



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

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS (with effect from Academic Year 2020 - 2021)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 20 UG Programmes, 14 PG Programmes, 6 M.Phil. Programmes and 6 Ph.D. Programmes. The curricula for all these Programmes, except Ph.D. Programmes, have been framed as per the guidelines given by the University Grants Commission (UGC) & Tamil Nadu State Council for Higher Education (TANSCHÉ) under Choice Based Credit System (CBCS) and the guidelines for Outcome Based Education (OBE).

The Departments of Commerce, English, History, Mathematics and Biochemistry, 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.

A. 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 performance of students is 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, 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 (Computer Applications), Commerce (Professional Accounting), Business Administration.

PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Chemistry, Zoology, Biochemistry, Home Science - Nutrition and Dietetics, Computer Science, Information Technology, Computer Applications (MCA*)
Commerce & Management	:	Commerce, Business Administration (MBA*) * AICTE approved Programmes

PRE-DOCTORAL PROGRAMMES (M.Phil.)

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

OUTLINE OF CHOICE BASED CREDIT SYSTEM - UG

1. Core Courses
2. Discipline Specific Elective Courses (DSEC)
3. Allied Courses
4. Skill Enhancement Courses (SEC)
5. Non Major Elective Courses (NMEC)
6. Ability Enhancement Compulsory Courses (AECC)
7. Generic Elective Courses (GEC)
8. Internship / Field Project
9. Self Study Courses
10. Extra Credit Courses (optional)

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	
இக்கால நீதி 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
Lifestyle 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	
Spreadsheet	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	

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

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

List of Non Major Elective Courses (NMEC)
(2023-2024 onwards)

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	
இக்கால நீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi – I	III	Hindi
Basic Hindi – II	IV	
Fundamental Hindi - I	III	Hindi
Fundamental Hindi – II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Financial Literacy I	III	
Financial Literacy II	IV	
Self-Employment And Start-Up Business	III	Commerce CA
Fundamentals Of Marketing	IV	
Women Protection Laws	III	Commerce (Professional Accounting)
Basic Labour Laws	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude I	III	Mathematics
Basic Statistics		
Quantitative Aptitude II		
Operations Research		
Physics in Everyday life -I	III	Physics
Physics in Everyday life -II	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
Lifestyle 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	
MS Office	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	
Cadet Corps for Career Development I	III	National Cadet Corps
Cadet Corps for Career Development II	IV	

மேல்நிலைக் கல்வி வரை தமிழை முதன்மைப் பாடமாக எடுத்துப் படிக்காத மாணவிகள் கீழ்க்கண்ட பாடங்களைக் கட்டாயம் படிக்க வேண்டும்

1. அடிப்படைத் தமிழ் - எழுத்தறிதல்
2. அடிப்படைத் தமிழ் - மொழித்ரதிநறிதல்

**List of Ability Enhancement Compulsory Courses (AECC) &
Generic Elective Courses (GEC) Offered**

ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)

1. Value Education
2. Environmental Studies

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

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK

The core philosophy of Outcome Based Education rests in employing a student - centric learning approach to measure the performance of students based on a set of pre-determined outcomes. The significant advantage of OBE is that it enables a revamp of the curriculum based on the learning outcomes, upgrade of academic resources, quality enhancement in research and integration of technology in the teaching –learning process. It also helps in bringing clarity among students as to what is expected of them after completion of the Programme in general and the Course in particular. The OBE directs the teachers to channelize their teaching methodologies and evaluation strategies to attain the PEOs and fulfill the Vision and Mission of the Institution.

Vision of the Institution

The founding vision of the Institution is to impart Quality Education to the rural womenfolk and to empower them with knowledge and leadership quality.

Mission of the Institution

The mission of the Institution is to impart liberal education committed to quality and excellence. Its quest is to mould learners into globally competent individuals instilling in them life-oriented skills, personal integrity, leadership qualities and service mindedness.

B.1 Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes

It is imperative for the institution to set the Programme Educational Objectives (PEOs), Programme Outcomes (POs) and Course Outcomes (COs), consistent with its Vision and Mission statements. The PEOs and the POs should be driven by the mission of the institution and should provide distinctive paths to achieve the stated goals. The PEOs for each Programme have to fulfill the Vision and Mission of the Department offering the Programme.

Vision of the Department of Biochemistry

To empower our students with scientific knowledge and skills and transform intellectually, socially and personally.

Mission of the Department of Biochemistry

The department of Biochemistry Discovers and transfers new knowledge about Biochemistry, basis of life through

- enhancing understanding of biochemistry, molecular biology, and science in general.

- providing an atmosphere to acquire skills in identifying the link between biological and human resources and transform it to develop entrepreneur skill.
- extending the fundamental knowledge of biochemistry by leading innovative research and careers, to create a positive impact on society

B.1.1 Programme Educational Objectives (PEOs)

PEOs are broad statements that describe the career and professional achievements that the Programme is preparing the graduates to achieve within the first few years after graduation. PEOs are framed for each Programme and should be consistent with the mission of the Institution.

Program Educational Objectives (PEOs) of B.Sc. Biochemistry Programme

The students will be able to

- apply fundamental knowledge related to pure sciences in an interdisciplinary manner for providing innovative solutions to need based problems for national and global impact.
- analyze scientific data, draw objective conclusions related to Biochemistry and apply this knowledge for human welfare.
- gain domain knowledge and know-how for successful career in academia and industry.

Key Components of the Mission Statement	PEO1	PEO2	PEO3
Enhancing understanding of biochemistry, molecular biology, and science	√	√	√
To develop entrepreneur skill	√	√	√
Innovative research and careers, to create a positive impact on society	√	√	√

B.1.2 Programme Outcomes (POs)

POs shall be based on Graduate Attributes (GAs) of the Programme. The GAs are the attributes expected of a graduate from a Programme in terms of knowledge, skills, attitude and values. The Graduate Attributes include Disciplinary Knowledge, Communication Skills, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills, Co-operation/Team Work, Scientific Reasoning, Reflective Thinking, Information/Digital Literacy, Multicultural Competence, Moral and Ethical Awareness/Reasoning, Leadership Qualities and Lifelong Learning.

On successful completion of the Programme, the students will be able to

- 1 apply effectively the acquired knowledge and skill in the field of Arts, Physical Science, Life Science, Computer Science, Commerce and Management for higher studies and employment. (*Disciplinary Knowledge*)
- 2 communicate proficiently and confidently with the ability to express original/complex ideas effectively in different situations. (*Communication Skills*)
- 3 identify, formulate and solve problems in real life situations scientifically / systematically by adapting updated skills in using modern tools and techniques. (*Scientific Reasoning and Problem Solving*)
- 4 critically analyse, synthesize and evaluate data, theories and ideas to provide valid suggestions for the betterment of the society. (*Critical Thinking and Analytical Reasoning*)
- 5 use ICT in a variety of self-directed lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - Directed and Lifelong Learning*)
- 6 self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/Team Work and Multicultural Competence*)
- 7 uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness*)

B.1.3 Programme Specific Outcomes (PSOs)

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each UG Programme. Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme specific. It is mandatory that each PO should be mapped to the respective PSO.

PROGRAMME SPECIFIC OUTCOMES**On completion of B.Sc. Biochemistry programme the students will be able to****PO1 - *Disciplinary Knowledge***

PSO 1: Apply the fundamental knowledge of Biochemistry incorporated with knowledge in related courses that would enable them to comprehend the emerging and advanced biochemical concepts in life sciences to pursue higher studies.

PO2 – Communication Skills

PSO 2: Apply the acquired conceptual knowledge with communicative skills by connecting disciplinary and interdisciplinary aspects of Biochemistry, Microbiology, Biotechnology and Biology which can be extended to society.

PO3 – Scientific Reasoning and Problem Solving

PSO 3.a: Evaluate the need and impact of scientific solutions on the environment and society, keeping in view of their sustainable development and to have entrepreneurial skills acquired by skill oriented course

PSO 3.b: Strengthen their biochemical, biological and chemical sciences experimental techniques to meet future challenges in their career.

PO4 – Critical Thinking and Analytical Reasoning

PSO 4.a: Analyze the techniques, reactions and concepts in various fields of Biochemistry and to provide valid suggestions to the industry.

PSO 4.b: Apply the principles of various fields of biochemistry to provide cost efficient solutions in life science related issues for the betterment of society.

PO5 – Digital Literacy, Self - Directed and Lifelong Learning

PSO 5.a: Use standard laboratory protocols of Biochemistry and biology and apply computers for data acquisition through available softwares.

PSO 5.b: Apply various technical knowledge with more parameters and updating their academics as lifelong learning activities.

PO6 – Co-operation/Team Work and Multicultural Competence

PSO 6: Uphold leadership qualities, team spirit and good interpersonal skills in team works.

PO7 –Moral and Ethical Awareness

PSO 7: Follow the global standards of codes of conduct in life science community and practice the imbibed moral values in their profession and society to maintain sustainable environment.

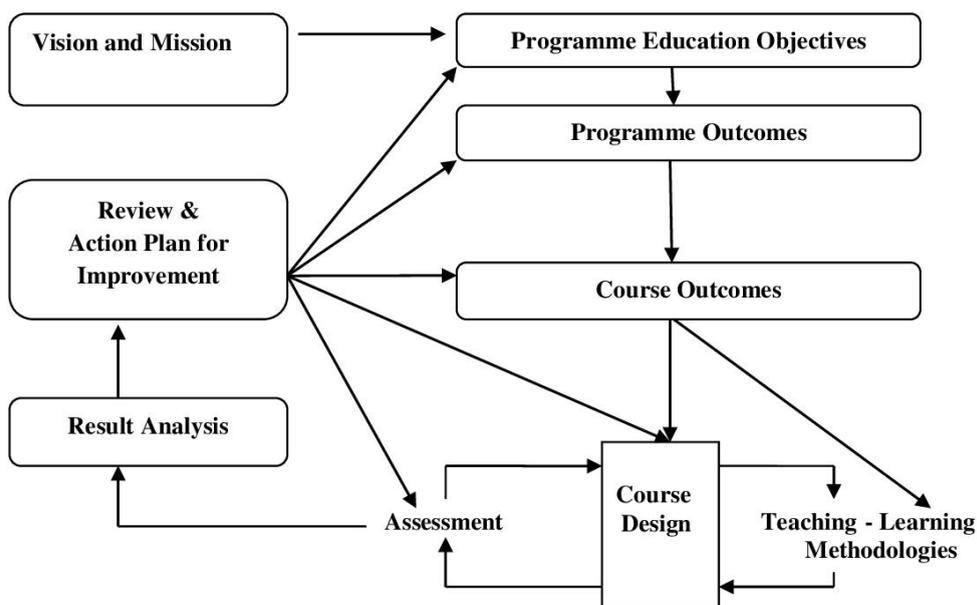
PO-PEO Mapping Matrix

Attainment of PEOs can be measured by a PO-PEO matrix. PEOs should evolve through constant feedback from alumnae, students, industry, management, *etc.* It is mandatory that each PEO should be mapped to at least one of the POs.

PEOs POs/PSOs	PEO1	PEO2	PEO3
PO1/PSO1	✓	✓	✓
PO2/PSO2	✓	✓	✓
PO3/PSO3	✓	✓	✓
PO4/PSO4	✓	✓	✓
PO5/PSO5	✓	-	✓
PO6/PSO6	-	✓	✓
PO7/PSO7	✓	✓	✓

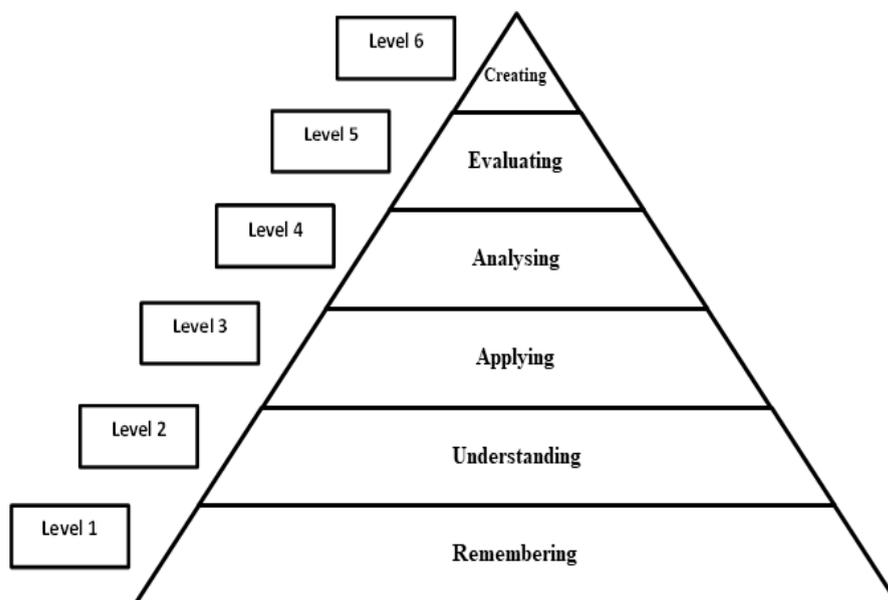
B.1.4 Course Outcomes (COs)

Course Outcomes are narrow statements restricted to the Course contents given in five units. Course Outcomes describe what students would be capable of, after learning the contents of the Course. They reflect the level of knowledge gained, skills acquired and attributes developed by the students after learning of Course contents. COs are measurable, attainable and manageable in number. COs contribute to attain POs in such a way that each CO addresses at least one of the POs and also each PO is reasonably addressed by adequate number of COs.



It is important to determine the methods of assessment. A comprehensive assessment strategy may be outlined using the revised Bloom's Taxonomy levels.

BLOOM'S TAXONOMY



CO – PO Mapping of Courses

After framing the CO statements, the COs framed for each Course is mapped with POs based on the relationship that exists between them. The COs which are not related to any of the POs is indicated with (-), signifying Nil. Measurement Mapping is based on Four Points Scale [High (H), Medium (M), Low (L) and Nil (-)]. For calculating weighted percentage of contribution of each Course in the attainment of the respective POs, the weights assigned for H, M and L are 3, 2 and 1 respectively.

CO-PO/PSO Mapping Table (Course Articulation Matrix)

PO/PSOs	PO1/ PSO1	PO2/ PSO2	PO3/ PSO3	PO4/ PSO4	PO5/ PSO5	PO6/ PSO6	PO7/ PSO7
COs							
CQ1							
CO2							
CO3							
CO4							
CO5							

ELIGIBILITY FOR ADMISSION

The candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamil Nadu or any other equivalent examination accepted by the Academic Council with Biology and Chemistry 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/Alternate Course
Part II	:	English
Part III	:	Core Courses
	:	Allied Courses
	:	Elective Courses: Discipline Specific Elective Courses
	:	Self Study Course
Part IV	:	Skill Enhancement Courses (SEC)
	:	Field Project/Internship
	:	Non-Major Elective Courses (NMEC)
	:	Ability Enhancement Compulsory Courses (AECC)
	:	Generic Elective Courses (GEC)
Part V	:	Self Study Course
	:	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 and National Cadet Corps/ Rotaract club

B.2. EVALUATION SCHEME

B.2.1 PART II

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	15	75	100
Practical	5+5	5	

INTERNAL ASSESSMENT

Distribution of Marks

Mode of Evaluation	Marks
Periodic Test	: 15
Practical	: 10
Total	: 25

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

B.2.1.1 PART II (II UG – 2023-2024 onwards)

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Test	15	45	100
Practical	25	15	

INTERNAL ASSESSMENT

Distribution of Marks

Mode of Evaluation	Marks
Periodic Test	: 15
Practical	: 25
Total	: 40

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

EXTERNAL ASSESSMENT

Distribution of Marks

Mode of Evaluation	Marks
Theory	: 45
Practical	: 15
Total	: 60

B.2.1 Part I PART III - Core Courses, Discipline Specific Elective Courses & Allied Courses

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

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

Mode of Evaluation			Marks
Periodic Test		:	15
Assignment	Core:I UG-K4 Level, II & III UG – K5 Level	:	5
	Part I & Allied: K4 Level		
	DSEC:K5 Level		
Quiz	K2:Level	:	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
Test	:	15
Model Examination	:	15
Performance	:	10
Total	:	40

Model Examination - Average of the best two will be considered

Performance - Attendance and Record

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

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)	Internal Choice - Either Or Type	3	3	7	21
C Q.No.(8-9)	Internal Choice - Either Or Type	2	2	10	20
Total					45*

*The total marks obtained in the Periodic Test will be calculated for 15 marks

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

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	10	10	1	10
B Q. No.(11 -15)	Internal Choice – Either Or Type	5	5	7	35
C Q. No.(16-18)	Internal Choice – Either Or Type	3	3	10	30
Total					75

PROJECT**Assessment by Internal examiner only****Distribution of Marks**

Mode of Evaluation	Marks
Project Work and report	60
Presentation and Viva	40
Total	100

B.2.2 SELF STUDY COURSE**Core Courses Quiz – Online**

Assessment by Internal Examiner only

- Question Bank is prepared by the Faculty Members of the Departments.
- No. of Questions to be taken 700.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in VI Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Distribution of Marks

	Mode of Evaluation	Marks
Periodic Test	:	40
Model Examination	:	60
	Total	100

Two Periodic Tests - Better of the two will be considered

B.2.3 PART IV - Skill Enhancement Courses & Non Major Elective Courses**INTERNAL ASSESSMENT****Distribution of Marks****Theory**

Mode of Evaluation			Marks
Periodic Test		:	25
Assignment	SEC:K4 Level	:	10
	NMEC:K3 Level		
Quiz	K2 Level	:	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	Marks for each Question	Total Marks
A Q. No.(1- 3)	Internal Choice – Either Or Type	3	3	5	15
B Q. No.4	Internal Choice - Either Or Type	1	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)	Internal Choice –Either Or Type	6	6	5	30
B Q. No.(9- 13)	Internal Choice –Either Or Type	3	3	10	30
Total					60

B.2.4 PART IV- Ability Enhancement Compulsory Courses (AECC) & Generic Elective Courses (GEC)

 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.

Distribution of Marks

Mode of Evaluation			Marks
Periodic Test		:	30
Assignment	K2 Level	:	10
Model Examination		:	60
Total		:	100

Two Periodic tests - Better of the two will be considered
 Two Assignments - Better 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- 3)	Internal Choice - Either Or Type	3	3	6	18
B Q. No.4	Internal Choice - Either Or Type	1	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- 5)	Internal Choice - Either Or Type	5	5	6	30
B Q. No.(6- 8)	Internal Choice - Either Or Type	3	3	10	30
Total					60

B.2.5.PART IV – Internship/Field Project

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

- **Internship:** A designated activity that carries one credit involving not less than 15 days of working in an organization under the guidance of an identified mentor
- **Field Project:** Students comprising of maximum 5 members in a team need to undertake a project that involves conducting surveys inside/outside the college premises and collection of data from designated communities or natural places.
- Assessment by Internal Examiner only

Mode of Evaluation		Marks
Onsite Learning/Survey	:	50
Report	:	25
Viva-Voce	:	25
Total		100

Self Study Course**Practice for Competitive Examinations - Online**

Assessment by Internal Examiner only

- Question Bank prepared by the Faculty Members of the respective Departments will be followed.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in V Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Subject wise Allotment of Marks

Subject		Marks
Tamil	:	10
English	:	10
History	:	10
Mathematics	:	10
Current affairs	:	10
Commerce, Law & Economics	:	10
Physical Sciences	:	10
Life Sciences	:	15
Computer Science	:	5
Food and Nutrition	:	5
Sports and Games	:	5
		100

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	40
Model Examination	:	60
Total	:	100

Two Periodic Tests - Better of the two will be considered

B.2.6. PART V- Extension Activities

Assessment by Internal examiner only

Distribution of Marks

Mode of Evaluation		Marks
Attendance	:	5
Performance	:	10
Report	:	10
Total		25*

*The marks obtained will be calculated for 100 marks

B.2.7 EXTRA CREDIT COURSE (OPTIONAL)

Assessment by Internal Examiner only

Distribution of Marks

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	10	10	1	10
B Q.No.(11- 15)	Internal Choice - Either Or Type	5	5	9	45
C Q.No.(16-20)	Open Choice	5	3	15	45
Total					100

ELIGIBILITY FOR THE DEGREE

The candidate will not be eligible for the Degree without completing the prescribed Courses of study, lab work, *etc.*, and a minimum Pass marks in all the Courses.

- No Pass minimum for Internal Assessment.
- Pass minimum for External Examination is 27 marks out of 75 for Core Courses, Discipline Specific Elective Courses and Allied Courses.
- Pass minimum for External Examination is 21 marks out of 60 for Skill Enhancement Courses and Non Major Elective Courses.
- The aggregate minimum pass percentage is 40
- Pass minimum for External Practical Examination is 21 marks out of 60 marks.
- Pass minimum for Ability Enhancement Compulsory Course and Generic Elective Course is 40 marks.
- Pass minimum for Self Study Courses is 40 marks.

ATTENDANCE

- For UG, PG and M.Phil. Programmes,
 - (a) The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.
 - (b) The students who have only 60-75 days (66% - 84%) of attendance are permitted to appear for the Summative Examinations after paying the required fine amount and fulfilling other conditions according to the respective cases.

- (c) The students who have attended the classes for 59 days and less - upto 45 days (50%-65%) can appear for the Summative Examinations only after getting special permission from the Principal.
- (d) The students who have attended the classes for 44 days or less (50%) cannot appear for the Summative Examinations and have to repeat the whole semester.
- For Part V in UG Programmes, the students require 75 % of attendance to get a credit.
 - For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

These rules come into effect from 2020-2021 onwards.

B.3 ASSESSMENT MANAGEMENT PLAN

An Assessment Management Plan that details the assessment strategy both at the Programme and the Course levels is prepared. The continuous assessment is implemented using an assessment rubric to interpret and grade students.

B.3.1 Assessment Process for CO Attainment

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of Course Outcomes and Programme Outcomes. Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a Course. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct Assessment (rubric based)-Conventional assessment tools such as Term Test, Assignment, Quiz and End Semester Summative Examination are used.

Indirect Assessment – Done through Course Exit Survey.

CO Assessment Rubrics

For the evaluation and assessment of COs and POs, rubrics are used. Internal assessment contributes 40% and End Semester assessment contributes 60% to the total attainment of a CO for the theory Courses. For the practical Courses, internal assessment contributes 50% and Semester assessment contributes 50% to the total attainment of a CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

CO Attainment

Direct CO Attainment

Course outcomes of all Courses are assessed and the CO – wise marks obtained by all the students are recorded for all the assessment tools. The respective CO attainment level is evaluated based on set attainment rubrics.

