

**Shree Manibhai Virani & Smt. Navalben Virani Science College, Rajkot  
(Autonomous)**

**Affiliated to Saurashtra University, Rajkot**

**BOARD OF STUDIES – MICROBIOLOGY**

**10<sup>th</sup> Meeting of Board of Studies in Microbiology**

**Programme: B.Sc. Microbiology**

**Date: 18.12.2021**

**Time: 10.30 am**

**Mode: Hybrid**

**Agenda**

1. Confirmation of MoM of previous BoS held on 30/06/2021
2. Scheme of Learning and Evaluation for 2<sup>nd</sup> Sem. of B.Sc. Microbiology programme
3. Syllabi of all theory & practical courses of Sem.-II of B.Sc. Microbiology programme
4. Syllabi & evaluation norms of Part-III : Value Added Course/s (VAC) offered by the department
5. Question paper pattern for all theory & practical courses of Sem.-II of B.Sc. Microbiology programme
6. List of paper setters and examiners for all theory & practical courses of B.Sc. Microbiology programme
7. Any other agenda with permission of the Chair

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**BoS Members:**

<b>S. No.</b>	<b>Name</b>	<b>Designation</b>	<b>Presence/Absence</b>
1.	Dr. Neepa Pandhi	Head of Department, Chairperson	
2.	Dr. Datta Madamwar	Subject Expert, VC Nominee	
3.	Dr. Mehul Dave	Subject expert, AC Nominee	
4.	(Dr.) Chitra Bhattacharya	Subject expert, AC Nominee	
5.	Dr. Madhavi Joshi-Bagtharia	Industry Representative	
6.	Dr. Vasant Jadeja	Faculty Member	
7.	Dr. Shivani Patel	Faculty Member	
8.	(Dr.) Lt. Hemangi Bhatt	Faculty Member	
9.	Dr. Hitarth Bhatt	Faculty Member	
10.	Dr. Rajesh Patel	Meritorious PG Alumni	



**Sarvodaya Kelavani Samaj Managed**  
**Shree Manibhai Virani & Smt. Navalben Virani Science College, Rajkot**  
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**Affiliated to Saurashtra University, Rajkot**

Reaccredited at the “A” Level (CGPA 3.28) by NAAC

“STAR” College Scheme & Status by MST-DBT

A College with Potential for Excellence – CPE (Phase - II) by UGC

Accredited at the G-AAA Highest Grade ‘A-1’ Level by KCG, Govt. of Gujarat

UGC-DDU KAUSHAL Kendra

GPCB-Government of Gujarat approved Environmental Audit Centre

## **SCHEME OF LEARNING AND EVALUATION**

**Of**

## **B. Sc. MICROBIOLOGY**

**(W.e.f June 2021)**

**Shree Manibhai Virani and Smt. Navalben Virani Science College, Rajkot**  
**(Autonomous)**  
**Affiliated to Saurashtra University, Rajkot**  
**Department of Microbiology**

**B. Sc. MICROBIOLOGY**  
**Regulations for Students Admitted from A.Y. 2021-2022 & Onwards**

**ELIGIBILITY**

Candidate who has passed Higher Secondary Certificate (10+2) examination with Science subjects in respective streams of Gujarat State or any other examination recognized as equivalent thereto with a good academic record, shall be eligible for admission, subject to such other conditions prescribed by the Parent University and State Government from time to time. All admissions are provisional and subject to the approval of Parent University.

**LATERAL ENTRY**

Candidates seeking admission directly in third semester of B.Sc. Microbiology must have passed examination of Diploma in Pharmacy or relevant subjects will be eligible for admission. A result of this type of candidate will be declared by considering his/her marks of semester 3 to 6 in aggregate and accordingly class will be awarded.

**DURATION OF THE PROGRAMME**

The Program

1. Shall extend over a period of three years comprising of six semesters for lateral entrants
2. Comprises of two semesters in one academic year wherein each semester normally will be of minimum 90 teaching days.

**CHOICE BASED CREDIT SYSTEM (CBCS)**

The CBCS provides an opportunity for the students to choose courses from the prescribed courses based on their interest. Mainly, each course is worth a certain number of credit points, determined by different criteria including learning outcome, contact hours etc.

The following mechanism is adopted for the purpose of computation of credits earned by the students:

- |  |            |
|--|------------|
| a) 1 hour instruction of Theory        | = 1 Credit |
| b) 2-3 hours instruction of Tutorial   | = 1 Credit |
| c) 2-3 hours instructions of Practical | = 1 Credit |

**OUTCOME BASED EDUCATION (OBE)**

Outcome based education is based on revised Bloom Taxonomy and is a learner-centric teaching and learning methodology in which the course delivery and assessment are planned to achieve stated objectives and outcomes. It focuses on measuring students performance i.e. outcomes at different levels. OBE method of learning is adopted.

## **STRUCTURE OF THE PROGRAMME**

UG program shall have a curriculum comprising theory and practical (separate / in built with theory) courses with a specified syllabus. The curriculum of the program is a blend of Language Courses, Core Courses, Interdisciplinary Courses (IDC), Discipline Specific Electives (DSE), Trans-disciplinary Electives (TDE) and Ability Enhancement Courses (AEC) shall be offered.

## **MEDIUM OF INSTRUCTION AND EXAMINATIONS**

The medium of instruction and examinations shall be English, except for courses on Languages other than English.

## **EVALUATION**

The evaluation shall generally comprise of Continuous Internal Assessment (CIA) and Semester End Examination (SEE) with percentage weightage as specified below, unless specified otherwise in the Scheme of Learning and Evaluation.

<b>Components</b>	<b>Theory Courses</b>	<b>Practical Courses</b>
Continuous Internal Assessment (CIA)	Varies from 30 percent to 60 percent based on the nature of course.	Varies from 40 percent to 100 percent based on the nature of course.
Semester End Examination (SEE)	Varies from 70 percent to 40 percent based on the nature of course.	Varies from 40 percent to 60 percent based on the nature of course.

## **COMPLETION OF PROGRAM TO EARN THE DEGREE CERTIFICATE**

The University shall publish the result after evaluation and with the recommendations of Result Passing Board at the end of each semester. On approval / ratification of the results by the Academic Council, the student will be recommended to Governing Body for the award of the degree provided that the student have earned all the credits towards mandatory course / components as mentioned in Scheme of Learning and Evaluation.

## **MINIMUM QUALIFICATION FOR APPOINTMENT OF FACULTY MEMBER**

As per norms of UGC and./or other related Regulatory body

**Shree Manibhai Virani and Smt. Navalben Virani Science College, Rajkot**  
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**Department of Microbiology**  
**B. Sc. MICROBIOLOGY**

**VISION OF THE DEPARTMENT**

Our vision is to produce highly qualified and competent microbiologists with expertise in all the relevant areas, to develop and maintain a strong and supportive research programme to complement our national needs while strengthening local relevance and to rise as center of excellence and knowledge in the subject of Microbiology

**MISSION OF THE DEPARTMENT**

The Mission of Microbiology Department is to promote good quality education, research and to provide the most rigorous and inspiring training in the discipline of Microbiology with greater significance of application in all relevant areas. The Department strives to educate and mentor students to:

- Acquire practical skills necessary for operation and maintenance of small and medium scale industry and research institute,
- Be aware of the role of microorganisms in various aspects of life processes and understand their importance in agriculture, environment, food, health, and other areas,
- Apply microbiological techniques and technologies to the betterment of human life, environment and national economy,
- Contribute to the pursuit of knowledge by contributing meaningfully in the area of Research in Microbiology

**OBJECTIVES OF THE PROGRAMME**

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. This programme will enable students to understand the basic anatomy, physiology, diversity, and genetics of microorganisms including viruses, bacteria, protozoa, algae and fungi, and exploit their interactions with environment and human beings.
2. The Curriculum is designed to impart to students the skill to operate basic and advanced instruments used for analysis of various biomolecules.
3. This programme will enable students to acquire knowledge on the Microbiology, Cell Biology, Microbiology, Immunology, Bioprocess Technology and Molecular Biology to enable them to understand emerging and advanced concept in modern biology and help them to take their career in this field.
4. After completion of the programme, the students will be able to acquire the necessary theoretical and practical competencies in Microbiology to enable them to undertake higher studies in recognized Institutions of advance learning and engage gainful self-employment.
5. The Programme is intended to help the students to be the innovative and versatile personalities in the field of Life Science with quality education and provide the skilled manpower required by Research and Development, Institutions of Higher Learning and Industry.

