

B. Sc., BIOCHEMISTRY

SYLLABUS

Programme Code : 3USBIC

2024-2027



**SENGAMALA THAYAR EDUCATIONAL TRUST
WOMEN'S COLLEGE (AUTONOMOUS)**

(Affiliated to Bharathidasan University, Tiruchirappalli)
(Accredited by NAAC)

**Sundarakkottai, Mannargudi – 614 016, Thiruvarur (Dt.),
Tamil Nadu, India.**



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE (AUTONOMOUS)

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**SUNDARAKKOTTAI, MANNARGUDI-614016.
TAMILNADU, INDIA.**

B.Sc., BIOCHEMISTRY **CHOICE BASED CREDIT SYSTEM–** **LEARNING OUTCOMES BASED CURRICULUM FRAME WORK (CBCS–LOCF)** *(For the candidates admitted in the academic year 2024–2025)*

CHOICE BASED CREDIT SYSTEM

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our College has moved to CBCS and implemented the grading system.

OUTCOME-BASED EDUCATION (OBE)

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of graduates of a programme of study. Learning outcomes specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. The expected learning outcomes are used as reference points that would help to formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes which in turn will help in curriculum planning and development, and in the design, delivery and review of academic programmes. They provide general guidance for articulating the essential learnings associated with programmes of study and courses within a programme, maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility and provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programmes and academic standards.

Some important aspects of the Outcome Based Education Course: is defined as a theory, practical or theory cum practical subject studied in a semester.
Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.
Programme: is defined as the specialization or discipline of a Degree.
Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned

closely with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC) A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE) Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

Generic Elective Courses An elective course chosen generally from an **unrelated discipline/subject**, with an intention to seek exposure is called a Generic Elective. Generic Elective courses are designed for the students of **other disciplines**. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Non Major Elective (NME). A student shall choose at least two Non – major Elective Courses (NME) from outside his /her department. Non –Major Elective I – Those who choose Tamil in Part I can choose a non –major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level or b) Special Tamil if Tamil language was studied upto 10th & 12th std.

Skill Enhancement Courses (SECs) These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL etc.

Undergraduate Programme:

Programme Pattern: The Under Graduate degree programme consists of **FIVE** vital components.

They are as follows:

Part -I: Languages (Tamil / Hindi / French / Sanskrit)

Part-II: General English

Part-III: Core Course (Theory, Practicals, Generic Elective courses, Discipline Specific Elective courses, Compulsory and Optional Allied courses, Project)

Part-IV: Non Major Elective, Foundation Course, Value Education, Environmental studies, Skill Enhancement Courses/ Soft Skills, Internship / field visit / industrial visit/ Case Study), Professional Competency Course

Part –V

Health & Wellness, Extension activity, Gender studies

EXAMINATION

Continuous Internal Assessment (CIA):

UG - Distribution of CIA Marks

Passing Minimum: 40 %

Assisgnment-3 = 30%

Test-2 = 50%

Seminar = 10%

Attendance = 10%

Question Paper Pattern

Section A:

Section A 1 (10X1=10 marks)

True or False/ Fill in/ Multiple Choice Questions/ One Word Question

Two Questions from Each unit

Section A 2 (5X2=10 marks)

Match the following / Short Answers

One question from Each unit

Total Marks – 20

Part B: (5X5=25 marks)

Paragraph Answers

Either/ or type, One Question from each unit

Part C: (10X3=30)

Essay Type Answers

Answer 3 out of 5 Questions

One Question from each unit

Part A: K1 Level

Part B: K2, K3 and K4 Level

Part C: K5 and K6 Level

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S. No.	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/ Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analyzing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level) K- LEVELS	Lower Order Thinking			Higher Order Thinking			Total
	K1	K2	K3	K4	K5	K6	
END SEMESTER EXAMINATIONS (ESE)	20	25			30		75
Continuous Internal Assessment (CIA)	20	25			30		75
QUESTION PATTERN FOR END SEMESTER EXAMINATION/ Continuous Internal Assessment							
PART							MARKS
PART –A I. (No choice ,One Mark) TWO questions from each unit (10x1 =10) II. (No choice ,Two Mark) ONE question from each unit (5x2 =10)							20
PART -B (Either/ or type ,5-Marks) ONE questions from each unit (5x5 =25)							25
PART -C (3 out of 5) (10 Marks) ONE question from each unit (3x10 =30)							30
Total							75

