ANNEXURE 18B17

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
Indian National Movement (A.D 1885-1947)	III	History(EM)
இந்திய Njrpய இயக்கம் (கி.பி. 1885 – 1947)	III	History (TM)
Constitution of India	IV	History(EM)
இந்தியாவில் அரrpயல் அமைப்பு	IV	History(TM)
Communication Skills-I	III	English
Communication Skills-II	IV	
இக்காலநீதி இலக்கியம்	III	Tamil
உ_ரைநடை 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 Development	IV	
Quantitative Aptitude – I	III	Mathematics
Quantitative Aptitude - II	IV	
Physics in Everyday life	III	Physics
Digital Electronics	IV	
Industrial Chemistry-I	III	Chemistry
Industrial Chemistry-II	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	
மருத்துவ தாவரவியல் - I	III	
மருத்துவ தாவரவியல் - 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 கீழ்கண்ட 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

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 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.

ATTENDANCE

The following rules are applicable to the students of all UG, PG and M.Phil. Programmes with effect from 2018-2019.

a) The students with an attendance of 85% and above are permitted to appear for the Summative Examinations without any condition.
b) The students with 78% - 84 % of attendance are permitted to appear for the Summative Examinations by paying a fine of ₹500/-
c) The students with 66% - 77% of attendance can appear for the Summative Examinations only after getting special permission from the Principal. Special permission shall be granted by the Principal only on medical grounds and those students should also pay a fine of ₹1000/- along with the application form for exemption. If permission is not granted, they have to appear for the Summative Examinations in the next Semester by paying a fine of ₹1000/-
d) The students who have less than 65% of attendance cannot appear for the Summative Examinations and have to repeat the whole semester.
e) For Part V Courses, the students require 75% of attendance to get the required credit.
f) For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

B.Sc. MICROBIOLOGY (SEMESTER)

Programme Code - 2024

PROGRAMME OUTCOMES

- Encourage intellectually disciplined process of thinking in analyzing, synthesizing, evaluating and applying scientific concepts.
- Develop good rapport with fellow-beings through efficient oral, written and technical communication.
- Connect with the society to transform ideas into action.
- Volunteer support in spreading scientific temperament and stand for the national cause in all core issues.
- Uphold the values and beliefs inherent in the nation's tradition and culture.
- Strive to preserve nature in all forms for a sustainable future.
- Develop an independent and self-disciplined specialized learning in tune with the changing socio-technological scenario.

PROGRAMME SPECIFIC OUTCOMES

- Elucidate basic biological principles that will help in combating vexing human health problems caused by Microorganisms.
- Stimulate novel applications of Microorganisms in the Biotechnology Industries.
- Meet the needs of Agricultural, Environmental, Genetic Engineering and developing Bioscience fields and create Self-employment for the empowerment of women.
- Motivate students for taking up higher studies in Microbiology and other related areas.

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PART I TAMIL

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UTAG11	தாள்: 1 பொதுத்தமிழ்	3	100
2.	II	18UTAG21	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, Ekganki - I, Short stories, Functional Hindi – I & Grammar	3	100
2.	II	18UHDG21	Drama, Ekganki – II, Letter Correspondence, Functional Hindi-II & Grammar	3	100
3.	III	18UHDG31	Ancient poetry, Drama, Indian History, Poetics and functional Hindi-III	3	100
4.	IV	18UHDG41	Modern poetry, History of Modern Hindi Literature and 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	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	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	Concepts in Biology - I	4	100
2.	IV	18UBIA41	Concepts in Biology - II	4	100
	IV	18UBIA41P	Allied Biology Practical	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**

PART IV–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	18UGHR31/ 18UGWS32	Human Rights/ Women studies	1	100
3.	IV	18UGEC41/	Constitution of India/	1	100
4		18UGEM42/	Modern Economics/		
6		18UGEA43/	Adolescent Psychology/		
7		18UGED44	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	National Service Scheme	1
2		18UVNS2	Physical Education	
3		18UVYR1 18UVYR2	Youth Red Cross Society	
4		18UVRR1	Red Ribbon Club	
5		18UVSF1	Science Forum	
6		18UVEC1	Eco Club	
7		18UVLI1	Library and Information Science	
8		18UVCC1	Consumer Forum	
9		18UVHF1	Health and Fitness Club	

