

ANNEXURE 18B07

V.V. VANNIAPERUMAL COLLEGE FOR WOMEN



(Belonging to Virudhunagar Hindu Nadars)

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai

Re-accredited with 'A' Grade (3rd Cycle) by NAAC

VIRUDHUNAGAR - 626 001

CHOICE BASED CREDIT SYSTEM

REGULATIONS AND SYLLABUS

(with effect from Academic Year 2018 - 2019)

V.V. Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 19 UG Programmes, 14 PG Programmes, 6 M.Phil. Programmes and 3 Ph.D. Programmes. All these programmes, except Ph.D. Programmes, have been framed as per the guidelines given by UGC under Choice Based Credit System (CBCS).

The Departments of Commerce, English and History upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The Students' performance will be evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

List of Programmes in which CBCS/Elective Course System is implemented

UG PROGRAMMES

- | | | |
|--------------------------|---|--|
| Arts & Humanities | : | History (E.M. & T.M.), English and Tamil |
| Physical & Life Sciences | : | Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology and Computer Applications. |
| Commerce & Management | : | Commerce, Commerce with Computer Applications, Commerce with Professional Accounting
Business Administration |

PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Biochemistry, Food Processing & Quality Control, Chemistry, Zoology, Computer Science, Information Technology
Commerce & Management	:	Commerce, Business Administration

PRE-DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Biochemistry
Commerce & Management	:	Commerce

OUTLINE OF CHOICE BASED CREDIT SYSTEM

1. Core Courses
2. Elective Courses
 - 2.1. Discipline Specific Elective Courses (DSEC)
 - 2.2. Dissertation / Project
3. Non Major Elective Courses (NMEC)
4. Generic Elective Courses (GEC)
5. Ability Enhancement Courses (AEC)
 - 5.1 Ability Enhancement Compulsory Courses (AECC)
 - 5.2. Skill Enhancement Courses (SEC)

List of Non Major Elective Courses (NMEC) Offered

UG PROGRAMMES

Name of the Course	Semester	Department
History of India upto A.D.1858	III	History(EM)
இந்திய வரலாறு கி.பி. 1858 வரை	III	History (TM)
Indian National Movement (A.D 1885-1947)	IV	History(EM)
இந்திய தேசிய இயக்கம் (கி.பி. 1885 – 1947)	IV	History(TM)
English for Professions I	III	English
English for Professions II	IV	
இக்காலநீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi – I	III	Hindi
Basic Hindi – II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude – I	III	Mathematics
Statistics and Operation Research	IV	
Physics in Everyday life	III	Physics
Fundamentals of Electronics	IV	
Industrial Chemistry	III	Chemistry
Drugs and Natural Products	IV	
Applied Zoology	III	Zoology
Animal Science	IV	
Basic Food Science	III	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	IV	
Women and Health	III	Biochemistry
Life style associated disorders	IV	
Medical Lab Technology	III	Microbiology
Applied Microbiology	IV	
Infectious Diseases	III	Biotechnology
Organic Farming	IV	
Basics of Fashion	III	Costume Design And Fashion
Interior Designing	IV	
Introduction to Computers and Office Automation	III	Computer Science
Introduction to Internet and HTML 5	IV	
Computer Fundamentals and E-mail	III	Information Technology
Introduction to HTML	IV	
Fundamentals of Computers	III	Computer Applications
Web Design with HTML	IV	
Horticulture – I	III	Botany
Horticulture – II	IV	
மருத்துவதாவரவியல் - I	III	
மருத்துவதாவரவியல் - II	IV	
Library and Information Science – I	III	Library Science
Library and Information Science - II	IV	

List of Generic Elective Courses (GEC) Offered

GENERIC ELECTIVE COURSES – 1

1. Human Rights/
2. Women Studies

GENERIC ELECTIVE COURSES – 2

1. Constitution of India/
2. Modern Economics/
3. Adolescent Psychology/
4. Disaster Management

ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)

1. Environmental Studies
2. Value Education

மேல்நிலை கல்வி வரை தமிழை முதன்மை பாடமாக எடுத்து படிக்காத மாணவிகள் கீழ்க்கண்ட பாடங்களை கட்டாயம் படிக்க வேண்டும்

1. அடிப்படை தமிழ் -எழுத்தறிதல்
2. அடிப்படைத் தமிழ் -மொழித்திறனறிதல்

ELIGIBILITY FOR ADMISSION

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamilnadu or any other equivalent Examination accepted by Academic Council with Biology as one of the subjects in Higher Secondary Course.

DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of three academic years (six semesters).

MEDIUM OF INSTRUCTION

English

COURSES OFFERED

Part I : Tamil/Hindi

Part II: English

Part-III:Core Courses

Elective Courses: Discipline Specific Electives Courses

Field Project

Allied Courses: 1.Chemistry

2. Concepts in Biology

Part IV:Non-Major Elective Courses (NMEC)

Generic Elective Courses (GEC)

Ability Enhancement Compulsory Courses (AECC)

Skill Enhancement Courses (SEC)

Part V : National Service Scheme, Physical Education, Youth Red Cross

Society, Red Ribbon Club, Science Forum, Eco Club, Library and

Information Science, Consumer Forum, Health and Fitness Club,

National Cadet Corps

Study Tour/ Field visit is mandatory for UG students.

Internship / Field Project is compulsory for II year UG Science students

Internship: A designated activity that carries one credit involving more than 7 days of working in an organization under the guidance of an identified mentor**Field Project:** Project students comprising of maximum 5 members in a team need to undertake project that involve conducting surveys inside/outside the college premises and collection of data from designated communities or natural places.**EVALUATION SCHEME**

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	100
Practical	40	60	100
Project	40	60	100

PART III - Core Courses, Discipline Specific Elective Courses & Allied Courses

INTERNAL ASSESSMENT**Distribution of Marks****Theory**

Mode of Evaluation		Marks
Periodic Test	:	15
Assignment	:	5
Quiz	:	5
Total	:	25

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Best of the two will be considered

Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Model Test	:	30
Performance	:	10
Total	:	40

Two Model Tests - Best one will be considered

Performance - Attendance and Record

Question Pattern for Periodic Tests**Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q.No.(1- 4)	Multiple Choice	4	4	1	4
B Q.No.(5- 7)	Either or type	3	3	7	21
C Q.No.(8-10)	Open Choice	3	2	10	20
				Total	45

EXTERNAL EXAMINATION**Question Pattern****Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 10)	Multiple Choice (Atleast Two question from each unit)	10	10	1	10
B Q. No.(11 -15)	Either Or type (one set from each unit)	5	5	7	35
C Q. No.(16-20)	Open Choice (one from each unit)	5	3	10	30
Total					75

ONLINE ASSESSMENT

Online Test will be conducted for the Core Courses in V & VI Semester.

Multiple Choice questions Pattern will be followed.

PART IV - Skill Enhancement Courses and Non Major Elective Courses**INTERNAL ASSESSMENT****Distribution of Marks****Theory**

Mode of Evaluation		Marks
Periodic Test	:	25
Assignment	:	10
Quiz	:	5
Total	:	40

Three Periodic tests - Average of the best two will be considered

Two Assignments - Best of the two will be considered

Three Quiz Tests - Best of the three will be considered

Question Pattern**Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 4)	Open Choice	4	3	5	15
B Q. No.(5- 6)	Open Choice	2	1	10	10
Total					25

EXTERNAL EXAMINATION**Question Pattern****Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 8)	Open Choice	8	6	5	30
B Q. No.(9- 13)	Open Choice	5	3	10	30
Total					60

PART IV- Generic Elective Courses and Ability Enhancement Compulsory Courses

- Assessment by Internal Examiner only
- Model Examination is conducted after two periodic tests.
- Book and Study Material prepared by the Faculty Members of the respective departments will be prescribed.