BLUE PRINT OF QUESTION PAPER FOR END SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.				Max Mark : 75			
K- LEVELS				K1	K2	K3	Total Marks
PART							
PART –A (One Mark, No choice) (10x1 =10)				10			10
(2-Marks, No choice) (5x2=10)				10			10
PART–B (5-Marks) (Either/or type) (5x5=25)					5	10	25
PART -C (10 Marks) (3 out of 5) (3x10=30) Courses having only K5,K6 levels, K5 level- 3 Questions, K6 level- 2 Questions (One K6 level question is compulsory)							
Total				20	05	10	75

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

Grade Point Average (GPA) will be calculated from the first semester onwards for all semester. From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), respectively. These two are calculated by the following formulae:

$$\text{GPA} = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i}$$

$$\text{WAM (Weighted Average Marks)} = \frac{\sum_{i=1}^n C_i M_i}{\sum_{i=1}^n C_i}$$

Where,

C_i is the Credit earned for the Course i

G_i is the Grade Point obtained by the student for the Course i

M_i is the marks obtained for the course i and

n is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

1. For each of the first three parts, there shall be separate classification on the basis of CGPA, as indicated in Table-2.
2. For the purpose of declaring a candidate to have qualified for the Degree of Bachelor of Arts/Science/Commerce/Management as Outstanding/Excellent/Very Good/Good/Above Average/Average, the marks and the corresponding CGPA earned by the candidate in Part-III alone will be the criterion, provided the candidate has secured the prescribed passing minimum in the all the Five parts of the Programme.
3. Grade in Part –IV and Part-V shall be shown separately and it shall not be taken into account for classification.
4. A Pass in PART- V will be mandatory although the marks will not count for the calculation of the CGPA.
5. Absence from an examination shall not be taken an attempt.

Table-1: Grading of the Courses – UG

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above and below 90	9	A+
70 and above and below 80	8	A
60 and above and below 70	7	B+
50 and above and below 60	6	B
40 and above and below 50	5	C
Below 40	NA	RA

The candidate's performance in every current semester is indicated by **Semester Grade Point Average (SGPA)** and from the second semester onwards, the continuous performance including previous semester /s is indicated by **Cumulative Grade Point Average (CGPA)**.

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re-appearance

The candidates who have passed in the first appearance and within the prescribed duration of the UG programme are eligible. If the candidate's Grade is O/A+ with more than one attempt, the performance is fixed as "Very Good".

VISION

Imparting quality education in Biochemistry to make the students to document the biological resources with scientific validation so as to enhance the quality of life.

MISSION

- To provide a learning environment to the students to understand, analyze and augment the basic analytical skills in Biochemistry.
- To expose the students and make them well versed in the various biochemical processes and update their knowledge and skills in advanced biochemical techniques.

PROGRAMME OUTCOMES FOR B.Sc., DEGREE PROGRAMMES

PO No.	Programme Outcomes (Upon completion of the B.Sc., Degree Programme, the Under graduate will be able to)
PO-1	Disciplinary knowledge: Demonstrate comprehensive knowledge and understanding of one or more disciplines that form a part of an under graduate Program of study in Bachelor of Science.
PO-2	Critical thinking, Problem Solving and Reflective thinking: Think critically about the issues and identify, critically analyze and solve problems from the disciplines of concern using appropriate tools and techniques and the knowledge, skills and attitudes acquired and extrapolate the same to real life situations; show critical sensibility to life experiences, with self-awareness and reflexivity of both self and society.
PO-3	Analytical & Scientific Reasoning: Evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesized from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints; critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.
PO-4	Research-related Skills: Develop a sense of capability for relevant/ appropriate inquiry and asking questions, synthesize, articulate and report results and to recognize and predict cause and effect relationships, define problems, formulate and establish hypothesis, analyze and interpret and draw conclusions from data, execute and report the results of an experiment or investigation.
PO-5	Digital literacy and Effective Communication: Use ICT in a variety of learning situations and speak, read, write and listen clearly in person and through electronic media in English and in one or more Indian languages, and make meaning of the world by connecting people, ideas, books, media and technology; Efficiently communicate thoughts and ideas in a clear and concise manner.
PO-6	Individual and Team Work: Effectively accomplish tasks individually as well as work effectively and respectfully as member or leader with diverse teams, facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interest so for a common cause and work efficiently as a member of a team.
PO-7	Multicultural Competence and Social Interaction: Understand the values and beliefs of multiple cultures, global perspectives, engage and interact respectfully with diverse groups and elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO-8	Awareness of Ethical issues, Human values and Gender Issues: Embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work and understand the value of relationship between self and the community and aware of the various issues concerning women and society.