## GRADUATE ATTRIBUTES

- **Academic excellence:** Ability to identify key questions, research and pursue rigorous evidence-based arguments.
- **Critical Thinking and Effective communications:** Analysis and evaluation of information to form a judgment about a subject or idea and ability to effectively communicate the same in a structured form.
- **Global Citizenship:** Mutual understanding with others from diverse cultures, perspectives and backgrounds
- **Life Long Learning:** Open, curious, willing to investigate, and consider new knowledge and ways of thinking

## PROGRAM EDUCATIONS OBJECTIVES (PEOs)

This programme will produce Graduates who will attain following PEOs after few years of graduation	
<b>PEO 1</b>	: <b>Core competency:</b> will develop the competency to pursue higher education, successful professional career, or be an entrepreneur with synergistic combination of the knowledge and skills of Microbiology and allied sciences
<b>PEO 2</b>	: <b>Breadth of knowledge:</b> will show the ability to critically analyse scientific data, drawing objective conclusions from it and apply this knowledge to independently design, and execute small research problems with the help of integrated knowledge of Microbiology and other domains for societal and human welfare.
<b>PEO 3</b>	: <b>Preparedness:</b> will have the potential to take any task or assignment in the capacity of a leader or team member in the chosen occupations or careers and will reflect an aptitude and ability for contribution in academics, entrepreneurship, and research, equipped with good communication skills.
<b>PEO 4</b>	: <b>Professionalism:</b> will possess strong professional ethics and expertise to fulfil moral duties towards their profession, community, society and nation at large.
<b>PEO 5</b>	: <b>Learning environment:</b> will show readiness for lifelong learning necessary to meet the ever evolving professional, social and personal demands through ethical, interpersonal and team skills.

## PROGRAM OUTCOMES:

After completion of the B.Sc. Microbiology programme, the Graduate will be able to :		
<b>PO 1</b>	:	<b>Domain knowledge:</b> Demonstrate an understanding of fundamental principles of Microbiology, its applications and scope, along with an ability to identify beneficial and harmful role of microorganisms for the benefit of Science and Society
<b>PO 2</b>	:	<b>Problem analysis:</b> Accurately identify and critically analyse pertinent problems in the field of Applied Microbiology and various domains of Biological sciences.
<b>PO 3</b>	:	<b>Design/development of solutions:</b> Search for and successfully arrive at viable conclusions/solutions pertaining to various aspects of life sciences using right approach and appropriate tools and techniques
<b>PO 4</b>	:	<b>Conduct investigations of complex problems:</b> Ability to investigate any complex problems related to Microbiology and other life science with the use of appropriate experimental tools/techniques/equipment.
<b>PO 5</b>	:	<b>Modern tool usage:</b> Understand standard operating procedures, safety measures and acquire in-depth technical competence to handle the basic laboratory instruments, and develop the skills to locate and retrieve scientific information with modern data search tools.
<b>PO 6</b>	:	<b>The Microbiologist and Society:</b> Demonstrate the ability to understand the role of scientific developments in a changing world from the disciplinary perspective as well as in relation to its professional and everyday use, with an insight into one's role in society and act in an honest and consistent manner based on a strong sense of self and personal values.
<b>PO 7</b>	:	<b>Environment and sustainability:</b> Analyse the impact of scientific and technological advances on the environment and society and the need for sustainable development.
<b>PO 8</b>	:	<b>Ethics:</b> Commitment to professional ethics and responsibilities.
<b>PO 9</b>	:	<b>Individual and team work:</b> Exhibit the potential to effectively accomplish tasks as a leader or a member of a team as well as independently in multidisciplinary settings.
<b>PO 10</b>	:	<b>Communication:</b> Communicate effectively in spoken and written forms as well as through digital media with scientific community, society, and fellow mates.
<b>PO 11</b>	:	<b>Project management and finance:</b> Demonstrate knowledge and scientific understanding to design a research project and manage its execution to generate new scientific insights, innovations in Microbiology research and exhibit organizational skills for able management of time and resources.
<b>PO 12</b>	:	<b>Life-long learning:</b> Able to recognize the need to undertake life-long learning and acquire the capacity to build on critical thinking skills for periodic updating of scientific knowledge and its application.



## PROGRAM SPECIFIC OUTCOMES (PSOs) for B. Sc. Microbiology programme

After completion of the programme, the Graduate will:	
<b>PSO1</b>	: Acquire knowledge on the fundamentals of Microbiology for sound and solid base which enables them to understand the emerging and advanced concepts in life sciences
<b>PSO2</b>	: To equip the students with knowledge, skill and inspiration to pursue higher education and research in Microbiology and allied fields in reputed institutes at national and international level.
<b>PSO3</b>	: Be able to understand fundamental principles of Microbiology to find innovative solutions for environment, agriculture, and health related issues at local and global level.
<b>PSO4</b>	: Apply the knowledge of Microbiology, preferably with the synergistic application of basic understanding of other allied fields, for finding sustainable ethical solutions to existing global problems in compliance to the SDGs
<b>PSO5</b>	: Become competent and eligible to appear in various competitive exams, getting placement in government and private sectors of academia, research and industries, and become a successful Microbiologist serving the Nation.

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**SCHEME OF LEARNING AND EVALUATION**

**For the students admitted from the A.Y. 2021-22 & onwards**

<b>Semester-I</b>									
Course Code	Course	Contact Hrs/wk.			SEE Duration hrs	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	Total	
<b>Part-I</b>									
21ULCEN101	English-I – Development of Functional English	3	-	-	3	40	60	100	3
<b>Part-I Total</b>		<b>3</b>	<b>0</b>	<b>0</b>		<b>40</b>	<b>60</b>	<b>100</b>	<b>3</b>
<b>Part-II</b>									
21UMBCC101	<b>Core1:</b> Fundamentals of Microbiology (F1)	4	-	-	3	30	70	100	4
21UMBCC102	<b>Core2:</b> Microbial Growth and Control (F2)	4	-	-	3	30	70	100	4
21UMBID101	<b>IDC-1: Zoology-1 Systematics and Anatomy</b>	3	-	-	3	30	70	100	3
21UMBCC103	<b>Core Practical-1</b> Basic Microbial Techniques	-	-	6	6#	40	60	100	4
21UMBID102	<b>IDC- Practical - 1: Zoology-1: Systematics and Anatomy</b>	-	-	6	3	40	60	100	2
	<b>Core Enrichment – 1: Concept to Practice Course</b>		1	-	-	(20)	Evaluation at the end of Semester - IV		
<b>Part-II Total</b>		<b>11</b>	<b>1</b>	<b>12</b>		<b>170</b>	<b>330</b>	<b>500</b>	<b>17</b>
<b>Part-III: Ability Enhancement Courses</b>									
21AESD101	<b>AECC I:</b> Introduction to SDG (online course)	-	-	-	-	-	-	Remarks	Audit course
	<b>AECC II:</b> Environmental Conservation and Sustainable Development	1	-	-	-	Evaluation at the end of 2 <sup>nd</sup> Semester			-

