV - (Brief description only).	**06**	**Chalk & Talk**
IV	ALGAL CLASSIFICATION General characteristics of algae - Short notes on Classification of algae by Fritsch and Smith. Classification of algae based on habitats-Fresh water, marine water, aquatic and unusual habitat, Economic importance of algae.	**06**	**Chalk & Talk**
V	LICHENS CLASSIFICATION General characteristics of Lichens, classification based on fungal partners-Ascolichens, Basidiolichens & Hymenolichens. Classification based on growth (definition only), Economic importance of Lichens.	**06**	**Chalk & Talk**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	**Cos**	**K Level**	**Section A**	
			MCQs	
			No. of. Questions	**K - Level**
CI AI	**CO1**	**K1 – K2**	**25**	**K1,K2**
	CO2	**K1 – K2**	**25**	**K1,K2**
CI AII	**CO3**	**K1 – K2**	**25**	**K1,K2**
	CO4	**K1 – K2**	**25**	**K1,K2**
Question Pattern CIA I & II		**No. of Questions to be asked**	**50**	
		No. of Questions to be answered	**50**	
		Marks for each question	**1**	
		Total Marks for each section	**50**	

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	**Section A (Multiple Choice Questions)**	**Total Marks**	**% of (Marks without choice)**	**Consolidate of %**
CIA I	**K1**	**30**	**30**	**60**	**100**
	K2	**20**	**20**	**40**	
	K3				
	K4				
	Marks	**50**	**50**	**100**	**100**
CIA II	**K1**	**30**	**30**	**60**	**100**
	K2	**20**	**20**	**40**	
	K3				
	K4				
	Marks	**50**	**50**	**100**	**100**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidated %
K1	40	40	53	100
K2	35	35	47	
K3				
K4				
Marks		75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				


SECOND SEMESTER

Course Name	MICROBIAL PHYSIOLOGY AND METABOLISM			
Course Code	23UMBCC21	L	P	C
Category	CORE	5	-	5

COURSE OBJECTIVES:

- Study the basic principles of microbial growth.
- Understand the basic concepts of aerobic and anaerobic metabolic pathways.
- Analyze the role of individual components in overall cell function.
- Provide information on sources of energy and its utilization by microorganisms.
- Study the different types of metabolic strategies.

UNIT-I PHYSIOLOGY OF MICROBIAL GROWTH 12

Batch – continuous - synchronous cultures; Growth Curve and measurement method (turbidity, biomass, and cell count). Control of microbial growth.

UNIT-II NUTRITION REQUIREMENTS 12

Photoautotrophs, Photoorganotrophs, Chemolithotrophs (Ammonia, Nitrite, Sulfur, Hydrogen, Iron oxidizing Bacteria), Chemoorganotrophs. Nutrition transport mechanisms – Passive diffusion and Active transport. Factors affecting microbial growth.

UNIT- III AN OVERVIEW OF METABOLISM 12

Embden Meyerhof Pathway, Entner-Doudoroff Pathway, Pentose Phosphate Pathway, Tricarboxylic Acid Cycle. Electron Transport Chain and Oxidative Phosphorylation. ATP synthesis. Fermentation-Homolactic Fermentation, Heterolactic Fermentation, Mixed Acid Fermentation, Butanediol Fermentation.

UNIT - IV PHOTOSYNTHESIS 12

An Overview of chloroplast structure. Photosynthetic Pigments, Light Reaction-Cyclic and non-cyclic Photophosphorylation. Dark Reaction - Calvin Cycle.

UNIT-V MICROBIAL DIVISION 12

Binary fission, Budding, Reproduction through conidia, cyst formation, endospore formation. Fungi asexual and sexual reproduction, Microalgae reproduction. Asexual and sexual reproduction of protozoa.

Total Lecture Hours 60

BOOKS FOR STUDY:

- Schlegal, H.G. (1993). General Microbiology.,7th Edition, Press syndicate of the University of Cambridge.
- Rajapandian K. (2010). Microbial Physiology, Chennai: PBS Book Enterprises India.
- MeenaKumari. S. Microbial Physiology, Chennai 1st Edition MJP Publishers 2006.
- Dubey R.C. and Maheswari, S. (2003). A textbook of Microbiology, New Delhi: S. Chand & Co.
- Ram Reddy, S AND Reddy S.M., (2008). Microbial Physiology. Anmol Publications Pvt Ltd.

BOOKS FOR REFERENCES:

- Robert K. Poole (2004). Advances in Microbial Physiology, Elsevier Academic Press, New York, Volume 49.
- Kim B.H., Gadd G.M. (2008). Bacterial Physiology and Metabolism. Cambridge University Press, Cambridge.
- Daniel R. Caldwell. (1995). Microbial Physiology & Metabolism Wm.C. Brown Communications, Inc. USA.
- Moat, A.G and J.W Foaster (1995). Microbial Physiology, 3rd edition. Wiley – LISS, A John Wiley & Sons. Inc. Publications.
- BhanuShrivastava. (2011). Microbial Physiology and Metabolism: Study of Microbial Physiology and Metabolism. Lambert academic Publication.