PO-9	Awareness of Environment and Sustainability: Understand the impacts of technology and business practices in societal and environmental contexts, and Sustainable development.
PO-10	Self directed and Lifelong learning: Acquire knowledge and skills, including learning “how to learn”, that are necessary for participating in learning activities throughout life and to engage in independent and life-long learning in the Broadest context of socio-technological changes.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO No.	Program Specific Outcomes (B.Sc., Biochemistry)
PSO1	Comprehend the knowledge in the biochemical, analytical, biostatistical and Computational areas
PSO2	Ability to understand the technical aspects of existing technologies that help in Addressing the biological and medical challenges faced by human kind
PSO3	Acquiring analytical and hands on skills to perform research in multidisciplinary environments
PSO4	Use library search tools and online databases and sources to locate and retrieve scientific information about a topic and techniques related to biochemistry

		Tamil in Part I must choose either c) Basic Tamil if Tamil language was not studied in school level. (or) d) Special Tamil if Tamil language was studied upto 10th & 12th std. Those who choose NCC in part V must choose NCC course as Non Major Elective												
		Skill Enhancement Course-I	U24SEBC21	Biomedical Instrumentation	2	1	1	-	-	2	3	25	75	100
			TOTAL		30	18	6	6	-	23	-	-	-	800
III	I	Language Course-III	U24LC303	Pothu Tamil-III Tamilaga Varalarum Panpadum	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-III	U24ELC303	General English -III	6	5	1	-	-	3	3	25	75	100
	III	Core Course-III	U24BC305	Biomolecules	4	3	1	-	-	4	3	25	75	100
		Core Practical-III	U24BC306P	Biomolecules Practical	4	-	-	4	-	4	3	25	75	100
		Allied Course-III	U24AMB301	Basic Microbiology	2	1	1	-	-	2	3	25	75	100
	IV	Allied Practical-II	U24AMB302P	Microbiology Practical	2	-	-	2	-	-	-	-	-	-
		Skill Enhancement Course-II	U24SEBC32	First Aid	2	1	1	-	-	2	3	25	75	100
	V	Skill Enhancement Course-III	U24SEBC33	Basics of Forensic Science	2	1	1	-	-	2	3	25	75	100
		Special Course	24UGSC	Health and Wellness	2	-	-	2	-	1	-	-	-	-
		TOTAL		30	16	6	8	-	21	-	-	-	700	
IV	I	Language Course-IV	U24LC404	Pothu Tamil-IV Tamilum Ariviyalum	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-IV	U24ELC404	General English-IV	6	5	1	-	-	3	3	25	75	100
	III	Core Course-IV	U24BC407	Biochemical Techniques	5	4	1	-	-	5	3	25	75	100
		Core Practical-IV	U24BC408P	Biochemical Techniques Practical	4	-	-	4	-	4	3	25	75	100
		Allied Course-IV	U24AMB403	Medical Microbiology	3	2	1	-	-	2	3	25	75	100
	IV	Allied Practical-II	U24AMB302P	Microbiology Practical	2	-	-	2	-	2	3	25	75	100
		Skill Enhancement Course-IV	U24SEBC44	Medical Coding	2	1	1	-	-	2	3	25	75	100
		Skill Enhancement Course-V	U24SEBC45	Medical Laboratory Techniques	2	1	1	-	-	2	3	25	75	100
		TOTAL		30	18	6	6	-	23	-	-	-	800	
V	III	Core Course-V	U24BC509	Enzymes	5	4	1	-	-	5	3	25	75	100
		Core Course-VI	U24BC510	Intermediary Metabolism	5	4	1	-	-	4	3	25	75	100
		Core Course-VII	U24BC511	Clinical Biochemistry	6	5	1	-	-	5	3	25	75	100
		Core Practical-V	U24BC512P	Clinical Biochemistry Practical	4	-	-	4	-	4	3	25	75	100
		Elective Course-I	U24BCE51A/ U24BCE51B/ U24BCE51C	Human Physiology/ Plant Biochemistry & Plant Therapeutics/ Food and Nutrition	4	3	1	-	-	3	3	25	75	100
		Elective Course-II	U24BCE52A/ U24BCE52B/ U24BCE52C	Research Methodology/ Biotechnology/ Genetic Engineering	4	3	1	-	-	3	3	25	75	100