	<b>AECC III: Human Values for Holistic Living</b>	1	2*	-	-	Evaluation at the end of 2 <sup>nd</sup> Semester			-
	<b>FS 3: Career Acceleration Programme</b>	2*							
	<b>Part-III Total</b>	<b>2</b>	<b>-</b>	<b>-</b>		<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>
	<b>Total (Part-I to Part-III)</b>	<b>16</b>	<b>1</b>	<b>12</b>	<b>-</b>	<b>210</b>	<b>390</b>	<b>600</b>	<b>20</b>
		<b>29</b>				<b>600</b>			

# 3hrs on day1 and 3 hrs on day 2;

\* Beyond Academic hours

( ) Final evaluation for 100 marks be made at the end of Semester IV, which include 20 marks CIA in Semesters I, II, and III each, and of 40 marks in Semester IV.

Semester-II									
Course Code	Course	Contact Hrs/wk.			SEE Duration hrs	Maximum Marks			Credits
		T	Tu	P		CIA	SE E	Total	
<b>Part -I</b>									
21ULCEN201	English II – Functional English	3	-	-	3	40	60	100	3
	<b>Part-I Total</b>	<b>3</b>	<b>0</b>	<b>0</b>		<b>40</b>	<b>60</b>	<b>100</b>	<b>3</b>
<b>Part-II</b>									
21UMBCC201	<b>Core3:</b> Microbial Taxonomy and diversity (F)	4	-	-	3	30	70	100	4
21UMBCC202	<b>Core 4:</b> Basic Biochemistry (F)	4	-	-	3	30	70	100	4
21UMBCC203	<b>Core 5:</b> Cell Structure and Organization (F)	4	-	-	3	30	70	100	4
21UMBID201	<b>IDC-2:</b> Botany	3	-		3	30	70	100	3
21UMBCC204	<b>Core Practical - 2</b> Microbial Diversity and Biochemistry	-	-	6	6#	40	60	100	2
21UMBID202	<b>IDC-2:</b> Practical: Botany	-	-	6	3	40	60	100	2
	<b>Core Enrichment – 2: Concept to Practice Course</b>		1		-	(20)	Evaluation at the end of Semester - IV		
	<b>Part-II Total</b>	<b>15</b>	<b>1</b>	<b>12</b>		<b>200</b>	<b>400</b>	<b>600</b>	<b>19</b>
<b>Part-III: Ability Enhancement Courses</b>									
21xxx	<b>AECC II:</b> Environmental Conservation and Sustainable Development	1	-	-	-	Remarks			2
21xxxx	<b>AECC III:</b> Human Values for Holistic Living	1	2*	-	-	Remarks			3
	<b>FS 3:</b> Career Acceleration Programme	2*							
	<b>Part-III Total</b>	<b>2</b>	<b>-</b>	<b>-</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>
	<b>Total (Part-I to Part-III)</b>	<b>20</b>	<b>1</b>	<b>12</b>	<b>-</b>	<b>240</b>	<b>460</b>	<b>700</b>	<b>27</b>
		<b>33</b>				<b>700</b>			

# 3hrs on day1 and 3 hrs on day 2;

\* Beyond Academic hours

( ) Final evaluation for 100 marks be made at the end of Semester IV, which include 20 marks CIA in Semesters I, II, and III each, and of 40 marks in Semester IV.

Minimum one-month internship pertaining to learning for concept to practice/prototype or product development for start-up/mini and final semester project/skilling in the summer vacation/combination of semester break and summer vacation in industry/premier research institute/NGO, etc.

Semester-III									
Course Code	Course	Contact Hrs/wk.			SEE Duration hrs	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	Total	
<b>Part – I</b>									
	English III –	3	-	-	3	40	60	100	3
	<b>Part-I Total</b>	<b>3</b>	<b>0</b>	<b>0</b>		<b>40</b>	<b>60</b>	<b>100</b>	<b>3</b>
<b>Part-II</b>									
21UMBCC301	<b>Core6:</b>	4	-	-	3	30	70	100	4
21UMBCC302	<b>Core7:</b>	4	-		3	30	70	100	4
21UMBCC303	<b>Core8:</b>	4	-		3	30	70	100	4
	<b>DSE 1: Zoology-2:</b>	3	-	-	3	30	70	100	3
21UMBCC304	<b>Core practical – 3 –</b>	-	-	6	6	40	60	100	2
	<b>DSE 1: Practical</b>	-	-	6	3	40	60	100	2
<No course code>	<b>Core Enrichment – 1: Concept to Practice Course</b>		1	-	-	20	Evaluation at the end of Semester - IV		
	<b>Core Enrichment 2: Internship 1</b>	-	-	-		100		100	1
	<b>Part-II Total</b>	<b>15</b>	<b>1</b>	<b>12</b>		<b>300</b>	<b>400</b>	<b>700</b>	<b>20</b>
<b>Part-III: Ability Enhancement Courses</b>									
	<b>FS 3: Career Acceleration Programme (CAP)</b>	-	2	-					Audit course
	<b>Part-III Total</b>	-	2	-		0	0	0	
	<b>Total (Part-I to Part-III)</b>	<b>18</b>	<b>3</b>	<b>12</b>	-	<b>340</b>	<b>460</b>	<b>800</b>	<b>23</b>
		<b>33</b>				<b>800</b>			

Semester– IV									
CourseCode	Course	Contact Hrs/wk.			SEE Durati on hrs	Maximum Marks			Credits
		T	T u	P		CIA	SEE	Total	
<b>Part – I</b>									
	English IV –	3	-	-	3	40	60	100	3
	<b>Part-I Total</b>	<b>3</b>	<b>0</b>	<b>0</b>		<b>40</b>	<b>60</b>	<b>100</b>	<b>3</b>
<b>Part–II</b>									
21UMBCC401	<b>Core 9:</b>	4	-	-	3	30	70	100	4
21UMBCC202	<b>Core10:</b>	4	-		3	30	70	100	4
	<b>Core elective 1:&lt;1&gt; &lt;2&gt;</b>	4	-		3	30	70	100	4
	<b>TDE 1</b>	2	-	-	3	30	70	100	2
	<b>DSE:2 –</b>	3	-	-	3	30	70	100	3
	<b>Core Practical – 4 –</b>			6	6	40	60	100	3
21UMBCC403	<b>Core elective Practical</b>			4	3	40	60	100	2
	<b>DSE:2 – Practical</b>			6	3	40	60	100	2
21xxx	<b>Core Enrichment – 1: Concept to Practice Course</b>		1	-	-	40	-	100	-
	<b>Part-II Total</b>	<b>17</b>	<b>1</b>	<b>18</b>		<b>270</b>	<b>530</b>	<b>800</b>	<b>24</b>
<b>Part-III: Ability Enhancement Courses</b>									
<no subject code>	<b>FS 3: Career Acceleration Programme (CAP)</b>	-	2	-					Audit course
	<b>Part-III Total</b>	<b>0</b>	<b>2</b>	<b>0</b>					
	<b>Total (Part-I to Part-III)</b>	<b>20</b>	<b>3</b>	<b>18</b>	<b>-</b>	<b>310</b>	<b>590</b>	<b>900</b>	<b>27</b>
		<b>37</b>				<b>900</b>			

Minimum one month internship pertaining to learning for concept to practice/prototype or product development for start-up/mini and final semester project/skilling in the summer vacation/combination of semester break and summer vacation in industry/premier research institute/NGO etc.