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BACHELOR OF MICROBIOLOGY

PROGRAME 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** Concepts in Biology – I Allied 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	18UGHR31/ 18UGWS32	**Generic Elective -1** 1.Human Rights/ 2. Women studies	0	1	40	60
		18UGEC41/	**Generic Elective -2** Constitution of India/	1	-	-	
		18UGEM42/	Modern Economics/				
		18UGEA43/	Adolescent Psychology/				
		18UGED44	Disaster Management				
			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
			Allied Course – II				
		18UBIA41	Concepts in Biology - II	4	4	25	75
		18UBIA41P	Allied Biology Practical	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	1	1	100	-
		18UGEC41	Constitution of India/				
		18UGEM42	Modern Economics/				
		18UGEA43	Adolescent Psychology/				
		18UGED44	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	**DSEC -1** 1.Virology 2.Diagnostic Microbiology	4	4	25	75
		18UMBO51	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** 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 – 12** Major Practical –IV	3	3	40	60
		18UMBC63P	**Core Course – 12** Major Practical –V	2	2	40	60
		18UMBE61 18UMBE62	**DSEC -2** 1.Environmental Microbiology 2. Food Microbiology	5	4	25	75
		18UMBO61	Online Assessment	-	1	50	
	Part IV	18UMBS61	**SEC -6** Nanobiotechnology	2	2	40	60
			TOTAL	**30**	**27**	**850**	

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VIRUDHUNAGAR - 626 001

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

Semester I	**GENERAL MICROBIOLOGY**	Hours/Week: 4	
Core Course-1		Credits: 4	
Course Code **18UMBC11**		Internal 25	External 75

COURSE OUTCOMES

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

- enhance the inspiration about the Microbiology and Microbiologists.
- obtain knowledge on the types of microorganisms & their differentiation.
- know the structure and functions of prokaryotic and eukaryotic cells.
- know the salient features and the structure of bacteria.
- obtain knowledge on the structure and characteristics of algae and fungi.
- retrieve knowledge on the characteristics and life cycle of viruses and protozoa.

UNIT I

Historical perspective: Discovery of microbial world - Contributions of Leeuwenhoek, Louis Pasteur and Robert Koch. Microbial role in disease (germ theory), Scope and relevance of microbiology, spontaneous generation conflicts **(**8 Hours)

UNIT II

Prokaryotic cell Structure and function: Cell wall (Gram positive and Gram negative), Cell membranes, Mesosome, Flagella, Pili, Capsule, Cytoplasm, Inclusion bodies, Ribosomes, Nucleoid, Endospores and Gas vesicles. **(**14 Hours)

UNIT III

Eukaryotic cell organelles: Endoplasmic reticulum, Golgi apparatus, Mitochondria, Ribosomes, Lysosomes, Chloroplasts and Nucleus. Differences between prokaryotic and eukaryotic cells. **(**14 Hours)

UNIT IV

Salient features of Bacteria: *Bacillus, E. coli, Streptococcus* and *Staphylococcus.* Structure and reproduction of Algae - *Chlamydomonas* and *Chlorella*. Structure and reproduction of Fungi - *Penicillium and Saccharomyces*. **(**12 Hours)

UNIT V

Structure and life cycle of bacterial viruses: T4 & Lambda. Structure and life cycle of plant and animal viruses: TMV & HIV. Salient features and Life cycle of Protozoa*: Plasmodium & Entamoeba histolytica*. **(**12 Hours)

TEXT BOOK

Prescott, Harley and Klein, (2006), *Microbiology* 7/e, The McGraw-Hill Companies, New Delhi.

REFERENCE BOOKS

1. Pelczar, M.J, Chan, E.C.S and Kreig, N.R, (2001), *Microbiology 5/e*, Tata McGraw Hill Publishing Co Ltd, New Delhi

2. Schlegel, H.G (200), *General Microbiology* 7/e, Cambridge University Press, Cambridge.

3. Stainer, R.Y, Ingraham, Wheelis, M.G. and Paintor, P.R. (1999), *The Microbial World 5/e*, Prentice Hall, New Jersey

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

Semester I	**BIOCHEMISTRY**	Hours/Week: 4	
Core Course-2		Credits: 4	
Course Code **18UMBC12**		Internal 25	External 75

COURSE OUTCOMES

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

- gain knowledge on the basic needs of our body like water, carbohydrates and lipids.
- gain knowledge on the types of protein present in our body and also to know about the structure and properties.
- know the properties and structure of aminoacids.
- know the components present in nucleic acids and the physical & chemical properties of lipids.
- gain knowledge on the roles of vitamins and their functions
- enhance knowledge about the metabolic actions of various hormones.