WEB RESOURCES:

- **https://sites.google.com/site/microbial physiologyoddsem/teaching-contents**
- **https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial-Nutrition**
- **https://onlinecourses.swayam2.ac.in/cec20_bt14/preview**
- **http://web.iitd.ac.in/~amittal/2007_Addy_Enzymes_Chapter.pdf**
- **https://www..frontiersin.org.microbial-physiology-and-metabolism**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓		

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Describe microorganisms based on nutrition.	K1 to K4
CO2	Know the concept of microbial growth and identify the factors affecting bacterial growth.	K1 to K4
CO3	Explain the methods of nutrient uptake.	K1 to K4
CO4	Describe anaerobic and aerobic energy production.	K1 to K4
CO5	Elaborate on the process of bacterial photosynthesis and reproduction.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1						M			M	
CO2						M	L		M	
CO3						M			M	
CO4						M			M	
CO5						M			M	

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	2	1	1	3
CO 2	2	1	1	2	2
CO 3	2	2	1	2	1
CO 4	2	1	1	2	2
CO 5	2	1	1	2	2
WEITAGE	10	7	5	9	10
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	2	2	1	1	3

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	Batch – continuous - synchronous cultures; Growth Curve and measurement method (turbidity, biomass, and cell count). Control of microbial growth.	12	Chalk & Talk, PPT
II	Photoautotrophs, Photoorganotrophs, Chemolithotrophs (Ammonia, Nitrite, Sulfur, Hydrogen, Iron oxidizing Bacteria), Chemoorganotrophs. Nutrition transport mechanisms – Passive diffusion and Active transport. Factors affecting microbial growth.	12	Chalk & Talk, PPT

III	Embden Meyerhof Pathway, Entner-Doudoroff Pathway, Pentose Phosphate Pathway, Tricarboxylic Acid Cycle. Electron Transport Chain and Oxidative Phosphorylation. ATP synthesis. Fermentation-Homolactic Fermentation, Heterolactic Fermentation, Mixed Acid Fermentation, Butanediol Fermentation.	**12**	**Chalk & Talk, PPT**
IV	An Overview of chloroplast structure. Photosynthetic Pigments, Light Reaction-Cyclic and non-cyclic Photophosphorylation. Dark Reaction - Calvin Cycle.	**12**	**Chalk & Talk, PPT**
V	Binary fission, Budding, Reproduction through conidia, cyst formation, endospore formation. Fungi asexual and sexual reproduction, Microalgae reproduction. Asexual and sexual reproduction of protozoa.	**12**	**Chalk & Talk, Ppt, Assignment**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	**Cos**	**K Level**	**Section A**		**Section B Either or Choice**	**Section C Either or Choice**
			MCQs			
			No. of. Questions	**K - Level**		
CI AI	**CO**	**K1 – K4**	2	K1, K2	2(K2, K2)	2(K3, K3)
	CO	**K1 – K4**	2	K1, K2	2(K3, K3)	2(K4, K4)
CI AII	**CO**	**K1 – K4**	2	K1, K2	2(K2, K2)	2(K3, K3)
	CO	**K1 – K4**	2	K1, K2	2(K3, K3)	2(K4, K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	25
	K2	2	10		12	21.4	
	K3		10	16	26	46.4	46.4
	K4			16	16	28.6	28.6
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2	10		12	3.6	
	K3		10	16	26	46.4	46.4
	K4			16	16	46.4	46.4
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1, K2	2(K2, K2)	2(K3, K3)
2	CO2	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
3	CO3	K1-K4	2	K1, K2	2(K2, K2)	2(K3, K3)
4	CO4	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
5	CO5	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	**Section A (Multiple Choice Questions)**	**Section B (Either or Choice**	**Section C (Either/ or Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	**5**			**5**	**3.6**	**4**
K2	**5**	**20**		**25**	**17.8**	**18**
K3		**30**	**32**	**62**	**44.3**	**44**
K4			**48**	**48**	**34.3**	**34**
Marks	**10**	**50**	**80**	**140**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	**Unit**	**CO**	**K-level**		
Answer **ALL** the questions			**PART – A**	**(10 x 1 = 10 Marks)**	
1.	**Unit - I**	**CO1**	**K1**		
				a)	b)
				c)	d)
2.	**Unit - I**	**CO1**	**K2**		
				a)	b)
				c)	d)
3.	**Unit - II**	**CO2**	**K1**		
				a)	b)
				c)	d)
4.	**Unit - II**	**CO2**	**K2**		
				a)	b)
				c)	d)
5.	**Unit - III**	**CO3**	**K1**		
				a)	b)
				c)	d)
6.	**Unit - III**	**CO3**	**K2**		
				a)	b)
				c)	d)
7.	**Unit - IV**	**CO4**	**K1**		
				a)	b)
				c)	d)
8.	**Unit - IV**	**CO4**	**K2**		
				a)	b)
				c)	d)
9.	**Unit - V**	**CO5**	**K1**		
				a)	b)
				c)	d)
10.	**Unit - V**	**CO5**	**K2**		
				a)	b)
				c)	d)

Answer **ALL** the questions		**PART – B**		**(5 x 5 = 25 Marks)**
11. a)	**Unit - I**	**CO1**	**K2**	
		OR		
11. b)	**Unit - I**	**CO1**	**K2**	
12. a)	**Unit - II**	**CO2**	**K3**	
		OR		
12. b)	**Unit - II**	**CO2**	**K3**	
13. a)	**Unit - III**	**CO3**	**K2**	
		OR		
13. b)	**Unit - III**	**CO3**	**K2**	
14. a)	**Unit - IV**	**CO4**	**K3**	
		OR		
14. b)	**Unit - IV**	**CO4**	**K3**	
15. a)	**Unit - V**	**CO5**	**K3**	
		OR		
15. b)	**Unit - V**	**CO5**	**K3**	