Semester– V									
Course Code	Course	Contact Hrs/wk.			SEE Duration hrs	Maximum Marks			Credits
		T	Tu	P		CIA	SEE	Total	
<b>Part-II</b>									
21UMBCC501	<b>Core11:</b>	4	-	-	3	30	70	100	4
21UMBCC502	<b>Core12:</b>	4	-	-	3	30	70	100	4
21UMBCC503	<b>Core 13: (Self-study) –</b>	1	-	-	3	30	70	100	4
21UMBCC504	<b>Core 14: Concept Recapitulation Test (CRT) for Core Courses of Semester I to V</b>				2	100	-	100	1
	<b>Core elective 2: &lt;1&gt;&lt;2&gt;</b>	4	-		3	30	70	100	4
	<b>TDE 2:</b>	2	-	-	3	30	70	100	2
21UMBCC505	<b>Core Practical – 5 -</b>			9	6	40	60	100	3
	<b>Core Elective Practical</b>			4	3	40	60	100	2
	<b>Core Enrichment 3: Internship 2</b>	-	-	-		100		100	1
	<b>Core Enrichment 4: Mini Project /Skill Enhancement</b>	-	2	4	-	100	-	100	4
	<b>Part-II Total</b>	<b>15</b>	<b>2</b>	<b>17</b>		<b>530</b>	<b>470</b>	<b>1000</b>	<b>29</b>
<b>Part-III: Ability Enhancement Courses</b>									
<no subject code>	<b>FS-3 Career Acceleration Programme (CAP)</b>	-	2	-		Remarks			Audit course
	<b>Part-III Total</b>	<b>0</b>	<b>2</b>	<b>-</b>		<b>0</b>	<b>0</b>	<b>0</b>	
	<b>Total (Part-II to Part-III)</b>	<b>15</b>	<b>4</b>	<b>17</b>	<b>-</b>	<b>530</b>	<b>470</b>	<b>1000</b>	<b>29</b>
		<b>34</b>				<b>1000</b>			



<b>Semester-VI</b>									
<b>Course Code</b>	<b>Course</b>	<b>Contact Hrs/wk.</b>			<b>SEE Duration hrs</b>	<b>Maximum Marks</b>			<b>Credits</b>
		<b>T</b>	<b>Tu</b>	<b>P</b>		<b>CIA</b>	<b>SEE</b>	<b>Total</b>	
<b>Part-II(Project + a Compulsory course/ Advanced Courses + a Compulsory course)</b>									
	<b>Core15: (Compulsory course)</b>	5	-	-	3	30	70	100	5
	<b>Core16:</b>	5	-	-	3	30	70	100	5
	<b>Core – 17:</b>	5	-	-	3	30	70	100	5
	<b>Core Practical – 6 – Skill Training / Start up</b>	-	-	9	6	40	60	100	4
	<b>Core Enrichment 5: Project / Dissertation</b>	-	-	20				300	14
		<b>24/25</b>						<b>400</b>	<b>19</b>
	<b>Part-II Total</b>							<b>400</b>	<b>19</b>
<b>Total Marks:400</b>									

**It is expected that student should spend \*4hrs each day for 6 days**

### Formation of Part-III

Course Code	Semester	Course / Component	Contact Hrs	No. of Courses	Credit/ Course	Total Credits
<b>A. Ability Enhancement Course (AEC)</b>						
<b>(i) Ability Enhancement Compulsory Course (AECC)</b>						
	I	<b>AECCI:</b> Introduction to SDG (online course)	-	1	Remarks	Audit Course
	I & II	<b>AECC II:</b> Environmental Conservation and Sustainable Development	1 Hr / Week / Semester	1	1+1	2
	I & II	<b>AECC III:</b> Human Values for Holistic Living	1 T + 2 Tu /Week /Semester	1	1+1+1	3
					<b>Sub Total</b>	<b>5 + Audit course</b>
<b>(ii) Skill Enhancement Course (SEC)</b>						
As per common list	Any Semester between II –V/VII	<b>SEC-I</b> *Value Added Courses	40 Hrs	1	1	1
	Any Semester between III – V/VII	<b>SEC-II</b> **Co-Curricular Course	80 to 120 Hrs	1	2	2
					<b>Sub Total</b>	3
<b>B. Finishing School</b>						
<b>FS I to FS IV Compulsory to Earn Degree.</b>						
	I	<b>FS I:</b> Student Induction Program	3 weeks Phase 1, Phase 2, Phase 3	-	Remark	Audit course
	Across I & II Semesters	<b>FS II:</b> Fundamentals of Design Thinking (Online/Offline)	40 to 60 Hrs	1	Remark	Audit course

	Semester s I to V / VII	<b>FS III:</b> Career Acceleration Programme – CAP (Placement Training)	2 Hrs / Week /Semester	As per syllabus	Remarks	Audit course
	Semester V (3 yrs program) Semester VI (4 yrs program)	<b>FS IV:</b> Community Engagement	Twice a month	1	Remarks	Audit course
<b>FS V to FS VIII Options for Advanced Learners</b>						
	Any semester from II to V/VII	<b>FS V:</b> Indian & Foreign Languages	-	Any number of courses	Remarks	Audit course
	Any semester from II to V/VII	<b>FS VI:</b> Any number of Online course(s) from select MOOC platforms	-	Any number of courses	Remarks	Credit as per provider/ audit course
	Any semester from III to V/VII	<b>FS VII:</b> Advanced Design Thinking	-	1	Remarks	Audit course
	Any semester from I to VI/VIII	<b>FS VIII:</b> <b>#Extra Credit Course</b> Any number of courses from any UG program across the College	Self-study	Any number of courses	As per course offered	As per credit(s) earned across all courses opted
					<b>Grand Total</b>	

**\*Value Added Courses** - Option to student to choose at least 1 from a list of courses offered by any department across the Institution.

**\*\*Co-Curricular Courses** - Option to students to choose 1 from a list of courses offered by any department across the Institution.

# Student may opt for any course of the odd/even prevailing semester from any UG program across the

Institution with the following guidelines:

- a. Attending class not mandatory.
- b. May be mentored by the course teacher.
- c. Preparation through self-study.
- d. CIA not mandatory; evaluated for total marks at the end of the semester.
- e. Indicates options to appear for the course through examination application and payment of examination fees of that course.
- f. Credits earned through each course indicated in the consolidated mark sheet as extra credits; not included for CGPA, percentage marks and classification.