Attainment Levels of COs

Assessment Methods	Attainment Levels	
Internal Assessment	Level 1	50% of students scoring more than average marks or set target marks in Internal Assessment tools
	Level 2	55% of students scoring more than average marks or set target marks in Internal Assessment tools
	Level 3	60% of students scoring more than average marks or set target marks in internal Assessment tools
End Semester Summative Examination	Level 1	50% of students scoring more than average marks or set target marks in End Semester Summative Examination
	Level 2	55% of students scoring more than average marks or set target marks in End Semester Summative Examination
	Level 3	60% of students scoring more than average marks or set target marks in End Semester Summative Examination

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixed as target. For setting up the target of End Semester Examination, the average mark of the class shall be set as target.

Formula for Attainment for each CO

Attainment = Percentage of students who have scored more than the target marks

$$\text{Percentage of Attainment} = \frac{\text{Number of Students who Scored more than the Target}}{\text{Total Number of Students}} \times 100$$

Indirect CO Attainment

At the end of each Course, an exit survey is conducted to collect the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the attainment of Course outcomes.

Overall CO Attainment= 75% of Direct CO Attainment + 25 % of Indirect CO Attainment

In each Course, the level of attainment of each CO is compared with the predefined targets. If the target is not reached, the Course teacher takes necessary steps for the improvement to reach the target.

For continuous improvement, if the target is reached, the Course teacher can set the target as a value greater than the CO attainment of the previous year.

B.3.2 Assessment Process for Overall PO Attainment

With the help of CO against PO mapping, the PO attainment is calculated. PO assessment is done by giving 75% weightage to direct assessment and 25% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester examination and 25 % weightage is given to attainment through internal assessments. Indirect assessment is done through Graduate Exit Survey and participation of students in Co-curricular/Extra-curricular activities.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage -75%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage - 25%)	Graduate Exit Survey 10%	At the end of the Programme, Graduate Exit Survey is collected from the graduates and it gives the opinion of the graduates on attainment
	Co-curricular / Extracurricular	For participation in Co-curricular / Extracurricular activities during the period of

Programme Articulation Matrix (PAM)

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Average Direct PO Attainment									
Direct PO Attainment in percentage									

Indirect Attainment of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Graduate Exit Survey								
Indirect PO Attainment								

Attainments of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Direct Attainment (Weightage - 75%)								
Indirect Attainment (Weightage - 25%)								
Overall PO Attainment								

Overall PO Attainment= [75% of Direct PO Attainment +

25% of Indirect PO Attainment (Graduate Exit Survey & Participation in Co- curricular and Extracurricular Activities)]

Expected Level of Attainment for each of the Programme Outcomes

POs	Level of Attainment
Value \geq 70%	Excellent
Value \geq 60 % and Value $<$ 70%	Very Good
Value \geq 50 % and Value $<$ 60%	Good
Value \geq 40% and Value $<$ 50%	Satisfactory
Value $<$ 40%	Not Satisfactory

Level of PO attainment

Graduation Batch	Overall PO Attainment (in percentage)	Whether Expected Level of PO is Achieved? (Yes/No)

B.3.3 Assessment Process for PEOs

The curriculum is designed so that all the courses contribute to the achievement of PEOs. The attainment of PEOs is measured after 5 years of completion of the programme only through Indirect methods.

Target for PEO Attainment

Assessment Criteria	Target (UG)	Target (PG)
Record of Employment	25% of the class strength	30% of the class strength
Progression to Higher Education	40% of the class strength	5% of the class strength
Record of Entrepreneurship	2% of the class strength	5% of the class strength

Attainment of PEOs

Assessment Criteria & Tool	Weightage
Record of Employment	10
Progression to Higher Education	20
Record of Entrepreneurship	10
Feedback from Alumnae	30
Feedback from Parents	10
Feedback from Employers	20
Total Attainment	100

$$\text{Percentage of PEO Attainment from Employment} = \frac{\text{Number of Students who have got Employment}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Higher Education} = \frac{\text{Number of Students who pursue Higher Education}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Entrepreneurship} = \frac{\text{Number of Students who have become Entrepreneurs}}{\text{Target}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

POs	Level of Attainment
Value \geq 70%	Excellent
Value \geq 60 % and Value $<$ 70%	Very Good
Value \geq 50 % and Value $<$ 60%	Good
Value \geq 40% and Value $<$ 50%	Satisfactory
Value $<$ 40%	Not Satisfactory

Level of PEO Attainment

Graduation Batch	Overall PEO Attainment (in percentage)	Whether Expected Level of PEO is Achieved? (Yes/No)

C. PROCESS OF REDEFINING THE PROGRAMME EDUCATIONAL OBJECTIVES

The college has always been involving the key stake holders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the Programme are defined, refined and are inscribed in the form of PEOs. The level of attainment of PEOs defined earlier will be analyzed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like Board of Studies, Academic Council and Governing Body may recommend appropriate actions. As per the Outcome Based Education Framework implemented from the Academic Year 2020 -2021, the following are the Programme Structure, the Programme Contents and the Course Contents of B.Sc. Programme.



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VIRUDHUNAGAR - 626 001

BACHELOR OF SCIENCE BIOCHEMISTRY (2021)

Outcome Based Education with Choice Base Credit System

Programme Structure - Allotment of Hours and Credits For those who join in the academic Year 2020-2021

Components	Semester						Total Number of Hours (Credits)
	I	II	III	IV	V	V I	
Part I : Tamil /Hindi	6 (3)	6 (3)	6 (3)	6 (3)	-	-	24 (12)
Part II : English	6 (3)	6(3)	6 (3)	6 (3)	-	-	24 (12)
Part III : Core Courses, Discipline Specific Elective Courses, Allied Courses & Self Study Course							
Core Course	4 (4)	4 (4)	5 (5)	5 (5)	4 (4)	5 (4)	27 (26)
Core Course	4 (4)	4 (4)	-	-	4 (4)	5 (4)	17(16)
Core Course	-	-	-	-	4 (4)	5 (4)	9 (8)
Core Course Practical	2 (0)	2 (2)	2 (0)	2 (2)	3 (0) 3 (0) 2 (0)	3 (3) 3 (3) 2 (2)	14 (7) 6 (3) 4 (2)
DSEC	-	-	-	-	4 (4)	5 (4)	9 (8)
Project	-	-			0(1)	-	0(1)
Allied Course I	4 (4)	4 (4)	-	-	-	-	8 (8)
Allied Course II	-	-	4 (4)	4 (4)	-	-	8 (8)
Allied Course Practical	2 (0)	2 (2)	2 (0)	2 (2)	-	-	8 (4)
Self Study Course	-	-	-	-	-	0 (1)	0 (1)
Part IV : Skill Enhancement Courses, Non Major Elective Courses, Ability Enhancement Compulsory Courses, Generic Elective Courses, Self Study Course & Internship/ Field Project							
SEC	-	2 (2)	2 (2)	2 (2)	2 (2)	2 (2)	10 (10)
SEC	-	-	-	-	2 (2)	-	2 (2)
Non Major Elective Course	-	-	2(2)	2 (2)	-	-	4 (4)
AECC - Value Education	2 (2)	-	-	-	-	-	2 (2)
AECC - Environmental Studies	-	-	-	-	2(1)	-	2 (1)
GEC -1	-	-	1 (1)	-	-	-	1(1)
GEC -2	-	-	-	1 (1)	-	-	1 (1)
Self Study Course					0 (1)	-	0 (1)
Internship/ Field Project	-	-	-	0 (1)	-	-	0 (1)
Part V : Extension Activities	-	-	-	0 (1)	-	-	0 (1)
Total	30 (20)	30 (24)	30 (20)	30 (26)	30 (23)	30(27)	180 (140)
Extra Credit Course					0(2)		0(2)

DSEC: Discipline Specific Elective Course

AECC: Ability Enhancement Compulsory Course

SEC: Skill Enhancement Course

GEC: Generic Elective Course



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PART I - TAMIL

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UTAG11	பொதுத்தமிழ் தாள் I	3	100
2.	II	20UTAG21	பொதுத்தமிழ் தாள் II	3	100
3.	III	20UTAG31	பொதுத்தமிழ் தாள் III	3	100
4.	IV	20UTAG41	பொதுத்தமிழ் தாள் IV	3	100
TOTAL				12	400

PART I - HINDI

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UHDG11 22UHDG11	Hindi - Paper I Prose – I & II, Ancient Stories - I, General Essays, Functional Hindi – I & Grammar General Hindi – I	3	100
2.	II	20UHDG21 22UHDG21	Hindi - Paper II Drama, One Act Play, Letter, Correspondence, Functional Hindi – II & Grammar General Hindi – II	3	100
3.	III	20UHDG31 22UHDG31	Hindi - Paper III Ancient Poetry, Drama, Indian History, Hindi Grammar & Functional Hindi III Advanced Hindi – I	3	100
4.	IV	20UHDG41 22UHDG41	Hindi - Paper IV Modern Poetry, Hindi Literary Essays, Letter Correspondence, Conversation & Functional Hindi IV Advanced Hindi - II	3	100
TOTAL				12	400

PART II - ENGLISH

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UENG11A 20UENG11B 20UENG11C	English – Paper I English for Advanced Learners I English for Career Guidance - I English for Communicative Competence-I	3	100
2.	II	20UENG21A 20UENG21B 20UENG21C	English – Paper II English for Advanced Learners II English for Career Guidance - II English for Communicative Competence - II	3	100
3.	III	20UENG31A 20UENG31B 20UENG31C 22UENG31	English – Paper III English for Advanced Learners III English for Career Guidance – III English for Communicative Competence – III Communicative English – I	3	100
4.	IV	20UENG41A 20UENG41B 20UENG41C 22UENG41	English – Paper IV English for Advanced Learners IV English for Career Guidance – IV English for Communicative Competence – IV Communicative English – II	3	100
TOTAL				12	400

PART III – CORE, DISCIPLINE SPECIFIC ELECTIVE COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1	I	20UBCC11	Biomolecules	4	100
2	I	20UBCC12	Biochemical Techniques	4	100
3	II	20UBCC21	Enzymes	4	100
4	II	20UBCC22/ 20UBCC22N	Metabolism	4	100
5	II	20UBCC21P	Core Course Practical 1 Biomolecules Lab	2	100
6	III	20UBCC31	Immunology	5	100
7	IV	22UBCC41	Principles of Food Science	5	100
8	IV	20UBCC42P	Core Course Practical 2 Biochemical analysis of metabolites Lab	2	100
9	V	20UBCC51	Molecular biology	4	100
10	V	20UBCC52	Microbiology	4	100
11	V	20UBCC53	Pharmacology	4	100

12	V	20UBCE51/ 20UBCE52/ 20UBCE53	Discipline Specific Elective 1 (DSEC -1) 1. Human Physiology 2. Genetics 3.Molecular Biophysics	4	100
13	V	20UBCC5PR	Project	1	100
14	VI	20UBCC61	Biotechnology	4	100
15	VI	20UBCC62	Plant Biochemistry	4	100
16	VI	20UBCC63	Clinical Biochemistry	4	100
17	VI	20UBCE61/ 20UBCE62/ 20UBCE63	Discipline Specific Elective 2 (DSEC - 2) 1. Medical Laboratory Technology 2. Biofertilizers and Biopesticides 3. Toxicology	4	100
18	VI	20UBCQ61	Core Course Quiz	1	100
19	VI	20UBCC61P	Core Course Practical 3- Clinical Biochemistry Lab	3	100
20	VI	20UBCC62P	Core Course Practical 4 – Microbiology Lab	3	100
21	VI	20UBCC63P	Core Course Practical 5- Bioinformatics Lab	2	100
Total				72	2100

PART III – ALLIED COURSE I- CHEMISTRY

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UCHA11	Chemistry –I	4	100
2.	II	20UCHA21 20UCHA21P	Chemistry – II Allied Practical –I	4 2	100 100
Total				10	300

PART III - ALLIED COURSE II- BIOLOGY

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	20UBIA31	Biology	4	100
2.	IV IV	20UBIA31 20UBIA31P	Biology Allied Practical –II	4 2	100 100
Total				10	300

PART IV - SKILL ENHANCEMENT COURSES

S.No.	Se	Code	Title of the Course	Credits	Marks
1.	I I	20UBCS21/ 20UBCS21N	Endocrinology	2	100
2.	III	20UBCS31	Nutrition	2	100
3.	IV	20UBCS41/ 20UBCS41N	Biostatistics	2	100
4.	V	20UBCS51	Bioinformatics	2	100
5.	V	20UBCS52	Molecular Basis of Non-infectious Human Diseases	2	100
6.	VI	20UBCS61	Forensic Science	2	100
Total				12	600

PART IV –NON MAJOR ELECTIVE COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UBCN31	Women and Health	2	100
2.	II	20UBCN42	Life Style Associated Disorders	2	100
Total				4	200

**PART IV- ABILITY ENHANCEMENT COMPULSORY COURSES,
GENERIC ELECTIVE COURSES AND INTERNSHIP / FIELD
PROJECT**

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UGVE11	Value Education	2	100
2.	V	20UGES51	Environmental Studies	1	100
3	III	20UGEH31 20UGEW32	Human Rights/ Women Studies	1	100
4.	IV	20UGEC41	Constitution of India/	1	100
		20UGEM42	Modern Economics/		
		20UGEA43	Adolescent Psychology/		
		20UGED44	Disaster Management		
		20UBCIF41	Internship/Field Project	1	100
5.	V	20UOLG51	Practice for Competitive Examinations	1	100
6.		PART-V	Extension Activities	1	-
Total				7	600

PART V -EXTENSION ACTIVITIES

S. No.	Semester	Code	Title of the Course	Credit
1	I, II,III, IV	20UVNS1 20UVNS2	National Service Scheme	1
2		20UVPE1	Physical Education	
3		20UVYR1 20UVYR2	Youth Red Cross Society	
4		20UVR1	Red Ribbon Club	
5		20UVSF1	Science Forum	
6		20UVEC1	Eco Club	
7		20UVLI1	Library and Information Science	
8		20UVCF1	Consumer Forum	
9		20UVHF1	Health and Fitness Club	
10		20UVNC1 20UVNC2	National Cadet Corps	
11		20UVRO1	Rotaract Club	

EXTRA CREDIT COURSE(OPTIONAL)

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	V	20UBCO51	Emergency Care	2	100



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Programme Code – 2021

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Total Marks				
						Int.	Ext.	Total		
I	Part I	20UTAG11	Tamil/Hindi Paper I	6	3	3	25	75	100	
	Part II	20UENG11A/ 20UENG11B/ 20UENG11C	English Paper I	6	3	3	25	75	100	
	Part III	20UBCC11	Core Course -1		4	4	3	25	75	100
			Biomolecules							
		20UBCC12	Core Course - 2		4	4	2	25	75	100
			Biochemical Techniques							
	20UBCC21P	Core Course Practical-1		2	-	3	-	-	-	
		Bio Molecules								
	20UCHA11	Allied Course –I Allied Chemistry 1 Allied Practical 1		4	4	3	25	75	100	
				2	-	3	-	-		
Part IV	20UGVE11	Value Education	2	2	-	100	-	100		
TOTAL			30	20				600		

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Marks			
						Int.	Ext.	Total	
II	Part I	20UTAG21	Tamil /Hindi Paper II	6	3	3	25	75	100
	Part II	20UENG21A/ 20UENG21B/ 20UENG21C	English Paper II	6	3	3	25	75	100
	Part III	20UBCC21	Core Course - 3 Enzymes	4	4	3	25	75	100
		20UBCC22	Core Course - 4 Metabolism	4	4	3	25	75	100
		20UBCC21P	Core Course Practical-1 Bio Molecules	2	2	3	40	60	100
		20UCHA21	Allied Course -I Allied Chemistry 1	4	4	3	25	75	100
		20UCHA22	Allied Practical 1	2	2	3	40	60	100
	Part IV	20UBCS21	Skill Enhancement Course 1 (SEC 1) Endocrinology	2	2	2	40	60	100
	TOTAL			30	24				800

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Total Marks			
						Int.	Ext.	Total	
III	Part I	20UTAG31	Tamil/ Hindi Paper III	6	3	3	25	75	100
	Part II	20UENG31A/ 20UENG31B/ 20UENG31C	English Paper III	6	3	3	25	75	100
	Part III	20UBCC31	Core Course -5 Immunology	5	5	3	25	75	100
		20UBCC41P	Core Course Practical -2	2	-	3	-	-	-
		20UBIA31 20UBIA41P	Allied Course -II Allied Biology Allied Practical -1	4 2	4 -	3 3	25 -	75 -	100
	Part IV	20UBCS31	Skill Enhancement Course 2 (SEC 2) Nutrition	2	2	2	40	60	100
		20UBCN31	NMEC-1 Women and Health	2	2	2	40	60	100
	Part IV	20UGEH31/ 20UGEW32	Generic Elective -1 1.Human Rights/ 2. Women studies	1	1	2	100	-	100
	TOTAL			30	20				700

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Total Marks			
						Int.	Ext.	Total	
IV	Part I	20UTAG41	Tamil /Hindi IV	6	3	3	25	75	100
	Part II	20UENG41A/ 20UENG41B/ 20UENG41C	English IV	6	3	3	25	75	100
	Part III	20UBCC41	Core Course -6 Food Science	5	5	3	25	75	100
		20UBCC41P	Core Course Practical – 2	2	2	3	40	60	100
		20UBIA41 20UBIA41P	Allied Course – II Allied Biology Allied Practical – 1	4 2	4 2	3 3	25 40	75 60	100 100
	Part IV	20UBCS41	Skill Enhancement Course 3 (SEC 3) Biostatistics	2	2	2	40	60	100
		20UBCN41	NMEC-2 Life style associated disorders	2	2	2	40	60	100
		20UBCIF41	Internship/Field Project	0	1	-	100	-	100
		20UGEC41/ 20UGEM42/ 20UGEA43/ 20UGED44	Generic Elective -2 Constitution of India/ Modern Economics/ Adolescent Psychology/ Disaster Management	1	1	2	100	-	100
	Part V		Extension Activities	-	1		100		
			TOTAL	30	26				1100

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Total Marks				
						Int.	Ext.	Total		
V	Part III	20UBCC51	Core Course – 7 Molecular biology	4	4	3	25	75	100	
		20UBCC52	Core Course - 8 Microbiology	4	4	3	25	75	100	
		20UBCC53	Core Course – 9 Pharmacology	4	4	3	25	75	100	
		20UBCC61P	Core Course Practical -3 Clinical Biochemistry	3	-	3	-	-	-	
		20UBCC62P	Core Course Practical - 4 Microbiology	3	-	3	-	-	-	
		20UBCC63P	Core Course Practical -5 Bioinformatics	2	-	3	-	-	-	
		20UBCE51/ 20UBCE52/ 20UBCE53	Discipline Specific Elective Course 1 (DSE1) Human Physiology/ Genetics/ Molecular Biophysics	4	4	3	25	75	100	
		20UBCC5PR	Core Course – 10 Project	0	1	-	100		100	
		Part IV	20UBCS51	Skill Enhancement Course 4 (SEC 4) Bioinformatics	2	2	2	40	60	100
			20UBCS52	Skill Enhancement Course 5 (SEC 5) Molecular basis of Non - Infectious human diseases	2	2	2	40	60	100
20UGCE51	Self-Study Course Practice for Competitive Examinations - Online		-	1	-	100	-	100		
20UGES51	Environmental Studies		2	1	2	100		100		
		TOTAL	30	23				900		

Semester	Course Code	Courses	Hours per week	Credits	Exam. Hours	Total Marks		
						Int.	Ext.	Total
VI	Part III	Core Course -11 20UBCC61 Biotechnology	5	4	3	25	75	100
		Core Course -12 20UBCC62 Plant Biochemistry	5	4	3	25	75	100
		Core Course -13 20UBCC63 Clinical Biochemistry	5	4	3	25	75	100
		Core Course Practical -3 20UBCC61P Clinical Biochemistry	3	3	3	40	60	100
		Core Course Practical -4 20UBCC62P Microbiology	3	3	3	40	60	100
		Core Course Practical -5 20UBCC63P Bioinformatics	2	2	3	40	60	100
		Discipline Specific Elective Course 2 (DSEC 2) 20UBCE61/ 20UBCE62/ 20UBCE63 Medical Laboratory Technology/ Biofertilizers and Biopesticides /	5	4	3	25	75	100
		Self-Study Course 20UBCQ61 Core Course Quiz - Online	-	1	-	100		100
	Part IV	20UBCS61 Skill Enhancement Course 6 (SEC 6) Forensic Science	2	2	2	40	60	100
TOTAL			30	27			900	