ASSESSMENT PATTERN

Mode of Evaluation		Marks
Periodic Test	:	30
Assignment	:	10
Model Examination	:	60
Total	:	100

Two Periodic tests - Best of the two will be considered

Two Assignments - Best of the two will be considered

Question Pattern for Periodic Test**Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 4)	Open Choice	4	3	6	18
B Q. No.(5- 6)	Open Choice	2	1	12	12
Total					30

Question Pattern for Model Examination**Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 8)	Open Choice	8	5	6	30
B Q. No.(9- 13)	Open Choice	5	3	10	30
Total					60

ELIGIBILITY FOR THE DEGREE

- i) The candidate will not be eligible for degree without completing the prescribed Courses of study and a minimum Pass marks in all the Courses.
- ii) Attendance, progress and conduct certification from the Head of the Institution will be required for the students to write the examination.
 - No Pass minimum for Internal Assessment.
 - Pass minimum for External Examination is 27 marks out of 75 marks for Core Courses, Allied Courses and Discipline Specific Elective Courses.
 - Pass minimum for External Examination is 21 marks out of 60 marks for Non Major Elective Courses and Skill Enhancement Courses.
 - The aggregate minimum pass percentage is 40.
 - Pass minimum for External Practical Examination is 21 marks out of 60 marks.
 - Pass minimum for Generic Elective Course and Ability Enhancement Compulsory Courses is 40.

B.Sc. MICROBIOLOGY (SEMESTER)

Programme Code -2024

PROGRAMME OUTCOMES

The students will be able to

- get an in-depth understanding of the subject.
- develop an effective oral and written communication.
- have wider social mobility into reality.
- outsource the acquired knowledge with social concern and responsibility.
- have a wholesome personality by imbibing ethical and traditional values.
- strengthen the passion for learning with vigour and self-motivation.

PROGRAMME SPECIFIC OUTCOMES

On the completion of B.Sc., Microbiology the students will be able to

- understand the basic concepts in various disciplines of Microbiology including Biotechnology, Biochemistry, Genetics, Molecular biology, Virology and Immunology.
- diagnose various diseases and their transmission, treatment, control and preventive methods with the help of biotechnological, immunological & nanotechnological techniques.
- explain the elaborate description of the taxonomic classification of microbes, metabolic processes and their molecular mechanisms.
- analyze the cell structure, functions and their relationships among the microorganisms, humans, plants, animals and environment.
- understand the various structural and enzymatic properties of microbes in fermentation engineering and will employ them for developing human/environment friendly products and processes.
- develop the knowledge to handle various basic and analytical instruments used in microbiology laboratories for analyzing microbial diversity and molecular mechanisms.
- interpret the applications of biological sciences with molecular techniques to manipulate biological systems and produce products.
- analyze the molecular data using newly emerging disciplines of Microbiology such as nanobiotechnology and bioinformatics methods.
- acquire the fundamental knowledge, entrepreneurial aspects and recent updates of various disciplines of life sciences.

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PARTI TAMIL

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UTAG11	தாள்: 1 பொதுத்தமிழ்	3	100
2.	II	18UTAG21N	தாள்: 2 பொதுத்தமிழ்	3	100
3.	III	18UTAG31	தாள்: 3 பொதுத்தமிழ்	3	100
4.	IV	18UTAG41	தாள்: 4 பொதுத்தமிழ்	3	100
TOTAL				12	400

PART I HINDI

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UHDG11	Prose – I & II, Ancient Stories - I, General Essays, Functional Hindi – I & Grammar	3	100
2.	II	18UHDG21	Drama, Ancient Stories - II, Letter Correspondence, Functional Hindi-II & Grammar	3	100
3.	III	18UHDG31	Ancient Poetry, Drama, Indian History, Hindi Grammar & Functional Hindi III	3	100
4.	IV	18UHDG41	Modern Poetry, Hindi Literary Essays, Letter Correspondence, Conversation & Functional Hindi IV	3	100
TOTAL				12	400

PART II

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UENG11A	English for Advanced Learners I	3	100
		18UENG11B	English for Career Guidance - I		
		18UENG11C	English for Communicative Competence-I		
2.	II	18UENG21A	English for Advanced Learners II	3	100
		18UENG21B	English for Career Guidance - II		
		18UENG21C	English for Communicative Competence - II		
3.	III	18UENG31A	English for Advanced Learners III	3	100
		18UENG31B	English for Career Guidance – III		
		18UENG31C	English for Communicative Competence - III		
4.	IV	18UENG41A	English for Advanced Learners IV	3	100
		18UENG41B	English for Career Guidance – IV		
		18UENG41C	English for Communicative Competence - IV		
TOTAL				12	400

PART III – CORE, DISCIPLINE SPECIFIC ELECTIVE COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1	I	18UMBC11	General Microbiology	4	100
2	I	18UMBC12	Biochemistry	4	100
3	II	18UMBC21	Microbial Taxonomy	4	100
4	II	18UMBC22	Microbial physiology and Metabolism	4	100
5	II	18UMBC21P	Major Practical- I	2	100
6	III	18UMBC31	Molecular Biology	5	100
7	IV	18UMBC41	Microbial Genetics	5	100
8	IV	18UMBC41P	Major Practical –II	2	100
9	V	18UMBC51	Clinical Microbiology	4	100
10	V	18UMBC52	Immunology	4	100
11	V	18UMBC53	Bioinformatics	4	100
12	V	18UMBE51	Discipline Specific Elective 1 1. Virology 2. Diagnostic Microbiology 3. Vermitechnology	4	100
13	V	18UMBO51	Online Assessment	1	50
14	VI	18UMBC61	Agricultural Microbiology	4	100
15	VI	18UMBC62	Industrial Microbiology	4	100
16	VI	18UMBC63	Biotechnology	4	100
17	VI	18UMBE61	Discipline Specific Elective 2 1. Environmental Microbiology 2. Food Microbiology 3. Biocontrol	4	100
18	VI	18UMBO61	Online Assessment	1	50
19	VI	18UMBC61P	Major Practical –III	3	100
20	VI	18UMBC62P	Major Practical –IV	3	100
21	VI	18UMBC63P	Major Practical –V	2	100
Total				72	2000

PART III – ALLIED COURSE I- CHEMISTRY

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UCHA11	Chemistry –I	4	100
2.	II	18UCHA21	Chemistry –II	4	100
		18UCHA21P	Allied Chemistry Practical	2	100
Total				10	300

PART III - ALLIED COURSE II- CONCEPTS IN BIOLOGY

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	18UBIA31	Biology-I(Cell biology)	4	100
2	IV	18UBIA41	Biology-II (Applied biology)	4	100
3	III&IV	18UBIA41P	Biology Practicals (Cell Biology, Applied Biology Practicals)	2	100
Total				10	300

PART IV -SKILL ENHANCEMENT COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	II	18UMBS21	Microbiological and Analytical Techniques	2	100
2.	III	18UMBS31	Enzymology and Enzyme Technology	2	100
3.	IV	18UMBS41	Mushroom Technology	2	100
4.	V	18UMBS51	Cosmetic Microbiology	2	100
5.	V	18UMBS52	Pharmaceutical Microbiology	2	100
6.	VI	18UMBS61	Nanobiotechnology	2	100
Total				12	600

PART IV –NON MAJOR ELECTIVE COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UMBN31	Medical Lab Technology	2	100
2.	II	18UMBN41	Applied Microbiology	2	100
Total				4	200

**PARTIV–GENERIC ELECTIVE COURSES AND ABILITY ENHANCEMENT
COMPULSORY COURSES**

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UGVE11	Value Education	2	100
2	III	18UGEH31/ 18UGEW32	Human Rights/ Women studies	1	100
3.	IV	18UGEC41/	Constitution of India/	1	100
4		18UGEM42/	Modern Economics/		
6		18UGEA43/	Adolescent Psychology/		
7		18UGED44 18UGED44N	Disaster Management Disaster Management		
8		18UMBI41G	Internship/Field Project	1	100
9		PART V	Extension Activities	1	-
10	V	18UGES51	Environmental Studies	2	100
Total				8	400