### **TOTAL MARKS & CREDIT DISTRIBUTION TO EARN THE DEGREE**

S. No	PART	Total Marks	Total Credits
1.	<b>PART I:</b> Language Course	400	12
2.	<b>PART II:</b> Core, IDC, DSE, TDE	4000	128
3.	<b>PART III:</b> AECC-I, II & III SEC- I & II FS I, II, III & IV	Remarks	08 + Credit audit
<b>TOTAL</b>		<b>4400</b>	<b>148</b>

### **VALUE ADDED COURSES (VAC) COURSES OFFERED BY THE DEPARTMENT**

Sr. No.	Course Code	Course Title	Course Duration	Credits
<b>1</b>	21UMBVA01	Mushroom Cultivation	40 Hrs	1

## Syllabus – Semester – II

Department: **Microbiology**

Programme: **B.Sc. Microbiology**

Course Code	Course Title (F)	Credits
21UMBCC201	Core 3: Microbial Taxonomy and Diversity (F)	4 Credits

### Course Description:

The world of microorganisms has great diversity in morphology, physiology, and anatomy among its members. This diversity can be put to beneficial use if studied and understood properly. This course will deal with the basic understanding of various groups of microorganisms, namely bacteria, fungi, algae, protozoa, and viruses, and the system adopted for their scientific classification, nomenclature and identification. The fundamental similarities and basic differences among these group of microbes will also be elucidated, and will be explained from the evolutionary point of view. The course is a fundamental nature for semester – II students who are entering into the wonderful world of microorganisms.

### Course Objectives:

1. Identify major groups of microorganisms with respect to it's diversity that laid the groundwork for modern microbiology.
2. Understand the bacterial classification, characteristics of prokaryotic cells and eukaryotic cells and major groups of microorganisms.
3. Outline the structural and functional differences among all the microbes such as morphological features of bacterial cell and its organelles.
4. Understand the influence of microbes in their natural environments on maintenance of the nutritional requirements of microbes.
5. Explain the underlying facts of identification and classification of microorganisms.

<b>Course Outcomes:</b> Upon completion of this course, the learner will be able to		
CO No.	CO Statement	Blooms taxonomy Level (K1 to K4)
CO <sub>1</sub>	Identify the microorganism and their activities of the subject and interpret their benefits that laid the groundwork for modern microbiology.	K2
CO <sub>2</sub>	Demonstrate and relate the characteristic features of prokaryotic and eukaryotic cells and major groups of microorganisms and diversity of microbial world with the identification and classification methods of microorganisms.	K2

CO <sub>3</sub>	To relate and describe the flow of structural and functional differences among all the microbes and their nutritional requirements for the microbial growth.	K2
CO <sub>4</sub>	Identify the influence of microbiology and 21 <sup>st</sup> century challenges and opportunities that arise from our changing relationship with and understanding of microbes.	K2
CO <sub>5</sub>	Relate the science of microbes and the social issues and concerns relevant to the field of microbiology.	K2

Course Content	Hours
<b>Unit. 1: Introduction to Microbial Diversity</b>	<b>10 hrs</b>
<ul style="list-style-type: none"> <li>• Introduction to Biodiversity- Microbial evolution and diversity, Types of diversity</li> <li>• Microbial Taxonomy: Introduction and overview, Taxonomic ranks of microorganisms, Classification systems</li> <li>• Major characteristics used in taxonomy</li> <li>• Assessing Microbial Phylogeny</li> <li>• The Major Divisions of Life</li> </ul>	
<b>Unit. 2: Prokaryotic Diversity</b>	<b>10 hrs</b>
<ul style="list-style-type: none"> <li>• Introduction to Eubacteria</li> <li>• <u>Gram negative bacteria</u> – General features of: <ul style="list-style-type: none"> <li>○ Aerobic/Microaerophilic motile, helical vibroid</li> <li>○ Non-motile curved bacteria</li> <li>○ Aerobic/Microaerophilic rods and cocci</li> </ul> </li> <li>• <u>Gram negative bacteria</u> – General features of: <ul style="list-style-type: none"> <li>○ Facultative anaerobes – rods, curved and helical bacteria</li> <li>○ Dissimilatory Sulphate reducers</li> </ul> </li> <li>• <u>Gram negative bacteria</u> – General features of: <ul style="list-style-type: none"> <li>○ Anaerobic cocci</li> <li>○ Phototrophic bacteria</li> </ul> </li> <li>• <u>Gram positive bacteria</u> – General features of: <ul style="list-style-type: none"> <li>○ Endospore forming rods and cocci</li> <li>○ Asporogenous rods</li> <li>○ Mycobacteria and Actinomycetes</li> </ul> </li> </ul>	
<b>Unit 3: Diversity of some unusual Prokaryotes</b>	<b>10 hrs</b>
<ul style="list-style-type: none"> <li>• <u>General Features of Bacteria with unusual morphology:</u> <ul style="list-style-type: none"> <li>○ Budding and appendaged bacteria</li> <li>○ Sheathed Bacteria</li> <li>○ Mycoplasma</li> </ul> </li> <li>• Bacteria with gliding motility,</li> <li>• Rickettsia and Chlamydia</li> </ul>	

<ul style="list-style-type: none"> <li>• <u>General Features of Bacteria of extreme environments:</u></li> <li>• Introduction to Archaea <ul style="list-style-type: none"> <li>○ Thermophiles</li> <li>○ Halophiles</li> <li>○ Acidophiles</li> <li>○ Barophiles</li> <li>○ Methanogens</li> <li>○ Psychrophiles</li> </ul> </li> </ul>	
<b>Unit. 4: Eukaryotic Diversity</b>	<b>10 hrs</b>
<ul style="list-style-type: none"> <li>• Fungi: General characteristics – Definition, occurrence and structure of fungi</li> <li>• Salient features and Economic importance of fungi</li> <li>• Algae: General Characteristics – Definition, Occurrence, Ultra- Structure, Reproduction</li> <li>• Economic importance of Algae</li> <li>• General Characteristics – Definition, Occurrence, Ultra- Structure, Reproduction and Economic importance of Protozoa</li> </ul>	
<b>Unit. 5: Akaryotic Diversity - Viruses</b>	<b>10 hrs</b>
<ul style="list-style-type: none"> <li>• Introduction to Viruses: Definition, Historical background of virology,</li> <li>• General features of viruses: Size, Capsids symmetry, Chemical Nature, Life cycle</li> <li>• Overview of Bacterial Virus: T4 and Lambda</li> <li>• Overview of plant Virus: TMV</li> <li>• Overview of Animal viruses; HIV</li> </ul>	

#### Text Books:

- Pelczar, M.J., Chan, E.C.S., Kreig, N.R. (1993). Microbiology, 5<sup>th</sup> Edition. New Delhi: Tata McGraw Hill Publishing Company Ltd.
- Prescott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology, 5<sup>th</sup> Edition, New York: WCB McGrawHill publication.

#### Reference Books:

1. Modi, H.A. Elementary Microbiology - Vol -I, AktaPrakashan, Nadiyad.
2. Modi, H.A. Elementary Microbiology – Vol-II, AktaPrakashan, Nadiyad.
3. Dubey, R.C.and Maheshwari, D.K., A Text Book of Microbiology, S. Chand Publications, New Delhi.
4. Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi.