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BACHELOR OF BIOCHEMISTRY

Programme Code – 2021

REVISED PROGRAMME CONTENT

Semester	Course Code	Courses	Hours per week	Credits	Total Marks			
					Int.	Ext.		
I	Part I	20UTAG11	Tamil/Hindi Paper I	6	3	25	75	
	Part II	20UENG11	English Paper I	6	3	25	75	
	Part III	20UBCC11	Core Course -1		4	4	25	75
			Biomolecules					
		20UBCC12	Core Course - 2		4	4	25	75
			Biochemical Techniques					
	20UBCC21P	Core Course Practical-1		2	-	-	-	
		Biomolecules Lab						
	20UCHA11 20UCHA21P	Allied Course –I		4	4	25	75	
Allied Chemistry 1								
20UGVE11	Value Education	Allied Practical 1	2	-	-	-		
Part IV	20UGVE11	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	20UTAG21	Tamil /Hindi Paper II	6	3	25	75
	Part II	20UENG21	English Paper II	6	3	25	75
	Part III	20UBCC21	Core Course - 3 Enzymes	4	4	25	75
		20UBCC22N	Core Course - 4 Metabolism	4	4	25	75
		20UBCC21P	Core Course Practical-1 Biomolecules Lab	2	2	40	60
		20UCHA21	Allied Course -I Allied Chemistry 1	4	4	25	75
		20UCHA21P	Allied Practical 1	2	2	40	60
	Part IV	20UBCS21N	Skill Enhancement Course 1 (SEC 1) Endocrinology	2	2	40	60
	TOTAL			30	24	800	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
III	Part I	20UTAG31	Tamil/ Hindi Paper III	6	3	25	75
	Part II	20UENG31	English Paper III	6	3	25	75
	Part III	20UBCC31	Core Course -5 Immunology	5	5	25	75
		20UBCC41P	Core Course Practical –2 Biochemical Analysis of Metabolites Lab	2	-	-	-
		20UZYA31 20UZYA41P	Allied Course -II Allied Biology Allied Practical -1	4 2	4 -	25 -	75 -
	Part IV	20UBCS31	Skill Enhancement Course 2 (SEC 2) Nutrition	2	2	40	60
		20UBCN31	NMEC-1 Women and Health	2	2	40	60
	Part IV	20UGEH31/ 20UGEW32	Generic Elective -1 1.Human Rights / 2. Women studies	1	1	40	60
	TOTAL			30	20	700	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
IV	Part I	20UTAG41	Tamil /Hindi IV	6	3	25	75
	Part II	20UENG41	English IV	6	3	25	75
	Part III	22UBCC41	Core Course -6 Principles of Food Science	5	5	25	75
		20UBCC41P	Core Course Practical – 2 Biochemical Analysis of Metabolites Lab	2	2	40	60
		20UZYA41 20UZYA41P	Allied Course – II Allied Biology Allied Practical – 1	4 2	4 2	25 40	75 60
	Part IV	20UBCS41N	Skill Enhancement Course 3 (SEC 3) Biostatistics	2	2	40	60
		20UBCN41	NMEC-2 Life style associated disorders	2	2	40	60
		20UBCIF41	Internship/Field Project	0	1	100	-
		20UGEC41/ 20UGEM42/ 20UGEA43/ 20UGED44	Generic Elective -2 Constitution of India/ Modern Economics/ Adolescent Psychology/ Disaster Management	1	1	100	-
	Part V		Extension Activities	-	1	-	-
			TOTAL	30	26	1000	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
V	Part III	20UBCC51	Core Course – 7 Molecular biology	4	4	25	75
		20UBCC52	Core Course - 8 Microbiology	4	4	25	75
		20UBCC53	Core Course – 9 Pharmacology	4	4	25	75
		20UBCC61P	Core Course Practical -3 Clinical Biochemistry Lab	3	-	-	-
		20UBCC62P	Core Course Practical - 4 Microbiology Lab	3	-	-	-
		20UBCC63P	Core Course Practical -5 Bioinformatics Lab	2	-	-	-
		20UBCE51/ 20UBCE52/ 20UBCE53	Discipline Specific Elective Course 1 (DSEC 1) Human Physiology/ Genetics/ Molecular Biophysics	4	4	25	75
		20UBCC5PR	Core Course – 10 Project	0	1	100	
	Part IV	20UBCS51	Skill Enhancement Course 4 (SEC 4) Bioinformatics	2	2	40	60
		20UBCS52	Skill Enhancement Course 5 (SEC 5) Molecular basis of Non - Infectious Human diseases	2	2	40	60
		20UGCE51	Self-Study Course Practice for Competitive Examinations	-	1	100	
		20UGES51	Environmental Studies	2	1	100	
			TOTAL	30	23	900	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
VI	Part III	20UBCC61	Core Course -11 Biotechnology	5	4	25	75
		20UBCC62	Core Course -12 Plant Biochemistry	5	4	25	75
		20UBCC63	Core Course -13 Clinical Biochemistry	5	4	25	75
		20UBCC61P	Core Course Practical -3 Clinical Biochemistry Lab	3	3	40	60
		20UBCC62P	Core Course Practical -4 Microbiology Lab	3	3	40	60
		20UBCC63P	Core Course Practical -5 Bioinformatics Lab	2	2	40	60
		20UBCE61/ 20UBCE62/ 20UBCE63	Discipline Specific Elective Course 2 (DSEC 2) Medical Laboratory Technology Biofertilizers and Biopesticides Toxicology	5	4	25	75
		20UBCQ61	Self-Study Course Core Course Quiz	-	1	100	
	Part IV	20UBCS61	Skill Enhancement Course 6 (SEC 6) Forensic Science	2	2	40	60
TOTAL			30	2	900		



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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020- 2021 onwards)

Semester I	BIOMOLECULES	Hours/Week: 4	
Core Course I		Credits: 4	
Course Code 20UBCC11		Internal 25	External 75

COURSE OUTCOMES

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

- CO1 : explain the various elements present in the biomolecules such as carbohydrates, proteins, lipids, nucleic acids and vitamins, their occurrence and classification [K1].
- CO2 : identify various molecular structures and to understand monomers, polymers and isomeric forms. [K2]
- CO3 : Explain the properties of biomolecules. [K2]
- CO4 : Apply the role of biomolecules in life. [K3]
- CO5 : correlate fundamental properties of biomolecules, their role in chemical reactions within living system and to prevent diseases. [K4]

UNIT I

Carbohydrates

chemical composition, occurrence, importance and general classification. Classification of Mono, Oligo and polysaccharides with suitable examples for each class.

Asymmetric carbon atom-isomerism-types of isomerism-stereo, geometrical, optical isomerism, epimers and enantiomers, structure of glucose, muta rotation, glycosidic linkage.

Disaccharides- Introduction-differences between reducing and non reducing sugars-occurrence, structure and properties and functions of maltose, lactose and sucrose .

Polysaccharides: Introduction-Types based on functional aspects-energy storage polysaccharides-starch and glycogen, structural polysaccharides-cellulose and chitin.

(15 Hours)

UNIT II

Amino acids and Peptides-

Introduction, general structure-isomerism, classification of amino acids-Rare amino acids of protein and non-protein amino acids, physical properties of amino acids-zwitter ion theory and isoelectric Ph, formation of peptide linkage-formation and naming of peptides, Biological role of peptides.

Proteins-

Introduction, fundamental role of proteins in life processes, composition and structure of protein, General properties of protein, Chemical bonds involved in maintaining the protein structure –formation of primary structure, secondary structure, tertiary structure and quaternary structure.Classification of proteins on the basis of their biological functions.

(10 Hours)

UNIT III

Lipids

Introduction, Biological importance and classification of lipids. Classification of naturally occurring fatty acids into saturated acids, unsaturated acids, branched chain acids, hydroxyl and keto derivative and cyclic acids and essential fatty acids chemical properties of fatty acids-salts, detergents and wetting agents-chemical reactions -hydrogenation, halogenations-iodine number-oxidation.

Fats-chemical composition of fats -physical and chemical properties of fats-waxes-common waxes-importance of waxes. Phospholipids-Biological functions-Lecithin, non-phospholipids and steroids.

(10 Hours)

UNIT IV

Nucleic acids

Introduction-fundamental role of Nucleic acids in life processes, Basic structure of DNA and RNA-Purine and Pyrimidine derivatives, structure of Nucleosides and nucleotides, structure and function of nucleotides such as AMP,ADP,ATP and cyclic AMP- formation of Inter nucleotide bonds.

DNA- Base composition of DNA -Chargaff's rule- primary structure-secondary structure and its salient features-Types of DNA-properties of DNA.

RNA-salient features of primary structure, secondary structure –types of RNA-structural characteristic, functions of mRNA, secondary and tertiary structural features and functions of tRNA. Differences between DNA and RNA. (15Hours)

UNIT V

Vitamins- An introduction, Brief mention of source and physiological role of Fat soluble vitamins-Vitamin A,D,E, and K. Brief mention of source and physiological role of Water soluble vitamins-Vitamin B complex, Vitamin C. (5 Hours)

TEXT BOOKS

1. Jain J.L.. (2008). *Fundamentals of Biochemistry*. New Delhi: Multicolour illustrative edition, S.Chand.& Company LTD. Ram Nagar.
2. Renuka Harekrishnan, *An Introduction to Biomolecules and Enzymes*, 3rd edition, Madurai: Indiraji Pathipagam.
3. Ambika Shanmugam. (2006). *Fundamentals of Biochemistry for medical students*.7th Edition revised, Chennai-600 035: 17,III Cross street, West C.I.T.Nagar,

REFERENCE BOOKS

1. Donald Voet & Judith Voet. (2004). *Biochemistry*, Wiley International Edition.
2. David I. Nelson, Michael M. Cox, Lehninger *Principles of Biochemistry*, fourth edition.

Course Code (20UBCC11)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5a	PSO 5b	PSO 6	PSO 7
CO 1	H	H	M	M	L	L	H	M	L	L
CO 2	H	H	H	M	M	L	H	M	L	L
CO 3	H	H	H	M	M	M	H	H	L	L
CO 4	H	H	H	M	H	M	H	H	L	M
CO 5	H	H	H	M	H	M	H	H	L	H

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020 -2021 onwards)

Semester I	BIOCHEMICAL TECHNIQUES	Hours/Week: 4	
Core Course 2		Credits: 4	
Course Code 20UBCC12		Internal 25	External 75

COURSE OUTCOMES

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

- CO1 : explain the basic principles of Biochemical Techniques [K1]
- CO2 : determine the applications of biochemical techniques in various fields [K2]
- CO3 : extract various biomolecules using biochemical techniques [K2].
- CO4 : apply various biochemical Techniques in analytical Laboratories [K3]
- CO5 : demonstrate various analytical techniques to interpret biological studies[K4]

UNIT I

Chromatography: Column, Paper and Thin layer chromatography, Ion exchange, Gas chromatography and HPLC, Gel filtration. Dialysis (15 Hours)

UNIT II

Electrophoresis - Principles and Instrumentation of AGE, SDS PAGE, 2D gel electrophoresis. (10 Hours)

UNIT III

Centrifugation – Principles of Centrifugation- Differential centrifugation, Density gradient centrifugation, types of rotors. (10 Hours)

UNIT IV

Colorimetry: Light spectrum and its wavelength regions- Complementary colours. Molar Extinction co- efficient. Beer lambert's law and its application. (10 Hours)

UNIT V

Radioisotopes in Biochemistry: Radioactivity, Elementary units, Detection and quantification - Auto radiography, fluorography, Isotopic tracer technique, Isotope dilution method.

(15 Hours)

Text Book

1. Upadhyay. (2005). *Biophysical biochemistry*, 3rd edition, Himalaya Publishing house Delhi.

REFERENCE BOOK

2. Wilson and Walker. (1995). *Practical biochemistry, Principles and techniques*- 4th Edition. Cambridge University Press. 1995.

Course Code (20UBCC12)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO 2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	H	H	M	H	H	M	H	H	L	M
CO 2	H	M	H	H	H	H	H	H	L	M
CO 3	H	H	M	H	H	H	H	H	L	M
CO 4	H	H	H	H	M	H	H	H	L	M
CO 5	H	H	H	M	H	H	H	M	L	H

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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020- 2021 onwards)

Semester I	ALLIED PAPER- ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY – I	Hours/Week: 4	
Allied Course -1		Credits: 4	
Course Code 20UCHA11		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the basic principles, statements, laws and theories in chemistry. [K1]

CO2: understand the fundamental concepts in organic, inorganic and physical chemistry. [K2]

CO3: illustrate the preparations, uses and applications of polymers, hydrogen and water, various metallurgical process, bonding theories, colloids, sols, emulsion and gels [K2]

CO4: predict the type of reactions involved in polymers preparation, utility of biomedical polymers, suitable process for metal extraction and water purification, shape of molecules using VSEPR, VB and MO theories, properties of gaseous and colloidal substances. [K3]

CO5: analyze different methodology of preparing polymers, separation of metals from their ores, water purification processes, various bonding theories, gas laws and properties of various colloids, applications of colloids and biomedical polymers.[K4]

UNIT I

1. Polymers – Polymerization – Definition – Classification – examples –Preparation and uses of polythene, PVC, teflon, polystyrene, dacron, nylon- 6,6.
2. Natural and synthetic rubbers – examples – vulcanization of rubber- Preparation and uses of SBR, Buna – N and neoprene.
3. Biomedical polymers – characteristics – examples - Biomedical applications of polymer.

(12Hours)

UNIT II

1. Metallurgy

Ores, minerals – various steps in the metallurgical processes – Froth floatation – calcination – roasting – leaching – smelting – Mond's process – Van Arkel –de-Boer process – Zone refining – Electrolytic refining – Extraction of titanium.

2. Hydrogen

Isotopes of hydrogen – Heavy water – uses- ortho and para hydrogen Interconversion. Occluded hydrogen – Nascent hydrogen – uses of hydrogen.

3. Water

Hardness of water – Types of hardness – Removal of hardness – sodalime, Permutit and Ion-exchange processes - Demineralisation process – purification of water using chlorine, Ozone and UV light. (12 Hours)

UNIT III

1. Bonding – Valence bond theory – postulates – Types of overlapping- σ & π bonds -

Concept of hybridization – sp , sp^2 and sp^3 hybridisation – VSEPR Theory – NH_3 and H_2O molecules.

2. Molecular orbital theory – postulates – Application to the formation of H_2 , O_2 and He_2 molecules. Comparison of VBT and MOT. (12Hours)

UNIT IV

1. Gas Laws - Boyle's law – Charles law – Gay Lussac's law – Ideal gas equation –

Avogadro's law – molar gas volume – Dalton's law of partial pressure -Graham's law of diffusion.

2. Kinetic Theory of gases - Postulates – Kinetic gas equation (Derivation not required) – Deduction of gas laws from kinetic gas equation.

3. Different types of Velocities – Average velocity, RMS velocity, most probable velocity – relationship between them. (No derivation)

4. Ideal and real gases - Definition – Deviation of real gases from ideal behavior – reasons for deviation. (12Hours)

UNIT V

1. Colloids – Definition and classification.
2. Sols – Different types – examples –Dialysis – electro osmosis – electrophoresis – stability of colloids- Gold number.
3. Emulsion – Types of emulsion – Emulsifier – Examples – Cleansing action of soap.
4. Gels – Types of gels – examples – Properties – Hydration – Swelling – syneresis – Thixotropy.
5. Applications of colloids. (12Hours)

TEXT BOOKS

1. 1.P.L.Soni, (2008) *Text book of Organic Chemistry*, Latest Edition.Sultan Chand & Sons.
2. P.L.Soni, (2008).*Text book of Inorganic Chemistry*,Latest Edition. Sultan Chand& Sons.
3. P.L.Soni, (2008).*Text book of Physical chemistry*Latest Edition.Sultan Chand & Sons.

REFERENCE BOOKS

1. Bahl and Arun Bahl,*Advanced Organic Chemistry*,22nd Edition.S.Chand&Company Ltd.
2. Puri, Sharma, Kalia, (2008).*Principles of Inorganic Chemistry*, 43rd Edition. Vishal Publishing Co.
3. Puri,Sharma,Patania,*Principles of Physical Chemistry*, 43rd Edition. Vishal Publishing Co.

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code (20UCHA11)	PSO1	PSO 2	PSO 3.a	PSO 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	M	M	H	H	L	M	L	L	L	L
CO 2	H	M	H	H	L	M	L	L	L	L
CO 3	H	M	H	M	M	M	M	M	M	M
CO 4	H	M	H	M	M	M	M	M	M	M
CO 5	H	M	H	M	M	M	M	M	M	M

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020 -2021 onwards)

Semester II	ENZYMES	Hours/Week: 4	
Core Course-4		Credits: 4	
Course Code 20UBCC21		Internal 25	External 75

COURSE OUTCOME

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

- CO1 : define the fundamentals of enzymology and the importance of enzymes in biological reactions. [K1]
- CO2 : understand the enzyme classification, functions, isolation, extraction and purification [K2]
- CO3 : infer the enzyme catalysed reactions and the factors affecting enzymatic actions [K2]
- CO4 : apply biochemical calculation for enzyme kinetics to understand the mechanism of enzyme action [K3]
- CO5 : illustrate the major applications of enzymes in industry and medicine [K4]

UNIT I

Nomenclature and Classification, Function, isolation, purification and Characteristics of Enzymes. (10 Hours)

UNIT II

Enzyme specificity- Enzyme reactions oxidation, and reduction, isomerisation, phosphorylation, acetylation and methylation, dehydration, decarboxylation, transamination. (10 Hours)

UNIT III

Enzyme substrate complexes- Michaelis and Menten kinetics: Determination of Km and Vmax-line Weaver Burk plot- Factors influencing Enzyme reactions, Enzyme inhibition- competitive, non-competitive and uncompetitive. (15 Hours)

UNIT IV

Mechanism of Enzyme actions – lysozyme and chymotrypsin, Role of coenzymes in Enzyme reactions. Eg: CoenzymeA, NAD, FAD only -Zymogens. (15 Hours)

UNIT V

A brief account of clinical and industrial application of Enzymes-Enzyme immobilization and its application. (10 Hours)

TEXT BOOKS

1. Jain, Sanjay Jain and Nitin Jain, 1997, “Fundamentals of Biochemistry” (6th Edition), New Delhi, S.Chand& Company Ltd
2. Lehninger, A.L Nelson, Cox. (2000).*Biochemistry*, 4th edition, W. H. Freeman & Co., New York.

REFERENCE BOOKS

1. Nicholas Price.(1989).*Enzymes*, 2nd Revised *edition*, Oxford University Press.
2. Trevor Palmer. (2004).*Enzymes*, 1st edition, Published by Albion
3. David Rawn. (2004). *Biochemistry*, 1st edition, Hans-Walter Heldt and Birgit Piechulla, Academic Press.

Course Code (20UBCC21)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO 2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	H	H	M	H	H	M	H	H	L	M
CO 2	H	M	H	H	H	H	H	H	L	M
CO 3	H	H	M	H	H	H	H	H	L	M
CO 4	H	H	H	H	M	H	H	H	L	M
CO 5	H	H	H	M	H	H	H	M	L	H

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Dr.R.Mallika
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B.Sc. BIOCHEMISTRY

(2020- 2021 onwards)

Semester II	METABOLISM	Hours/Week: 4	
Core Course-5		Credits: 4	
Course Code 20UBCC22		Internal 25	External 75

COURSE OUTCOME

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

- CO1 : explain all metabolic pathways of carbohydrates, lipid, amino acids ,
purine and pyrimidine. [K1]
- CO2 : discuss and elaborate the bioenergetics of TCA cycle, oxidation , reduction,
purine and pyrimidine. [K2]
- CO3 : identify the pathways of ETC, oxidative phosphorylation HMP, ketone body
metabolism, glycerol metabolism, glycine, cysteine metabolism. [K2]
- CO4 : differentiate and correlate the pathways of ETC ,oxidative phosphorylation
HMP ,glycogenolysis, glycogenesis, triglycerides, phospholipids,
cholesterol metabolism, protein, carbohydrate and fat metabolism. [K3]
- CO5 : illustrate the various metabolic pathways of carbohydrate, protein, lipid and
Nucleic acids. [K4]

UNIT I

Over view of metabolism-anabolic, catabolic and amphibolic pathways. Bioenergetics:
High energy and low energy phosphates; Electron Transport chain, Oxidative
phosphorylation. (10 Hours)

UNIT II

Carbohydrate metabolism: Conversion of simple sugars into glucose, Glycolysis, TCA cycle,
Energetics of TCA cycle, HMP shunt, Gluconeogenesis, Glycogenolysis, Glycogenesis.
(15 Hours)

Unit III

Lipid metabolism: Oxidation of Fatty acid, Energetics of oxidation, ketone body metabolism,

Glycerol metabolism, Biosynthesis of Triglycerides, phospholipids, Cholesterol metabolism (Structure is not needed) cholesterol level in cardiac ailments.

(10 Hours)

UNIT IV

Amino acid metabolism: A brief account of amino acid metabolism of Glycine, Cysteine, Proline, Homoserine, Phenylalanine only.

(10 Hours)

UNIT V

Nucleic acid metabolism - Purine and pyrimidine bases - Biosynthesis of purine, pyrimidine- Gout- inter relationship between protein, carbohydrate and fat metabolism.

(15 Hours)

TEXT BOOK

1. Robert K. Murray., Peter A.Meyes., and Victor W.Rodwel. (2003).
2. *Harper's Illustrated Biochemistry*, 26th edition.

REFERENCE BOOKS

1. Bender., David., A. (1985). *Amino acid Metabolism*, Willey.
2. Devlin.(1985).*Biochemistry*.
3. Donald Voet., & Judith Voet. (2004). *Biochemistry*, Wiley International Edition. *Biochemistry*, Fifth edition, New York: W.H. Freeman and Company.
4. Lehninger, A.L., Nelson, Cox. (2000). *Biochemistry*, 4th edition.

Course Code (20UBCC22)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	H	M	H	H	H	M	L	M	L	H
CO 2	H	H	H	M	M	M	L	L	L	H
CO 3	H	H	H	H	H	H	L	M	L	H
CO 4	H	H	H	M	H	M	L	L	L	H
CO 5	H	M	H	H	M	H	L	M	L	H

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2022- 2023 onwards)

Semester II	METABOLISM	Hours/Week: 4	
Core Course-5		Credits: 4	
Course Code 20UBCC22N		Internal 25	External 75

COURSE OUTCOME

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

- CO1: recall all metabolic pathways of carbohydrates, lipid, amino acids , purine and pyrimidine. [K1]
- CO2: discuss and elaborate the bioenergetics of TCA cycle, oxidation , reduction, purine and pyrimidine. [K2]
- CO3: identify the pathways of ETC, oxidative phosphorylation HMP, ketone body metabolism, glycerol metabolism, glycine, cysteine metabolism. [K2]
- CO4: differentiate and correlate the pathways of ETC ,oxidative phosphorylation HMP ,glycogenolysis, glycogenesis, triglycerides, phospholipids, cholesterol metabolism, protein, carbohydrate and fat metabolism. [K3]
- CO5: illustrate the various metabolic pathways of carbohydrate, protein, lipid and Nucleic acids. [K4]

UNIT I

Over view of metabolism-anabolic, catabolic and amphibolic pathways. Bioenergetics: High energy and low energy phosphates; Electron Transport chain, Oxidative phosphorylation. (15 Hours)

UNIT II

Carbohydrate metabolism: Conversion of simple sugars into glucose, Glycolysis, TCA cycle, Energetics of TCA cycle, HMP shunt, Gluconeogenesis, Glycogenolysis, Glycogenesis (15 Hours)

UNIT III

Lipid metabolism: Oxidation of Fatty acid, Synthesis of Fatty acids- Palmitic acid. Energetics of oxidation, ketone body metabolism, Glycerol metabolism, Biosynthesis of Triglycerides phospholipids, Cholesterol metabolism (Structure is not needed), cholesterol level in cardiac ailments. (15 Hours)

UNIT IV

Amino acid metabolism: A brief account of amino acid anabolism of Glycine, Cysteine, Proline, Homoserine, Phenylalanine. Catabolism of proteins- Transamination, Deamination and Urea Cycle. (10 Hours)

UNIT V

Nucleic acid metabolism - Purine and pyrimidine bases. Biosynthesis of purine – IMP, AMP, GMP. Biosynthesis of pyrimidine – UMP, CMP, TMP. Gout. Metabolic inter-relationship between adipose tissue, liver and extra hepatic tissues. (15 Hours)

TEXT BOOK

1. Robert K. Murray., Peter A. Meyses., and Victor W. Rodwel. (2003).
2. *Harper's Illustrated Biochemistry*, 26th edition.