UNIT I

Water and Life – pH and buffers. Carbohydrates –Biological significance – classification, structure, chemical and physical properties of monosaccharides (Glucose), disaccharides (Sucrose) and polysaccharides (Starch). (10 Hours)

UNIT II

Lipids – Biological significance, Classification, Structure, Physical and Chemical properties of Fats, Fatty acids, Glycerol, phospholipids, Spingolipids, Lipoproteins and Eicosanoids. (10 Hours)

UNIT III

Amino acids –Classification and Properties. Proteins – Primary, Secondary, Tertiary and Quaternary structure. Nucleic acids – components, Structural conformation, types & properties of DNA and RNA. (12 Hours)

UNIT IV

Vitamins – classification – Fat soluble vitamins – Structure, properties and functions of Vitamin A,D,E and K –. Water soluble vitamins – Structure, properties and functions of Vitamin C, $B_{1,}$ $B_{2,}$ Folic acid and $B_{12.}$ **(**14 Hours)

UNIT V

Hormones – Introduction – Biosynthesis and metabolic actions of Thyroid, Insulin, Glucagon, Adrenal and Pituitary hormones. **(**14 Hours)

TEXT BOOK

Jain J.L, Sunjay jain, Nitin jain (2005), *Fundamentals of Biochemistry, 6/e*,

REFERENCE BOOKS

1. Lehninger, A.L, (2012), *Principles of Biochemistry. 6/e*, CSB Publishers.
2. Zubay, G, (1998), *Biochemistry -4/e*, McMillan Publishers NY, Collier McMillan Company Publishers, London.
3. Ambika Shanmugam, (2016), *Fundamentals of Biochemistry for Medical Students*, 8th edition.
4. Lubert Stryer, (2009), *Biochemistry.* 4th edition.

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Semester I	**VALUE EDUCATION** **(2018 -19 onwards)**	Hours/Week: 2	
Ability Enhancement Compulsory Course		Credits: 2	
Course Code **18UGVE11**		Internal 100	External -

COURSE OUTCOMES

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

- instill moral values of life in mind of students
- realize potential of human being and glory of human life
- be aware of Indian culture and heritage
- be aware of their rights as women and thereby enabling them to meet the challenges of life.

UNIT I: Values of Life

Introduction - Definition of Values - Significance of Values - Classification of Values – Need for Value Education.

UNIT II: Values for Individual Welfare

Honesty and Integrity- Punctuality- Positive Thinking - Commitment at the Workplace .

UNIT III: Values for Familial Welfare/Peace

Respect and Love for Elders – Truthfulness- Harmonious Relationship – Hospitality.

UNIT IV: Values for Social Welfare/Prosperity

Patriotism and Non-Violence-Human Rights-Women's Rights.

UNIT V: Values for Spiritual Welfare/Well being

Faith in God- Meditation- Purity- Self Surrender.

BOOK PRESCRIBED

Maithili.B & Thilakam.C., *et al.* (2014) . *Value Education*. Chennai: New Century Book House (P) Ltd.

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

Semester II	**MICROBIAL TAXONOMY**	Hours/Week: 4	
Core Course-4		Credits: 4	
Course Code **18UMBC21**		Internal 25	External 75

COURSE OUTCOMS

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

- obtain the ability to identify the nature of microorganisms based on Bergey's manual.
- retrieve skill to differentiate microorganisms based on their major characteristics.
- gain knowledge on the organism's cell division, spore forming ability, locomotory ability & cell wall synthesizing nature.
- obtain knowledge on the differential features of Eubacteria and Archaeobacteria.
- understand the nomenclature & classification of algae and fungi.
- enhance the ability to classify protozoa and virus.