5. Powar and Dagainawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.
6. Atlas. R.M., Principles of Microbiology- 2<sup>nd</sup> Edition ,

### Pedagogic tools:

- Chalk and Board
- PPT and Videos.
- Assignment
- Class Activity: Think-Pair-Share / Class Test

### Suggested reading / E-resources

- Bacterial Growth Curve Protocol | Protocols | Microbe Notes
- NPTEL :: Biotechnology - Microbiology
- 9: Microbial Growth - Biology LibreTexts
- Lecture notes, lecture 1 - Micro Chapter The microbial world The microbes - StuDocu

### Suggested MOOCs

- General Microbiology - Course (swayam2.ac.in)

### Methods of assessing the course outcomes

Components of CIA: 30 marks

Sr. No.	Component	Content	Duration (if any)	Marks	Sub Total
A	Test 1	1 <sup>st</sup> & 2 <sup>nd</sup> Units	1 <sup>1/2</sup> hours	30	05
	Test 2	Units 3,4,5	3 hours	70	15
B	Assignment-1	Any topic from the syllabus	By the end of 8 <sup>th</sup> week	20	05
C	Assignment-2	Any topic from the syllabus	Before 2 <sup>nd</sup> CIA	20	05
<b>Grand Total</b>					<b>30</b>



## Syllabus – Semester – II

Department: **Microbiology**

Programme: **B.Sc. Microbiology**

Course Code	Course Title (F)	Credits
21UMBCC202	Core 4: Basic Biochemistry (F)	4 Credits

### Course Description:

Basic Biochemistry is appropriate for students with some background in the fundamentals of biochemistry. This course introduces the basic structure and functions of elements of life and the biomolecules as well. From this subject student will be able identify the basic structure of monosaccharide, amino acids, nitrogenous base, and other polymeric forms of biomolecules like carbohydrates, proteins, lipids and nucleic acids through the lectures, group activities, class test and homework projects. after complications of this paper students can very well understand the basic properties and the importance of biomolecules in the biological system.

### Course Objectives:

1. Understand the basics of structure of cellular matter, various types of reactions, pH scale and the special properties of water
2. Understand the structure of fundamental monosaccharide, its properties and polysaccharides
3. Understand the structures of amino acids, their chemical properties and their organization into polypeptides and proteins.
4. Understand structure and basic function of nucleotides
5. Understand structure of different classes of lipids and their roles in biological systems
6. Outline the chemical and physical properties of enzymes, mechanism of enzyme actions, factors affecting enzyme activity and enzyme synthesis.

<b>Course Outcomes:</b> Upon completion of this course, the learner will be able to		
<b>CO No.</b>	<b>CO Statement</b>	<b>Blooms taxonomy Level (K1 to K4)</b>
CO <sub>1</sub>	Understand the basics of structure of cellular matter, various types of reactions, pH scale and the special properties of water	K2
CO <sub>2</sub>	Understand and differentiate the structure and properties of fundamental monosaccharides,	K2
CO <sub>3</sub>	To relate and describe the flow of structural and functional differences among all the amino acids and proteins, for the microbial growth.	K2
CO <sub>4</sub>	Identify the structure and basic function of nucleotides. Understand structure of different classes of lipids and their roles in biological systems	K2
CO <sub>5</sub>	Outline the chemical and physical properties of enzymes ,mechanism of enzyme actions, factors affecting enzyme activity and enzyme synthesis.	K2

<b>Course Content</b>	<b>Hours</b>
<b>Unit 1: Basic Biochemistry</b>	<b>12hrs</b>
<ul style="list-style-type: none"> <li>• Introduction to Atoms, Elements &amp; Molecules</li> <li>• Major Chemical bonds found in biological system: Ionic Bonds, Covalent Bonds, Hydrogen Bonds, Van der Waals interactions, Hydrophobic interactions</li> <li>• Introduction to pH</li> <li>• Major Chemical reactions: Acid Base, Redox, Condensation-Hydrolysis Reactions</li> <li>• Water and its important properties</li> </ul>	
<b>Unit 2: Carbohydrates</b>	<b>12hrs</b>
<ul style="list-style-type: none"> <li>• Definition and Functions of Carbohydrates</li> <li>• Classification of Carbohydrates</li> <li>• Structure and properties of Monosaccharide</li> <li>• Types and importance of Disaccharides</li> <li>• Types of importance of Polysaccharides</li> </ul>	

<b>Unit 3: Proteins</b>	<b>12hrs</b>
<ul style="list-style-type: none"> <li>• Definition and Functions of Proteins</li> <li>• Classification of Proteins</li> <li>• Amino acids: Classification</li> <li>• Physical &amp; Chemical Properties of Amino acids</li> <li>• Structure of Proteins: Primary, Secondary, Tertiary &amp; Quaternary Levels</li> </ul>	
<b>Unit 4: Lipids and Nucleic acids</b>	<b>12hrs</b>
<ul style="list-style-type: none"> <li>• Definition, Functions and Classification of Lipids</li> <li>• Fatty acids: Structure and types, Introduction to phospholipids: Examples and Significance</li> <li>• Introduction and Significance of Steroids</li> <li>• Introduction to Nitrogen Base, Nucleosides &amp; Nucleotides, Structure of Deoxyribonucleic acid: A-DNA, B-DNA, Z-DNA</li> <li>• Introduction to RNA &amp; its types</li> </ul>	
<b>Unit 5: Enzymes</b>	<b>12hrs</b>
<ul style="list-style-type: none"> <li>• Definition of Enzymes, Apoenzyme, Core Enzyme, Holo enzyme, Coenzyme, Cofactors, Prosthetic Groups, and Classification</li> <li>• Mechanism of enzyme action – Active Sites, Activation Energy, Lock &amp; Key Model, Induced Fit model</li> <li>• Factors affecting enzyme activity</li> <li>• Enzyme inhibition</li> <li>• Phenotypic and genotypic regulation of Enzymes</li> </ul>	

#### **Text Books:**

1. Atlas, R.M., Bartha, R. (1997). Microbial Ecology, 4<sup>th</sup> Edition: Benjamin Cummings publication (UNIT: 1)
2. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi. (UNIT: 2 – 5)
3. Powar, C.B., Daginawala, J.F. (2010). General Microbiology Vol-I. Mumbai: Himalaya Publishing House. (UNIT: 2 - 5)

#### **Reference Books:**

1. Conn E.E., Stumpf P.K. (1989). Outlines of Biochemistry. Wiley publication.
2. Stanier, R.Y. (1987). General Microbiology, 5<sup>th</sup> Edition: Macmillan publication.

3. Nelson, D.L., Cox, M.M. (2013). Lehninger: Principles of Biochemistry. W.H. Freeman publication.
4. Satyanarayan, U. (2008). Biotechnology. Kolkata, West Bengal: Books and allied (P) Ltd

**Pedagogic tools:**

- Chalk and Board
- PPT and Videos.
- Assignment
- Class Activity: Think-Pair-Share / Class Test

**Suggested reading / E-resources**

- NPTEL :: Biochemistry
- Lecture notes
- Biochemistry free & easy. (kindle edition)
- Lippincott's illustrated q&a review of biochemistry. (kindle edition)

**Suggested MOOCs**

- Biochemistry - Course (swayam2.ac.in)
- Food Microbiology and Food Safety - Course (swayam2.ac.in)

**Methods of assessing the course outcomes**

Components of CIA: 30 marks

Sr. No.	Component	Content	Duration (if any)	Marks	Sub Total
A	Test 1	1 <sup>st</sup> & 2 <sup>nd</sup> Units	1 <sup>1/2</sup> hours	30	05
	Test 2	Units 3,4,5	3 hours	70	15
B	Assignment-1	Any topic from the syllabus	By the end of 8 <sup>th</sup> week	20	05
C	Assignment-2	Any topic from the syllabus	Before 2 <sup>nd</sup> CIA	20	05
<b>Grand Total</b>					<b>30</b>

## Syllabus – Semester – II

Department: **Microbiology**

Programme: **B.Sc. Microbiology**

Course Code	Course Title (F)	Credits
21UMBCC102	Core 5: Cell Biology (F 2)	4 Credits

### Course Description:

This course covers study of structure and functions of prokaryotic and Eukaryotic cells. This course is segregated into different units elucidating cell theory, history of cell biology, cell evolution, prokaryotic cell structure and function, structure and functions of cellular organelles of eukaryotic cell, cell membrane structure, transport mechanism of macro and small molecules, cell cycle, and intercellular and intracellular transport.