REFERENCE BOOKS

1. Bender., David., A. (1985). *Amino acid Metabolism*, Willey.
2. Devlin. (1985). *Biochemistry*.
3. Donald Voet., & Judith Voet. (2004). *Biochemistry*, Wiley International Edition.
4. *Biochemistry*, Fifth edition, New York: W.H. Freeman and Company.
5. Lehninger, A.L., Nelson, Cox. (2000). *Biochemistry*, 4th edition.

Course Code (20UBCC22N)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO 2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	H	M	H	H	H	M	L	M	L	H
CO 2	H	H	H	M	M	M	L	L	L	H
CO 3	H	H	H	H	H	H	L	M	L	H
CO 4	H	H	H	M	H	M	L	L	L	H
CO 5	H	M	H	H	M	H	L	M	L	H

Dr.P.Annapoorani
Head of the Department

Dr.P.Annapoorani
Course Designer



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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020-2021 onwards)

Semester I/II	CORE PRACTICAL - I - BIOMOLECULES	Hours/Week: 2	
Core Course-3		Credits: 2	
Course Code 20UBCC21P		Internal 40	External 60

COURSE OUTCOMES

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

- CO1: apply the principle and procedure to detect various biomolecules present in the given sample. [K3]
- CO2: identify the given spotters and comment on them with illustrations. [K3]
- CO3: observe the reactions of the biomolecules through various biochemical tests and prepare various biochemical polymers from natural sources. [K3]
- CO4 : infer the findings of the biochemical reactions, report the results and complete the record note book. [K3]
- CO5 : analyze and compare the properties of various biomolecules. [K4]

Major Practical - I

1. Qualitative analysis of bioorganic compounds
 - a. Analysis of carbohydrates
 - b. Analysis of amino acids
 - c. Test for proteins
 - d. Test for lipids
 - e. Qualitative tests for DNA and RNA
2. Biochemical preparation
 - a. starch from potato
 - b. Casein from milk

4. Use of pH meter for the preparation of buffer
5. a. Separation of sugars using paper chromatography
 b. Verification of Beer-Lambert's law using colorimeter
- i) Determining the concentration of any given coloured compounds using a standard graph.

REFERENCE BOOKS

1. Jayaraman J. (2001). Laboratory Manual.

Course Code (20UBCC21P)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4 b	PSO 5a	PSO5 b	PSO 6	PSO 7
CO 1	H	H	M	L	--	L	--	--	H	M
CO 2	H	H	L	H	H	H	L	H	M	--
CO 3	H	H	L	H	H	H	M	H	H	L
CO 4	H	H	L	H	H	H	M	H	H	--
CO 5	H	H	L	H	H	H	H	H	H	M

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B.Sc. BIOCHEMISTRY

(2020-2021 onwards)

Semester II	ENDOCRINOLOGY	Hours/Week: 2	
SEC -1		Credits: 2	
Course Code 20UBCS21		Internal 40	External 60

COURSE OUTCOME

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

- CO1 : recall about hypothalamus and different endocrine glands and their role in regulating homeostasis. [K1]
- CO2 : explain about the biosynthetic pathways, structure, secretion and functions of hormones. [K2]
- CO3 : develop the knowledge on mechanism of action of hormones and their effect on target cells. [K2]
- CO4 : analyse the important hormonally regulated physiological processes and disorders. [K3]
- CO5 : correlate symptoms of major disorders associated with selected endocrine gland. [K4]

UNIT I

Hormones introduction-Target gland concept-Receptors-Hormone classification-(Group I, Group II) Mechanism of action of Hormones (Steroid Hormones, Peptide Hormones)-Calcium- calmodulin role. (5 Hours)

UNIT II

Hypothalamus and pituitary gland: Hypothalamic hormones, hormones of pituitary gland:- chemical nature, secretion, biological functions, disorders of Adenohypophyseal and neurohypophyseal hormones. Anatomical relationships of the Pituitary Gland and Hypothalamus (5 Hours)

UNIT III

Thyroid and parathyroid glands: Chemical nature, secretion, biological function, disorder of thyroid and parathyroid hormones. Pancreatic hormone- synthesis and functions insulin of and glucagon only. (10 Hours)

UNIT IV

G.I. Tract hormones: Chemical nature, secretion, biological function, disorders of Gastrin, Secretin and Cholecystokinin. Adrenal gland: – Chemical nature, secretion, biological function, disorders of adrenal medullary and Cortical hormones. (5 Hours)

UNIT V

Gonadotropic hormones: Chemical nature, secretion, biological function, disorders of male and female reproductive hormones. The female menstrual cycle -Estrogens and the endocrinology of pregnancy - endometriosis and polycystic ovarian syndrome - male hormones and conversion of testosterone to DHT - Androgens, gonadal differentiation and free-martins - benign prostatic hyperplasia and Leydig cell tumors (5 Hours)

TEXT BOOKS

1. Arumugam, Animal Physiology.
2. Robert K.Murray., Peter A.Meyes., and Victor W.Rodwell. (2003). *Harper's Illustrated Biochemistry*, 26th edition.
3. Dr.A.C.Deb. (2006). *Fundamentals of Biochemistry* by.8th edition, 8/1 Chintamoni
4. Das Lane, Kolkata: 700 009 (INDIA): New central book agency (p) LTD.

REFERENCE BOOKS

1. Elaine N. Marieb. (2006). *Human Anatomy and Human Physiology*, 6th edition.
2. Wilson and Foster. (1998). *Text Book of Endocrinology*, 8th edition.

Course Code (20UBCS21)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	H	H	M	L	L	H	L	L	--	--
CO 2	H	H	L	M	M	H	L	M	L	L
CO 3	H	H	L	M	M	M	M	M	L	--
CO 4	H	H	L	M	M	H	M	H	--	M
CO 5	H	H	L	M	M	H	M	H	L	H

Dr. P. Annapoorani
Head of the Department

Dr. R. Renuka
Course Designer



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B.Sc. BIOCHEMISTRY
 (2022-2023 onwards)

Semester II	ENDOCRINOLOGY	Hours/Week: 2	
SEC -1		Credits: 2	
Course Code 20UBCS21N		Internal 40	External 60

COURSE OUTCOME

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

CO1: recall about hypothalamus and different endocrine glands and their role in regulating homeostasis. [K1]

CO2: explain about the biosynthetic pathways, structure, secretion and functions of hormones. [K2]

CO3: develop the knowledge on mechanism of action of hormones and their effect on target cells. [K2]

CO4: analyse the important hormonally regulated physiological processes and disorders. [K3]

CO5: correlate symptoms of major disorders associated with selected endocrine gland. [K4]

UNIT I

Hormones: introduction-Target gland concept-Receptors-Hormone classification-(Group I, Group II) Mechanism of action of Hormones (Steroid Hormones, Peptide Hormones)- Calcium-calmodulin role. (6 Hours)

UNIT II

Hypothalamus and pituitary gland: Hypothalamic hormones, hormones of pituitary gland: chemical nature, secretion, biological functions, disorders of Adenohypophyseal and Neurohypophyseal hormones. Anatomical relationships of the Pituitary Gland and Hypothalamus. (6 Hours)

UNIT III

Thyroid and parathyroid glands: Chemical nature, secretion, biological function, disorder of thyroid and parathyroid hormones. Pancreatic hormone- synthesis and functions of insulin and glucagon only. (6 Hours)

UNIT IV

G.I. Tract hormones: Chemical nature, secretion, biological function, disorders of Gastrin, Secretin and Cholecystokinin. Adrenal gland – Chemical nature, secretion, biological functions. Abnormal secretion of adrenal hormones-Addison's disease, Cushing's syndrome and congenital adrenal hyperplasia. (6 Hours)

UNIT V

Gonadotropic hormones: Chemical nature, secretion, biological function, disorders of male and female reproductive hormones. The female menstrual cycle -Estrogens and the endocrinology of pregnancy - endometriosis and polycystic ovarian syndrome - male hormones and conversion of testosterone to DHT; benign prostatic hyperplasia and Leydig cell tumors. (6 Hours)

TEXT BOOKS

1. Arumugam, Animal Physiology. Saras Publications. New Edition.
2. Robert K.Murray., Peter A.Meyes., and Victor W.Rodwell. (2003). *Harper's Illustrated Biochemistry*, 26th edition.
3. Dr.A.C.Deb. (2006). *Fundamentals of Biochemistry* by.8th edition, 8/1 Chintamani
4. Das Lane, Kolkata: 700 009 (INDIA): New central book agency (p) LTD.

REFERENCE BOOKS

1. Elaine N. Marieb. (2006). *Human Anatomy and Human Physiology*, 6th edition.
2. Wilson and Foster. (1998). *Text Book of Endocrinology*, 8th edition.

Course Code (20UBCS21N)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	M	L	L	H	L	L	--	--
CO 2	H	H	L	M	M	H	L	M	L	L
CO 3	H	H	L	M	M	M	M	M	L	--
CO 4	H	H	L	M	M	H	M	H	--	M
CO 5	H	H	L	M	M	H	M	H	L	H

Dr. P. Annapoorani
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Dr. R. Renuka
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B.Sc. CHEMISTRY (2020-2021 onwards)

Semester II	ALLIED PAPER- ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY – II	Hours/Week: 4	
Allied Course -2		Credits: 4	
Course Code 20UCHA21		Internal 25	External 75

COURSE OUTCOMES

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

CO1: know about the basic concepts in organic, inorganic and physical chemistry. [K1]

CO2: understand the chemical constituent in oils, fats, soaps, detergents, biomolecules, fuels, fertilizers and pollutants. [K2]

CO3: identify the methods of preparation for organic and inorganic compounds, sources, effects and control measures of pollutions, methods for removal of salt from water. [K2]

CO4: comprehend the classification of biomolecules, fuels, fertilizers, catalyst, pollutions, application of adsorption and biomolecule. [K3]

CO5: analyze the oils, fats and biomolecules functions, sources of pollutions, characteristics of catalysts and the effects with control measures for various pollution. [K4]

UNIT I

1. Oils and Fats – Definition – Properties - Distinction between them -Hydrogenation, Hydrogenolysis, Rancidification and Drying of oils – Preparation of Vanaspathi- Analysis of oils and Fats – Saponification and iodine number.

2. Soaps and Detergents

Soap – Definition – Different types – Manufacture of soap – Kettle process - Detergent – Definition – Synthetic detergents – examples – Distinction between soaps and detergents.

(12Hours)

UNIT II

1. Carbohydrates – classification – Differences between glucose and fructose – Inter conversion of glucose and fructose – Haworth structure of glucose and fructose- Differences between starch and cellulose – Derivatives of cellulose and their uses.
2. Amino acids – classification – preparation of α -amino acids– properties – Zwitterion – isoelectric point .
3. Proteins – classification – Biological function – colour reaction of proteins.
4. Nucleic acids – RNA and DNA – Biological functions (Elementary idea only).
(12Hours)

UNIT III

1. Fuels – classification – Advantages of gaseous fuels – constituents and uses of water gas, producer gas, LPG, Gobar gas and natural gas.
2. Fertilizers – classification – Macro and micro nutrients – Functions of nutrients preparation and uses of urea, ammonium sulphate, superphosphate, triple superphosphate, potassium nitrate and NPK.
(12 Hours)

UNIT IV

1. Air pollution – Definition – sources of air pollution –classification and effects of air pollutants – Ozone layer- formation and depletion – Greenhouse effect – Acid rain – Preventive measures of air pollution.
2. Water pollution –types and sources of water pollution –classification and effects of water pollutants-control of water pollution-Desalination of sea water by electrodialysis and reverse osmosis.
3. Radioactive pollution – sources – nuclear waste disposal – Effects of radiations.
(12 Hours)

UNIT V

1. Adsorption – Characteristics – Types of adsorption and comparison – Factors influencing adsorption – Langmuir and Freundlich adsorption isotherm (No derivation) – Applications of adsorption.

2. Catalysts – Characteristics- Different types with examples – Catalytic poisoning – promoters with examples. (12 Hours)

TEXT BOOKS

1. Soni P.L.,(2008).*Text book of Organic Chemistry*, Latest Edition.Sultan Chand & Sons.
2. Soni P.L.,(2008).*Text book of Inorganic Chemistry*, Latest Edition. Sultan Chand & Sons.
3. Jayashree Ghosh, (2013). *Fundamental Concepts of Applied Chemistry*,S.Chand& Company Ltd.
4. Soni, P.L.(2008).*Text book of Physical chemistry*, Latest Edition,Sultan Chand & Sons.

REFERENCE BOOKS

1. Jain, M.K. & Sharma, S.C. (2016). *Modern Organic Chemistry*, 1st Edition. New Delhi: Vishal Publishing Co.
2. Sindhu P.S.,*Environmental Chemistry*.
3. Jain, P.C. & Monika Jain. (2013). *Engineering Chemistry*. 1stEdition.New Delhi: Dhanpat Rai Publishing CompanyPvt.Ltd.
4. Puri, Sharma, Pathania, (2008). *Elements of Physical Chemistry*, 4th Edition. Jalandhar
5. Delhi: Vishal Publishing& Co.

Course Code (20UCHA21)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO 3.a	PSO 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	M	M	H	H	L	M	L	L	L	L
CO 2	M	M	H	H	L	M	L	L	L	M
CO 3	H	M	H	M	M	H	M	M	M	H
CO 4	H	M	H	M	M	H	M	M	M	H
CO 5	H	M	H	M	M	H	H	M	M	H

Mrs.M. Dhanalakshmi
Head of the Department

R.Nagasathya
Course Designer



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VIRUDHUNAGAR - 626 001

B.Sc. CHEMISTRY

(2020-2021 onwards)

Semester II	VOLUMETRIC ANALYSIS	Hours/Week: 2	
Allied Course Practical -1		Credits: 2	
Course Code 20UCHA21P		Internal 40	External 60

COURSE OUTCOMES

On successful completion of the course, the learners should be able to

CO1: apply the Principles involved in the Volumetric analysis [K3]

CO2: find out the strength of standard solutions [K3]

CO3: estimate the amount of the substance present in the given solution by volumetric analysis [K3]

CO4: determine the concentration of the unknown solutions. [K4]

CO5: analyse and evaluate the accuracy of the results.[K4]

a. Acidimetry and Alkalimetry:

1. Titration between a strong acid and strong base
2. Titration between a strong acid and weak base.
3. Titration between a weak acid and strong base

b. Permanganimetry:

Titration between potassium permanganate and

- i) oxalic acid ii) ferrous sulphate and iii) ferrous ammonium sulphate (Mohr's salt)

c. Iodometry:

Titration between sodium thiosulphate and i) potassium permanganate and ii) potassium dichromate.

Course Code (20UCHA21P)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO 3.a	PSO 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	M	M	H	L	M	L	H	L	M
CO 2	M	M	L	H	M	M	L	H	M	H
CO 3	M	M	L	H	M	M	L	H	M	H
CO 4	H	M	H	H	M	M	L	H	M	H
CO 5	H	M	H	H	M	M	L	H	M	H

Mrs.M. Dhanalakshmi
Head of the Department

Mrs.R.Nagasathya
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B.Sc. BIOCHEMISTRY
 (2020-2021 onwards)

Semester III	IMMUNOLOGY	Hours/Week: 5	
Core Course -5		Credits: 5	
Course Code 20UBCC31		Internal 25	External 75

COURSE OUTCOMES

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

- CO1 : describe the structure and functions of major lymphatic systems including biochemical and cellular mechanisms for maintaining homeostasis and the reasons for vaccination. [K1].
- CO2 : outline the key mechanisms and cellular players of innate and adaptive immunity and how they relate. [K2].
- CO3 : apply the mechanism of Ag-Ab interaction in various immunoassay techniques and their applications [K2].
- CO4 : analyse how the immune responses by CD4 and CD8 T cells, and B cells are initiated and regulated in hypersensitivity, autoimmune diseases and transplantation reactions. [K3].
- CO5 : relate the basic immunological principles in research and in clinical diagnosis /applied science. [K3]& [K4].

UNIT I

Contributions of Edward Jenner and Louis Pasteur to immunology-immunity, Types of immunity - Innate and acquired immunity-types of vaccines, National vaccination schedule. Introduction to cells of the immune system. T-Lymphocytes, B-cells, Natural killer cells, Mononuclear phagocytes, Granulocytes: Neutrophils, Eosinophils, Basophils, Dendritic cells. (15 Hours)

UNIT II

Primary lymphoid organs: Bone marrow, Thymus, Bursa of Fabricus in birds, Peyer patches - Secondary lymphoid organs: Lymph nodes, spleen, MALT, GALT, BALT & CALT. (15 Hours)

UNIT III

Basic structure of antibody molecule -Types of immunoglobulins – structure and functions of Ig M, Ig G, IgA, Ig D and Ig E.

The nature and characteristics of antigens -antigenicity and immunogenicity, T dependent and T independent antigens, immunogens and haptens. (15 Hours)

UNIT IV

Antigen-antibody interaction- cross reactivity, agglutination, precipitation, Immunotechniques - immunodiffusion, immunoelectrophoresis, radioimmunoassay, ELISA, production of monoclonal antibodies (hybridoma), polyclonal antibodies. (15 Hours)

UNIT V

Structure and Functions (exogenous and endogenous pathway) of Class I & II Major Histocompatibility Complex (MHC) Autoimmune disease (rheumatoid arthritis, myasthenia gravis and Grave's disease), Hyper Sensitivity – Coombs and Gell classification - mechanism in brief, Transplantation- graft rejection, tissue typing, immunosuppression.

(15 Hours)

TEXT BOOK

1. Arumugam, N. (2004). *Immunology*, Tamil Nadu: Saras Publication, 1st Edition.
2. Sudha Gangal and Shubhangi Sontakke (2016). *Text book of Basic and Clinical*
3. *Immunology*, University Press (India) Private Limited, Himayatnagar, Hyderabad, Telengana, corrected and revised reprint 2016.
3. Shyamasree Ghosh (2017). *Immunology and Immunotechnology*, Books and Allied (P) Ltd. Shubham Plaza, 83/1, Beliaghata Main Road, Kolkatta, 1st Edition.

REFERENCE BOOKS`

1. Roitt, M. (2005). *Essentials of Immunology*, New York: Wiley- Blackwell Scientific Publication. 12th Edition.
2. Kuby, J. (2004). *Immunology*, New York: W.H. Freeman Publishers, 5th Edition.
3. Tizard (1995). *Immunology- An Introduction*, U.S.A : Harcourt College Publishers, 4th Edition.
4. James T. Barrett (1988). *Text Book of Immunology*, New York: Mosby Publishers, 3rd Edition.
5. Microbiology and Immunology online by Richard Hunt et al. - University of South Carolina , 2004 <https://www.e-booksdirectory.com/details.php?ebook=2427>
6. Principles of Immunology <https://www.e-booksdirectory.com/details.php?ebook=7507>
7. Physiology and Pathology of Immunology by Nima Rezaei (ed.) - InTech , 2017 <https://www.e-booksdirectory.com/details.php?ebook=11671>
8. Kuby Immunology, 7th Edition by Owen, Punt and Stranford
9. Immunology With STUDENT CONSULT Online Access (Kindle Edition)

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code (20UBCC31)	PSO1	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO 6	PSO 7
CO 1	H	H	L	M	L	H	M	-	H	H
CO 2	H	H	M	L	L	H	H	L	M	L
CO 3	H	H	H	H	H	H	H	H	H	H
CO 4	H	H	H	M	H	H	H	L	H	H
CO 5	H	H	H	H	H	H	H	H	M	M

Dr. P. Annapoorani
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Dr. R.Renuka
Course Designer



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B.Sc. BIOCHEMISTRY

(2020-2021 onwards)

Semester III	CELL BIOLOGY	Hours/Week: 4+2(P)	
Allied Course		Credits: 4	
Course Code 20UBIA31		Internal 25	External 75

COURSE OUTCOMES

On successful completion of the course, the learners should be able to

- CO1 : choose the basic cytological techniques (K1)
- CO2 : explain the origin, structure and chemistry of each organelles (K2)
- CO3 : interpret the functions of cell organelles (K2)
- CO4 : identify the importance of cell as a basic unit of life (K3)
- CO5 : distinguish the harmful viruses, cancer cells and living with hygienic Environment (K4)

UNIT I

Basic techniques for cytological studies - Microscopy - Light and Electron microscope (brief account only). Sub cellular fractionations - Ultra centrifugation, Differential and Density gradient centrifugation. Cell count Method – Haemocytometer. Histochemical staining: Proteins - Mercuric Bromophenol blue method. Lipids and lipoproteins - Sudan black B method. (14 Hours)

UNIT II

Cell Structure - Prokaryotic and Eukaryotic (brief account only). Plasma membrane - Ultra structure of Fluid mosaic model, chemistry and functions (brief account only). Protoplasm – Physical and Biological properties. (13 Hours)

UNIT III

Membrane systems in Eukaryotes - Endoplasmic Reticulum, Golgi complex and Ribosomes – Origin, structure and functions. (10 Hours)

UNIT IV

Cell Organelles in Eukaryotes – Nucleus, Mitochondria, Chloroplast and Chromosomes - Origin, structure and functions. (13 Hours)

UNIT V

Cell cycle – Cell Division – Mitosis and Meiosis – Stages and significance, Cell growth – Oncogenes, Comparative aspects of Normal and Cancerous cell. (10 Hours)

TEXT BOOKS

1. Verma, P.S. & Agarwal, V.K. (2006). *Cell Biology*, New Delhi: S. Chand & Company Ltd.,
2. Mariyakuttikan, G. (1992). *Cell Biology*, JAC Publication.

REFERENCE BOOKS

1. De Robertis, P, Nowinski, E.D and Saez, A, (2001 reprint), *Cell Biology*, WB Saunders Co, Philadelphia.
2. Debnath, M. (2008). *Molecular cell Biology*, Jaipur: Vol 2. Pointers Publishers.
3. Dalela, R.C, (1984). *Cytology*, Jai Prakash Nath & Co.
4. Rastogi, S.C. (1990). *Cell Biology*, New Delhi: Tata Mc Graw Hill Publishing Company Ltd.,

	PO1		PO2	PO3		PO4		PO5	PO6	PO7
Course Code 20UBYA21	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO 1	S	S	M	S	S	S	S	-	S	S
CO 2	S	S	M	S	S	S	S	-	S	S
CO 3	S	S	M	S	S	S	S	-	S	S
CO 4	S	S	M	S	S	S	S	-	S	S
CO 5	S	S	M	S	S	S	S	-	S	S

(Dr. R. Radha Lakshmi, Zoology Department)
(Dr.R. Murugalakshmi Kumari, Botany Department)
Course Designers



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c

B.Sc. BIOCHEMISTRY

(2020-2021 onwards)

Semester III	NUTRITION	Hours/Week: 2	
SEC -2		Credits: 2	
Course Code 20UBCS31		Internal 40	External 60

COURSE OUTCOMES

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

- CO1 : remember the sources and requirement of major and minor nutrients. [K1]
- CO2 : understand the different food groups, role of food and nutrition in health and its functions. [K2]
- CO3 : apply the concepts of nutritional status and energy needs in various stages of human life. [K3]
- CO4 : analyze the nutritional challenges to improve the overall health of individuals to combat diseases. [K4]
- CO5 : infer the Nutrition care process to deliver safe and effective nutritional care. [K4]

UNIT I

Food groups, food habits, food fads and fallacies. Carbohydrates: Kinds, Functions, food sources- Fats: Kinds, Functions, food sources, essential fatty acids and cholesterol.