IV		EVS	24UGCES	Environmental Studies	2	2	-	-	-	2	3	25	75	100	
		Internship/ Industrial Visit/ Field Visit	U24BCI51	Internship/ Industrial Visit/ Field Visit	-	-	-	-	-	2	-	-	-	-	
			TOTAL		30	21	5	4	-	28	-	-	-	700	
VI	III	Core Course-VIII	U24BC613	Molecular Biology	6	5	1	-	-	4	3	25	75	100	
		Core Practical-VI	U24BC614P	Molecular Biology Practical	6	-	-	6	-	4	3	25	75	100	
		Core Project	U24BCPW	Project with Viva-Voce/ Group Project	5	-	1	4	-	5	3	25	75	100	
		Elective Course-III	U24BCE63A/ U24BCE63B/ U24BCE63C	Endocrinology/ Biochemical Pharmacology/ Genetics	4	3	1		-	3	3	25	75	100	
		Elective Course-IV	U24BCE64A/ U24BCE64B/ U24BCE64C	Immunology/ Bioinformatics/ Pharmaceutical Biochemistry	4	3	1		-	3	3	25	75	100	
	IV	Value Education	24UGVED	Value Education	2	2	-	-	-	2	3	25	75	100	
		Professional Competency Course	U24PCBC61	Bioentrepreneurship	2	2	-	-	-	2	3	25	75	100	
	V	Gender Studies	24UGGS	Gender Studies	1	1	-	-	-	1	3	25	75	100	
		Extension activity	-	Extension activity	-	-	-	-	-	1	-	-	-	-	
			TOTAL		30	16	4	10	-	25	-	-	-	800	
	GRAND TOTAL					180	107	33	40	-	141	-	-	-	4500
	Extra Credit				MOOC/SWAYAM/NPTEL	-	-	-	-	-	2	-	-	-	-
					Value Added Courses (Atleast One Per Year)	-	-	-	-	-	2	-	-	-	-
L-Lecture			T-Tutorial		P-Practical				S-Seminar						

Note:

		CIA	ESE
1	Theory	25	75
2	Practical	25	75
3	Separate passing minimum is prescribed for Internal and External marks		

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

NME OFFERED BY THE DEPARTMENT

Semester	Part	Course	Course Code	Title of the Course
I	IV	NME-I	U24NMEBC11	Health and Diseases
II		NME-II	U24NMEBC22	Life Style Diseases

SEMESTER - V



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: V- CC- V: Enzymes

Ins. Hrs./Week: 5

Course Credit: 5

Course Code: U24BC509

UNIT-I: Introduction to enzymes (15 Hours)

Nomenclature and Classification based on IUB with examples, enzyme as catalyst-Activation energy, Enzyme specificity-absolute, Group, linkage and stereo specificities. Concept of Active site, Lock and key hypothesis and induced fit theory, Enzyme expression Units-IU, turnover number, katal and specific activity.

UNIT –II: Mechanism of enzyme catalysis (15 Hours)

Acid Base catalysis, covalent catalysis, electrostatic catalysis, metal ion catalysis, proximity and orientation effect. Coenzymes -Definition, types, co-enzymatic forms of vitamins- NAD/NADP, FAD, FMN, Coenzyme A TPP, PLP, lipoic acid and biotin. Multienzyme complexes - Pyruvate dehydrogenase complex. Isoenzyme with reference to LDH and CK.

UNIT- III: Enzyme kinetics (15 Hours)

Definition of kinetics, Factors affecting enzyme activity - temperature, pH, substrate and enzyme concentration, activators-cofactors, Derivation of Michaelis-Menton equation for unisubstrate reactions , Lineweaver - Burk plot, Eadie –Hofstee plot Significance of K_m and V_{max} and their determination using the plots.