UNIT I

Introduction to microbial diversity – Taxonomic ranks, hierarchial arrangements in taxonomy. Classification systems - phenetic and phylogenetic. Major characteristics used in taxonomy – Morphological, Physiological, Biochemical and molecular characteristics. Principles of numerical taxonomy. **(**12 Hours)

UNIT II

Classification based on Kingdom systems – Whittaker, Carl Woese & Cavalier Smith. Classification of bacteria as per the Bergey's manual of systematic bacteriology – Gram negative bacteria (Vol - 1): Gram Negative Aerobic Rods (*Pseudomonas)* and Cocci (*Neisseria*), Facultatively Anaerobic Gram Negative Rods (*Enterobacteriaceae* & *Vibrionaceae),* Aerobic, Motile and Helical Gram Negative Bacteria *Bdellovibrio.*

(13 Hours)

UNIT III

Gram positive bacteria (Vol - II): Gram positive cocci *(Staphylococcus),* Endospore forming Gram Positive Rods *(Clostridium)* & Cocci *(Sporosarcina).* Gram negative bacteria (Vol - III): Oxygenic and anoxygenic photosynthetic bacteria, Archaebacteria: Methanogens, Halophiles, Acidophiles, and Thermophiles. General properties of *Actinomycetes* (Vol - IV): *Streptomyces.* (13 Hours)

UNIT IV

Classification of of algae and their characteristics: Fritsch. Classification of fungi and their characteristics: Alexopoulos & Mims. Classification of Protozoa and their salient features. (12 Hours)

UNIT V

Viral taxonomy: characteristics used in nomenclature & classification of bacterial, plant and animal viruses. **(**10 Hours)

TEXT BOOK

Prescott, Harley and Klein, (2006), *Microbiology, 7/e.* The McGraw – Hill Companies

REFERENCE BOOKS

1. Maigan, M.T, Martinko J.M and J. Parker, (2000), *Brock Biology of Microorganisms,* (9th edition), Prentice – Hall.
2. C.J. Alexopoulos and C.W. Mims (1979), *Introductory Mycology,* 3rd edition, Wiley, New York.

3. E.W. Nester, C.V. Roberts and M.T. Nester 1995. *Microbiology – A Human Perspective,* lowa, USA.
4. R.Y. Stainer, J.L. Ingraham, M.L. Wheelis and P.R. Paintor 1999. *General Microbiology*, McMillan Educational Ltd, London.
5. D.H.Bergey, John.G.Holt, 1994, *Bergey's Manual of Determinative Bacteriology*, Baltimore; Williams & Wilkins,

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

Semester II	**MICROBIAL PHYSIOLOGY AND METABOLISM**	Hours/Week: 4	
Core Course-5		Credits: 4	
Course Code **18UMBC22**		Internal 25	External 75

COURSE OUTCOMES

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

- explore the vast range of physiology and metabolism found throughout the microbial community.
- know the anabolism and catabolism of macromolecules.
- gain knowledge on energy generation process.
- know the transport of metabolites inside the microbial cell and their role in microbial metabolism.
- know the survival of bacteria at extreme environment.
- gain knowledge on the photosynthetic bacteria and photosynthesis.

UNIT I

Bioenergetics – Laws of thermodynamics, Entropy, Free energy and Generation of ATP. Carbohydrate metabolism – Embden Meyerhof (EMP) and Entner doudoroff (ED) pathways, Tricarboxylic acid Cycle (TCA), Substrate level phosphorylation, Electron Transport Chain (ETC) and Oxidative phosphorylation. Fermentation pathways from Pyruvate.(Lactic acid Fermentation). Gluconeogenesis. (12 Hours)

UNIT II

Biosynthesis of aminoacids (Glutamic acid, lysine), Urea cycle. Fatty acid biosynthesis and oxidation (beta oxidation). Cell wall biosynthesis in prokaryotes.

(12 Hours)

UNIT III

Bacterial photosynthesis – Oxygenic and Anoxygenic Photosynthesis. Carbon dioxide fixation. Transport of sugar and metabolites – active, passive and facilitated transport systems, Chemiosmosis and ion gradients. (12 Hours)

UNIT IV

Physiology of Bacterial Growth – Growth Factors – Different phases – Growth measurements. Survival at Extreme Environments – Thermophilic, Psychrophilic, Halophilic, Barophilic and Acidophilic bacteria. Radiation resistance: *Deinococcus radiodurans,* Magnetotactic Bacteria: *Magnetospirillum magneticum.* (12 Hours)

UNIT V

Morphology and Life cycle of *Hyphobacterium* and *Caulobacte*r, Gliding bacteria, Life cycle of fruiting bacteria - *Myxobacteri*a. Life cycle of *Bacillus* – Stages of endospore formation, germination and outgrowth. (12 Hours)

TEXT BOOK

Moat, AG, Foster JW and Spector MP, (2002), *Microbial Physiology, 4/e* Wiley- liss.