(6 Hours)

UNIT II

Proteins: Kinds, Functions, food sources, complete and incomplete proteins - Energy: Calorific value of food, Basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature, energy needs, total energy requirement and energy value of foods, food supplements.

(6 Hours)

UNIT III

Protein nutritional Nitrogen balance, proteins requirements, Protein nutrition abnormalities, Protein deficiency disorder/ PEM- Balanced diet formulation- Assessment of nutritional status – vitamins – deficiency disorders. (6 Hours)

UNIT IV

Nutrition at various stages of growth and development- Diets for infants, children, adolescents, pregnant women, lactating mothers and older persons. (6 Hours)

UNIT V

Nutritional challenges of the future: Food adulteration, food additives - Food production and food storages, future foods, new protein foods - fast foods and zero calorie foods. (6 Hours)

TEXT BOOKS

1. Swaminathan, M. (1993). *Principles of Nutrition and Dietetics*, 2nd Edition. Bangalore: Bappco Publications
2. Patricia, (2011). *Nutritional Biochemistry*, 1st Edition. Chennai: MJP Publishers

REFERENCE BOOKS

1. Srilakshmi, B. (2008). *Nutrition Science*, 3rd Edition. New Delhi: New age International (P) Limited Publishers.
2. Swaminathan, M. (2015). *Advanced Textbook on Food and Nutrition- Vol-I&II*, 2nd Edition. Bangalore: Bappco Publications.
3. Corinne Robinson (1982). *Normal and Therapeutic Nutrition*, 16th Edition. London: Collier Macmillan Publishers.
4. Swaminathan, M. (1981). *Handbook of Food and Nutrition*, 5th edition. Bangalore: Bappco Publications.

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code (20UBCS31)	PSO 1	PSO 2	PSO 3 3.a	PSO 3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO 6	PSO 7
CO 1	M	H	M	L	L	H	H	H	L	M
CO 2	M	L	M	M	H	H	M	M	M	M
CO 3	H	M	H	H	M	M	M	M	L	H
CO 4	M	H	H	H	M	H	M	L	M	M
CO 5	H	M	M	M	H	H	L	H	H	H

Dr. P. Annapoorani
Head of the Department

Mrs.M.Rajakumari
Course Designer



V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020- 2021 onwards)

Semester IV	FOOD SCIENCE	Hours/Week: 5	
Core Course -6		Credits: 5	
Course Code 20UBCC41		Internal 25	External 75

COURSE OUTCOMES

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

- CO1 : recognize the Nutritional value of foods and the scientific aspects of food safety and food processing [K1].
- CO2 : apply the basic strategies involved in the new product development [K2]
- CO3 : analyse and control adulterants in various foods and evaluate food quality [K3].
- CO4 : recommend new combination of foods in the development of food products[K4].
- CO5 : explain the frame work for packaging, labelling and food standards [K4].

UNIT I

Introduction to food science – Definition, Natural food, Organic food, Fruits and Vegetables - Functions of food, Food in relation to health, food preservation- Food spoilage, fermentation, methods of food preservation, preservation by low temperature, high temperature, preservatives, osmosis, dehydration and concentration , food irradiation, hurdle technology – Transportation – product based – distance, storage and facilities. (10 Hours)

UNIT II

Beverages and Confectionary- Carbonated Nonalcoholic Beverages, Alcoholic beverages- Beer, Wine, Rum, Toddy and feni. Coffee, Tea, Green tea. and human health. Confectionery and Chocolate Products- Sugar based Confections, Ingredients, Chocolate and Cocoa Products, Confectionery Manufacturing Practices. (10 Hours)

UNIT III

Meat- composition and nutritive value, Ageing, Tenderizing, curing, cuts and grades. Poultry- Classification, Composition and nutritive value, processing, preservation and storage. Fish – Classification, Composition and nutritive value, selection, preservation and storage, fish and health. (10 Hours)

UNIT IV

Baking Industry- Baking industry and its scope in the Indian economy, History of Bakery- present trends, prospects, Nutritional facts of bakery products. Classes of Batters and dough, Functions of various ingredients in Batters and dough, leavening process of baked products, Mixing methods for various batters and doughs- Biscuits, cakes and pastries. Storage of baked products. (15 Hours)

UNIT V

Food adulteration, food laws and standards- Food poisoning and Food borne illness, Food adulteration, types of adulterants, adulterants and their effects on health, detection of adulteration , food laws, voluntary standards and certification system. Food standardization and regulation agencies in India, International standards – GM foods and their safety. (15 Hours)

TEXT BOOKS

1. Srilakshmi, B. (2015). *Food Science*, New Delhi: New age International Publishers, 6th Edition.
2. Norman N. Potter, Joseph H. Hotchkiss (2006). *Food Science*, New Delhi: CBS Publishers and Distributors, 5th Edition.
3. Gajalakshmi R.(2014). *Nutrition Science*, New Delhi: CBS Publishers and Distributors, 1st Edition

REFERENCE BOOKS

1. Vickie A. Vaclavik, Elizabeth W. Christian. (2014). *Essentials of Food Science*, New York: Springer, 4th Edition.
2. Sumati R.Mudambi .(1990). *Food science*, New Delhi: Wiley Eastern Limited, 3rd Edition.
3. Yogambal Ashok kumar. (2012). Text book of *Bakery and confectionary*, Chennai: UBS Publishers, 2nd Edition.
4. Jegmohan Negi. (2004). *Food & Beverage Laws – Food safety and Hygiene*, New Delhi: Aman Publications.

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code (20UBCC41)	PSO1	PSO 2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	H	H	M	H	H	M	H	H	L	M
CO 2	H	M	H	H	H	H	H	H	L	L
CO 3	H	H	M	H	H	H	H	H	L	M
CO 4	H	H	H	H	M	H	H	H	L	L
CO 5	H	H	H	M	H	H	H	M	L	H

Dr.P.Annapoorani
Head of the Department

Dr.R.Salini
Mrs.R.Gloria Jemmi Christobel
Course Designers



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B.Sc. BIOCHEMISTRY

(2022- 2023 onwards)

Semester IV	PRINCIPLES OF FOOD SCIENCE	Hours/Week: 5	
Core Course -6		Credits: 5	
Course Code 22UBCC41		Internal 25	External 75

COURSE OUTCOMES

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

- CO1 : state the factors influencing food processing, preservation , storage and cooking quality of different foods , scientific aspects of food safety , laws and quality for mankind. [K1]
- CO2 : explain the basic strategies of cooking methods ,food preservation, processing, storage, detection of adulterants, food standards. [K2]
- CO3 : illustrate the various processes used in food industry for food safety, quality also the laws for food processing, preservation , storage.[K3]
- CO4 : analyze various cooking methods , food and beverage preparations, and the laws and techniques used for food processing, packaging, labeling and quality checking. [K4]
- CO5 : evaluate the food standards , cooking methods, effects of adulterants, proper storage , preservation ,processing of food and also the effect of GM foods on mankind and environment. [K5]

UNIT I

Introduction to Food Science – Definition of Food and Food Science, Classification of Foods based on functions. Different methods of cooking- Moist heat method, Dry heat method, Roasting, Grilling, Frying. Modern Methods of Cooking; Pressure cooking, Solar cooking, Infrared cooking , Microwave cooking, Induction cooking, Fireless Cooking. HACCP Standards and Professional Kitchens. (15 Hours)

UNIT II

Beverages, Baking, Confectionary - Classification Of Beverages ; Carbonated Non-Alcoholic Beverages, Alcoholic Beverages . Beer, Wine, Coffee, Tea, Green Tea And Human Health. Baking; Classification of Baked Foods. Classes of Batters And Dough,

Functions of Various Ingredients In Batters And Dough, Leavening Process of Baked Products, Mixing Methods for Various Batters And Doughs- Biscuits, Cakes And Pastries. Confectionery Ingredients ; Cocoa And Chocolate . Hard And Soft Candies .

(15 Hours)

UNIT III

Milk, Meat, Poultry, Fish- Milk- Composition, Nutritive Value. Types Of Milk. Milk Products ; Fermented and Non-Fermented. Meat- Composition and Nutritive Value, Ageing, Tenderizing, Curing, Cuts and Grades. Poultry- Composition and Nutritive Value, Processing, Preservation and Storage. Fish – Composition and Nutritive Value, Selection, Preservation and Storage.

(15 Hours)

UNIT IV

Food Preservation Methods- Importance of Preservation. Food Spoilage; Types of Spoilage, Causes of spoilage. Preservation by Low Temperature; Refrigeration, Freezing. Preservation by High Temperature; Drying, Osmotic Dehydration. Preservation by Chemical Preservatives. Permitted preservatives; FPO Specification. Preservation by using Sugar; Jam, Squashes. Preservation by salting and Pickling. Post Harvest Technology - Definition, importance and Governmental measures to augment food production- need for food conservation.

(15 Hours)

UNIT V

Food Adulteration, Foodborne Illness, Food Laws and Standards- Food Poisoning, Food Adulteration; Type of Adulterants, Effects on Health, Detection of Adulteration. Food Laws and Regulations, Prevention of Food Adulteration Act, Fruit Product Order, Agmark, Essential Commodity Act, Consumer Protection Act, Bureau of Indian Standards, Codex Standards, FSSAI. GM Foods and Their Safety.

(15 Hours)

TEXT BOOKS

1. Srilakshmi, B. (2015). *Food Science*, New Delhi: New age ternational Publishers, 6th Edition.
2. Norman N. Potter, Joseph H. Hotchkiss (2006). *Food Science*, New Delhi: CBS Publishers and Distributors, 5th Edition.
3. Gajalakshmi R.(2014). *Nutrition Science*, New Delhi: CBS Publishers and Distributors, 1st Edition

REFERENCE BOOKS

1. Vickie A. Vaclavik, Elizabeth W. Christian. (2014). *Essentials of Food Science*, New York: Springer, 4th Edition.
2. Sumati R. Mudambi. (1990). *Food science*, New Delhi: Wiley Eastern Limited, 3rd Edition.
3. Yogambal Ashok kumar. (2012). Text book of *Bakery and confectionary*, Chennai: UBS Publishers, 2nd Edition.
4. Jegmohan Negi. (2004). *Food & Beverage Laws – Food safety and Hygiene*, New Delhi: Aman Publications.

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code (22UBCC41)	PSO1	PSO2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	M	H	H	M	L	H	L	M
CO 2	H	M	M	M	M	M	L	H	L	L
CO 3	H	H	M	H	H	H	L	H	L	M
CO 4	H	H	H	H	M	H	L	H	L	L
CO 5	H	H	H	M	H	H	L	M	L	H

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Dr.R.Gloria Jemmi Christobel
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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020- 2021 onwards)

Semester IV	APPLIED BIOLOGY	Hours/Week: 4+2(P)	
Allied Course		Credits: 4	
Course Code 20UBIA41		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, students will be able to

CO1 : Find the applied areas of Biology. (K1)

CO2 : Learnt skills related to laboratory as well as industries based work. (K2)

CO3 : Explain the applications areas of Biology in various industries and how to become an entrepreneur. (K2)

CO4 : Solve the issues related to the applied areas of Biology. (K3)

CO5 : Analyze the applied potential areas/branches of Biology. (K4)

UNIT I

Mushroom cultivation

Introduction - morphology and reproduction of mushroom - nutritive and medicinal value of mushrooms, identification of edible and poisonous mushrooms, cultivation methods of oyster and button mushrooms. Contaminations in mushroom cultivation- fungi - green mould disease, bacteria – bacterial blotch disease and virus – die back disease. Mushroom recipes, Post harvesting technology. Economic importance of mushrooms. (13 Hours)

UNIT II

Vermiculture

Morphological features of earthworm, Cultivable species of earthworm (any five) and its significance. Vermicomposting methods (bin and windrow) and conditions required for vermicomposting. Vermicast and vermiwash, economic importance of earthworms.

(11 Hours)

UNIT III

Apiculture

Life cycle of honeybee, Ecological services of honey bees. Bee hive - natural and artificial bee hive - Newton's bee hive. Rearing appliances. Enemies and diseases of

honeybee – Nosemosis, Acariasis, American fowl brood. Chemical composition, nutritional and medicinal values of honey, honey harvesting and processing, economic importance of honeybees. (11 Hours)

UNIT IV

Sericulture

Type of Silkworms, Life cycle of *Bombyx mori*. Moriculture- mulberry cultivation. Rearing operations – disinfection, hatching, brushing, bed cleaning, feeding, mounting and harvesting. Rearing appliances. Diseases of silkworm – Bebrine and Muscardine. Economic importance of silkworm. (13 Hours)

UNIT V

Horticulture

Introduction, tools of horticulture techniques, methods of vegetative propagation – cuttage – stem and leaf, layerage – simple, compound and air layering, graftage – whip and cleft. Indoor gardening - Hanging pots, Planning and layout of kitchen garden and orchards. (12 Hours)

TEXT BOOK

1. Kumaresan, V. (2009). *Biotechnology*, Nagercoil: Saras Publication.

REFERENCE BOOKS

1. Bahl, N. (2006). *Hand book on Mushrooms* (Ed-IV), New Delhi: Oxford and IBH Publishing Co Pvt Ltd,
2. Ravindranathan, K.R. (2003). *Economic Zoology*, New Delhi: Dominant Publishers and Distributors.
3. Sathe, T.V. (2006). *Fundamentals of Bee Keeping*, Delhi: Daya Publishing House
4. Ganga, G & Sulochana Chetty, J. (1998). *An Introduction to Sericulture (Ed-II)*, New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd

Course Code 20UBIA41	PO1		PO2	PO3		PO4		PO5	PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO 1	S	S	M	S	S	S	S	-	M	S
CO 2	S	S	M	S	S	S	S	-	M	S
CO 3	S	S	M	S	S	S	S	-	M	S
CO 4	S	S	M	S	S	S	S	-	M	S
CO 5	S	S	M	S	S	S	S	-	M	S

(Dr. R. Radha Lakshmi, Zoology Department)
(Dr.R. Murugalakshmi Kumari, Botany Department)
Course Designers



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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020- 2021 onwards)

Semester IV	Ancillary Biology Practical – I Cell Biology and Applied Biology	Hours/Week: 2	
Allied Course		Credits: 1	
Course Code 20UBIA41P		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, students will be able to

- CO1: apply the basic concepts learnt in biology for the preparation of slides. [K3]
- CO2: identify and dissect the biological specimens and to draw the anatomical features. [K3]
- CO3: observe and comment on the biological specimens. [K3]
- CO4: infer about the mitotic cell division stage and completion the record work. [K3]
- CO5: analyze and categorize the functions of cell organelles and in the related area. [K4]

Botany

1. Parts and functions of compound Microscope.
2. Spotters - Plasma membrane – Fluid mosaic model.
3. Study of cell organelles - Chloroplast, Mitochondria, Endoplasmic reticulum and Golgi complex.
4. Cell division - Mitosis and Meiosis Studies
5. Histochemical localization of proteins and lipids (Pea and Coconut).
6. Morphology and anatomy of edible mushroom (*Pleurotus* and *Agaricus*)
7. Demonstration of Horticulture techniques - Whip and cleft grafting

Zoology

1. Preparation of human blood smear and identification of blood cells.
Mounting of buccal epithelium.
2. Spotters - Study of Cell organelles: Ribosomes, Lysosomes, Chromosomes- Giant chromosome and Nucleus.
3. Identification and differentiation among honeybees - Queen, Worker and Drone bee.
4. Newton's hive and other appliances (Queen Excluder, Honey extractor, Bee veil and Smoker)
5. Vermicompost – Demonstration only.
6. Various developmental stages of silkworm (Chart)
7. Identification of diseased silkworms – (Pebrine, Muscardine)

	PO1		PO2	PO3		PO4		PO5	PO6	PO7
Course Code 20UBIA41P	PSO 1.a	PSO 1.b	PSO 2	PSO 3.a	PSO 3.b	PSO 4.a	PSO 4.b	PSO 5	PSO 6	PSO 7
CO 1	S	S	M	S	S	S	S	-	S	S
CO 2	S	S	M	S	S	S	S	-	S	S
CO 3	S	S	M	S	S	S	S	-	S	S
CO 4	S	S	M	S	S	S	S	-	S	S
CO 5	S	S	M	S	S	S	S	-	S	S

(Dr. R. Radha Lakshmi, Zoology Department)
(Dr.R. Murugalakshmi Kumari, Botany Department)

Course Designers



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B.Sc. BIOCHEMISTRY

(2020- 2021 onwards)

Semester IV	BIOSTATISTICS	Hours/Week: 2	
SEC -3		Credits: 2	
Course Code 20UBCS41		Internal 40	External 60

COURSE OUTCOMES

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

- CO1 : observe the methods of data collection, sampling, analysis and interpretation in biology. [K1]
- CO2 : paraphrase the formulas for different statistical methods to interpret biological data. [K2]
- CO3 : apply appropriate statistical method in problem solving. [K3]
- CO4 : interpret the knowledge of probability, symmetry, averages and dispersion in science experiments. [K3]
- CO5 : classify the statistical methods to interpret biological data. [K4]

UNIT I

Introduction

Basis of Statistics- Definition- Statistical Methods – Kinds of Biological Data Collection, organization and Representation of Data: Collection of Data - Types of data: primary Data, Secondary Data- Methods of collecting Data.Sampling and Sampling Designs- definitions - Random and Non random sampling. Classification of Data: Definition, Objectives of classification of Data. (5 Hours)

UNIT II

Tabulation: Meaning and definition - parts of table - advantages. Representation of the Data:

Diagrammatic: Simple bar diagram, Rectangles, squares, circles or Pie diagram - Graphic representation: Histogram, Frequency-Polygon, frequency curve, cumulative frequency curve or ogive curve. (5 Hours)

UNIT III

Measures of central Tendency: Explanation, Types of averages: 1. Arithmetic mean
2. Median 3. Mode (problems)

Measures of Dispersion: Explanation, Types of dispersion: 1. Range, 2. Mean deviation 3. Standard deviation (simple problems only). (7 Hours)

UNIT IV

Measures of Symmetry: Explanation and definition - Skewness, Kurtosis, Tests of Skewness, Measures of Skewness, and Measures of Kurtosis (simple problems only).

(8 Hours)

UNIT V

Probability: Definition and Explanation:

1. Theorems of probability: Definition, Basic concepts, Kinds, addition theorem and multiplication theorem.

2. Types of theoretical distribution: Binomial distribution (simple problems)

Discussion about Biostatistics software.

(5 Hours)

TEXT BOOK

1. Palanichamy, S. (1994). *Statistical Methods for Biologists*, Palani, Tamil Nadu: Palani Paramount Publications, 2nd Edition.

REFERENCE BOOKS

1. Gupta, S.P. (2008). *Statistical Methods*, New Delhi. Sultan Chand & Sons, 36th Edition.
2. Maxwell, A.E. (1972). *Basic Statistics*, London: Chapman and Hall, 1st Edition.

Course Code (20UBCS41)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1	PSO 2	PSO 3	PSO 3.a 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO 6	PSO 7
CO 1	H	L	M	M	M	M	M	M	L	L
CO 2	H	L	M	M	L	M	M	M	L	L
CO 3	H	L	M	M	L	M	M	M	L	L
CO 4	H	L	M	M	L	M	M	M	L	L
CO 5	H	L	M	M	M	M	M	M	L	L

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Dr.R.Salini
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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY (SEMESTER)

(2022- 2023 onwards)

Semester IV	BIOSTATISTICS	Hours/Week: 2	
SEC -3		Credits: 2	
Course Code 20UBCS41N		Internal 40	External 60

COURSE OUTCOMES

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

CO1:observe the methods of data collection, sampling, analysis and interpretation in biology.

[K1]

CO2:paraphrase the formulas for different statistical methods to interpret biological data. [K2]

CO3:apply appropriate statistical method in problem solving. [K3]

CO4:interpret the knowledge of probability, symmetry, averages and dispersion in science experiments. [K3]

CO5:classify the statistical methods to interpret biological data. [K4]

UNIT I

Introduction

Basics of Statistics :Definition- Statistical Methods. Classification of Data: Definition, Objectives of classification of Data. Types of data: Primary Data, Secondary Data-Methods of Biological Data Collection. Sampling and Sampling Designs- Definitions, Types - Random and Non random sampling. Types of Distribution- Binomial, Poisson, Normal Distribution (Brief Notes). (5 Hours)

UNIT II

Tabulation: Meaning and Definition - Parts of table - Advantages. Representation of the Data:

Diagrammatic: Simple bar diagram, Rectangles, Squares, Circles or Pie diagram - Graphic representation: Histogram, Frequency-Polygon, Frequency curve, Cumulative frequency curve or Ogive curve. (5 Hours)

UNIT III

Measures of central Tendency: Explanation, Types of averages: 1. Arithmetic mean 2. Median 3. Mode (problems)

Measures of Dispersion: Explanation, Types of dispersion: 1. Range, 2. Mean deviation 3. Standard deviation (simple problems only). (7 Hours)

UNIT IV

Measures of Symmetry: Explanation and Definition - Skewness, Kurtosis, Tests of Skewness, Measures of Skewness, and Measures of Kurtosis (simple problems only).

(8 Hours)

UNIT V

Probability , Project writing method, Biostatistics : Definition and Explanation:

Theorems of probability: Definition, Basic concepts, Kinds, addition theorem and multiplication theorem.

Project Writing- Introduction, Review of Literature, Aim and scope, Materials and Methods, Results and Discussion, Summary and Conclusion, Bibliography. Discussion about Biostatistics software. (5 Hours)

TEXT BOOK

1. L.Ramakrishnan,P.(2015).Biostatistics,Saras Publication, Kanyakumari, Tamil Nadu,4th Edition.
- 2.Palanichamy, S. (1994). *Statistical Methods for Biologists*, Palani Paramount Publications,Palani, Tamil Nadu, 2nd Edition.