PART –V -EXTENSION ACTIVITIES

S.No.	Sem.	Code	Title of the Course	Credit
1	I, II, III & IV	18UVNS1 18UVNS2	National Service Scheme	1
2		18UVPE1 18UVPE2	Physical Education	
3		18UVYR1 18UVYR2	Youth Red Cross Society	
4		18UVRR1	Red Ribbon Club	
5		18UVSF1	ScienceForum	
6		18UVEC1	Eco Club	
7		18UVLI1	Library and Information Science	
8		18UVCC1	Consumer Forum	
9		18UVHF1	Health and Fitness Club	
10		18UVNC1 18UVNC2	National Cadet Corps	



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BACHELOR OF MICROBIOLOGY PROGRAMME STRUCTURE

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
I	Part I	18UTAG11	Tamil/Hindi I	6	3	25	75
	Part II	18UENG11	English I	6	3	25	75
	Part III	18UMBC11	Core Course -1 General Microbiology	4	4	25	75
		18UMBC12	Core Course - 2 Biochemistry	4	4	25	75
		18UMBC21P	Core Course-3 Major Practical – I	2	-	-	-
		18UCHA11	Allied Course –I Chemistry - 1	4	4	25	75
		18UCHA21P	Allied Course Allied Chemistry Practical - I	2	-	-	-
	Part IV	18UGVE11	Value Education	2	2	40	60
	TOTAL			30	20	600	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
II	Part I	18UTAG21	Tamil /Hindi II	6	3	25	75
	Part II	18UENG21	English II	6	3	25	75
	Part III	18UMBC21	Core Course - 4 Microbial Taxonomy	4	4	25	75
		18UMBC22	Core Course - 5 Microbial Physiology and Metabolism	4	4	25	75
		18UMBC21P	Core Course - 3 Major Practical -I	2	2	40	60
	18UCHA21	Allied Course -I Chemistry - II	4	4	25	75	
	18UCHA21P	Allied Course Allied Chemistry Practical	2	2	40	60	
	Part IV	18UMBS21	SEC -1 Microbiological and Analytical Techniques	2	2	40	60
	TOTAL			30	24	800	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
III	Part I	18UTAG31	Tamil/ Hindi III	6	3	25	75
	Part II	18UENG31	English III	6	3	25	75
	Part III	18UMBC31	Core Course -6 Molecular Biology	5	5	25	75
		18UMBC41P	Core Course -7 Major Practical – II	2	-	-	-
		18UBIA31 18UBIA41P	Allied-Course -II Cell Biology Cell Biology and Applied Biology Practical-1	4 2	4 -	25 -	75 -
	Part IV	18UMBS31	SEC -2 Enzymology and Enzyme Technology	2	2	40	60
		18UMBN31	NMEC-1 Medical Lab Technology	2	2	40	60
	Part IV	18UGEH31/ 18UGEW32	Generic Elective -1 1.Human Rights/ 2. Women studies	0	1	40	60
		18UGE41/ 18UGEM42/ 18UGEA43/ 18UGED44 18UGED44N	Generic Elective -2 Constitution of India/ Modern Economics/ Adolescent Psychology/ Disaster Management Disaster Management	1	-	-	-
		TOTAL		30	20	700	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
IV	Part I	18UTAG41	Tamil /Hindi IV	6	3	25	75
	Part II	18UENG41	English IV	6	3	25	75
	Part III	18UMBC41	Core Course - 8 Microbial Genetics	5	5	25	75
		18UMBC41P	Core Course - 7 Major Practical –II	2	2	40	60
		18UBIA41	Allied Course – II Applied Biology	4	4	25	75
		18UBIA41P	Cell Biology and Applied Biology Practical-1	2	2	40	60
	Part IV	18UMBS41	SEC -3 Mushroom Technology	2	2	40	60
		18UMBN41	NMEC-2 Applied Microbiology	2	2	40	60
		18UMBI41G	Internship/Field Project	0	1	100	-
			Generic Elective -2				
		18UGEC41/	Constitution of India/	1	1	100	-
		18UGEM42/	Modern Economics/				
		18UGEA43/	Adolescent Psychology/				
		18UGED44 18UGED44N	Disaster Management Disaster Management				
Part V		Extension Activities	-	1	-	-	
		TOTAL	30	26	1000		

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int	Ext	
V	Part - III	18UMBC51	Core Course – 9 Clinical Microbiology	4	4	25	75
		18UMBC52	Core Course – 10 Immunology	4	4	25	75
		18UMBC53	Core Course – 11 Bioinformatics	4	4	25	75
		18UMBC61P	Core Course – 12 Major Practical - III	3	-	-	-
		18UMBC62P	Core Course – 13 Major Practical - IV	3	-	-	-
		18UMBC63P	Core Course – 14 Major Practical - V	2	-	-	-
		18UMBE51 18UMBE52 18UMBE53	DSEC - 1 1. Virology 2. Diagnostic Microbiology 3. Vermitechnology	4	4	25	75
	18UMBOL51	Online Assessment	-	1	50		
	Part - IV	18UMBS51	SEC – 4 Cosmetic Microbiology	2	2	40	60
		18UMBS52	SEC - 5 Pharmaceutical Microbiology	2	2	40	60
		18UGES51	Environmental Studies	2	2	40	60
			TOTAL	30	23	750	

Semester		Course Code	Courses	Hours per week	Credits	Total Marks	
						Int	Ext
VI	Part - III	18UMBC61	Core Course – 15 Soil & Agricultural Microbiology	5	4	25	75
		18UMBC62	Core Course – 16 Industrial Microbiology	5	4	25	75
		18UMBC63	Core Course – 17 Biotechnology	5	4	25	75
		18UMBC61P	Core Course – 12 Major Practical - III	3	3	40	60
		18UMBC62P	Core Course – 13 Major Practical - IV	3	3	40	60
		18UMBC63P	Core Course – 14 Major Practical - V	2	2	40	60
		18UMBE61 18UMBE62 18UMBE63	DSEC - 2 1. Environmental Microbiology 2. Food Microbiology 3. Biocontrol	5	4	25	75
	18UMBOL61	Online Assessment	-	1	50		
	Part - IV	18UMBS61	SEC – 6 Nanobiotechnology	2	2	40	60
			TOTAL	30	27	850	



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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester V	CLINICAL MICROBIOLOGY	Hours/Week: 4	
Core Course – 9		Credits:4	
Course Code 18UMBC51		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- acquire knowledge about the medically important microbes and infectious diseases
- know the defense system, normal flora and mechanism of pathogenesis in human body.
- understand the etiology, prophylaxis and diagnosis methods of various infectious diseases.
- analyze the features of newly emerged viral diseases.
- learn different approaches, current techniques and tools used to identify pathogens.

UNIT I

The History of Infectious Diseases: Human and microbe interactions – Normal flora in human body- Mechanism of pathogenesis- Host–defense mechanisms. Epidemiology of infectious diseases – Nosocomial infections. (7Hours)

UNIT II

Bacterial diseases: Cultural and Biochemical characteristics, Transmission, diagnosis, clinical symptoms and treatment of bacterial diseases- Tuberculosis, Cholera, Typhoid, Syphilis, UTI (*E.coli*), Staphylococcal and Streptococcal diseases. (10Hours)

UNIT III

Viral diseases: Etiology, prophylaxis, clinical symptoms and treatment for human viral diseases - Rabies, Hepatitis, Poliomyelitis, Dengue Fever and Flu Fever (H1N1).

(10Hours)

UNIT IV

Fungal diseases: Cutaneous mycoses: Dermatomycosis - subcutaneous mycoses: Mycetoma - systemic mycoses: Histoplasmosis - Opportunistic mycoses: Aspergillosis and Candidiosis.

(9Hours)

UNIT V

Protozoan diseases: Life cycle, diagnosis and treatment of protozoan diseases – amoebiasis, malaria, filariasis, kala-azar and trypanosomiasis.