Answer **ALL** the questions		**PART – C**		**(5 x 8 = 40 Marks)**
16. a)	**Unit - I**	**CO1**	**K3**	
		OR		
16. b)	**Unit - I**	**CO1**	**K3**	
17. a)	**Unit - II**	**CO2**	**K4**	
		OR		
17. b)	**Unit - II**	**CO2**	**K4**	
18. a)	**Unit - III**	**CO3**	**K3**	
		OR		
18. b)	**Unit - III**	**CO3**	**K3**	
19. a)	**Unit - IV**	**CO4**	**K4**	
		OR		
19. b)	**Unit - IV**	**CO4**	**K4**	
20. a)	**Unit - V**	**CO5**	**K4**	
		OR		
20. b)	**Unit - V**	**CO5**	**K4**	

Course Name	MICROBIAL PHYSIOLOGY AND METABOLISM - PRACTICAL			
Course Code	23UMBCP21	**L**	**P**	**C**
Category	CORE PRACTICAL - II	-	5	5

COURSE OBJECTIVES

- To understand the principles of motility test.
- To understand the basic concepts of staining methods.
- To learn anaerobic culture and bacterial count using different methods.
- To study the morphological demonstration of microorganisms and identification.
- To study the biochemical identification of the bacteria.

UNIT - I	**MOTILITY AND STAINING TECHNIQUES:**	**12**

Hanging drop, Wet mount preparation, semi-solid agar, Craigie's tube method. Staining techniques: Gram's staining, spore and capsule staining.

UNIT -II	**DIRECT COUNTS:**	**12**

Direct cell count (Petroff-Hausser counting chamber), Turbidometry. Viable count - pour plate, spread plate. Bacterial growth curve.

UNIT-III	**ANAEROBIC CULTURE METHODS:**	**12**

Antibiotic sensitivity testing: Disc diffusion test- quality control with standard strains.

UNIT-IV	**SENSITIVITY TESTING AND FUNGAL IDENTIFICATION:**	**12**

Antibiotic sensitivity testing, Demonstration of Stoke's method, Identification of different fungi by Lactophenol Cotton Blue and KOH mounting.

UNIT- V	**SPOTTERS IDENTIFICATION:**	**12**

Nostoc, Anabaena, Oscillatoria & Cyanobacteria, Entaemoeba and Plasmodium.

Total Lecture Hours	**60**

BOOKS FOR STUDY:

- James G Cappucino and N. Sherman MB (1996). A lab manual Benjamin Cummins, New York.
- Kannan. N (1996).Laboratory manual in General Microbiology. Palani Publications.
- Sundararaj T (2005). Microbiology Lab Manual (1st edition) publications.
- Gunasekaran. P (2007). Laboratory manual in Microbiology. New age international publisher.
- Elsa Cooper (2018). Microbial Physiology: A Practical Approach. Callisto Reference publisher.

BOOKS FOR REFERENCES:

- David White., James Drummond., Clay Fuqua (2012) Physiology and Biochemistry of Prokaryotes. 4th Ed. Oxford University Press, New York.
- Robert K. Poole (2004). Advances in Microbial Physiology, Elsevier Academic Press, New York, Volume 49.
- Kim B.H., Gadd G.M. (2008). Bacterial Physiology and Metabolism. Cambridge University Press, Cambridge.
- Dawes, I.W and Sutherland L.W (1992). Microbial Physiology (2nd edition), Oxford Blackwell Scientific Publications.
- 5. Moat, A.G and J.W Foaster, (1995). Microbial Physiology, 3rd edition. Wiley – LISS, A John Wiley & Sons. Inc. Publications.

WEB RESOURCES:

- **https://sites.google.com/site/microbial physiology odd sem /teaching-contents**
- **https://courses.lumenlearning.com/boundless-microbiology/chapter/microbial-Nutrition**
- **https://onlinecourses.swayam2.ac.in/cec20_bt14/preview**
- **https://www.studocu.com/microbial-physiology-practicals**
- **https://www.agr.hokudai.ac.jp/microbial-physiology**

Nature of Course	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓		

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Describe hanging drop, wet mount preparation, semi-solid agar, Craigie's tube method.	K1 to K4
CO2	Demonstrate Smear preparation, permanent specimen preparation, Capsular, and Acid-fast staining.	K1 to K4
CO3	Explain antibiotic sensitivity testing: Disc diffusion test- quality control with standard strains.	K1 to K4
CO4	Describe demonstration of the size of yeast, fungal filaments and protozoa.	K1 to K4
CO5	Elaborate on the bacterial identification- morphological, physiological, and biochemical methods.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1						M	L	M	L	M
CO2						M	M	L	M	M
CO3						L	M	M	L	L
CO4						L	M	M	M	L
CO5						M	M	M	M	M

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	1	3	3	1	3
CO 2	1	3	3	1	3
CO 3	1	3	3	2	3
CO 4	1	3	3	3	2
CO 5	1	3	3	1	3
WEITAGE	5	15	15	8	14
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	33	100	100	53	93

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	Hanging drop, Wet mount preparation, semi-solid agar, Craigie's tube method. Staining techniques: Gram's staining, spore and capsule staining.	12	PPT/CHALK AND TALK DEMONSTRATION
II	Direct cell count (Petroff-Hausser counting chamber), Turbidometry.	12	PPT/CHALK

	Viable count - pour plate, spread plate. Bacterial growth curve.		**AND TALK DEMONSTRATION**
III	Antibiotic sensitivity testing: Disc diffusion test- quality control with standard strains.	**12**	**PPT/CHALK AND TALK DEMONSTRATION**
IV	Antibiotic sensitivity testing, Demonstration of Stoke's method, Identification of different fungi by Lactophenol Cotton Blue and KOH mounting.	**12**	**PPT/CHALK AND TALK DEMONSTRATION**
V	Nostoc, Anabaena, Oscillatoria & Cyanobacteria, Entaemoeba and Plasmodium.	**12**	**PPT/CHALK AND TALK DEMONSTRATION**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