### Course Purpose:

This course aims to provide basic understanding of structure and functions of prokaryotic and eukaryotic cell. This is designed in such a way that learners will be able to understand Historical developments of cell, cell theories and concepts; Cell structure and function of bacteria and archaea, Importance of membrane chemistry and regulation in cell communication; Intracellular signalling cascades and their impact on cellular activities, including cytoskeleton rearrangements and motility; Mechanisms of cell cycle stages and regulation; structure and functions of cellular organelles. This course will make students skilful in isolation and identification of gram positive and gram-negative bacteria, fungi, and microalgae; Staining and microscopic examination of cell and subcellular structures; Quantitative and qualitative estimation of cell components such as protein, carbohydrate and enzymes.

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

CO No.	Course Outcomes Statement	Blooms taxonomy Level (K <sub>1</sub> to K <sub>6</sub> )
CO <sub>1</sub>	Appreciate and understand the dynamic nature of the cell, including how it receives information and responds to its environment.	K <sub>2</sub>
CO <sub>2</sub>	Comprehend various stages of cell cycle	K <sub>1</sub>
CO <sub>3</sub>	Understand cellular transport mechanisms and how cellular organelles work and regulate biochemical synthesis in cell	K <sub>1</sub>

CO <sub>4</sub>	Learn & Apply techniques of microscopic analysis of cell and cellular structures	K3
CO <sub>5</sub>	Learn & apply the methods of qualitative and quantitative estimation of protein, carbohydrate and enzymes	K2

Course Content	Hours
<b>Unit-I: Cell theory and concepts</b>	<b>12 hrs</b>
<ul style="list-style-type: none"> <li>• Cell concept, principal levels of cellular organization</li> <li>• History of cell biology</li> <li>• Structural organization in Prokaryotes and Eukaryotes</li> <li>• Eukaryotic cell: Animal and Plant cell</li> <li>• Endosymbiosis: Chloroplast, Hydrogenosome and Mitochondria</li> </ul>	
<b>Unit-II: Prokaryotic cell: Structure and Functions</b>	<b>12 hrs</b>
<ul style="list-style-type: none"> <li>• Bacterial cell wall: Structure and function</li> <li>• Archaeal cell wall: Structure and function</li> <li>• Ribosomes: Structure and function</li> <li>• Capsule and spore: structure and function</li> <li>• Plasmids in prokaryotes and their functions</li> </ul>	
<b>Unit-III: Eukaryotic cell: Structure and Functions</b>	<b>12 hrs</b>
<ul style="list-style-type: none"> <li>• Chloroplast: Ultrastructure and function</li> <li>• Mitochondria: structure, morphogenesis, and functions</li> <li>• Lysosomes, Peroxisomes and Glyoxisomes: Structure &amp; functions</li> <li>• Centrosomes, Centrioles, and Cytoskeletal elements</li> <li>• Motility: Cilia and Flagella</li> </ul>	
<b>Unit-IV: Cell wall, intercellular and intracellular transport</b>	<b>12 hrs</b>
<ul style="list-style-type: none"> <li>• Plant cell wall: its ultra-structure and function</li> <li>• Intercellular transport: tight junction, intermediate junction, spot desmosome, gap junctions, plasmodesmata</li> <li>• Endoplasmic reticulum: structure and function</li> <li>• Golgi apparatus: structure and function</li> <li>• GERL system and its role in intra-cellular secretion</li> </ul>	
<b>Unit-V: Cell Membrane structure, Transport and Cell cycle</b>	<b>12 hrs</b>
<ul style="list-style-type: none"> <li>• Models of cell membrane</li> <li>• Structural organization of plasma membrane – Fluid Mosaic Model</li> <li>• Cellular transport of small molecules: Active and Passive Transport</li> <li>• Cellular transport of Macromolecules: Endocytosis, Receptor mediated endocytosis, Pinocytosis and exocytosis</li> <li>• Cell Cycle and Cell Division – Mitosis and Meiosis</li> </ul>	

**Text Books:**

1. De Robertis, EDP, De Robertis EMF. (2006). Cell and Molecular Biology, 8<sup>th</sup> edition. Philadelphia: Lipincott Williams and Wilkins. (UNIT: 1 – 5)
2. Verma, P.S., Agrawal, V.K. (2005). Ecology, Cell Biology, Molecular Biology, Genetics. New Delhi: S. Chand and Company Limited. (UNIT: 1 – 5)

**Reference Books:**

1. Presscott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology, 5<sup>th</sup> Edition. New York: WCB Mc GrawHill publication.
2. Stanier, R.Y. (1987). General Microbiology, 5<sup>th</sup> Edition: Macmillan publication.
3. Tortora, G.J., Funke, B.R., Case, C.L. (2008). Microbiology, 8<sup>th</sup> Edition: McGraw Hill Company.

**Pedagogic tools:**

- Chalk and Board
- Power point presentation
- Video
- Seminars

**Methods of Assessment & Tools:**

Components of CIE: 30 marks

Sr. No.	Component	Content	Duration (if any)	Marks	Sub Total
A	Test 1	1 <sup>st</sup> 2 units	1 <sup>1/2</sup> hours	5 (Set for 30)	20
	Test 2	All 5 units	3 hours	15 (Set for 70)	
B	Assignment			04	10
C	Class activity			06	
<b>Grand Total</b>					<b>30</b>
<b>Assignment</b>		<ul style="list-style-type: none"> <li>• Power point presentation of given topic</li> <li>• Chart preparation</li> </ul>			
<b>Class activity</b>		<ul style="list-style-type: none"> <li>• Quiz</li> <li>• Class Test</li> <li>• Seminars</li> <li>• Group Discussion</li> </ul>			

Note: Any other assessment tools or methods can be adopted as per requirement of the course

## Syllabus – Semester – II

Course Code	Course Title (F)	Credits
21UMBCC204	<b>Core Practical - 2: Microbial Diversity and Biochemistry</b>	<b>2 Credits</b>

### **Course Description:**

This course covers the study of isolation and laboratory cultivation of some major groups of microorganisms, like bacteria, fungi, and virus as well as microscopic observation of algae and protozoa from natural sample. The course also involves the basic analytical techniques for the qualitative and quantitative estimation of biomolecules. Microscopic observation of some intracellular organelles also makes a major part of the course.

### **Course Purpose:**

This course aims to provide basic understanding of isolation and cultivation techniques to help student understand the growth characteristics of different microorganisms. The course is designed in such a way that learners will be able to understand the use of various methods of microbial identification, especially by biochemical and morphological methods. Microscopic observation and study of microbial morphology and cellular structure will enable students to identify and distinguish microbes on the basis of morphology and colony characters. This course will also make students skilful in qualitative and quantitative estimation of various biomolecules. Further it will also facilitate students to understand the sub-cellular organelles by microscopic observation of cells. .