(9Hours)

TEXT BOOKS

1. Ananthanarayanan, R., & Jayaram Panicker, C.K. (2005). *Textbook of Microbiology*, 9th edition. Hyderabad: Orient Longman.
2. Rajan, S. (2009). *Medical Microbiology*, 1st edition. New Delhi: MJP Publishers.

REFERENCE BOOKS

1. Jawetz, E., Melnick, J.L., & Adelberg, E.A. (2004). *Medical microbiology*, 21st edition. New York: McGraw Hill Companies.
2. David Greenwood. (1997). *Medical Microbiology*, 15th edition. London: Churchill Livingstone publisher.
3. Patrick Murray, R. (1990). *Medical Microbiology*, 1st edition. United States: The C.V. Mosby Company.
4. Rajesh Karyakarte, P. (2005). *Medical Parasitology*, 3rd edition. Kolkata: Books and Allied (P) Ltd.

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VIRUDHUNAGAR - 626 001

B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester V	IMMUNOLOGY	Hours/Week: 4	
Core Course – 10		Credits:4	
Course Code 18UMBC52		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- understand the basic concepts of innate and adaptive immunity.
- describe the various cell types and organs involved in the immune response.
- apply the basic techniques for identifying antigen and antibody interactions.
- illustrate the adverse effect of immune system including allergy, hyper sensitivity and autoimmunity.
- describe the immunological response against transplantation and tumor.

UNIT I

Basic concepts in immunology (History), overview of the Immune system Humoral and cell mediated immune response –principles of innate and acquired immunity – Cells and organs of the immune system. (10 Hours)

UNIT II

Antigen and their characteristics – factors influence the antigenicity. Haptens and Adjuvants. Antibody - structure, types and characterization. Monoclonal antibodies– Introduction, production and uses. Antigen- Antibody reactions- Precipitation(Ouchterlony double immunodiffusion) and agglutination(Blood typing). (10 Hours)

UNIT III

B cell maturation, activation and differentiation. Major Histocompatibility complex (MHC) – antigen processing and differentiation. T cell maturation, activation and differentiation- complement system – Classical and alternative pathway. (10 Hours)

UNIT IV

Hypersensitivity reaction – Types and mechanism. Auto immunity – induction of autoimmunity, mechanism of tissue damage in autoimmunity, autoimmune diseases – Rheumatoid arthritis and autoimmune thyroiditis. Immune tolerance. Vaccines. (8Hours)

UNIT V

Transplantation immunology: Basics of graft rejection & acceptance, tumor antigens, immune response to tumor. Tissue typing – HLA. Clinical transplantation- kidney and eye transplantation. (7 Hours)

TEXT BOOK

Kuby, J.(1997). *Immunology*, 3rd edition. New York: W.H. Freeman and company.

REFERENCE BOOKS

1. Roitt, I.M., (1998). *Essential of immunology*, 9th edition. New Jersey: Blackwell scientific publication.
2. Tizard, R. (2007). *Immunology*, 4th edition. United States: Thomson organization Ltd.
3. Robert Coleman, M. (1992). *Fundamental Immunology*, 2nd edition. New York: WCB Publishers.
4. Haleem Khan, A.A. (2011). *Textbook of Immunology*, 1st edition. New Delhi: Ane Books Pvt. Ltd.

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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester V	BIOINFORMATICS	Hours/Week: 4	
Core course – 11		Credits:4	
Course Code 18UMBC53		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- gain knowledge about the parts and uses of the computer in data abstraction and how to integrate these sources through networks.
- make use of information stored in biological data and its retrieval method.
- assume the method of identification of gene location, structure prediction and classification.
- assess the knowledge about organizing the data and how to relate with the family based on evolutionary changes.
- understand the difficulty in an efficient manner to develop tools that aid in analysis of data and also interpret the results in an accurate and meaningful way.
- develop skills about the theoretical uses of biologically relevant data bases for making new creativity with bioinformatics tools

UNIT I

History and development of computers; generations of computers; (I, II, III, IV and V), Block diagram of computer, Input devices: Keyboard and mouse, Modern input devices: OMR, MICR, Bar code reader, Output devices: Visual display unit (LCD & LED), Printer (Dot matrix, Ink jet and Laser), Storage devices: primary memory (RAM and ROM), Secondary memory: Magnetic storage (Hard disk), Optical storage: (CD & DVD), Solid state storage: (Pen drive & memory card). (10 Hours)

UNIT II

Bioinformatics: Introduction, Scope and objectives, Introduction of Database related programs (brief description): DBMS, RDBMS & SQL and Classification of biological databases (generalized & specialized). Internet basics: World Wide Web, HTTP, HTML, FTP, Electronic mail and Intranet, Sequence retrieval method, Operating system: Windows xp. (10 Hours)

UNIT III

Nucleotide sequence databases:NCBI - GenBank, EMBL and DDBJ, Literature Data Bank (PubMed), Pairwise alignment: gap penalty, scoring matrices, local and global sequence alignment (Dot plot, Dynamic programming), Multiple sequence alignment (Progressive alignment), Useful programs: BLAST, FASTA and ClustalW. (15 Hours)

UNIT IV

Protein sequence databases: NBRF - PIR and SWISS PROT, Secondary databases: PROSITE, Protein structural databases: PDB, Protein structural classification databases: CATH and SCOP, Secondary structure prediction: Chou Fasman, GOR and Neural network methods. (15 Hours)

UNIT V

Carbohydrate structure database: CCSD, Glycome DB, Metabolic or Enzyme databases: BRENDA, KEGG pathway database, Specialized database: genome data base and EST, Evolutionary analysis: Cladistic methods (Maximum parsimony and Maximum likelihood) and Phenetic methods (UPGMA and Neighbor Joining). Phylogenetic analysis tools - Phylip. (10 Hours)

TEXT BOOKS

1. Sundaralingam, R., and Kumaresan,V. (2008). *Bioinformatics*, 1st edition.Nagarcoil: Saras Publication.
2. Rajaraman,V. (2010). *Fundamentals of computers*, 5th edition.New Delhi: PHI learning Pvt Ltd.

REFERENCE BOOKS

1. TeresaAttwood, K.,& David parry smith, J. (2006). *Introduction to Bioinformatics*, 1st edition. London: Dorling Kindersley Pvt, Ltd.
2. Kuppuswamy, C. (2006). *Bioinformatics*, 1st edition. New Delhi: Dominant Publishers.
3. Subramanian, C. (2006). *A textbook of bioinformatics*, 8th edition. New Delhi: Dominant Publishers.
4. Srinivasa Rao, D. (2010). *Bioinformatics*, 1st edition. Hyderabad: Biotech Pharma Publications.
5. Ignacimuthu, S.J. (2009). *Basic Bioinformatics*, 1st edition. New Delhi: Narosa Publishing House.

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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester V	VIROLOGY	Hours/Week: 4	
DSEC - 1		Credits:4	
Course Code 18UMBE51		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- understand the basic structure and principles of viral taxonomy.
- apply the basic techniques of cultivation, purification and assay of viruses.
- describe the structure and replicative cycle of animal, plant and bacteriophages.
- illustrate the interaction of virus-host and mechanism of diseases.
- gain knowledge on pathogenesis of viral infection and their inhibition by antiviral therapy and vaccination.

UNIT I

Introduction-History-Viral diversity-Classification, General structure and composition of viruses-capsid, viral envelope and nucleic acids. Cultivation, purification and assay of viruses. (10 Hours)

UNIT II

Animal viruses- Introduction, structure and replication of Pox, Adeno, Rhabdo, Influenza and HIV. Prions and Viroids. (10 Hours)

UNIT III

Plant viruses – Introduction, structure and replication of TMV, Poty virus, CaMV and Rice tungro virus. Transmission of plant viruses. Symptoms of plant virus infections. (8 Hours)

UNIT IV

Bacteriophages – Introduction- lytic and lysogenic cycle. Virulent phages- structure and replication of T4 and X174. Temperate phage- lysogenic replication of Lambda, choice between lytic and lysogenic cycle. Filamentous phage- M13. (9 Hours)

UNIT V

Control of viral diseases- prevention, immunization and treatment of viral diseases. Antiviral therapy- Acyclovir and Amantidine. Phage therapy- commercial production and treatment for bacterial infections. (8 Hours)

TEXT BOOK

1. Dr.Dubey,R.C.,&Dr. Maheswari,D.K. (2014). *A textbook of microbiology*, 4th edition. New Delhi: S. Chand & company pvt Ltd.