INTERNAL	**COs**	**K LEVEL**	**MAJOR**	**MINOR**	**SPOTTERS**	**RECORD**	**VIVA**
CIAI	**CO1**	**K1**					5
	CO2	**K2**				5	
	CO3	**K3**			5		
	CO4	**K4**		5			
	CO5	**K4**	5				
Question Pattern		**No. of Questions to be asked**	2 (A-Written B-Practical Demo)	2 (A-Written B-Practical Demo)	2	1	5
		No. of Questions to be answered	2	2	2	1	5
		Marks for each question	A-3 B-2	A-3 B-2	5	10	1
		Total Marks for each section	5	5	5	5	5

Distribution of Marks with K Level									
	K Level	**Major**	**Minor**	**Spotters**	**Record**	**Viva**	**Total Marks**	**% of Marks without choice**	**Consolidated %**
CIA	**K1**	**-**	**-**	**-**	**-**	**5**	**5**	**6.66**	**6.66**
	K2	**-**	**-**	**-**	**5**	**-**	**5**	**6.66**	**6.66**
	K3	**-**	**-**	**5**	**-**	**-**	**5**	**6.66**	**6.66**
	K4	**-**	**5**	**-**	**-**	**-**	**5**	**6.66**	**6.66**
	K4	**5**					**5**	**6.66**	**6.66**

Summative Examination – Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)							
EXTERNAL	**COs**	**K LEVEL**	**MAJOR**	**MINOR**	**SPOTTERS**	**RECORD**	**VIVA**
CIAI	**CO1**	**K1**					5
	CO2	**K2**				5	
	CO3	**K3**			20		
	CO4	**K4**		20			
	CO5	**K4**	25				
Question Pattern		**No. of Questions to be asked**	2 (A-Written B-Practical Demo)	2 (A-Written B-Practical Demo)	2	1	5
		No. of Questions to be answered	2	2	2	1	5
		Marks for each question	A-20 B-5	A-15 B-5	5	10	1
		Total Marks for each section	25	20	20	5	5

Distribution of Marks with K Level CIA									
	K Level	**Major**	**Minor**	**Spotters**	**Record**	**Viva**	**Total Marks**	**% of Marks without choice**	**Consolidated %**
CIA	**K1**					**5**	**5**	**6.6**	**6.6**
	K2				**5**		**5**	**6.6**	**6.6**
	K3			**20**			**20**	**26.6**	**26.6**
	K4		**20**				**20**	**26.6**	**26.6**
	K4	**25**					**25**	**33.3**	**33.3**
	Marks	**25**	**20**	**20**	**5**	**5**	**75**	**100**	**100**

Course Name	BIOINSTRUMENTATION			
Course Code	23UMBEC21	**L**	**P**	**C**
Category	ELECTIVE	4	-	3

COURSE OBJECTIVES:

- To gain knowledge about principles of spectroscopy
- Understand the analytical techniques of Chromatography and electrophoresis
- Understand the analytical instruments and study the basic principles in the field of sciences
- To understand the principle of different types of scans used in medical diagnosis
- To gain information about the principles of radioactivity and its measurements

UNIT-I BASIC INSTRUMENT **12**

pH meter, Buffer of biological importance, Centrifuge- Preparative, Analytical and Ultra, Laminar Air Flow, Autoclave, Hot Air Oven and Incubator. Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

UNIT-II SPECTROSCOPIC TECHNIQUES **12**

Colorimeter, Ultraviolet and visible, Infra red and Mass Spectroscopy.

UNIT-III CHROMATOGRAPHIC AND ELECTROPHORESIS TECHNIQUES **12**

Chromatographic Techniques: Paper, Thin Layer, Column, HPLC and GC. Electrophoresis Techniques: Starch Gel, AGE, PAGE.

UNIT-IV IMAGING TECHNIQUES **12**

Principle, Instrumentation and application of ECG, EEG, EMG, MRI, CT and PET scan radioisotopes.

UNIT-V FLUORESCENCE AND RADIATION BASED TECHNIQUES **12**

Spectro fluorimeter, Flame photometer, Scintillation counter, Geiger Muller counter, Autoradiography

Total Lecture Hours **60**

BOOKS FOR STUDY:

- Jayaraman J (2011). Laboratory Manual in Biochemistry, 2nd Edition. Wiley Eastern Ltd., New Delhi
- Ponmurugan. P and Gangathara PB (2012). Biotechniques.1stEdition. MJP publishers
- Veerakumari, L (2009).Bioinstrumentation- 5 thEdition -.MJP publishers.
- Upadhyay, Upadhyay and Nath (2002). Biophysical chemistry – Principles and techniques 3rd Edition. Himalaya publishing home.
- Chatwal G and Anand (1989). Instrumental Methods of Chemical Analysis. S.Himalaya Publishing House, Mumbai.

BOOKS FOR REFERENCES:

- Rodney.F.Boyer (2000). Modern Experimental Biochemistry, 3rd Edition. Pearson Publication.
- Skoog A. and West M. (2014). Principles of Instrumental Analysis – 14th Edition W.B. Saunders Co., Philadelphia.
- N.Gurumani. (2006). Research Methodology for biological sciences- 1st Edition – MJP Publishers, New Delhi.
- Wilson K, and Walker J (2010). Principles and Techniques of Biochemistry and Molecular Biology.7thEdition. Cambridge University Press .
- Webster, J.G. (2004). Bioinstrumentation- 4th Edition - John Wiley & Sons (Asia) Pvt. Ltd, Singapore.