UNIT-IV: Enzyme inhibition (15 Hours)

Reversible and irreversible inhibition-types of reversible inhibitors, competitive, non-competitive, uncompetitive inhibitors. Graphical representation by L-B plot, (Kinetic derivations not required), Determination of K_m and V_{max} in the presence and absence of inhibitors. Allosteric enzymes - Sigmoidal curve, positive and negative modulators

UNIT-V: Applications of enzymes (15 Hours)

Immobilized enzymes - methods of immobilization-adsorption, covalent bonding, crosslinking, encapsulation, entrapment and applications of immobilized enzymes. Biosensors – e.g. Glucose sensors. Industrial applications of enzymes –Food, textile and pharmaceutical industries.

Total Lecture Hours-75

COURSE OUTCOME

The students are able to,

1. Identify the major classes of enzymes, differentiate between a chemical catalyst and a biocatalyst and define the units of enzymes.
2. Explain the mechanism of enzyme catalysis and the role of coenzymes in enzyme action.
3. Illustrate the steady state kinetics, interpret MM plot and LB plot based on kinetics data, and determine K_m and V_{max} .
4. Distinguish the types of inhibition along with its importance in biochemical reactions.
5. Comprehend the various methods for production of immobilized enzymes and discuss the application of enzymes in clinical diagnosis and various industries.

TEXT BOOK(S)

1. Price, N. C., & Stevens, L. (1989). *Fundamentals of enzymology* (2nd ed.). Oxford Bioscience Publications.
2. Palmer, T., & Bonner, P. (2007). *Enzymes: Biochemistry, biotechnology, clinical chemistry* (2nd ed.). Horwood Publishing.
3. Weisman. (n.d.). *Handbook of enzyme technology* (3rd ed.). Prentice Hall Publishers.
4. Satyanarayana, U. (2019). *Fundamentals of biochemistry*. Allied & Books Pvt Ltd.
5. Jain, J. L. (2005). *Fundamentals of biochemistry* (6th ed.). S. Chand Publishers.

REFERENCEBOOK(S)

1. Nelson, D. L., & Cox, M. M. (2004). *Lehninger principles of biochemistry* (4th ed., International ed.). CBS Publishers.
2. Stryer, L. (1995). *Biochemistry* (4th ed.). W.H. Freeman & Co.
3. Voet, D., & Voet, J. G. (1990). *Biochemistry* (4th ed.). John Wiley & Sons.
4. White, A. (1959). *Principles of biochemistry* (3rd ed.). McGraw-Hill Book Co.
5. Price, N. C., & Stevens, L. (1999). *Fundamentals of enzymology* (3rd ed.). Oxford University Press.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2013-14.pdf>
3. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2015.pdf>
4. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2016-%2017.pdf>
5. https://www.rgpv.ac.in/campus/PY/enzymes_ppt.pdf

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	1	2	3	2	2	2	3	2	–	–	3	3	3
CO 2	3	2	1	3	2	2	2	3	2	–	–	3	3	–
CO 3	3	1	–	–	–	–	1	3	1	2	2	3	1	–
CO 4	2	2	–	–	–	–	2	3	2	2	2	1	3	–
CO 5	3	3	2	3	2	2	2	3	2	2	2	3	3	–

S-Strong (3) M-Medium (2) L-Low (1)



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(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: V-CC- VI: Intermediary Metabolism

Ins. Hrs. /Week: 5

Course Credit: 4

Course Code: U24BC510

UNIT- I: Bioenergetics

(15 Hours)

High energy compounds: Role of high energy compounds, free energy hydrolysis of ATP and other organophosphates, ATP-ADP cycle. Biological Oxidation: Electron transport chain -its organization and function. Inhibitors of ETC. Oxidative phosphorylation, P/O ratio, Peter Mitchell's chemiosmotic hypothesis. Mechanism of ATP synthesis, uncouplers of oxidative phosphorylation, substrate level phosphorylation with examples.

UNIT-II: Metabolism of carbohydrates

(15 Hours)

Glycolysis, TCA Cycle, Amphibolic nature and integrating role of TCA cycle. Anaplerosis, Pentose Phosphate Pathway (HMP shunt), Gluconeogenesis, Glycogenesis, Glycogenolysis and its regulation, glyoxylate cycle, Entner-Doudoroff pathway and Cori cycle.

UNIT- III: Metabolism of lipids

(15 Hours)

Oxidation of fatty acids - α , β and ω -oxidation of saturated fatty acids, Oxidation of fatty acids with odd number of carbon atoms and unsaturated fatty acids, Ketogenesis, Biosynthesis of saturated fatty acids and unsaturated fatty acids, Biosynthesis and degradation of triglycerides, phospholipids and cholesterol.