REFERENCE BOOKS

1. Saravanan, P. (2006). *Virology*, 1st edition. New Delhi: MJP Publishers.
2. Sawant, K.C. (2015). *Virology*, 1st edition. New Delhi: Dominant publishers.
3. Prescott, Harley & Klein. (2010). *Microbiology* 10th edition. New York: The McGraw-Hill Companies.
4. Sri Ramkumar,S.R. (2016). *Basic concepts of Microbiology and Pathology*, 1st edition. Nagercoil: Nanjil book Publishers.

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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester V	DIAGNOSTIC MICROBIOLOGY	Hours/Week: 4	
DSEC - 1		Credits: 4	
Course Code 18UMBE52		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- know the role of Microbiology laboratory for the analysis of various clinical specimens.
- understand the collection and handling procedures need to analyze body fluids.
- learn the types of hematological tests and current diagnostic procedures for identifying diseases.
- get skills for analyzing blood by routine biochemical tests.
- acquire knowledge to the novel techniques implied for diagnosing mycotic and parasitic infections.

UNIT I

Introduction to Diagnostic Microbiology – Role of Microbiology laboratory – Basic rules for working in Microbiology Laboratory. Specimen collection and Handling – Transportation of specimen – Laboratory records – Procedures for reporting of results – safety regulations – Quality control in Microbiology. (10 Hours)

UNIT II

Diagnostic Bacteriology – Collection, Handling and diagnosis of specimens: Blood (Bacteraemia), throat swab (Septic sore throat), Purulent exudates, Sputum (Tuberculosis), Stool (Dysentry), Urine(UTI)& CSF (Meningitis). (8 Hours)

UNIT III

Diagnosis of Mycotic infections – Specimen collection & Processing. Histopathology of fungal infection. Macroscopic : Wood's lamp – Microscopic : Wet mount in alkali, Indian ink (CSF) & LPCB. (9 Hours)

UNIT IV

Diagnosis of parasitic infections – Collection, Handling and preservation of faecal specimen – Laboratory examination – Gross examination – wet mount – staining – Trichome stain & Iron haematoxylin stain. (9 Hours)

UNIT V

Routine haematological tests- RBC, WBC, ESR, Haemoglobin and Platelets. Special haematological tests – Estimation of foetal Haemoglobin & Haemoglobin electrophoresis. Routine biochemical tests – Glucose, Blood urea, Creatinine, Cholesterol & Electrolytes. (9 Hours)

TEXT BOOKS

1. Mukherjee, K.L., 1988. *Medical Laboratory Technology*, Volume – I to III, 2nd edition. New Delhi: Tata McGraw-Hill Publishing Company Limited.
2. Rajan, S. (2009). *Medical Microbiology*, 1st edition. New Delhi: MJP Publishers.

REFERENCE BOOKS

1. Praful Godkar, B., & Darshan Godkar, P. (2014). *Text Book of Medical Laboratory Technology*, Volume I & II, 3rd edition. New Delhi: Bhalamni Publishing House.
2. Jawetz, E., Melnick, J.L., & Adelberg, E.A. (2004). *Medical microbiology*, 21st edition. New Delhi: McGraw Hill Companies.
3. David Greenwood. (1997). *Medical Microbiology*, 15th edition. London: Churchill Livingstone publisher.
4. Patrick Murray, R. (1990). *Medical Microbiology*, 1st edition. United States: The C.V. Mosby Company.
5. Rajesh Karyakarte, P. (2005). *Medical Parasitology*, 3rd edition. Kolkata: Books and Allied (P) Ltd.

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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester V	VERMITECHNOLOGY	Hours/Week: 4	
DSEC - 1		Credits: 4	
Course Code 18UMBE53		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- characterize the chemical profile of humic substances and their biological activities.
- describe the structure of vermibed that provides ideal conditions for worms.
- relate the types of composting to the types of crops & promotes its use in agriculture.
- understand the compounds rich in humic substances for soil amendment.
- develop an integrated and environmentally sound organic waste management system with sustainable methods.

UNIT I

Earthworms – Introduction, Types and Characteristics - Biology and Life cycle of *Lumbricusterrestris*, *Eisenia fetida*, *Eisenia andreei*, *Perionyx excavatus* – Economic importance. (9 Hours)

UNITII

Vermiculture – Organic resources – Monoculture & Polyculture. Vermicompost – Materials required - Species selection and Parameters. (9 Hours)

UNITIII

Vermicompost methods – Field pits, Ground heaps, Tank method, Roof shed, Bin, Wormery, Windows and Wedges – Harvest of vermicast. (9 Hours)

UNIT IV

Role of Microbes in Vermicomposting. Storage of vermicompost – Characterization – Uses – Vermiwash. Vermicompost in Plant Growth – Role of earthworms in soil – Aeration in plant root – Nutrient Availability. (9 Hours)

UNIT V

Plant growth parameter analysis – Standardization, Processing, Nutrient content and Economic viability of Vermicompost. Parameters and tests of product quality. (9 Hours)

TEXTBOOK

1. Mary violet Christy, A. (2014). *Vermitechnology*, 1st edition. New Delhi: MJP Publishers.

REFERENCE BOOK

Dr. Ramanathan, N., Dr. Muthukkaruppan, S.M. (2002). *Environmental Microbiology*, Chidambaram: Om Sakthi Pathippagam.

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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester V	COSMETIC MICROBIOLOGY	Hours/Week: 2	
Skill Enhancement Course - 4		Credits:2	
Course Code 18UMBS51		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, the students will be able to

- know the history and the formulation of cosmetic products in ancient as well as recent days
- get information about the uses of plants and its derived products in cosmetic industry
- knowledge about sanitation and preservative measures to control the microbial contamination in cosmetic products.
- understand cosmetic regulations and setup tests as necessary to help cosmetic companies.
- create the awareness of cosmetics preparation, uses of cosmetic products and how to overcome the impacts in cosmetic formulations

UNIT I

History and scope of cosmetic microbiology, Natural Cosmetic Agents and its antimicrobial property: garlic, neem, turmeric, thulsi and alivera, plant enzymes in cosmetics preparation. (6 Hours)

UNIT II

Sanitization basics: detergents, surfactants, chemical and physical sanitizers for sanitizing the equipment, Sanitization procedure: cleansing in manufacturing, filling and waste disposal areas, personal hygiene, raw material handling, sanitary design of air, water systems and monitoring. (5 Hours)

UNIT III

Manufacturing of cosmetics: Physical & Chemical properties of Cosmetics agents- Surface active agents, pH stabilizers, Hydrocolloids, Talc, color additives: definition, classification, properties and its significance, Preservatives: Types, Ideal characters and factors influencing the effectiveness of preservatives. (10 Hours)

UNIT IV

Dispensing of cosmetic formulations: Importance of different materials for containers and closures, Packaging of cosmetic product and labeling, appropriate recycling and disposal methods, Green packaging. (5 Hours)

UNIT V

Contamination of cosmetic products: *Pseudomonas*, *Staphylococcus* and *Clostridia*, Quality control measures in cosmetic preparation: Microbial resistance, Critical control point, and methods of detection of preservatives (PET). Laws and safety regulations. (4 Hours)

TEXT BOOK

1. Daniel Brannan,K. (2004). *Cosmetic Microbiology*, A practical Hand book, Florida: CRC press.

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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester V	PHARMACEUTICAL MICROBIOLOGY	Hours/Week: 2	
Skill Enhancement Course - 5		Credits:2	
Course Code 18UMBS52		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, the students will be able to