REFERENCE BOOKS

1. Prescott, Harley and Klein, (2006), *Microbiology* 7/e, The McGraw- Hill Companies.
2. C.B.Powar, H.F.Daginawala, (1997), *General Microbiology* ,Vol I 2/e

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

Semester II	**MICROBIOLOGICAL AND ANALYTICAL TECHNIQUES**	Hours/Week: 2	
Skill Enhancement Course -1		Credits: 2	
Course Code **18UMBS21**		Internal 40	External 60

COURSE OUTCOMES

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

- know the basic equipment like various Microscope used for the observation of microorganisms.
- know the importance of sterilization techniques and equipments used in microbiology laboratory.
- enhance the knowledge on the analytical techniques like centrifugation.
- obtain knowledge on chromatography separation techniques.

UNIT I

Principles and Types of sterilization - Physical methods - radiation and heat. Chemical methods – disinfectants. (4 Hours)

UNIT II

Sterilization equipments - Autoclave, Hot air oven. Principles and functions of Laminar air flow chamber, Incubator, pH meter and Colorimeter. (7 Hours)

UNIT III

Microscopy – Principles, parts and functions of Light, Darkfield, Phase contrast, Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). (7 Hours)

UNIT IV

Centrifugation –Centrifugal force and principles of sedimentation, Sedimentation coefficient, Types of centrifugation – Differential centrifugation, density gradient centrifugation and Ultra centrifugation. (6 Hours)

UNIT V

Chromatography – Types – principles of paper chromatography, Thin layer chromatography and Column chromatography (ion exchange chromatography). (6 Hours)

TEXT BOOK

P. Palanivelu, *Analytical Biochemistry & Separation Techniques, IV Edition* – 21st Century Publication, Palkalai Nagar, Madurai (2004).

REFERENCE BOOKS

1. Prescott, Harley and Klein. 2006. *Microbiology 7/e.* The McGraw-Hill Companies.

2. K.R. Aneja, *Experiments in Microbiology Plant pathology Tissue culture and Mushroom cultivation.*

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Semester I/II	**CORE PRACTICAL - I** **MAJOR PRACTICAL - I**	Hours/Week: 2	
Core Course-3		Credits: 2	
Course Code **18UMBC21P**		Internal 40	External 60

Basic Microbiology

1. Personal protection and conduct in microbiology laboratory.
2. Isolation and Enumeration of bacteria / fungi from environmental samples (Soil & Water)
3. Pure culture techniques: streak, spread and pour plate methods
4. Observation of bacterial motility by hanging drop method
5. Staining methods: Simple staining, Gram-staining, Fungal staining (Lastophenol Cotton Blue).

Biochemistry

1. Estimation of Carbohydrates – Anthrone Method
2. Estimation of Proteins – Lowry's Method
3. Estimation of Ascorbic acid by Volumetric Analysis.
4. Separation of Amino acids by paper chromatography.

Microbial Taxonomy

Biochemical tests for bacterial identification

1. Carbohydrate fermentation
2. IMViC tests
3. Catalase test
4. Oxidase test
5. Starch hydrolysis

Microbial Physiology

1. Measurement of growth - Turbidity method.
2. Effect of pH and Utilization of Carbohydrates on the growth of microorganisms.

REFERENCE BOOKS

1. P. Gunasekaran, *Microbiology: A laboratory manua*l, 1996. New Age international publishers.
2. N. Kannan, *Laboratory manual in general microbiology,* 2002. Panima publishers.
3. J.G. Cappuccino and N. Sherman, *Microbiology: A laboratory manual,* 2002. Addison Wesley.
4. P. Palanivelu, *Analytical Biochemistry & Separation Techniques, IV Edition* – 21st Century Publication, Palkalai Nagar, Madurai. (2004).
5. Jeyaraman, J. *Laboratory manual in biochemistry, 4th edition,* Wiley Eastern Publishers, 1992.