WEB RESOURCES:

- **http://www.biologydiscussion.com/biochemistry/centrifugation/centrifugeintroduction- types- uses-and-other-details-with-diagram/12489**
- **https://www.watelectrical.com/biosensors-types-its-working-andapplications/**
- **http://www.wikiscales.com/articles/electronic-analytical-balance/ Page 24 of 75**
- **https://study.com/academy/lesson/what-is-chromatography-definition-typesuses.html**
- **https://study.com/academy/lesson/what-is-chromatography-definition-typesuses.html**

Nature of Course	EMPLOYABILITY			SKILL ORIENTED			ENTREPRENEURSHIP		✓			
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL			GLOBAL	✓			
Changes Made in the Course	Percentage of Change			No Changes Made			New Course		✓			
*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**												

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Gain knowledge about the basics of instrumentation.	K1 to K4
CO2	Exemplify the structure of atoms and molecules by using the principles of spectroscopy.	K1 to K4
CO3	Evaluate by separating and purifying the components.	K1 to K4
CO4	Understand the need and applications of imaging techniques.	K1 to K4
CO5	Categorize the working principle and applications of fluorescence and radiation.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	M	S	M			
CO2	M	S	S	M	S	M	M			
CO3	M	M	S	M	S	M	M			
CO4	M	S	S	M	S	M	S			
CO5	S	S	S	M	S	M	M			

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	2	2	1	2
CO 2	2	1	1	2	1
CO 3	2	2	1	2	1
CO 4	2	2	1	2	1
CO 5	3	1	1	2	1
WEITAGE	11	8	6	9	6
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS					

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	BASIC INSTRUMENTS: pH meter, Buffer of biological importance. Centrifuge- Preparative, Analytical and Ultra, Laminar Air Flow, Autoclave, Hot Air Oven and Incubator. Biochemical calculations- preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.	12	Chalk & Talk, Power point.
II	SPECTROSCOPIC TECHNIQUES: Spectroscopic Techniques:	12	Chalk &

	Colorimeter, Ultraviolet and visible, Infra-red and Mass Spectroscopy.		**Talk, Power point.**
III	CHROMATOGRAPHIC AND ELECTROPHORESIS TECHNIQUES: Chromatographic Techniques: Paper, Thin Layer, Column, HPLC and GC. Electrophoresis Techniques: Starch Gel, AGE, PAGE.	**12**	**Chalk & Talk, Power point.**
IV	IMAGING TECHNIQUES: Principle, Instrumentation and application of ECG, EEG, EMG, MRI, CT and PET scan radioisotopes.	**12**	**Chalk & Talk, Power point.**
V	FLUORESCENCE AND RADIATION BASED TECHNIQUES: Spectro fluoro meter, Flame photometer, Scintillation counter, Geiger Muller counter, Autoradiography.	**12**	**Chalk & Talk, Power point.**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1, K2	2(K2, K2)	2(K3, K3)
	CO2	K1 – K4	2	K1, K2	2(K3, K3)	2(K4, K4)
CI AII	CO3	K1 – K4	2	K1, K2	2(K2, K2)	2(K3, K3)
	CO4	K1 – K4	2	K1, K2	2(K3, K3)	2(K4, K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	25
	K2	2	10		12	21.4	
	K3		10	16	26	46.4	46.4
	K4			16	16	28.6	28.6
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2	10		12	3.6	
	K3		10	16	26	46.4	46.4
	K4			16	16	46.4	46.4
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1, K2	2(K2, K2)	2(K3, K3)
2	CO2	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
3	CO3	K1-K4	2	K1, K2	2(K2, K2)	2(K3, K3)
4	CO4	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
5	CO5	K1-K4	2	K1, K2	2(K3, K3)	2(K4, K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	**Section A (Multiple Choice Questions)**	**Section B (Either or Choice**	**Section C (Either/ or Choice)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	**5**			**5**	**3.6**	**4**
K2	**5**	**20**		**25**	**17.8**	**18**
K3		**30**	**32**	**62**	**44.3**	**44**
K4			**48**	**48**	**34.3**	**34**
Marks	**10**	**50**	**80**	**140**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	**Unit**	**CO**	**K-level**		
Answer **ALL** the questions			**PART – A**	**(10 x 1 = 10 Marks)**	
1.	**Unit - I**	**CO1**	**K1**		
				a)	b)
				c)	d)
2.	**Unit - I**	**CO1**	**K2**		
				a)	b)
				c)	d)
3.	**Unit - II**	**CO2**	**K1**		
				a)	b)
				c)	d)
4.	**Unit - II**	**CO2**	**K2**		
				a)	b)
				c)	d)
5.	**Unit - III**	**CO3**	**K1**		
				a)	b)
				c)	d)
6.	**Unit - III**	**CO3**	**K2**		
				a)	b)
				c)	d)
7.	**Unit - IV**	**CO4**	**K1**		
				a)	b)
				c)	d)
8.	**Unit - IV**	**CO4**	**K2**		
				a)	b)
				c)	d)
9.	**Unit - V**	**CO5**	**K1**		
				a)	b)
				c)	d)
10.	**Unit - V**	**CO5**	**K2**		
				a)	b)
				c)	d)

Answer **ALL** the questions		**PART – B**		**(5 x 5 = 25 Marks)**
11. a)	**Unit - I**	**CO1**	**K2**	
		OR		
11. b)	**Unit - I**	**CO1**	**K2**	
12. a)	**Unit - II**	**CO2**	**K3**	
		OR		
12. b)	**Unit - II**	**CO2**	**K3**	
13. a)	**Unit - III**	**CO3**	**K2**	
		OR		
13. b)	**Unit - III**	**CO3**	**K2**	
14. a)	**Unit - IV**	**CO4**	**K3**	
		OR		
14. b)	**Unit - IV**	**CO4**	**K3**	
15. a)	**Unit - V**	**CO5**	**K3**	
		OR		
15. b)	**Unit - V**	**CO5**	**K3**	