REFERENCE BOOKS

1. Gupta, S.P. (2008). *Statistical Methods*, New Delhi. Sultan Chand & Sons,36th Edition.
2. Maxwell, A.E. (1972). *Basic Statistics*, London: Chapman and Hall, 1st Edition.
3. Peer Mohamad S, Akbar Batch PB, Shazuli Ibrahim SAN (2005) .Research Methodolgy , Pass Publications, VOC Nagar,Madurai,1st edition.

Course Code (20UBCS41N)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1	PSO 2	PSO 3.a	PSO 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO 6	PSO 7
CO 1	H	M	M	L	M	M	M	M	-	M
CO 2	H	M	L	L	L	M	M	M	M	M
CO 3	H	M	L	L	L	M	M	M	M	M
CO 4	H	H	L	L	L	M	M	M	M	M
CO 5	H	H	M	L	M	M	M	M	-	M

Dr.P.Annapoorani
Head of the Department

Dr.R.Salini
Course Designer



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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020- 2021onwards)

Semester IV	BIOCHEMICAL ANALYSIS OF METABOLITES LAB	Hours/Week: 2	
Core Course		Credits: 2	
Course Code 20UBCC41P		Internal 40	External 60

COURSE OUTCOMES

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

- CO1 : apply the principles and procedures in quantitative determination of biochemical metabolites [K3]
- CO2 : use colorimetry to detect the concentration of unknown compounds using a standard graph [K3].
- CO3 : measure the quantity of electrolytes using flame photometry in food stuffs.[K3].
- CO4 : Estimate the biomolecules in biological samples and complete the record work[K3].
- CO5 : analyse the role of reagents and biochemical techniques in nutritional analysis ([K4].

UNIT I

Analysis of Minerals:

- a. Estimation of Moisture content of food sample
- b. Estimation of Iron in food sample
- c. Estimation of Phosphorous in food sample

UNIT II

Analysis of Carbohydrates:

Estimation of glucose by (any two experiments)

- a. Phenol sulphuric acid method.
- b. Anthrone method.
- c. Benedict's method
- d. Copper reduction method.

UNIT III

- a. Estimation of pentose by Bial's method.
- b. Estimation of fructose by Seliwanoff's method.
- c. Estimation of reducing sugar in fruit sample
- d. Estimation of lactose in milk.

UNIT IV

Proteins:

- a. Protein determination- Lowry's method
- b. Protein determination - Biuret method.

UNIT V

Vitamins:

- a. Determination of ascorbic acid (Volumetry)
- b. Determination of Nicotinic acid.
- c. Mineral analysis: Estimation of Ca, Mg, Fe, Na and K

REFERENCE BOOK

1. Sadasivam .(1996). *Biochemical Methods*, New Delhi: New Age International Publishers, 2nd Edition.

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code (20UBCC41P)	PSO1	PSO2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	M	H	H	M	H	H	H	M
CO 2	H	M	H	H	H	H	H	H	H	L
CO 3	H	H	M	H	H	H	H	H	H	M
CO 4	H	H	H	H	M	H	H	H	H	M
CO 5	H	H	H	H	H	H	H	M	H	H

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Dr.R.Mallika
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VIRUDHUNAGAR - 626 001

Semester IV	Internship / Field Project (2020 -21 onwards)	Hours/Week: 0
PART IV		Credit: 1
Course Code 20UBCI41G		Internal 100

COURSE OUTCOMES

On completion of the Internship/Field Project, students will be able to

- CO1: relate their theoretical insights with hands-on experience. [K3]
- CO2: develop technical skills to their respective field of study. [K3]
- CO3: demonstrate the attributes such as observational skills, team spirit and inter personal skills built through site visits. [K3]
- CO4: exhibit the written communication skills acquired through internship/field project. [K3]
- CO5: analyze the observations and results and communicate their academic and technological knowledge appropriately oral means. [K4]

GENERAL INSTRUCTIONS:

- **Internship:** A designated activity that carries one credit involving not more than 15 days of working in an organization under the guidance of an identified mentor
- **Field Project:** Students comprising of maximum 5 members in a team need to undertake a project that involves conducting surveys inside/outside the college premises and collection of data from designated communities or natural places.
- Internal Assessment only.

Course Code 20UBCI41G	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	M	M	M	H	-
CO2	H	M	M	M	M	H	
CO3	H	M	-	-	-	H	
CO4	H	H	M	M	-	M	H
CO5	H	M	H	H	M	-	

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

Semester V	MOLECULAR BIOLOGY	Hours/Week: 4	
Core course: 7		Credits: 4	
Course Code 20UBCC51		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: State the principles of genome organization, origin of nucleic acids replication, transcription, translation, and gene expression. [K1]

CO2: Understand the mechanisms of replication, transcription, translation, gene expression, genome organisation and the nucleic acids evolution. [K2]

CO3: Identify the organic evolution of nucleic acids and the molecular mechanisms in prokaryotes. [K3]

CO4: Illustrate the normal and abnormal events of central dogma, genome organization and genetic material evolution. [K4]

CO5: Interpret the cell functions at the molecular level with respect to nucleic acids origin, replication, transcription, translation, genome organisation and gene expression. [K5]

UNIT I

Origin of life on Earth : Abiogenesis and Biogenesis. Theory of Chemical Evolution, Primitive Earth Conditions - anoxic reductive atmosphere, relatively high temperature, Volcanic eruption, high frequency UV radiation. Abiotic formation of sugars, amino acids, organic acids, purines, pyrimidines, glycerol. Self replicating molecules -Ribozymes and RNA World. Formation of DNA, Formation of nucleoproteins. Advantages of compartmentalization of Biomolecules. (15 hours)

UNIT II

Genome organisation: The central dogma of Molecular biology. Organisation of the genome- Histones , nucleosomes, Chromatin structure. Chemical basis of hereditary- Nucleic acid as the genetic material - and composition. Fundamentals of DNA structure. Functions of nucleic acid. (10 hours)

UNIT III

Replication : Prokaryotic replication- model of replication- semiconservative mode of replication replication forks, semi-discontinuous replication, Okazaki fragments. Bacteriophages M13 and Φ X174 replication, rolling circle model of replication. Enzymology of replication- role of DNA polymerases I, II, III, gyrase, topoisomerases, helicase, ligases and SSB proteins. Theta replication in E.Coli- initiation events at Ori C, elongation events on the replication fork and termination- fidelity of replication- inhibition of replication. Recombination- Homologous and site specific recombination. (15 hours)

UNIT IV

Transcription : Types of RNA - tRNA, rRNA, mRNA. Transcription of RNA - initiation, elongation and termination of transcription. Post transcriptional modification- splicing, circular RNA -Modulation of gene expression. Concepts of Operon-Inducers and repressors-Lac operon only. (10 hours)

UNIT V

Translation: Genetic code – General features . Mutations- Base substitutions, deletions and insertions. Structure of Eukaryotic and prokaryotic ribosomes. Translation process -Initiation, elongation and termination. Post translational modification of proteins. Natural and artificial gene transfer methods- Transformation, transduction, conjugation, electroporation liposome-mediated gene transfer, microinjection . Transposable elements.

(10 hours)

REFERENCE BOOKS

1. Adams R.L.P., Burdon R.H., Campbell A.M., Leader D.P., Smellie. (1981). *The Biochemistry of the Nucleic acids*, 9th edition. London: Chapman and Hall.
2. Freifelder, D. (1982). *Physical Biochemistry: Applications to Biochemistry and Molecular Biology*, 2nd Edition. San Francisco: W.H. Freeman and Co.
3. Freifelder, D. (2005), *Molecular Biology*- 2nd edition. USA: Jones Bartlett publishers.
4. Geoffrey M. Cooper. (1997). *The cell - A Molecular approach*, 1st edition: Washington, D.C: ASM Press, Oxford : distributed by Oxford University Press.
5. Brown T.A.(1998) . *Molecular biology*. London : Academic Press, San Diego.

Course Code (20UBCC51)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	H	H	H	H	H	M	L	-
CO 2	H	H	H	H	H	H	H	M	L	L
CO 3	H	H	H	H	H	H	H	M	L	L
CO 4	H	H	H	H	H	H	H	M	L	L
CO 5	H	H	H	H	H	H	H	M	L	L

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B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

Semester V	MICROBIOLOGY	Hours/Week: 4	
Core course: 8		Credits: 4	
Course Code 20UBCC52		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: describe the classification, structural organization, microscopic analysis, growth and reproduction, industrial and medical traits of microbes [K1]
- CO2: interpret the structural organization, classification and microscopic identification, growth requirements, reproduction, harmful and beneficial aspects of microorganisms [K2]
- CO3: sketch the structure and functions, growth and reproduction, microscopic analysis, harmful and industrial applications of microbes [K3]
- CO4: analyze the structural organization, classification and microscopic identification, growth and reproduction, harmful and beneficial aspects of microorganisms [K4]
- CO5: Evaluate the classification, structure, modes of nutrition and reproduction, merits and demerits of microbes [K5]

UNIT I

General classification of microorganisms and their characteristics. Prokaryotic organization cytoplasmic membrane and their functions- mesosomes. Cell wall- Gram positive and Gram negative bacteria, capsules and slime layers- flagella and cilia- bacterial chromosomes, plasmids, ribosomes, reserved food and endospore. (13 hours)

UNIT II

Growth and reproduction- bacterial growth curve - autotrophic and heterotrophic nutrition- Binary fission and other modes of reproduction- Conjugation- Transformation- transduction- sporulation. Microscopy-SEM, TEM (10 hours)

UNIT III

Food microbiology – microbial spoilage of food, food preservation, food poisoning- food borne infection.

Dairy Microbiology- types of microorganisms in milk- pasteurization of milk- Production of fermented milk, butter, cheese, and yoghurt and koumiss. (12 hours)

UNIT IV

Use of microbes in industries - ethanol, organic acid (lactic and citric) and antibiotics (Penicillin and Streptomycin) production. Fermentation (overview). (10 hours)

UNIT V

Pathogenesis and prevention of air and water borne diseases – tuberculosis, diphtheria, poliomyelitis, Typhoid, Cholera, Dysentery, Diarrhea, hepatitis, amoebiosis, pox diseases, and present day epidemics-dengue, ebola and chikungunya. (15 hours)

TEXT BOOKS

1. Power, C.B., and Dagainawala, H.F. (1986). *General Microbiology* Vol I & II (2nd Edition, Mumbai: Himalaya Publishing House,
2. Dubey R. C.(2000).*Text book on microbiology*, 1st Edition.New Delhi: S. Chand & Co.

REFERENCE BOOKS

1. Eugene W., Nester et al. (2001).*Microbiology*, 3rd Edition.Dubuque, Iowa : McGraw-Hill.
2. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). *Microbiology*. 5th Edition,New Delhi: Tata Publishing Co., Ltd.
3. Prescott, M.J., Harley, J.P. and Klein, D.A. (2010). *Microbiology*. 5th Edition,New York: WCB Mc GrawHill,
4. Casida LE. (1991). *Industrial Microbiology*. 1st edition. Wiley Eastern Limited.

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code 20UBCC52	PSO1	PSO2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	H	H	H	M	M	M	-	-
CO 2	H	M	H	H	M	M	M	M	M	L
CO 3	H	H	H	H	M	M	M	M	M	M
CO 4	H	H	H	H	M	M	M	M	L	M
CO 5	H	M	H	H	M	M	M	M	L	M

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B.Sc. BIOCHEMISTRY

(2020-2021 Onwards)

Semester V	PHARMACOLOGY	Hours/Week: 4	
Core course 9		Credits: 4	
Course Code 20UBCC53		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: understand the basic principles and concepts of Pharmacology [K1]

CO2: explain the drug metabolism, pharmacological action of drugs on various systems of the body, drug interactions, adverse drug reactions, drug dependence and tolerance, drug designing, development and toxicity due to over dosage [K2]

CO3: relate the pharmacological action of drugs with their metabolism, interaction with receptor, adverse reactions, dependence and tolerance, drug designing, development and toxic effects of drugs [K3]

CO4: interpret the over dosage toxicity due to pharmacological action of drugs, interactions, adverse reactions, dependence and tolerance to modify drug design and development [K4]

CO5: evaluate the drug design and development using the pharmacokinetic and dynamic principles, pharmacological actions, interactions with receptors, adverse reactions, dependence and tolerance of drugs and toxic effects.

UNIT I

Introduction to pharmacology – Principles and Concepts of pharmacology –Sources of drugs, routes of drug administration, dosage forms. Bioavailability of drugs- determination and its importance, Combined effect of drugs - Synergism, antagonism. (12 Hours)

UNIT II

Pharmacokinetics & Pharmacodynamics: Absorption and distribution of drugs, factors influencing drug absorption and distribution. Drug elimination: - Renal excretion,

fecal excretion, biliary excretion, pulmonary excretion. Mechanism of phase I and Phase II metabolic reactions, factors affecting drug metabolism. (12 Hours)

UNIT III

Mechanism of drug action: Basis of drug action, drug - receptor interactions. Action of drugs on human systems: A brief account on drugs acting on cardiovascular system- Cardiac glycosides- Digoxin, Digitoxin, B blockers- propranolol and timolol. A brief account on drugs acting on central nervous system- Barbiturates, Antipsychotics- phenothiazines, butyrophenones. (12 Hours)

UNIT IV

A brief account on drugs acting on digestive system- Drugs used for constipation- Senna Anthracene purgatives, Saline purgatives. Antidiarrhoeal drugs, gastric antacids, Drugs used in healing of peptic ulcer. (12 Hours)

UNIT V

Adverse drug reactions: Classification: - Pharmacological Adverse drug reactions, Non-pharmacological Adverse drug reactions, disease related ADRs. Overdosage of drugs – Quinines, Xanthine alkaloids, Opioid analgesics and Catecholamines. Drug dependence, drug tolerance and intolerance. Drug designing and Drug development-Random screening, serendipity, molecular modification of known drug. (12 Hours)

TEXT BOOK

Basu D.K. (2017). *Essentials of Pharmacology*, 1 Edition, New Delhi: CBS Publishers & Distributors.

REFERENCE BOOKS

1. William O Foye., Thomas L Lemke, David A Williams, Victoria F Roche, S William Zito. (2012). *Foye's, Principles of Medicinal Chemistry*, 7th Edition, Creighton University, Omaha, Wolters Kluwer Health Adis (ESP).
2. Lippincott., Williams and Wilkins. (2013). *Clinical Epidemiology: The Essentials*, 4th Edition, Philadelphia, Credo.
3. Metha S C., and Ashutosh Kar. (2011). *Pharmaceutical Pharmacology*, 3rd Edition, New Delhi, New age International publishers.
4. Satoskar R,S., Nirmala Rege and Bhandarkar S,D. (2017). *Pharmacology and Pharmacotherapeutics*, 25th Kindle Edition, India, Elsevier publication.

Course Code (20UBCC53)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO 2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	M	H	H	M	H	H	L	L
CO 2	H	M	H	H	H	H	H	H	L	L
CO 3	H	H	M	H	H	H	H	H	L	M
CO 4	H	H	H	H	M	H	H	H	L	M
CO 5	H	H	H	M	H	H	H	M	L	H

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020-2021 Onwards)

Semester V	PROJECT	Hours/Week: 1
Core course 10		Credits: 1
Course Code 20UBCC5PR		Internal 100

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: make use of the theoretical knowledge to analyse the biological samples .[K3]

CO2: discover the inter disciplinary knowledge to carry out the project work for the welfare of the society. [K3]

CO3 : execute the technical skills in handling the equipments during the analysis of the Biological samples. [K3]

CO4: Analyze the results of the project work that is being executed and to correlate them for improving the society. [K4]

CO5: Develop an insight into the experiments carried out during the project work and conclude the findings with the existing results.[K5]

Students are expected to select a project in the field of Physics, Electronics and related interdisciplinary fields. Two students can do one project. Minimum pages for project report should be 20 pages. Two typed copies of the report on the completed project will be submitted to the Controller of Examination through the Head of the department in the month of November during V semester. Evaluation will be done internally.

Project work & Report - 60 marks

Presentation & Viva-voce - 40 marks

Course Code (20UBCC5PR)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	M	H	H	M	H	H	H	L
CO 2	H	M	H	H	H	H	H	H	H	L
CO 3	H	H	M	H	H	H	H	H	H	M
CO 4	H	H	H	H	M	H	H	H	M	M
CO 5	H	H	H	M	H	H	H	M	H	H

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Dr. P. Annapoorani
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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

Semester V	HUMAN PHYSIOLOGY	Hours/Week: 4	
DSEC -1		Credits: 4	
Course Code 20UBCE51		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: state the structure of important physiological systems including the cardio-

respiratory, renal, digestive, nervous, and reproductive systems. [K1]

CO2: explain the principles, functions and the structures of the human body. [K2]

CO3: Relate cardio- respiratory, renal, digestive, nervous, and reproductive systems of the human system. [K3]

CO4: analyze the relationship between anatomy and physiology of the human system. [K4]

CO5: interpret the composition and mechanism of various organs in the human body. [K5]

UNIT I

Digestive and Excretory System

Anatomy and functions of the organs - digestive system – oral cavity, stomach, small intestine, large intestine, pancreas, liver. Composition and functions of saliva and bile. Excretory System - kidney, nephron, urinary bladder – its structure and functions, renal circulation, volume and formation of urine and micturition. Skin- structure, functions and regulation of temperature. (15 Hours)

UNIT II

Blood and Circulatory System

Blood – structure, composition, functions and volume. Blood cells - Erythrocytes, Leucocytes and Thrombocytes, erythropoiesis, hemoglobin - erythrocyte sedimentation rate. Diseases - leucopenia, leukemia, polycythemia, anaemia. Blood coagulation, blood grouping,

transfusion, RH factor, Erythroblastosis fetalis. Structure & functions of heart, cardiac cycle, blood pressure-factors affecting blood pressure. (15 Hours)

UNIT III

Respiratory system

Anatomy-respiratory pathway, lungs-lung unit, mechanism of respiration, lung volumes, physiology of respiration, regulation of respiration types of breathing, modified forms of respiration – coughing, sneezing, hiccups, yawning, laughing, oxygen debt, and artificial respiration. (15 Hours)

UNIT IV

Reproductive & Endocrine system

Anatomy of male and female reproductive organs-menstrual cycle, process of reproduction and lactation, conception, structure and functions of pituitary, thyroid, adrenal glands, gonads. (15 Hours)

UNIT V

Nervous system & Sense organs- Structure and functions of neuron, brain and spinal cord, Autonomic nervous system, reflex action. Structure and physiology of eye and ear. (15 Hours)

TEXT BOOK

Sampath T. K., and Uma Maheshwari B. (2017). *Human Anatomy and Physiology*, (11th ed). Mumbai: Birla publications.

REFERENCE BOOKS

1. Vidhya Ratan. (1993). *Hand Book of Physiology*, New Delhi: Jaypee brothers, Medical Publishers (p) Ltd.
2. Kenneth S.Saladin. (1998). *Anatomy Physiology*, New York: MC Grow-hill.
3. Sarada Subramanyam., Madhavan Kutty K., and Singh H.D. (1996). *Text Book of Human Physiology* – S.Chand Company.

Course Code (20UBCE51)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	M	M	M	H	L	L	-	L
CO 2	H	H	M	M	M	H	-	M	-	L
CO 3	H	H	M	M	M	M	M	M	-	M
CO 4	H	H	H	H	H	H	H	M	L	L
CO 5	H	H	M	M	M	M	M	M	-	M

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

Semester V	GENETICS	Hours/Week: 4	
DSEC -1		Credits: 4	
Course Code 20UBCE52		Internal 25	External 75

COURSE OUTCOMES

The course has been designed to provide an introduction to the basic concepts of Genetics. The course will help the students to understand the mechanism of determining sex of an individual, Structural details and the role of chromosomes in human congenital anomalies.

On completion of the course the students will be able to

CO1: Define history of genetics, karyotyping, linkages, chromosome number and allele frequency [K1]

CO2: Explain Mendelism, segregation, dominance, independent assortment, epistasis, sex determination, linkages, cytogenetics, pedigree analysis, coupling repulsion theories, ploidies, an Hardy- Weinberg's equation an variation [K2]

CO3: Apply Laws of Mendel – law of segregation, law of dominance and law of independent assortment, linkages, mutations and variations [K3]

CO4- Examine Mendelian laws, traits, epistasis, chromosomal aberrations, crossing over and speciation [K4]

CO5 - Evaluate Chromosomal inheritance, cytogenetics in medicine, syndromes, genetic mapping, chromosomal aberrations, significance of mutations' Hardy Weinberg's law in and factors producing changes in population [K5]

UNIT I

Introduction: A brief overview of the modern history of genetics; Mendelism and the chromosomal theory - Mendel's experiments, segregation, dominance, independent assortment; Epistasis; Multiple alleles; one gene-one enzyme hypothesis. Inheritance – Sex linked inheritance and extra chromosomal inheritance. (12 hours)

UNIT II

Cytogenetics: Normal human karyotype, sex chromosomes and sex determination patterns, dosage compensation. Sex linkage-X Linkage in Drosophila and Human. sex limited and sex influenced traits, Chromosomal banding, Human cytogenetics in medical Science, Pedigree analysis. (13 hours)

UNIT III

Linkage: Types of linkage and theories of linkage, coupling and repulsion, factors affecting linkage, Non disjunction: types in man, syndromes. Genetic mapping. (12 hours)

UNIT IV

Changes in chromosome number and structure: Monoploidy, euploidy, and polyploidy, Mutations - Point mutation: transversion, transition, deletion, missense, nonsense and frame shift; Chromosomal aberrations, crossing over, and significance of mutation. (13 hours)

UNIT V

Population genetics: Gene pool, allele frequency, genotype frequency, and Hardy-Weinberg equation; Variation, Mutation, Mechanisms of speciation, factors producing changes in populations. (10 hours)

TEXT BOOKS

1. Verma, P.S., and Agarwal, V.K. (2004). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. New Delhi: S. Chand & Co. Ltd.

REFERENCE BOOKS

1. Sambamurthy. (1999). Genetics, New Delhi: Nasoa publishing house.
2. Sinnot E.W., L.C. Dunn., and T. Dobzhansky. (1958). Principles of Genetics. 5th Edition. New York: McGraw Hill.