<b>Course Outcomes:</b> Upon completion of this course, the learner will be able to		
CO No.	Course Outcomes Statement	Blooms taxonomy Level (S <sub>1</sub> to S <sub>6</sub> )
CO <sub>1</sub>	Understand the methods of isolation of different groups of microorganisms	S1
CO <sub>2</sub>	Comprehend principle and procedure of identification of bacteria using various biochemical media	S1
CO <sub>3</sub>	Analyse the qualitative and quantitative aspect of biomolecules using analytical techniques.	S1
CO <sub>4</sub>	Learn & Apply techniques of microbial characterization using morphological features seen under microscope	S3
CO <sub>5</sub>	Learn & apply the methods of microbial identification	S2



Sr. No.	Experiment
1	Isolation of Gram negative bacteria from the given sample.
2	Identification of Gram negative bacteria from the given pure culture using biochemical media ( <i>E.coli</i> , <i>Enterobacter aerogens</i> , <i>Proteus</i> , <i>Salmonella</i> )
3	Isolation of Gram positive bacteria from the given sample.
4	Identification of Gram positive bacteria from the given pure culture using biochemical media ( <i>Bacillus megaterium</i> , <i>Bacillus subtilis</i> , <i>Staphylococcus aureus</i> )
5	Identification of Fungi on the basis of Morphological Characteristics.
6	Cultivation of yeast from different natural samples and its morphological characterization using microscopic observation.
7	Microscopic observation of different algae from the given samples.
8	Microscopic observation of different protozoa from the given sample.
9	Isolation and cultivation of bacteriophage of <i>E.coli</i> from the given sewage sample.
10	Estimation of Protein by Foiln-Lowry's Method.
11	Estimation of Sugar by Cole's Method.
12	Estimation of Reducing sugar by DNSA method
13	Estimation of DNA by DPA Method.
14	Qualitative Analysis of Carbohydrates.
15	Qualitative Analysis of Proteins & Amino acids.
16	Determination of alpha amylase activity by iodometric method.
17	Demonstration and study of various phases of mitosis and meiosis
18	Microscopic observation of plant cells from onion
19	Microscopic observation of Barr bodies and Drum stick
20	Mitochondrial staining

### Reference Books:

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1. Jayaraman, J. (2011). Laboratory Manual in Biochemistry: New Age International Private Limited. India
2. Sawhney S.K., Singh, R. (2005). Introductory Practical Biochemistry: Alpha Science International.
3. Cappuccino, J.G., Sherman, N. (2004). International student edition: Microbiology- A laboratory Manual 4<sup>th</sup> edition: Benjamin Cummings publications

**Pedagogic tools:**

- Chalk and Board
- Power point presentation
- Video

**Methods of Assessment & Tools:**

Components of CIE: 40 marks

<b>Sr. No.</b>	<b>Component</b>	<b>Content</b>	<b>Duration (if any)</b>	<b>Marks</b>	<b>Sub Total</b>
<b>A</b>	Test	After the completion of 60-70% of the performance practical	6 hrs ( 3 hrs on Day – 1 and 3 hrs on Day – 2)	30	30
<b>B</b>	Laboratory book and Journal	-	-	10	10
<b>Grand Total</b>					<b>40</b>

## DEPARTMENT OF MICROBIOLOGY

### PART III – SEC – III

### VALUE ADDED COURSE

(To be offered from Semester – II – V)

21UAEVA01	Mushroom Cultivation	40 hrs Duration	2 Credits
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### **Course Profile:**

Once called “Food of the Gods”, edible Mushrooms are still treated as a garnish or delicacy and can be considered as healthy food rich in crude fiber, protein, low fat, low calories, high content vitamins, and mineral. Mushrooms also possess multi-functional medicinal properties. Mushroom cultivation technology is environmentally friendly as many organic waste and refuse can be used for this purpose. The potential of mushroom farming in generating new employment opportunities is another positive element emanating from mushroom farming ventures. The course aims at developing skills and making the students become self-reliable and employable besides giving them an edge to become entrepreneur. That is, when students pass out of the college with their degrees, they also are equipped with additional skills to meet the challenges in future.

### **Employment Opportunities:**

#### **a. Job Prospects:**

1. Lab assistant in mushroom labs.
2. Mushroom marketer in a industry
3. Mushroom lab equipment operator in a lab.
4. Mushroom spawn producer in a lab.
5. Mushroom processor in a farm.

#### **b. Entrepreneur:**

1. Mushroom spawn produce
2. Mushroom grower (crop producer),
3. Mushroom marketer
4. Mushroom processor.

### **Duration of course:**

The course shall be conducted in batches for 40 Hours as per the declared schedule as and when a batch is filled up. Students may opt to enrol anytime of their study from the II to V semesters.

### **Examinations:**

The course carries 2 credits and the students will be evaluated on the basis of their performance in skill development and learning through regular practicals, assignments, field trips, group projects and tests. The pattern of evaluation will be 100% internal.

Certificates will be issued by the Autonomous College to the candidates on successful completion of the Course.

### **Course Objectives:**

The Course is designed:

- To enable the students to identify the edible and poisonous mushrooms.
- To provide hands-on training for the preparation of bed for mushroom cultivation and its harvesting, pests and diseases control and post harvesting management.
- To provide the students awareness about the marketing trends of Mushrooms.
- To help the students to learn a means of self-employment and income generation.

#### **UNIT I: Introduction**

**10hrs**

- Introduction: General History, edible mushrooms, mushrooms with medicinal importance and poisonous mushrooms.
- Common Indian mushrooms.
- Nutritional value, medicinal value and advantages.
- Systematic position, morphology, distribution, structure and life cycle of *Agaricus*.

#### **UNIT II: Basics of Mushroom Cultivation**

**10hrs**

- Fundamentals of cultivation system- small village unit & larger commercial unit.
- Principles of mushroom farm layout- location of building plot, design of farm, bulk chamber, composting platform, equipments & facilities , pasteurization room & growing rooms.
- Cultivation: Paddy straw mushroom – substrate, spawn making.
- Methods – bedmethod, polythene bag method, field cultivation.
- Oyster mushroom cultivation –Substrate, spawning, pre-treatment of substrate.

#### **UNIT III: Post Cultivation process**

**10hrs**

- Maintenance of mushroom.
- Diseases- Common pests, disease prevention and control measures.
- Processing - Blanching, steeping, sun drying, canning, pickling, freeze drying.
- Storage – short term and long term storage.

#### **UNIT IV: Economics of Mushroom Cultivation**

**10hrs**

- Production level, economic return, Foreign exchange from Mushroom cultivating countries and international trade.

## **Practical**

1. Identification of Edible and poisonous mushrooms
2. Microscopic observations of mushrooms
3. Cultivation of mushrooms at laboratory level

## **Text Books**

1. Harander Singh. 1991. Mushrooms- The Art of Cultivation- Sterling Publishers.
2. Kaul, T.N. (1997). Introduction to Mushroom Science (Systematics). Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi & Calcutta, India.
3. Vijaya Khader (1998). Mushrooms for Livelihood. Kalyani Publishers, Ludhiana, India.

## **Reference books**

1. Mushroom Production and Processing Technology, Pathak Yadav Gour (2010) Published by Agrobios (India).
2. Singh, Reeti and Singh, V.C. (2005). Modern Mushroom Cultivation. Agrobios, India.
3. Suman, B.C. and Sharma, V.P. (2005). Mushroom Cultivation and Uses. Agrobios, India.