- know the sources of drug and their formulations during production
- understand the mechanism of drug action from absorption to expelling process
- compare the informations based on drug action and its resistance in humans as well as microbes to apply novel techniques for the identification drug structure and its interaction sites.
- infer the prime factor of drug receptor and its adverse effects with interaction of drug
- compile knowledge about drug quality evaluation and the novelty introduced in drug designing process

UNIT I

Pharmacognosy: Nature and Sources of drugs- Microbiological, mineral and plant and animal. Pharmacology-Introduction- Routes of drug administration (Enteral and parental). Pharmacokinetics: absorption, distribution, metabolism and excretion of drugs. (5 Hours)

UNIT II

Pharmacodynamics: Mechanism of action of drugs, Factors modifying drug action, Adverse reactions of drugs, Drug toxicity. (8 Hours)

UNIT III

Principles of Drug Design Synthetic procedures (Theoretic Aspects): Drug – receptor interaction, Site of drug action, Structure activity relationship, Traditional analog (QSAR) and Computer Aided Drug Designing (CADD). (5 Hours)

UNIT IV

Pharmacotherapy (chemotherapy) and Antibiotics: Mechanism of action of antibacterial drugs – Penicillin, Polymyxin, Aminoglycosides, Rifampin, Sulfonamides. Drug resistance in bacteria. (7 Hours)

UNIT V

Assessment of microbial contamination in pharmaceutical industry: Microbial limit tests, Preservative efficacy test (challenge test). Quality Assurance: Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP). (5 Hours)

TEXT BOOK

Satoskar, Kale, Bhandarka, S. (1999). *Pharmacology and Pharmacotherapeutics*, 16th edition. Mumbai: Popular prakashan.

REFERENCE BOOKS

1. Prescott, Harley & Klein, (2008). *Microbiology*, 6th edition. New York: The McGraw-Hill companies.
2. Patrick, & Murray, R. (1990). *Medical Microbiology*, 1st edition. Missouri: The C.V. Mosby Company.
3. Hugo, W.B., & Russell, A. D. (1998). *Pharmaceutical Microbiology*, 6th edition. Oxford: Blackwell Science.

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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester VI	SOIL&AGRICULTURAL MICROBIOLOGY	Hours/Week: 5	
Core Course – 15		Credits: 4	
Course Code 18UMBC61		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- know the distribution and role of soil microbes in agriculture improvement.
- develop set of skills to recognize plant diseases and inhibiting plant pathogens.
- understand the nature of soil and microbes in determining soil fertility through the production of plant growth promoting substances.
- analyze various interactions between plant and microbes especially rhizosphere, Phyllosphere and mycorrhizae.
- learn the significance of biotechnological methods and current research in agriculture

UNIT I

Classification of soil - physical and chemical properties of soil - structure of soil - Stages of Soil formation. Historical developments in soil microbiology – Contributions of Beijerinck, Winogradsky, Fleming and Waksman. Soil as a nutrient for microorganisms - Factors affecting the activities of soil microorganisms. Enumeration of soil microorganisms: Quantitative (direct microscopic method) & Qualitative (slide technique). (15 Hours)

UNIT II

Microbial interactions: mutualism, commensalism, amensalism, synergism, parasitism, predation and competition. Plant microbe interactions: Rhizosphere, Phyllosphere & Mycorrhizae -Biological nitrogen fixation: Symbiotic (*Rhizobium*) & asymbiotic (*Azotobacter*) association. (13 Hours)

UNIT III

Plant pathology – Mechanism of pathogen establishment and symptoms – Plant diseases caused by Bacteria: Bacterial blight of rice (*Xanthomonas oryzae*), Wilt of potato (*Ralstonia solanacearum*) & Fire blight of apple (*Erwinia amylovora*). Virus: Bunchy top of banana (*Banana bunchy top virus*), Nematode: Root knot of brinjal (*Meloidogyne incognita*). (16 Hours)

UNIT IV

Fungi - Foot rot of papaya (*Pythium aphanidermatum*), Wheat stem rust (*Puccinia graminis*) & Tikka in ground nut (*Cercospora personata*). Biofertilizers – Mass production of *Rhizobium*, *Azotobacter*, BGA, *Frankia*, VAM, and *PGPR*. Quality guidelines for biofertilizers. (16 Hours)

UNIT V

Genetic manipulation in Agriculture – Regeneration of plants from Protoplasts - *Agrobacterium* mediated gene transfer and improvements of crops - Virus resistant papaya & tobacco, Innate potato, Insect resistant plant (Bt toxin), Herbicide resistant plant (Glyphosate) & Ice nucleating bacteria in strawberry. (15 Hours)

TEXT BOOKS

1. Subba Rao, N.S. (2003). *Soil Microbiology*, 4th edition. New York: Oxford and IBH Publishing Co. Pvt. Ltd.
2. Chaube, H.S., & Pundhir, V.S. (2005). *Crop diseases and their management*, 1st edition. New Delhi: Prentice Hall of India Pvt. Ltd.
3. Sharma, P.D. (2006). *Plant Pathology*, 1st edition. New Delhi: Narosa Publishing House Pvt. Ltd.

REFERENCE BOOKS

1. Rangasami, G., & Bagyaraj, DJ. (1993). *Agricultural Microbiology*, 2nd edition. New Jersey: Prentice – Hall publications.
2. Ronald Atlas, M., & Richard Bartha. (1997). *Microbial Ecology*, 4th edition. San Francisco: Benjamin/Cummings Science Publishing

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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester VI	INDUSTRIAL MICROBIOLOGY	Hours/Week: 5	
Core Course – 16		Credits: 4	
Course Code 18UMBC62		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- understand the design of various fermenters and types of fermentation process.
- describe the various factors that influence the fermentation process.
- gain knowledge on screening strategies and strain improvement techniques of industrially important microbes.
- describe the large-scale fermentation and downstream processing.
- grasp the knowledge on commercial production of fermentation products.

UNIT I

Design of fermenters - Basic fermenter, components of basic fermenter, various designs of fermenters- lift- tube fermenter, fixed-bed reactor, fluidized bed reactor. Fermentation types: batch, fed batch, continuous, aerobic, anaerobic and solid state fermentation. (17 Hours)

UNIT II

Control and monitoring of variables: temperature, pH, agitation, pressure, online measurement, on/off control and PD control - Computer applications in fermentation technology - Biosafety consideration - Biosafety levels, guidelines and regulations. (13 Hours)

UNIT III

Industrially important microorganisms -Screening strategies for industrially important microorganisms - strain improvement by classical and recombinant methods. Media composition & optimization – Classical & Statistical Design (Plackett Burman). (13 Hours)

UNIT IV

Large scale fermentation and downstream processing - Fermentation processes: inoculum preparation, inoculum built-up, scale up of microbial fermentation - Downstream processing: precipitation, centrifugation, filtration, solvent extraction, chromatographic purification and affinity purification. (16 Hours)

UNIT V

Major products of Industrial Microbiology - Single cell proteins: Cultivation of *Spirulina*- Industrial enzymes (amylase and protease), alcoholic fermentation (beer), antibiotics (penicillin), organic acid (citric acid), amino acid (glutamate), and vitamins (B₁₂) - Quality assurance (*fssai*) and quality control of fermented products. (16 Hours)

TEXT BOOK

1. Patel, A.H.(2010). *Industrial Microbiology*, 2nd edition. Hyderabad:Macmillan India Limited.

REFERENCE BOOKS

1. Stanbury, O.F., Whittaker, A., & Hall, S.J. (1997). *Principles of Fermentation Technology*, 2nd edition. New Delhi: Aditya Books (P) Ltd.
2. Cassida, L.E. (1999). *Industrial Microbiology*, 2nd edition. Bengaluru: New Age International (P) Limited Publishers.
3. Siva kumar, P.K. (2010). *An Introduction to Industrial Microbiology*, 1st edition. New Delhi: S.Chand & company Ltd.