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code 20UBCE52	PSO1	PSO 2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	H	H	H	H	H	M	M	H	-	-
CO 2	H	H	H	H	H	M	H	H	M	L
CO 3	H	H	H	M	M	H	H	M	M	M
CO 4	H	M	H	H	H	H	H	H	L	M
CO 5	H	M	H	H	M	M	M	M	L	M

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B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

Semester V	MOLECULAR BIOPHYSICS	Hours/Week: 4	
DSEC -1		Credits: 4	
Course Code 20UBCE53		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: Remember different atomic system, different coupling schemes and their interactions with magnetic and electric field, and learn the Laws and functions and their relations of thermodynamics in Bioenergetics in biological systems.[K1]

CO2: Understand the Fundamentals of physical phenomenon associated with biological reactions with the basic laws and explore the concept of Biophysics.[K2]

CO3: Apply the principles of Bio physics in analytical determination of biomolecules and life processes, theoretical modelling techniques involved in biomolecular system.[K3]

CO4: Analyse the Structural and molecular properties of biomolecules in Biological process and various methods in the Biophysical analysis and Contemporary issues on atomic and Molecular physics.[K4]

CO5: Evaluate the applications of physics in biological sciences needed to develop the new approach in the academic and Industrial Research .[K5]

UNIT I

Structure of atom-Models & theories, Periodic table, Concept of bonding; valence of carbon; hybridizations of carbon; hybridizations of nitrogen & oxygen; molecular orbital theories, polar & non polar molecules; inductive effect; Secondary bonding: weak interactions, hydrogen bonding; dipole-dipole & dipole induced dipole interactions; London dispersion forces. Bonds within molecules-Ionic, covalent, Hydrogen, Electrostatic, Disulphide & peptide bonds, Van-der Waals forces, Bond lengths & Bond energies, Bond angles, Structural isomerism; optical isomerism & optical activity. (12 Hours)

UNIT II

Biophysics of Water: Physicochemical properties of water, Molecular structure, Nature of hydrophobic interactions, Water Structure. Small-Molecule Solutes: Hydrophiles, Hydrophobes, Large Hydrophobic Solutes and Surfaces, Aqueous Environment of the Cell, State of water in bio- structures & its significance, Protein Hydration-Nonspecific Effects, The Hydration Shell. Acid & Bases: Acid-Base theories, Mole concept, Molarity, Molality & Normality, Ampholyte, concept of pH, measurements of pH, Henderson–Hasselbatch equation, Titration curve & pK values, Buffers & Stability of their pH, numerical problems. Redox potential : Oxidation –Reduction, examples of redox potential in biological system.

(12 Hours)

UNIT III

Thermodynamics of Biological system: First and second laws of thermodynamics, activation energy. Biological systems as open, non-equilibrium systems, Concept of free energy, unavailable energy and entropy, heat content of food, bomb calorimetry, Enthalpy, Negative entropy as applicable to biological systems. thermodynamics of passive and active transport, glycolytic oscillations, biological clocks.

(12 Hours)

UNIT IV

Bioenergetics: Concept of energy coupling in biological processors, Energy requirements in cell metabolism, structure and role of mitochondria, high energy phosphate bond, energy currency of cell, Biological oxidation, Electron-transport chain, Oxidative Phosphorylation including chemi osmotic hypothesis. Thermodynamic analysis of TCA cycle and oxidative phosphorylation.

(12 Hours)

UNIT V

Nucleic acids: Purine and Pyrimidine bases, nucleosides, nucleotides, basic differences in structure and function of RNA and DNA Amino acids & Proteins: Amino acid general structure & types, peptide bond, Structure of Proteins - primary, secondary, tertiary and quarternary, Carbohydrates : Structure and function of mono, di ,oligo and polysaccharides, Structure of D-glucose & D-fructose; formation of glucosides & the cyclic structure of D glucose; Structure and conformation of disaccharides and polysaccharides-cellulose, amylopectin & glycogen, Chitin. Lipids : Definition: Types of lipids; Triglycerides, fatty acids, Fats & oils, Phospholipids, Glycolipids; lipoproteins, Structure, Function and Localization Vitamins & hormones: Structure, classification & function.

(12 Hours)

TEXT BOOKS

1. Lehninger A.L., Nelson D.L. and Cox M.M.. (1993). *Principles of Biochemistry*, 2nd Edition, New Delhi: CBS Publishers.
2. Stryer L. (2002). *Biochemistry*, 5th Edition, New York: W.H Freeman Co.
3. Rao V.S.R., Qasba P.K., Balaji P.V., and Chandrasekaran R.(1998). *Conformation of Carbohydrates*, 1st Edition, Netherland: Harwood Academic Publishers.
4. Stoddart J.F. (1971). *Stereo Chemistry of Carbohydrates*, 1st Edition, New York, John Wiley & Sons.

REFERENCE BOOKS

1. Sharon N. (1978). *Complex Carbohydrates their Chemistry, Biosynthesis and Functions*, 1st Edition, London: Amsterdam- Don Mills.
2. Kennedy J.F., and White C.A. (1983). *Bioactive carbohydrates in Chemistry, Biochemistry and Biology*, 1st Edition, Chichester: Ellis Harwood Limited.
3. Schulz G. and Schirmer R.H.(1984). *Principles of Protein Structure*, 1st Edition, New York: Springer - Verlag.

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code 20UBCE53	PSO1	PSO 2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	H	H	H	H	H	M	M	H	-	-
CO 2	H	H	H	H	H	M	H	H	M	L
CO 3	H	H	M	M	M	H	H	M	M	M
CO 4	H	H	H	H	H	H	M	H	L	M
CO 5	H	M	H	H	M	M	M	M	L	M

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY (2020-21 Onwards)

Semester V	BIOINFORMATICS	Hours/Week: 2	
SEC-4		Credits: 2	
Course Code 20UBCS51		Internal 40	External 60

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: write the basic concepts of bioinformatics, networks, sequence database, various alignment technique and phylogenetic analysis [K1]

CO2: understand the concept of computer, information networks, sequence databases, sequence alignment techniques, tools, construction of phylogenetic tree [K2]

CO3: outline the overview of networks, database, sequence alignment, usage of Matrix , multiple sequence alignment and application of bioinformatics. [K2]

CO4: apply the concept about alignment algorithms, matrix, networks, phylogenetic trees in structural prediction and evolutionary relationship [K3]

CO5: analyze the role of bioinformatics, pairwise database searching tools, networks and methods of phylogenetic trees [K4]

UNIT I

Computer Network: Bioinformatics – Objectives, scope and application. Overview of a network – Modems, Communication media –Twisted pairwise, Coaxial cable, fiber optic cables, Communication Satellites, Telecommunication Software. (6 hours)

UNIT II

Information Networks: Types of networks – LAN, WAN, Topology –bus, star, and ring. Internet, Ip address, WWW, Web browsers, HTTP, HTML. (6 hours)

UNIT III

Sequence database: Nucleic acid sequence database - Genbank, EMBL, DDBJ, GSDB. Ensembl. Protein sequencing database -PIR, MIPS, SWISSPROT, TrEMBL, NRL - 3D. Structural database – PDB, CSD, SCOP, CATH, BMRB, FSSP, MMDB. (6 hours)

UNIT IV

Sequence Alignment and analysis package: Pairwise alignment technique - Local alignment (Smith –Waterman algorithm), Global alignment (Needleman and Wunsch algorithm). Pairwise database searching tools –FASTA, BLAST. Analysis package- definition packages specializing in DNA analysis, Intranet packages-Synergy, GenMill, GeneWorld, GeneThesaurus, Internet packages- CINEMA, EMBOSS, Alfresco. (6 hours)

UNIT V

Homology and diversity: Multiple sequence Alignment, Scoring Matrix : Dot plot, Dayhoff Mutation Data Matrix(PAM), BLOSUM matrices, alignment significance. Phylogeny: Phylogenetic analysis- Definition and description of phylogenetic trees and various types of trees, Method of construction of Phylogenetic trees [distance based method (UPGMA, NJ), character based method (Maximum Parsimony and Maximum Likelihood method)].6 hours)

TEXT BOOK

1. Alexis Leon., Mathews Leon. (2009). *Fundamentals of information technology*. New Delhi: Vikas Publishing House Pvt Ltd.
2. Attwood, T.K., Parry-Smith, DJ. (2002). *Introduction to Bioinformatics*, Singapore: Pearson Education Private Ltd.

REFERNCE BOOKS

1. Ignacimuthu. (2008). *Basic Bioinformatics*, 2nd edition. England, United Kingdom: Alpha Science Intl Ltd.

Course Code (20UBCS51)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO 6	PSO 7
CO 1	H	H	M	M	H	M	H	H	H	L
CO 2	H	H	M	M	H	H	H	H	M	L
CO 3	H	H	H	H	H	H	H	H	H	L
CO 4	H	H	H	H	H	H	H	H	H	H
CO 5	H	H	H	H	H	H	H	H	H	H

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020-2021 Onwards)

Semester V	MOLECULAR BASIS OF NON- INFECTIOUS HUMAN DISEASES	Hours/Week: 2	
SEC-5		Credits: 2	
Course Code 20UBCS52		Internal 40	External 60

COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: define the nutritional requirements, the molecular defects behind nutritional disorders, protein and lifestyle associated disorders, metabolic disorders, monogenic disorders and cancer [K1]
- CO2: associate the genetic abnormalities with the nutritional, protein and lifestyle related, metabolic and monogenic disorders and cancer [K2]
- CO3: describe the genetics behind life style associated non infectious diseases. [K2]
- CO4: interpret the non-infectious human diseases from their genetic defects [K3]
- CO5: evaluate the abnormalities of noninfectious human diseases [K4]

UNIT 1

Nutritional disorders

Overview of major and minor nutrient components in the diet. Balanced diet and the concept of RDA. Nutrient deficiencies, Kwashiorkor and Marasmus, Scurvy, beri beri, pellagra and B12 deficiency, Xerophthalmia and Night blindness, Vitamin D deficiency, Vitamin K deficiency. (6 hours)

UNIT II

Metabolic and Lifestyle disorders

Molecular basis of major complex diseases such as Diabetes, Obesity, Hypertension, Atherosclerosis and eating disorders like Anorexia nervosa and Bullemlia, Irritable bowel syndrome.

(6 hours)

UNIT III

Cancer

Cancer: characteristics of a transformed cell, causes and stages of Cancer, molecular basis for neoplastic growth and metastasis, Proto-oncogenes and tumor suppressor genes, Cancer causing mutations and Tumor viruses. (6 hours)

UNIT IV

Diseases due to misfolded proteins

Introduction to protein folding and Proteasome. Removal of misfolded proteins- Etiology and molecular basis for Alzheimer's, Prion diseases, Huntington's Chorea, Thalassemia. (6 hours)

UNIT V

Monogenic diseases

Phenyl ketonuria, Hemophilia A, Albinism, Familial hypercholesterolemia, Cystic fibrosis, Sickle-cell anemia, Hemophilia A, Huntington's disease, Polycystic kidney disease, Rett's syndrome, Duchenne muscular dystrophy. (6 hours)

TEXT BOOKS

1. Devlin, T.M. (2011). *Textbook of Biochemistry with Clinical Correlations*. ISBN: 978-0-4710-28173-4. John Wiley & Sons, Inc. New York.
2. Lauralee S. (2013). *Introduction to Human Physiology* 8th edition; Brooks/Cole, Cengage Learning.

REFERENCE BOOKS

1. Lewis J. Kleinsmith., Wayne M. Becker., and Gregory Paul Bertoni, Jeff Hardin, (2009). *The World of the cell*, 7th edition. San Francisco, USA: Benjamin Cummings.
2. Gardner., Simmons and Snustad. (2012). *Genetics*, New Delhi: CBS Publishers & Distributors Pvt Ltd.
3. Cooper, G.M., Hausman, R.E. (2009) *The Cell: A Molecular Approach*. 5th edition. Sunderland, Washington: ASM Press & D.C. Sinauer Associates, MA.

Course Code (20UBCS52)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO 2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	H	H	H	M	H	H	L	L
CO 2	H	M	H	H	H	H	H	H	L	M
CO 3	H	H	M	H	H	H	H	H	L	M
CO 4	H	H	H	H	M	H	H	H	L	M
CO 5	H	H	H	M	H	H	H	M	L	M

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B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

EXTRA CREDIT COURSE

Semester V	EMERGENCY CARE	Credits: 2
EXTRA CREDIT COURSE 1		
Course Code 20UBCO51		Internal 100

COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: Identify the basic Concepts of first aid , minor and major emergencies, first aid during special conditions , certifications and organisations.[K1]
- CO2: Demonstrate the first aid during major and minor emergencies and discuss the certifications and organisations ..[K2]
- CO3: Apply the principles of first aid during minor and major emergencies. [K3]
- CO4: Analyse the first aid training methods and plan to render the first aid in special conditions and disasters. [K4]
- CO5: Evaluate the guidelines for first aid offered by various national and international Organizations , first aid during minor and major emergencies. [K5]

UNIT I

Basic Concepts of First aid-Definition – ABC rule – emergency action principles – emergency management systems – spot analysis - primary assessment - secondary assessment - emergency moves (Medivac) – legal awareness& responsibilities of first aid – first aid kit.

UNIT II

Minor Emergencies -First aid - accident care - wounds & bleeding - burns – hypothermia/hyperthermia - dehydration – electric shock – allergies – bites and stings – sprains – cramps – eye injuries – pain –air way obstructions - breathing emergencies – choking.

UNIT III

Major Emergencies-First aid - head injury – concussion – cerebral compression – spinal injuries – chest injury – angina - heart attack – CPR – AED – stroke – epilepsy –

fractures - dislocations – splinting - suicide emergencies- drowning- cold shock – bleeding – unconsciousness – levels of response (AVPU scale) – soft tissue injuries – poisoning.

UNIT IV

First Aid in Special conditions -Special care and first aid for infants, children's and aged persons – first aid in pregnancy- diabetic emergency – Weil's disease – Marine stings – fish hooks for divers – disaster emergencies – management - do's & don'ts.

UNIT V

Certification and Organizations -First aid training methods – Hand on training demonstrations - volunteers - Youth Red Cross – management measures – guidelines of first aid – role of government and voluntary organizations – National and International organizations – Red Cross – Red Crescent & St. John Ambulance Association.

REFERENCES

1. Alton L. Thygeson, (2006), First Aid, 5th edition, Jones Bartlett Publishers, London ISBN: 07-637-4244-9.
2. Jon R. Kroner (2004), First Aid Manual, 2nd edition. D.K. Publications, London, ISBN: 07 -566 -0195-9.
3. Doring Kindersley (2002), First Aid Manual 9th edition, A publication of St. John Ambulance & British Red Cross Society, ISBN: 07-5136- 9438.
4. Kathleen Handel (1992), The American Red Cross First Aid Safety Hand book, Little brown, United Kingdom, ISBN 03 -167-3646-5.
5. First Aid to the injured (2009), 5th edition, St. John Ambulance, New Delhi.

Course Code (20UBCO51)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	H	H	H	M	H	M	M	H
CO 2	H	H	H	H	H	M	M	M	M	H
CO 3	H	H	H	H	H	H	M	M	H	H
CO 4	H	H	H	H	H	M	H	M	M	H
CO 5	H	H	H	H	H	M	M	M	M	H

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B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

Semester VI	BIOTECHNOLOGY	Hours/Week: 5	
Core Course-11		Credits: 4	
Course Code 20UBCC61		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: Remember the basic principles and practices of microbiological, molecular and analytical methods, which are extensively used in biotechnology. [K1]

CO2: Understand the Basic concepts of biotechnological tool and its mechanism in host cell, Developments made in the field of biotechnology for use in human welfare and solving problems in the society. [K2]

CO3: Apply the knowledge in the basics of research and development in biotechnological field and integrate scientific and technological knowledge on the use of bioprocesses for industrial products. [K3]

CO4: Analyze the applications of Genetic engineering in biological research and biotechnological industries for entrepreneurial development and investigate the different strategies of recombinant DNA technology and resolve the problems encountered [K4].

CO5: Evaluate the biological science techniques that manipulate living organisms and biological systems to produce novel products in the field of microbial, plant, animal and environmental biotechnology and Examine the results behind the molecular and microbiological techniques for the development of new techniques in future. [K5]

UNIT I

Genetic Engineering - Introduction to gene cloning, restriction enzymes and mode of action, Types of cloning vectors- plasmids, cosmids, viral and yeast vectors, BACs and Phagemids, Ligation Independent Cloning. Gene transfer techniques in Microbes, Plants and Animals .

(15 hours)

UNIT II

Plant Biotechnology - Binary vectors for plants- *Agrobacterium tumefaciens*, Gemini virus, transgenic plants (Bt Cotton, Bt Tomato), Gene gun, Pathogen Derived Resistance (SiRNA), Phytoremediation. (15 hours)

UNIT III

Animal Biotechnology - gene cloning vectors for animals- SV40, Adenoviruses, Retroviruses, Transgenic animals. Embryo Technology and animal breeding. Gene therapy- types-ADA Deficiency. (15 hours)

UNIT IV

Microbial biotechnology – Bacteriophage vectors-M13 phage vector, Types, design and operation of Fermentors, Oil spill clean by microbes, biodegradable plastics. (15 hours)

UNIT V

Production of Novel proteins – Insulin, Interferons, Vaccines, Gene therapy- Treatment of Various human disorders. A brief account on single cell protein(SCP). Use of genetically modified organisms and their release to environment. (15 hours)

TEXT BOOK

1. Kumaresan. V. (2015). *Biotechnology*, 6th edition. Nagercoil: Saras Publications.

REFERENCE BOOKS

1. Gupta, P.K. (2010). *Elements of Biotechnology*, New Delhi: Rastogi Publications.
2. Dubey, R.C. (2006). *Text Book of Biotechnology*, 4th edition, S. Chand Publishing.
3. James, D., Watson. (1992). *Recombinant DNA technology*. 2nd Edition. USA: W.H. Freeman.
4. Singh, B.D. (2008). *Biotechnology*, 3rd edition. Mumbai: G.G. Publications.
5. Old and primrose. (2004). *Principles of gene manipulation. An introduction to genetic engineering*, 6th edition, University of York.
6. Purohit, S.S. (2008). *Biotechnology*, 3rd edition, Agrobios, India.
7. Stanbury, P.F., Whitaker A., and Hall, S.J. (2007). *Principles of Fermentation Technology*, 2nd edition. Elsevier India Pvt Ltd.

	PO1	PO2	PO3		PO4		PO5		PO6	PO7
Course Code 20UBCC61	PSO1	PSO2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	H	H	H	M	M	H	M	H
CO 2	H	H	H	H	H	M	H	H	M	L
CO 3	H	H	H	H	M	H	H	M	M	M
CO 4	H	M	H	H	H	H	H	H	L	M
CO 5	H	M	H	H	M	M	M	M	L	M

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B.Sc. BIOCHEMISTRY (2020-21 Onwards)

Semester VI	PLANT BIOCHEMISTRY	Hours/Week: 5	
Core Course-12		Credits: 4	
Course Code 20UBCC62		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

- CO 1: write about various components of plant cell, photosynthetic process, importance of mineral nutrients, plant hormones, reproduction and basics of plant tissue culture.
- CO 2: explain the structure and function of plant cell components, pathways of photosynthesis, photorespiration, N₂ fixation, sulphur assimilation process, physiological role of mineral nutrients and plant hormones and basic technique of plant tissue culture.
- CO 3: illustrate the plant cell organelles, photosynthesis, fixation and assimilation of minerals, growth, reproduction and plant tissue culture.
- CO 4: analyze the pathways involved in the photosynthesis, nitrogen and sulphur metabolism, growth, reproduction and plant tissue culture.
- CO 5: evaluate the role of subcellular organelles of plant cell, photosynthesis, mineral nutrients and plant hormones, physiology of growth and reproduction and plant tissue culture technique.

UNIT I

Introduction:

Structure of plant cell, Occurrence, classification, structure and function of naturally occurring photosynthetic pigments- Carotenoids, Xanthophylls and chlorophylls, structure of photosynthetic apparatus - chloroplast. (15 hours)

UNIT II

Photosynthesis:

Light reactions – Hills reactions, Blink's effect, Emerson effect, Red drop, Cyclic and non-cyclic photophosphorylation, Z-scheme and energetics of light reaction.

Dark reactions of photosynthesis - C₃, C₄ and CAM pathway of plants, factors affecting photosynthesis, photorespiration. (15 hours)

UNIT III

Plant Nutrition: Essential mineral nutrients - function, effects of toxicity and deficiency, N₂ cycle, N₂ fixation - symbiotic and asymbiotic Nitrogen Fixation, Nitrogenase, and nitrate assimilation, sulphur as a mineral nutrient - sulphate assimilation.

(15 hours)

UNIT IV

Plant growth regulators: Structure and physiological functions of natural growth hormones- Auxins, GA, Cytokinins, Ethylene and ABA, synthetic hormones (15 hours)

UNIT V

Physiology and reproduction: Brief account on physiology of seed germination and Dormancy- factors affecting germination and biological significance of dormancy, Photoperiodism- Physiology of flowering, importance of light and dark period on flowering, phytochrome, Vernalization- mechanism, significance and importance, Basic methodology of Plant tissue culture. (15 hours)

TEXT BOOKS

1. Pandey, S. N. & Sinha, B.K. (2005). *Plant physiology, 4th edition*. New Delhi: Vikas Publishing House Pvt. Ltd.
2. Sinha, R. K. (2018), *Modern plant physiology-*, 2nd edition. New Delhi: Narosa Publishing House Pvt. Ltd.
3. Salisbury., Ross.(2006). *Plant physiology, 3rd Edition*. New Delhi: CBS publishers and Distributors.
4. Jain, V. K. (2013). *Fundamentals of Plant Physiology, 15th Edition*. New Delhi: S.Chand & Company Ltd.

REFERENCE BOOKS

1. Robert, M.Devlin., Witham. (1983). *Plant Physiology, 4th edition*. Boston: Prindle, Weber & Schmidt Publishers.
2. James Bonner., Varner, J.E. (2016). *PlantBiochemistry, 3rd edition*. New York & London: Academic press.
3. Verma, S.K., & Mohit verma. (2008). *A Text Book ofPlant physiology, Biochemistry & Biotechnology, 1st edition*. New Delhi: S.Chand& Company Ltd.
4. Kochhar, S.L. & Sukhbir Kaur Gujral. (2016). *Plant Physiology Theory and Applications*. New Delhi: Cambridge University Press India Pvt. Ltd.