Answer **ALL** the questions		**PART – C**		**(5 x 8 = 40 Marks)**
16. a)	**Unit - I**	**CO1**	**K3**	
		OR		
16. b)	**Unit - I**	**CO1**	**K3**	
17. a)	**Unit - II**	**CO2**	**K4**	
		OR		
17. b)	**Unit - II**	**CO2**	**K4**	
18. a)	**Unit - III**	**CO3**	**K3**	
		OR		
18. b)	**Unit - III**	**CO3**	**K3**	
19. a)	**Unit - IV**	**CO4**	**K4**	
		OR		
19. b)	**Unit - IV**	**CO4**	**K4**	
20. a)	**Unit - V**	**CO5**	**K4**	
		OR		
20. b)	**Unit - V**	**CO5**	**K4**	

Course Name	NUTRITION AND HEALTH HYGIENE			
Course Code	23UMBNM21	**L**	**P**	**C**
Category	NME	2	-	2

COURSE OBJECTIVES:

- Learn about nutrition and their importance.
- Make student understand the nutritional facts for a better life.
- Learn information to optimize our diet.
- Impart knowledge on different health care programs taken up by India.
- Learn knowledge on different health indicators and types of hygiene methods.

UNIT - I NUTRITION AND ITS IMPORTANCE: 6

Nutrition – definition, importance, good nutrition, and mal nutrition; Balanced Diet: Basics of Meal Planning. Carbohydrates, Lipids, Proteins and Vitamins –functions, dietary sources, effects of deficiency. Macro and micro minerals –functions, effects of deficiency; food sources of Calcium, Potassium, and Sodium; food sources of Iron, Iodine, and Zinc. Importance of water– functions, sources, requirements and effects of deficiency.

UNIT - II BALANCED DIET FOR HEALTHY LIFE: 6

Nutrition for Life Cycle: Balanced diet - Normal, Pregnant, lactating women, Infancy, young children Adolescents, Adults, and the Elderly; Diet Chart; Nutritive value of Indian foods.

UNIT - III NUTRITIONAL DISEASES AND DISORDERS: 6

Improper diets: Definition, Identification, Signs and Symptoms - malnutrition, under-nutrition, over-nutrition, Protein Energy Malnutrition, obesity; Nutritional Disease and Disorder - hypertension, diabetes, anemia, osteomalacia, cardiovascular disease.

UNIT - IV HEALTH EDUCATION AND HEALTH ORGANIZATIONS IN INDIA: 6

Health - Determinants of health, Key Health Indicators, Environment health & Public health; Health-Education: Principles and Strategies. Health Policy & Health Organizations: Health Indicators and National Health Policy of Govt. of India; Functioning of various nutrition and health organizations in India.

UNIT - V HYGIENE: 6

Hygiene – Definition; Personal, Community, Medical and Culinary hygiene; WASH (Water, Sanitation and Hygiene) programme. Rural Community Health: Village health sanitation & Nutritional committee. Community & Personal Hygiene: Environmental Sanitation and Sanitation in Public places.

Total Lecture Hours 30

BOOKS FOR STUDY:

- 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.
- Swaminathan (1995) Food &Nutrition (Vol I, Second Edition) The Bangalore Printing &Publishing Co Ltd., Bangalore.
- SK. Haldar (2022). Occupational Health and Hygiene in Industry. CBS Publishers.
- Acharya, Sankar Kr, Rama Das, Minati Sen (2021). Health Hygiene and Nutrition Perception and Practices. Satish Serial Publishing House.
- Dass (2021). Public Health and Hygiene, Notion Press.

BOOKS FOR REFERENCES:

- VijayaKhader (2000) Food, nutrition & health, Kalyan Publishers, New Delhi.
- Srilakshmi, B., (2010) Food Science, (5th Edition) New Age International Ltd., New Delhi.
- Arvind Kumar Goel (2005). A College Textbook of Health &Hygiene, ABD Publishers.
- Sharma D. (2015). Textbook on Food Science and Human Nutrition. Daya Publishing House.
- Revilla M. K. F., Titchenal A. and Draper J. (2020). Human Nutrition. University of Hawaii, Mānoa.

WEB RESOURCES:

- **https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=969&lid=49**
- **https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=970&lid=137.**
- **https://nhm.gov.in/index1.php?lang=1&level=1&sublinkid=149&lid=225**
- **https://www.who.int/hia/about/faq/en/**
- **https://www.nhp.gov.in/healthylivingViewall.**

Nature of Course	EMPLOYABILITY			SKILL ORIENTED		✓	ENTREPRENEURSHIP					
Curriculum Relevance	LOCAL		REGIONAL		✓	NATIONAL			GLOBAL			
Changes Made in the Course	Percentage of Change			No Changes Made			New Course			✓		

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		**K LEVEL**
After studying this course, the students will be able to:		
CO1	Learn the importance of nutrition for a healthy life.	**K1 to K2**
CO2	Study the nutrition for life cycle.	**K1 to K2**
CO3	Know the health care programmers of India.	**K1 to K2**
CO4	Learn the importance of community and personal health & hygiene measures.	**K1 to K2**
CO5	Create awareness on community health and hygiene.	**K1 to K2**

MAPPING WITH PROGRAM OUTCOMES:										
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	**S**	**L**	**L**	**S**	**S**	**M**	**S**	**M**		