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B.Sc. MICROBIOLOGY (SEMESTER) (2018 -19 onwards)

Semester VI	BIOTECHNOLOGY	Hours/Week: 5	
Core course 17		Credits:4	
Course Code 18UMBC63		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- recall the basic concepts of various biotechnology related terms
- gain experimental ideas of gene transfer methods and molecular techniques involved in gene manipulation
- understand the issues related to plant nutrition and quality improvement, then the production of edible vaccines, therapeutic drugs by transgenic modifications
- identify the basics of gene modification and the significance of transgenic plants and animals
- interpret the bioethical and biosafety issues related to patenting of products
- acquire some information about the impact of novel strategies in the field of biotechnology

UNIT I

Introduction: Scope of Biotechnology, General Strategies of gene cloning, Vectors: Properties of good Vector, Constructed plasmids - pBR322 & pUC18, Phagemids, Cosmids, Animal vectors - SV40, Plant vectors - Ti plasmids. Expression and Shuttle vectors. (15 Hours)

UNIT II

Tools and techniques used in biotechnology: Restriction endonucleases, Ligases. Introduction of genes: Vector mode and Vector less mode – Biolistics, Electroporation and Microinjection, Gene manipulation techniques: Selection of recombinants, Marker techniques - RFLP, RAPD and PCR. (15 Hours)

UNIT III

Plant and Environmental biotechnology: Fossil fuels as energy source and their impact on environment, Types of biomass – plant, animal and microbial biomass, Production of biofuels (bioethanol) and Bioplastics. Transgenic plants – FlavrSavr tomato and Golden rice. Introduction to *Agrobacterium tumifaciens* - Features of Ti Plasmid and molecular mechanism of T-DNA transfer. (20 Hours)

UNIT IV

Transgenic animals: In vitro fertilization and embryo transfer in Mice and Sheep. Recombinant DNA products in medicine (Insulin), subunit vaccines (Hepatitis B) and attenuated vaccines – Cholera. Gene therapy (stem cell). (15 Hours)

UNIT V

Biohazards and biosafety, Ethical values in animal and plant biotechnology. Intellectual Property Rights: TRIPS & IPR – national & international scenario, IPR protection of life forms, patenting of biological materials. (10 Hours)

TEXT BOOK

Dubey, R. C. (2007), *A text book of Biotechnology*, S.Chand & Company Ltd. New Delhi.

REFERENCE BOOKS

1. Satyanarayana. U, (2005), *Biotechnology*, 1/e, Books and Allied (p) Ltd.
2. Gupta P.K. (2006). *Elements of Biotechnology*, 1/e, Rastogi publications.
3. Ignacimuthu, S, (2012). *Biotechnology: An Introduction*, 2/e, Narosa publications.
4. Chawla, (2003). *Introduction to Plant Biotechnology*, 2/e, Oxford and IBH publishers.

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Re-accredited with 'A' Grade (3rd Cycle) by NAAC

VIRUDHUNAGAR - 626 001

B.Sc. MICROBIOLOGY (2018 – 2019 onwards)

Semester VI	ENVIRONMENTAL MICROBIOLOGY	Hours/Week: 5	
DSEC - 2		Credits: 4	
Course Code 18UMBE61		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- describe the diversity of microorganism and microbial communities inhabiting a multitude of habitats and occupying a wide range of ecological habitats.
- understand the various biogeochemical cycles- carbon, nitrogen, phosphorous cycles and microbes involved.
- apply the principles of environmental microbiology to understand and solving environmental problems- bioremediation and bioleaching.
- gain knowledge on biodegradation of xenobiotics.
- determine the sanitary quality of water and sewage treatment methods employed in waste water treatment.

UNIT I

Introduction to environmental microbiology- Basic concepts of ecology – Ecological niches- Natural habitats of microorganisms. Adaptations of microorganisms – structural and physiological adaptations. Development and succession of microbial communities. Adaptations of extremophiles. (13 Hours)

UNIT II

Microbes in biogeochemical cycles – carbon, nitrogen, phosphorous and sulphur cycles. Air microbiology – Adaptations of air borne microbes – microbes in aerosol – Assessment of quality of air, air borne diseases and preventive measures. (17 Hours)

UNIT III

Aquatic microbiology – microbes in fresh and marine water – Eutrophication – microbiological quality testing of water – MPN test. Water borne diseases and preventive measures. Soil Microbiology- microbial communities in soil. (15 Hours)

UNIT IV

Waste treatment- types of wastes- characterization of solid and liquid waste. Waste treatment and useful byproducts. Solid waste treatment (sanitary land fills and composting). Liquid waste treatment – primary, secondary and tertiary treatments. (17 Hours)

UNIT V

Biodegradation principles, types and applications. Biodegradation of xenobiotics (chlorinated pesticides) – Bioaccumulations – Biomagnification – Bioleaching of metals (copper and gold). (13 Hours)

TEXT BOOK

Ronald Atlas, M., & Richard Bartha . (1997). *Microbial Ecology*, 4th edition. San Francisco: Benjamin/Cummings Science Publishing.

REFERENCES

1. Dr. Ramanathan, N., & Dr. Muthukkaruppan, S.M. (2002). *Environmental Microbiology*, 1st edition. Chidambaram: Om Sakthi Pathippagam.
2. Vijaya Ramesh, K. (2004). *Environmental Microbiology*, 1st edition. New Delhi: MJP Publishers.

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B.Sc. MICROBIOLOGY (2018 – 2019 onwards)

Semester VI	FOOD MICROBIOLOGY	Hours/Week: 5	
Discipline Specific Elective 2		Credits:4	
Course Code 18UMBE62		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- study the beneficial role of microbes and its characteristics in food and food products
- get information about intrinsic and extrinsic factors role in survival of microbes
- find out the causatives of spoilage in food and the preservation methods
- learn the methods of isolation, detection and confirmation tests employed in food industry
- develop basics of food safety and regulation procedures for detecting food quality
- acquire information about recent day's food manufacturing and preservation practices

UNIT I

History and development of Food microbiology, Common Food borne: Bacteria, Molds and yeasts. Food as substrate for microorganisms: Intrinsic – pH, water activity, oxidation reduction potential, nutrient content and inhibitory substances. Extrinsic factors affecting growth and survival of microorganisms in foods. (10 Hours)

UNIT II

General principles of food preservation: chemicals, food additives, antibiotics, bacteriocins, high temperature, low temperature, radiation, drying, aseptic packaging and manothermosonication. (20 Hours)

UNIT III

Spoilage and preservation of vegetables, cereals, bread, egg, meat, milk. Food borne infection: Bacterial (Salmonellosis), Nonbacterial (trichinosis), Viral (hepatitis). Food borne intoxication: Bacterial (Botulism and Staphylococcal food poisoning), Mycotoxin (Patulin). (15 Hours)

UNIT IV

Microorganisms in Food fermentation (brief), Applications of Probiotics and prebiotics, Genetically Modified Foods: Bovine somatotropin, alpha lactalbumin & lactoferrin in milk, Edible vaccine (Cholera vaccine- potatoes & Hepatitis B vaccine - maize). (15 Hours)

UNIT V

Methods for detection of microorganisms in food: Physical, Chemical and Immunological assays. Biosensors in food. Microbiological quality standards in food: FDA, HACCP, ISI & FSSAI. (15 Hours)

TEXT BOOK

Frazier, WC and Westhoff DC, (2012). *Food Microbiology*, 4/e, McGraw-Hill, NewYork.

REFERENCE BOOKS

1. Adams. MR and Moss, MO. (2005). *Food Microbiology*, New age International Pvt Ltd publications.
2. Jay. JM, (2000). *Modern Food Microbiology*, 4/e, Aspen publishers.

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B.Sc. MICROBIOLOGY (2018 – 2019 onwards)

Semester VI	BIOCONTROL	Hours/Week: 5	
DSEC - 2		Credits: 4	
Course Code 18UMBE63		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, the students will be able to

- explain the history, theory, practice and science of biological control.
- evaluate the scientific studies and concepts related to biological control.
- asses the current and future roles of biological control with in context of agricultural and natural ecosystem.
- understand the types of biocontrol and biological control agents of insects and their biology.
- apply the ecological principles of biological control of plant pests by parasitoids, predators, pathogens and entomopathogenic nematodes to manage pest problems.