Course Code (20UBCC62)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	M	M	L	L	-	M	L	L
CO 2	H	H	M	M	M	L	-	M	L	L
CO 3	H	H	M	L	M	M	-	H	L	L
CO 4	H	H	H	M	H	M	L	H	L	M
CO 5	H	H	H	M	H	M	L	H	L	H

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B.Sc. BIOCHEMISTRY (2020-21 Onwards)

Semester VI	CLINICAL BIOCHEMISTRY	Hours/Week: 5	
Core Course-13		Credits: 4	
Course Code 20UBCC63		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: describe the clinical aspects of various diseases. [K1]

CO2: Understand the biochemical mechanisms and pathophysiological processes

responsible for the metabolic, inherited disorders and infectious diseases. [K2]

CO3: apply the knowledge of aetiology, pathology, diagnosis and interpretation of diseases

which help the students for further employment in basic research and the health profession. [K3]

CO4: analyse the variations in the levels of biochemical constituents and their relationship

with various diseases. [K4]

CO5: critically evaluate the role of clinical biochemistry in screening, diagnosis and

monitoring of various diseases. [K5]

UNIT I

Disorders of Carbohydrate metabolism: sugar level in normal blood- Hypo and Hyperglycemia, Types of Diabetes, Glycosuria, and Galactosemia. Glucose tolerance test.

(15 Hours)

UNIT II

Disorders of lipid metabolism: hypo and hyperlipoproteinemias, Atherosclerosis, Coronary arterial disease, myocardial infarction, cardiac hypertrophy, fatty liver, obesity.

(15 Hours)

UNIT III

Disorders of amino acid, protein and nucleic acid metabolism: amino acid metabolism in starvation, disorders of Plasma proteins. Clinical significance of urea, Uric acid, Creatinine, ammonia. Porphyrrias. Disorders of Purine and Pyrimidine metabolism - Gout, LNS, Orotic aciduria, Xanthinuria. (15 Hours)

UNIT IV

A brief account on causes, signs, symptoms, diagnosis and prevention of common infectious diseases- AIDS, Meningitis, Influenza , Microencephalitis, Cholera, Dengue, Corona, Diphtheria (15 Hours)

UNIT V

Inborn errors of metabolism - carbohydrate metabolism-Glycosuria, Glycogen storage disease, Galactosemia. Protein metabolism-Phenylketonuria, Maple syrup urine disease, alkaptonuria, cystinuria, lipid metabolism –Taysach’s disease, Niemann pick disease, Fabry’s disease, and nucleic acid metabolism -Oraticaciduria, (15 Hours)

TEXT BOOKS

1. Chatterjee, M.N. (2007). *Text Book of Medical Biochemistry*, 7th Edition. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.
2. Deb, A.C. (1997). *Fundamentals of Biochemistry*- 6th edition, Calcutta: New Central Book agency.

REFERENCE BOOKS

1. Harold Varley. (1991). *Practical Clinical Biochemistry*, 5th edition. London: Boca Raton, Fla. : CRC Press.
2. Allan Gaw. (1996). *Illustrated clinical biochemistry*, 4th edition. Edinburgh, Scotland: Churchill Livingstone.

Course Code (20UBCC63)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO 3a	PSO 3b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	H	H	M	M	M	H	M	M
CO 2	H	H	H	H	M	H	M	H	M	M
CO 3	H	H	H	H	H	H	H	H	H	H
CO 4	H	H	H	H	H	H	H	H	H	H
CO 5	H	H	H	H	H	H	H	H	H	H

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B.Sc. BIOCHEMISTRY (2020-2021 Onwards)

Semester V	CLINICAL BIOCHEMISTRY LAB	Hours/Week: 3	
Core course Practical:3		Credits: 3	
Course Code 20UBCC 61P		Internal 40	External 60

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: Apply the principles and procedures in qualitative and quantitative determination of unknown constituents in the biological samples. [K3]

CO2 : Make use of enzyme assay and colorimetric principles to detect the concentration of unknown components in the biological samples. [K3]

CO3 :Identify the normal and abnormal parameters of biological samples using colorimetry and other basic biochemical methods [K3]

CO4 : Observe and calculate the results for the colorimetry, ESR, hemoglobin estimation, and enzyme assays of biological samples and to complete the record work. [K3]

CO5 : Infer the normal and abnormal parameters of biological samples analyzed by colorimetry and other basic biochemical methods for enzyme assay , hemoglobin estimation and ESR. [K4]

UNIT I

Blood Analysis

1. Blood sugar - method
2. Blood Urea -DAM method
3. Blood cholesterol- Ferric chloride method

UNIT II

Blood Analysis

1. Blood uric acid - Molybdate method
2. Creatinine- Picric acid method
3. Serum phosphorus- Fiske Subbarrow method
4. Estimation of haemoglobin
5. Erythrocyte Sedimentation rate

UNIT III**Urine Analysis:** Qualitative analysis for sugar and Protein**UNIT IV****Urine Analysis:** Qualitative analysis for Uric acid & Creatinine**UNIT V****Estimation of any two enzymes**

- a. LDH
- b. Acid phosphatase
- c. Alkaline phosphatase
- d. SGOT
- e. SGPT
- f. Amylase.
- g. Urease

REFERENCE BOOK

1. Harold Varley, (1991). *Practical Clinical biochemistry*. CBS Publishers & distributors, New Delhi

Course Code (20UBCC51)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO3	PSO3	PSO	PSO	PSO	PSO	PSO6	PSO7
			3.a	3.b	4a	4 b	5a	5b		
CO 1	H	H	H	H	H	H	H	M	M	H
CO 2	H	H	H	H	H	H	H	M	M	H
CO 3	H	H	H	H	H	H	H	M	M	H
CO 4	H	H	H	H	H	H	H	M	M	H
CO 5	H	H	H	H	H	H	H	M	M	H

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B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

Semester VI	MICROBIOLOGY LAB	Hours/Week: 3	
Core Course Practical-4		Credits: 3	
Course Code 20UBCC62P		Internal 40	External 60

COURSE OUTCOMES

On completion of the course the students will be able to

- CO1 - apply the working principle of different laboratory equipment's and techniques used in microbiology, plant biochemistry and immunology in various fields of biology [K3]
- CO2 - sketch the schema chart of different microbiological, immunological and plant biochemistry techniques [K3]
- CO3 - illustrate the observations of various microbiological, immunological and plant biochemistry techniques [K3]
- CO4 - interpret the result and inference of different techniques used in microbiology, immunology and plant biochemistry [K3]
- CO5 - criticize the different microbiological, immunological and plant biochemistry techniques [K4]

UNIT I

1. Cleaning of glass wares
2. Preparation of simple culture media
3. Selection of suitable culture medium
4. Gram's staining, motility - Hanging drop

UNIT II

1. Isolation of microbes - streak plate, pour plate and spread plate techniques
2. Identification of unknown microorganisms through biochemical characterization.

UNIT III

1. Enumeration of *E.coli* in milk and ice cream by serial dilution method
2. Water Quality analysis

UNIT IV**Group Practical**

1. Plant tissue culture
2. Separation of proteins by SDS - PAGE
3. Identification of nucleic acids by Agarose Gel Electrophoresis

Demonstration only

4. Separation of amino acids by Paper chromatography, TLC
5. Antibiotic assay of selected micro organisms.

UNIT V

1. Haemagglutination (Blood grouping)

Demonstration only

1. Immunodiffusion
2. RBC and WBC count

REFERENCE BOOKS

1. Gunasekaran,P.(2018) *Laboratory manual in Microbiology*. 2nd Edition, New Age International Private Limited, New Delhi, India.
- 2.Palanivelu (2000)- *Analytical Biochemistry and Separation Techniques*. 6th Edition, Twerntyfirst Century Publications, Patiala, Punjab, India.

Course Code (20UBCC62P)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO 2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO4 b	PSO 5a	PSO 5b	PSO6	PSO 7
CO 1	H	M	H	H	H	M	M	M	H	M
CO 2	H	M	M	H	H	M	M	M	H	M
CO 3	H	M	M	M	H	M	M	M	H	H
CO 4	H	M	H	M	H	M	M	M	H	M
CO 5	H	M	M	M	H	M	M	M	H	H

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

Semester VI	BIOINFORMATICS LAB	Hours/Week: 2	
Core Course Practical-5		Credits: 2	
Course Code 20UBCC63P		Internal 40	External 60

COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: apply the principle and the protocols for sequence retrieval from NCBI. [K3]
- CO2: construct the methodologies for accessing proteomic & Similarity search tools. [K3]
- CO3: interpret the results of retrieved and aligned sequences from Genbank & analysis of protein sequence and complete the record work notebook. [K3]
- CO4: infer the basic tools to retrieve and visualise the biological sequences from NCBI, expasy and other different databases. [K3]
- CO5: Analyse the role of bioinformatics, biological databases and alignment tools in research and development of drugs for the human kind. [K4]

Experiments

1. Retrieve nucleic acid sequence from NCBI
2. Retrieve protein sequence from NCBI
3. Pairwise sequence alignment using Blast
4. Proteomics:
 - Predicting physicochemical properties
 - Peptide mass fingerprint
 - Predicting secondary structure
 - Tracking hydrophobic regions
 - Predicting transmembrane regions
5. Molecular visualization using Rasmol.

Course Code (20UBCC63P)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO 6	PSO 7
CO 1	H	H	M	M	H	L	H	H	H	H
CO 2	H	H	M	M	H	H	H	H	M	H
CO 3	H	H	H	H	H	H	H	H	H	H
CO 4	H	H	H	H	H	H	H	H	H	H
CO 5	H	H	H	H	H	H	H	H	H	H

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B.Sc. BIOCHEMISTRY (2020-21 Onwards)

Semester VI	MEDICAL LABORATORY TECHNOLOGY	Hours/Week: 5	
DSEC-2		Credits: 4	
Course Code 20UBCE61		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: Describe the techniques involved in the collection and analysis of different samples from human [K1]

CO2: Understand the basic methods involved in the collection, processing, storage, preservation and investigation of various biological specimens.[K2]

CO3: Apply the laboratory procedures to diagnose diseases.[K3]

CO4: analyse the biochemical, immunological and histopathological examinations for the screening , prognosis and diagnosis of various diseases. [K4]

CO5: Evaluate the various laboratory procedures in the diagnosis of diseases.[K5]

UNIT I

Blood analysis: collection methods, anticoagulants, normal hematological values, Blood banking. Complete haematogram - Hb, ESR, Haematocrit, Red blood cell index, Total count and differential count, Eosinophil and platelet count (Clinical significance and determination) (15 hours)

UNIT II

Urine and Faeces analysis: collection and preservation of urine. Physical examination of urine – examination of urine for colors, cloudiness, specific gravity, reaction and pH. Chemical examination of urine- protein, reducing sugar, ketones, blood, Bile salts and bile pigments. Microscopic examination-Casts and crystals. Chemical examination of urinary calculi. Faeces: Collection and preservation, examination of motion for color, mucus, consistency, ova, ameba, cysts, parasites, puscells, RBC and crystals. Detection of occult blood in stool, concentration techniques. (15 Hours)

UNIT III

Body fluids: Sputum- Method of collection for various purposes including AFB fungal, malignant cells and others. Microscopic examination of sputum, sputum for AFB. Semen - methods of collection, examination of semen for time for liquefaction, Macroscopic and microscopic examinations, semen fructose determination and antisperm antibodies . CSF- CSF collection, Transport of CSF, examination of CSF, colour, turbidity and fibrin clot (Cob web), total and differential leukocyte count. CSF examination by gram's staining and acid fast staining, biochemical tests, clinical significance of CSF analysis in various meningitis and encephelitis and interpretations. Other body fluids- Methods of collection, transport and macroscopic and microscopic examination of pleural fluid, pericardial fluid and synovial fluid. (15 hours)

UNIT IV

Immunology and Mycology: Collection and preservation of serum - Measurement of Antibodies, Agglutination reactions, Widal test, serological tests for syphilis- VDRL, slide flocculation test, ELISA. Mycology - Introduction to common fungal disease, Sample collection and processing - Investigation of fungal infections - Candidiasis , Mycetomas, Cryptococcus. (15 hours)

UNIT V

Histopathology: Introduction - Tissue Preparation. Fixation - Aims and functions of a fixative , Classification of fixatives - Simple fixatives , Compound , Micro anatomical fixatives , Cytological fixatives. Techniques of impregnation - Embedding or Blocking, Type of mould, Techniques of moulding . Treatment of hard tissues - Decalcifying Agents : Determination of end point , Neutralization of acid Washing , Use of ion exchange resins, Chelating agents, Electrophoretic decalcification . Section Cutting: Microtome and its types, Microtome knives, sharpening of knives, Care of microtome knives. (15 hours)

TEXT BOOK

1. C.R.Maiti (2012).A concise note on Medical Laboratory Technology , 2nd edition , New Central Book Agency.

REFERENCE BOOKS

1. Harold Varley (1991). *Practical Clinical biochemistry*. Delhi: CBS Publishers & Distributors.
2. Mukherjee, K.L (2003) Medical Laboratory Technology, Vol.I., TATA McGraw Hill Publishing Comp. Ltd., New Delhi.
3. Talib, V.H.(1993).*A hand book of Medical lab technology*, 1st edition. New Delhi: CBS Publishers.

Course Code (20UBCE61)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO 6	PSO 7
CO 1	H	H	H	H	M	M	L	H	L	M
CO 2	H	H	M	H	M	M	M	H	L	M
CO 3	H	H	H	H	M	M	M	H	L	M
CO 4	H	H	H	H	M	H	H	H	M	H
CO 5	H	H	H	H	H	H	H	H	M	H

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY (2020-21 Onwards)

Semester VI	BIOFERTILIZERS AND BIOPESTICIDES	Hours/Week: 5	
DSEC -2		Credits: 4	
Course Code 20UBCE62		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO 1: Recall the role of the microorganisms as biofertilizers and biopesticides (K1).

CO 2: Explain the biofertilizer and biopesticides preparation process (K2).

CO 3: Identify the importance of microbial inoculants for the preparation of biofertilizer and biopesticides. (K3).

CO 4: Analyze the applications of biofertilizers and biopesticides (K4).

CO 5: Interpret the importance of biofertilizers and biopesticide preparation (K5).

UNIT I

Biofertilizer : Introduction and benefits from biofertilizers. Blue Green Algae (BGA) : Isolation and methods applied for mass culture of BGA. Mass cultivation and field application of *Anabeena* and *Nostoc*. (15 hours)

UNIT II

Symbiotic bacterial biofertilizer: *Rhizobium* and *Azospirillum* - isolation, identification, mass culture, carrier based inoculant, field application and its advantages. (15 hours)

UNIT III

Nonsymbiotic bacterial biofertilizer – *Azotobacter* and *Clostridium* characteristics, isolation, mass production of inoculants, field application and its beneficial role. (15 hours)

UNIT IV

Mycorrhizal fungi: types of mycorrhizae. Vesicular - Arbuscular Mycorrhizal Fungi (VAM) - morphology, isolation, mass production, importance on growth and yield of crop plants. Phosphate solubilizing organisms: Isolation and mass cultivation.

(15 hours)

UNIT V

Biopesticides: Biological pest control agents - Predators and microbial pesticides. Methods applied for control of plant pathogens. Biological control of weeds: mycoherbicide. Insects as weed killer. Plant extracts as insecticides.

(15 hours)

TEXT BOOKS

1. Dubey, R. C. (2006). *A Text book of Biotechnology*. New Delhi: S. Chand & company Ltd. Albert, F. Hill.
2. John Jothi Prakash, E. (2004). *Outlines of Plant Biotechnology*. New Delhi: Emkay Publication.

REFERENCE BOOKS

1. Gupta, P.K.(1994). *Elements of Biotechnology*. Meerut: Rastogi & company.
2. Subha Rao, NS. (2000). *Soil Microbiology*, New Delhi: Oxford & IBH Publishers.

Course Code (20UBCE62)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO 3a	PSO 3b	PSO 4a	PSO 4b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	M	M	M	H	H	H	-	L
CO 2	H	H	H	M	M	M	H	M	-	L
CO 3	H	H	H	M	M	M	M	M	L	L
CO 4	H	H	H	M	M	H	H	H	L	L
CO 5	H	H	H	M	H	M	M	M	M	-

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VIRUDHUNAGAR - 626 001

B.Sc. BIOCHEMISTRY (2020-21 Onwards)

Semester VI	TOXICOLOGY	Hours/Week: 5	
DSEC -2		Credits: 4	
Course Code 20UBCE63		Internal 25	External 75

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: Write the classification of toxicants, mechanism, fate, evaluation of toxicity and toxic effects of metals and pesticides [K1]

CO2: Understand the route, site of exposure of xenobiotic in humans, tolerance, Biotransformation and organ toxicity [K2]

CO3: Apply the concept of toxicants involved in ADME in human and its impact in Environment [K3]

CO4: analyze the impact of toxicants in human and environment. [K4]

CO5: evaluate the techniques, methods of toxicity, fate of xenobiotic in human body and environment [K5]

UNIT I

Introduction -Brief history, Different areas of modern toxicology, classification of toxic substances, various definitions of toxicological significance. Toxic exposure and response, Effect of duration, frequency, route and site of exposure of xenobiotics on its toxicity. Characteristic and types of toxic response. Types of interactions between two and more xenobiotics exposure in humans. (12 Hours)

UNIT II

Evaluation of toxicity, Various types of dose response relationships, assumptions in deriving dose response, LD50, LC50, TD50 and therapeutic index. Mechanism of toxicity, Delivery of the toxicant, mechanisms involved in formation of ultimate toxicant, detoxification of ultimate toxicant. (12 Hours)

UNIT III

Fate of xenobiotics in human body, Absorption, Distribution, Excretion and Metabolism of xenobiotics (biotransformation, Phase- I reactions including oxidations, hydrolysis, reductions and phase II conjugation reactions). Toxicants to liver, its susceptibility to toxicants with reference to any two hepatotoxicants. Toxic agents, Human exposure, mechanism of action and resultant toxicities of the following xenobiotics: Metals: lead, arsenic, Pesticides: organophosphates, carbamates, organochlorine, bipyridyl compounds and anticoagulant pesticides. (14 Hours)

UNIT IV

Eco-toxicology, Brief introduction to avian and aquatic toxicology, movement and effect of toxic compounds in food chain (DDT, mercury), bioaccumulation, biomagnification, acid rain and its effect on ecosystems, concept of BOD and COD. (12 Hours)

UNIT V

Clinical toxicology -Management of poisoned patients, clinical methods to decrease absorption and enhance excretion of toxicants from the body use of antidotes. (10 Hours)

TEXT BOOKS

1. John Timbrell.(2001). *Introduction to Toxicology*, 3rd Edition, England: Taylor and Francis Publishers.
2. Stine Karen., Thomas, M. Brown.(2006). *Principles of Toxicology*, 2nd Edition. United states: CRC press.

REFERENCES BOOKS

1. Cassarett, Doull.(2008). *Toxicology "The Basic Science of The Poisons"* 7th edition, India: McGrawHill publishers.
2. Cassarett, Doull.(2010). *"Essentials of Toxicology"* 2nd edition, India: McGraw Hill Publisher.
3. Frank, C., Sam Kacew. (2009). *Basic Toxicology: Fundamentals target organ and risk assessment*, 5th edition, United states: CRC Press.

Course Code (20UBCE63)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO 1	PSO 2	PSO 3a	PSO 3b	PSO 4a	PSO 4 b	PSO 5a	PSO 5b	PSO 6	PSO 7
CO 1	H	H	H	M	H	M	H	H	M	L
CO 2	H	H	H	M	H	H	H	H	M	L
CO 3	H	H	H	H	H	H	H	H	H	L
CO 4	H	H	H	H	H	H	H	H	H	H
CO 5	H	H	H	H	H	H	H	H	H	H

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B.Sc. BIOCHEMISTRY

(2020-21 Onwards)

Semester VI	FORENSIC SCIENCE	Hours/Week: 2	
SEC -6		Credits: 2	
Course Code 20UBCS61		Internal 40	External 60

COURSE OUTCOMES

On completion of the course the students will be able to

CO1 - Identify the role and scientific principles of crime scene investigation, finger printing , evidence collection , legal procedures and techniques related to investigation . [K1]

CO2- Outline the legal procedures , sociological aspects of crime , importance of the finger printing techniques , evidences and relate them with various offenses. [K2]

CO3- Demonstrate the legal procedures , physical evidence recognition, collection, preservation and admissibility of biological evidence using latest techniques. [K2]

CO4- Determine the biological basis of finger printing , legal procedures for investigating non- sexual and sexual offences, identification & comparison of evidences. [K3]

CO5- Infer the legal ethics involved in forensic evidences due to sociological aspects that provoke crime and justify the truth with finger printing . [K4]

UNIT I

Introduction: Definition – branches, forensic Science Laboratories- legal procedures – Introduction to crime — types of crime – sociological aspects. Types of fingerprints. Fingerprint patterns. Plain and rolled fingerprints. Classification method for fingerprint record keeping. (6 hours)

UNIT II

Evidences: Classification ,identification ,comparison , collection methods .Preservation of Body fluids, hair & nail fibers, paint, glass, soil .Types of injuries, wounds .Socio-economic offences. (6 hours)

UNIT III

Blood lethal, non- sexual and sexual offences : Collection of blood stains – blood grouping . Semen analysis .Signs of sexual and non-sexual offences .Symptoms of death , time of death , autopsy, postmortem changes. Disputed paternity (6 hours)

UNIT IV

Techniques : Microscopy – principles and types . Blotting techniques, RFLP, PCR, STR and DNA finger printing technology. (6 hours)

UNIT V

Drugs and poisons : Classification – sources of drugs, narcotics, cosmetics and abortifacients – physiological and psychological effects – withdrawal syndrome .Types of poisons – signs of food poisoning– medico legal cases. (6 hours)

REFERENCES

1. B. J. Fisher, W.J. Tilstone, C. Woytowicz, Introduction to Criminalistics: The foundation of Forensic Science, ISBN-13: 978-0120885916.
2. Parikh C. K. (1999), Parikh's Textbook of Medical Jurisprudence, Forensic Medicine and Toxicology 6th edition, CBS Publishers & Distributors Pvt. Ltd., New Delhi, ISBN:978812390675.
3. AK Jaiswal, TabinMillo (2014), Handbook of Forensic Analytical Toxicology 1st edition JaypeeBrothers Medical Publishers, New Delhi, ISBN 9789351522249.
4. David Freifelder (1983), Molecular Biology 2nd edition Jones & Bartlett publishers, Inc.,ISBN: 81-85198-34-9. .
5. Textbook of forensic medicine and toxicology edited by V.V. Pillay 16th

Course Code (20UBCS61)	PO1	PO2	PO3		PO4		PO5		PO6	PO7
	PSO1	PSO2	PSO3 3.a	PSO3 3.b	PSO 4a	PSO 4b	PSO 5a	PSO 5b	PSO6	PSO7
CO 1	H	H	M	H	H	H	H	H	M	H
CO 2	H	H	M	H	H	H	H	H	M	H
CO 3	H	H	M	H	H	H	H	H	M	H
CO 4	H	H	M	H	H	H	H	H	M	H
CO 5	H	H	M	H	H	H	H	H	M	H

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