CO2	S	M	S	M	M	M	M	L		
CO3	M	L	L	L	L	M	L	L		
CO4	S	M	M	M	M	S	L	L		
CO5	S	M	S	M	M	L	L	L		

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	1	1	3	3
CO 2	3	2	3	2	2
CO 3	2	1	1	1	1
CO 4	3	2	2	2	2
CO 5	3	2	3	2	2
WEITAGE	14	8	10	10	10
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	93.3	53.3	66.6	66.6	66.6

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	Nutrition – Definition, importance, Good nutrition, and mal nutrition; Balanced Diet: Basics of Meal Planning. Carbohydrates, Lipids, Proteins and Vitamins –functions, dietary sources, effects of deficiency. Macro and micro minerals –functions, effects of deficiency; food sources of Calcium, Potassium, and Sodium; food sources of Iron, Iodine, and Zinc. Importance of water– functions, sources, requirements and effects of deficiency.	6	Chack & Talk and Power Point Presentation.
II	Nutrition for Life Cycle: Balanced diet - Normal, Pregnant, lactating women, Infancy, young children Adolescents, Adults, and the Elderly; Diet Chart; Nutritive value of Indian foods.	6	Chack & Talk and Power Point Presentation.
III	Improper diets: Definition, Identification, Signs and Symptoms - malnutrition, under-nutrition, over-nutrition, Protein Energy Malnutrition, obesity; Nutritional Disease and Disorder - hypertension, diabetes, anemia, osteomalacia, cardiovascular disease.	6	Chack & Talk and Power Point Presentation.
IV	Health - Determinants of health, Key Health Indicators, Environment health & Public health; Health-Education: Principles and Strategies. Health Policy & Health Organizations: Health Indicators and National Health Policy of Govt. of India; Functioning of various nutrition and health organizations in India.	6	Chack & Talk and Power Point Presentation.

V	Hygiene – Definition; Personal, Community, Medical and Culinary hygiene; WASH (Water, Sanitation and Hygiene) programme. Rural Community Health: Village health sanitation & Nutritional committee. Community & Personal Hygiene: Environmental Sanitation and Sanitation in Public places.	**6**	**Chack & Talk and Power Point Presentation.**

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)				
Internal	**Cos**	**K Level**	**Section A**	
			MCQs	
			No. of. Questions	**K - Level**
CI AI	**CO1**	**K1 – K2**	**25**	**K1,K2**
	CO2	**K1 – K2**	**25**	**K1,K2**
CI AII	**CO3**	**K1 – K2**	**25**	**K1,K2**
	CO4	**K1 – K2**	**25**	**K1,K2**
Question Pattern CIA I & II		**No. of Questions to be asked**	**50**	
		No. of Questions to be answered	**50**	
		Marks for each question	**1**	
		Total Marks for each section	**50**	

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	**Section A (Multiple Choice Questions)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	**40**	**40**	**53**	**100**
K2	**35**	**35**	**47**	
K3				
K4				
Marks		**75**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				

Course Name	SERICULTURE			
Course Code	23UMBSC21	**L**	**P**	**C**
Category	SKILL ENHANCEMENT COURSE	2	-	2

COURSE OBJECTIVES:

- Acquire knowledge on the concepts of origin, growth and study of Sericulture as science and scientifi approach of mulberry plant.
- Describe the morphology and physiology of silkworm.
- Discuss effective management of silkworm diseases.
- Demonstrate field skills in mulberry cultivation and silkworm rearing with an emphasis on technological aspects.
- Demonstrate entrepreneurship abilities, innovative thinking, planning, and setting up small-scale enterprises.

UNIT-I INTRODUCTION TO SERICULTURE 6

General introduction to Sericulture, its distribution in India. Botanical distribution and taxonomical characters of mulberry varieties and species. Biology of Mulberry plant and Mulberry crop cultivation and protection.

UNIT-II SILKWORM MORPHOLOGY& LIFE CYCLE 6

Silkworm- biology-morphology of silkworm. Life cycle of silkworm- egg, larva, pupa, and moth.

UNIT-III PATHOLOGY OF SILKWORM 6

Silkworm pathology: Introduction to Parasitism, Commensalism, Symbiosis and Parasite relationship - Mulberry Silkworm Diseases: Introduction, types, Pebrine, Grasserie, Muscardine, Flacherie, Symptoms and Pathogens, Mode of Infection, Prevention and Control -Non – mulberry silkworm diseases: Pebrine, Bacterial and viral diseases. Brief Account of Pests and Predators of Silkworms, Nature of damage and control measures.

UNIT-IV SILKWORM REARING 6

Rearing of silkworm. Cocoon assessment and processing technologies. Value added products of mulberry and silkworms.

UNIT-V ENTREPRENEURSHIP &RURAL DEVELOPMENT 6

Entrepreneurship and rural development in sericulture: Planning for EDP, Project formulation, Marketing, Insectary facilities and equipments: Location, building specification, air conditioning and environmental control, furnishings and equipment, sanitation and equipment, subsidiary facilities.

Total Lecture Hours	**30**

BOOKS FOR STUDY:

- Ganga, G. and Sulochana Chetty (2010). Introduction to Sericulture,, J., Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
- Dr. R. K. Rajan&Dr. M. T. Himantharaj(2005). Silkworm Rearing Technology, Central Silk Board, Bangalore
- Dandin S B, Jayant Jayaswal and Giridhar K (2010). Handbook of Sericulture technologies, Central Silk Board, Bangalore.
- M. C. Devaiah, K. C. Narayanaswamy and V. G. Maribashetty (2010). Advances in Mulberry Sericulture, CVG Publications, Bangalore
- *T. V. Sathe and Jadhav. A.D.(2021). Sericulture and Pest Management,* Daya Publishing House.