UNIT I

Introduction to biological control- Definition, need of biocontrol agents. Predators, parasitods and Pathogens as biocontrol agents- Importation, Conservation and augmentation. Economics of biocontrol. (15 Hours)

UNIT II

Biopesticides- Microbes used in biopesticides. Bacterial pesticides – *Bacillus thuringiensis* and *Pseudomonas aeruginosa* as biocontrol agents, benefits and limitations.

(16 Hours)

UNIT III

Viral insecticides -NPV and CPV as biocontrol agents, benefits and limitations. Fungal pesticides – *Beauveria bassiana* and *Metarhiziumanisopliae* as biological control agents, potentials and limitations. (16 Hours)

UNIT IV

Microsporidia –Nosema pyrausta as biocontrol agent, potentials and limitations. Insect parasitic nematodes – Steinernema and heterorhabditis as biopesticides ,benefits and limitations. Protozoa in insect control. Biological control of weeds – Bioherbicides. (15 Hours)

UNIT V

Integrated pest management – Definition, Need for IPM, Methods of IPM, Components and benefits of IPM. Genetic engineering in biological control. (13 Hours)

TEXTBOOK

1. Chaube.H.S, Pundhir.V.S. (2005). Crop diseases and their management, 1/e. Prentice Hall of India Pvt. Ltd. New Delhi.

REFERENCE BOOKS

1. Roy G. Van Driesche and Bellows Jr. TS., (1996). Biological control – Guide to its applications, Springer.
2. Ronald Atlas.M, Richard Bartha. (1997). *Microbial Ecology*, 4/e, Benjamin/Cummings Science Publishing.
3. Sharma.PD, (2006), *Plant Pathology*, New Delhi: 1/e, Narosa Publishing House Pvt. Ltd.
4. Helmut Fritz Van Embden and Service MW, (2004). *Pest and vector control*, Cambridge University Press.

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B.Sc. MICROBIOLOGY (2018 – 2019 onwards)

Semester VI	NANOBIOTECHNOLOGY	Hours/Week: 2	
SEC - 6		Credits: 2	
Course Code 18UMBS61		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, the students will be able to

- review the basics and applications of nanobiotechnological devices.
- characterize, classify and produce nanoparticles.
- analyze the applications of nanomaterials as nanomedicine in drug delivery systems.
- retrieve the mode of impact, toxic effects and environmental risks of nanomaterials.
- understand the role of nanomedicine for treating diseases by novel aspects.

UNIT I

Nanotechnology – Basics - Nanobiotechnological devices – Nanoparticles, Dendrimers, Nanorobots, Nubot and Nanoshell - Applications of Nanobiotechnology.

(6 Hours)

UNIT II

Nanoparticles – Introduction, Morphology, Classification, Properties and characterization: Electrospinning and FTIR - Production methods of nanoparticles: Carbon nanotube and colloidal gold.

(6 Hours)

UNIT III

Nanomedicine - Drug delivery system – Nanomaterials for drug delivery system: Dendrimers, Hydrogels and Biodegradable pH sensitive micelle system.

(6 Hours)

UNIT IV

Nanotechnology in Biomedical applications: Biosensors in medicine, Quantum Dot Technology in cancer treatment and Cell repair machines. (6 Hours)

UNIT V

Health and Environmental impacts of Nanotechnology: Routes of entry of Nanomaterials in the body - Toxic mechanisms - Toxicological Health Effects by nanoparticles – Integrated concept of risk assessment - Environmental implications of nanoparticles. (6 Hours)

TEXT BOOKS

1. Subbiah Balaji. (2010).*Nanobiotechnology*, 1st edition. New Delhi: MJP Publishers.
2. Manasi Karkare. (2017).*Nanotechnology*, 1st edition. New Delhi: I.K. International Publishing House Pvt. Ltd.

REFERENCE BOOKS

2. Shanmugam, S. (2011).*Nanotechnology*, 1st edition. New Delhi: MJP Publishers.
3. Pradeep, T. (2013).*Nano: The essentials*, 1st edition. New York: McGraw Hill Publications.

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B.Sc. MICROBIOLOGY

(2018 – 2019 onwards)

Semester - VI	MAJOR PRACTICAL - III	Hours/Week: 3	
Core course - 12		Credits: 3	
Course Code 18UMBC61P		Internal 40	External 60

1. Isolation of pathogenic bacteria from clinical specimens – *Streptococcus*, *Staphylococcus*, *Salmonella*, *Shigella* and *Vibrio*.
2. Antibiotic susceptibility test: disc diffusion method.
3. Measurement of minimal inhibitory concentration (MIC).
4. Separation of serum and plasma.
5. Erythrocyte sedimentation rate.
6. Blood grouping: ABO & Rh typing.
7. Agglutination tests: Widal test.
8. Precipitation: Ouchterlony double immunodiffusion.
9. Diagnosis of human viral diseases-Dot ELISA.
10. Demonstration of phage titre – T₄ phage.

REFERENCE BOOKS

1. Murugalatha, N. (2012). *Microbiological Techniques*, 1st edition. New Delhi: MJP Publishers.
2. Cappuccino, J.G., & Sherman, N. (2002.) *Microbiology: A laboratory manual*, 4th edition. Boston: Addison Wesley.
3. Aneja, K.R. (2003). *Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom cultivation*, 4th edition. Bengaluru: New Age International Publishers.

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B.Sc. MICROBIOLOGY (2018 – 2019 onwards)

Semester - VI	MAJOR PRACTICAL - IV	Hours/Week: 3	
Core course - 12		Credits: 3	
Course Code 18UMBC62P		Internal 40	External 60

1. Isolation of symbiotic nitrogen fixing bacteria from root nodules *Rhizobium*.
2. Isolation of phosphate solubilizing bacteria – *Pseudomonas*.
3. Examination of mycorrhizae – VAM.
4. Potability testing of water (MPN test).
5. Milk quality test – Methylene blue dye reduction test.
6. Enumeration of microbial populations in ice cream & pickles.
7. Isolation of amylase and protease producing bacteria.
8. Crowded plate technique for antibiotics producing microbes.
9. Alcohol (ethanol) production.
10. Immobilization of yeast.

REFERENCE BOOKS

1. Murugalatha, N. (2012). *Microbiological Techniques*, 1st edition. New Delhi: MJP Publishers.
2. Cappuccino, J.G., & Sherman, N. (2002). *Microbiology: A laboratory manual*, 4th edition. Boston: Addison Wesley.
3. Aneja, K.R. (2003). *Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom cultivation*, 4th edition. Bengaluru: New Age international publishers.

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B.Sc. MICROBIOLOGY (2018 – 2019 onwards)

Semester VI	MAJOR PRACTICAL– V	Hours/Week: 2	
Core Course - 12		Credits: 2	
Course Code 18UMBC63P		Internal 40	External 60

1. Retrieval of DNA and protein sequences
2. Access to structural (protein) database
3. Primary and secondary structure prediction of protein
4. Pairwise sequence alignment
5. Isolation and purification of plasmid DNA
6. Separation of DNA by agarose gel electrophoresis
7. Restriction digestion analysis
8. Ligation

REFERENCE BOOKS

1. Terasa, K., Attwood & David parry smith, J. (2006). *Introduction to Bioinformatics*, 1st edition. New Delhi: Dorling Kindersley Pvt Ltd.
2. Sundaralingam, R., & Kumaresan, V. (2008). *Bioinformatics*, 1st edition. Nagarcoil: Saras Publication.
3. Cappuccino, J.G., & Sherman, N. (2002). *Microbiology: A laboratory manual*, 4th edition. Boston: Addison Wesley.
4. Murugalatha, N. (2012). *Microbiological Techniques*, 1st edition. New Delhi: MJP publishers.

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