BOOKS FOR REFERENCES:

- S. Morohoshi (2001). Development Physiology of Silkworms 2nd Edition, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi
- Hamamura, Y (2001). Silkworm rearing on Artificial Diet. Oxford & IBH publishing Co., Pvt. Ltd. NewDelhi.
- M.Johnson, M.Kesary (2019). Sericulture, 5th. Edition. Saras Publications.
- **Manisha Bhattacharyya (2019).** Economics of Sericulture, Rajesh Publications.
- **Muzafar Ahmad Bhat, Suraksha Chanotra, Zafar Iqbal Buhroo, Abdul Aziz and Mohd. Azam (2020).**

WEB RESOURCES:

- **https://egyankosh.ac.in › bitstream**
- **https://archive.org › details › Sericulture Handbook**
- **https://www.academic.oup.com**
- **https://www.sericulture.karnataka.gov.in**
- **https://www.silks.csb.gov.in**

Nature of Course	EMPLOYABILITY		SKILL ORIENTED		ENTREPRENEURSHIP	✓		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		No Changes Made		New Course	✓		

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:		K LEVEL
After studying this course, the students will be able to:		
CO1	Discuss the overall aspects of Sericulture and the biology and varieties of mulberry plant. Create awareness among students about the economic importance and suitability of Sericulture in Indian conditions.	K1 to K2
CO2	Familiarize with the lifecycle of silk worm.	K1 to K2
CO3	Explain common diseases of silkworm encountered during rearing, sources of infection, disease symptoms, pre-disposing factors and their management practices.	K1 to K2
CO4	Attain thorough knowledge about the cultivation of mulberry, maintenance of the farm, seed technology, silkworm rearing, post cocoon techniques like stifling, reeling, and utilization of by-products.	K1 to K2
CO5	Competent to transfer the knowledge and technical skills to the Seri-farmers. Analyze the importance of sericulture in entrepreneurship development and emerge as potential entrepreneur.	K1 to K2

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S				S		S			
CO2	M				S					
CO3	S				S					
CO4							S	S		S
CO5					S		S	S		

S- STRONG M – MEDIUM L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	2	2	2	1
CO 2	2	1	1	2	1
CO 3	2	2	1	2	1
CO 4	2	2	1	2	2
CO 5	23	1	1	2	2
WEITAGE	10	8	6	10	8
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	66.6	53.33	40	66.6	53.33

LESSON PLAN:

UNIT	COURSE NAME	HRS	PEDAGOGY
I	General introduction to Sericulture, its distribution in India. Botanical distribution and taxonomical characters of mulberry varieties and species. Biology of Mulberry plant and Mulberry crop cultivation and protection.	6	Chalk & Talk

II	Silkworm- biology-morphology of silkworm. Life cycle of silkworm- egg, larva, pupa, and moth.	**6**	**Chalk & Talk**
III	Silkworm pathology: Introduction to Parasitism, Commensalism, Symbiosis and Parasite relationship - Mulberry Silkworm Diseases: Introduction, types, Pebrine, Grasserie, Muscardine, Flacherie, Symptoms and Pathogens, Mode of Infection, Prevention and Control -Non – mulberry silkworm diseases: Pebrine, Bacterial and viral diseases. Brief Account of Pests and Predators of Silkworms, Nature of damage and control measures.	**6**	**Chalk & Talk**
IV	Rearing of silkworm. Cocoon assessment and processing technologies. Value added products of mulberry and silkworms.	**6**	**Chalk & Talk**
V	Entrepreneurship and rural development in sericulture: Planning for EDP, Project formulation, Marketing, Insectary facilities and equipments: Location, building specification, air conditioning and environmental control, furnishings and equipment, sanitation and equipment, subsidiary facilities.	**6**	**Chalk & Talk**

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	**Cos**	**K Level**	**Section A**	
			MCQs	
			No. of. Questions	**K - Level**
CI AI	**CO1**	**K1 – K2**	**25**	**K1,K2**
	CO2	**K1 – K2**	**25**	**K1,K2**
CI AII	**CO3**	**K1 – K2**	**25**	**K1,K2**
	CO4	**K1 – K2**	**25**	**K1,K2**
Question Pattern CIA I & II		**No. of Questions to be asked**	**50**	
		No. of Questions to be answered	**50**	
		Marks for each question	**1**	
		Total Marks for each section	**50**	

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (Ist Test-2 CO's & IInd Test-2 CO's) in equal weightage

Distribution of Marks with K Level CIA I & CIA II					
	K Level	Section A (Multiple Choice Questions)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100
CIA II	K1	30	30	60	100
	K2	20	20	40	
	K3				
	K4				
	Marks	50	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)				
S. No	COs	K - Level	Section A (MCQs)	
			No. of Questions	K – Level
1	CO1	K1-K2	15	K1,K2
2	CO2	K1-K2	15	K1,K2
3	CO3	K1-K2	15	K1,K2
4	CO4	K1-K2	15	K1,K2
5	CO5	K1-K2	15	K1,K2
No. of Questions to be Asked			75	
No. of Questions to be answered			75	
Marks for each question			1	
Total Marks for each section			75	
(Figures in parenthesis denotes, questions should be asked with the given K level)				

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

Distribution of Marks with K Level				
K Level	**Section A (Multiple Choice Questions)**	**Total Marks**	**% of (Marks without choice)**	**Consolidated %**
K1	**40**	**40**	**53**	**100**
K2	**35**	**35**	**47**	
K3				
K4				
Marks		**75**	**100**	**100**
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.				