UNIT-IV: Metabolism of amino acid

(15 Hours)

Metabolic nitrogen pool, Catabolism of amino acid: Oxidative deamination, non – oxidative deamination, transamination and decarboxylation, Biogenic amines, Urea cycle and its regulation.

UNIT- V: Metabolism of nucleotides

(15 Hours)

Biosynthesis of purines and pyrimidines, - denovo synthesis and salvage pathways, Degradation of purines and pyrimidines, Conversion of ribonucleotide to deoxyribonucleotide.

Total Lecture Hours-75

COURSE OUTCOME

The students are able to,

1. State the concepts of bioenergetics and illustrate the mechanism of flow of electrons and the production of ATP.
2. Elaborate the biochemical reactions and integration of pathways of carbohydrate metabolism.
3. Sketch the oxidation and biosynthesis of fatty acids, phospholipids, triglycerides and cholesterol with suitable examples.
4. Explain catabolism of amino acids, synthesis of non-essential amino acids and specialized products from amino acids.
5. Describe the metabolism of nucleic acids with necessary illustrations and its regulation.

TEXT BOOK(S)

1. Ferrier, D. R. (2013). *Biochemistry* (6th ed.). Lippincott Williams & Wilkins.

2. Frayn, K. N., & Evans, R. D. (2019). *Human metabolism: A regulatory perspective* (4th ed.). John Wiley & Sons.
3. Garrett, R. H., & Grisham, C. M. (2010). *Biochemistry* (4th ed.). Mary Finch Publishers.
4. Murray, R. K., Granner, D. K., Mayes, P. A., & Rodwell, V. W. (2012). *Harper's illustrated biochemistry* (29th ed.). McGraw-Hill Medical.
5. Voet, D., & Voet, J. G. (2010). *Biochemistry* (4th ed.). John Wiley & Sons.

REFERENCE BOOK(S)

1. Berg, J. M., Tymoczko, J. L., & Stryer, L. (2012). *Biochemistry* (7th ed.). W.H. Freeman.
2. Bender, D. A., & Cunningham, S. M. C. (2021). *Introduction to nutrition and metabolism* (6th ed.). CRC Press.
3. Nelson, D. L., & Cox, M. M. (2021). *Lehninger principles of biochemistry* (8th ed.). W.H. Freeman & Co.
4. Gropper, S. S., Smith, J. L., & Carr, T. P. (2018). *Advanced nutrition and human metabolism* (7th ed.). Cengage Learning.
5. Rodwell, V., & Bender, D. (2018). *Harper's illustrated biochemistry* (31st ed.). McGraw-Hill Education.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. https://www.pnas.org/content/107/Supplement_2/8947_
3. <https://pubmed.ncbi.nlm.nih.gov/23680095/>
4. <https://www.ncbi.nlm.nih.gov/books/NBK556047/>
5. <https://www.khanacademy.org/test-prep/mcat/biomolecules/fat-and-protein•metabolism/v/overview-of-fatty-acid-oxidation>

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	3	1	–	–	–	1	2	3	2	2	1
CO 2	3	3	3	3	1	–	–	–	1	2	3	3	2	1
CO 3	3	2	3	2	1	–	–	–	2	2	3	3	2	1
CO 4	3	2	2	2	1	–	–	1	–	2	3	2	2	1
CO 5	3	2	3	3	1	–	–	1	1	2	3	3	2	2

S-Strong (3)

M-Medium (2)

L-Low (1)



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAL, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: V-CC- VII: Clinical Biochemistry

Ins. Hrs. / Week: 6

Course Credit: 5

Course Code: U24BC511

UNIT-I: Disorders of carbohydrate metabolism (18 Hours)

Maintenance of blood glucose by hormone with special reference to insulin and glucagon. Abnormalities in glucose metabolism: Diabetes mellitus; types, causes, biochemical manifestations, diagnosis and treatment, glycated hemoglobin. Inborn errors of carbohydrate metabolism, glycosuria, Fructosuria, Pentosuria, Galactosemia and Glycogen storage diseases.

UNIT -II: Disorders of Lipid metabolism (17 Hours)

Lipid metabolism in liver and adipose tissue, plasma lipoproteins, cholesterol triglycerides and phospholipids in health and diseases, Fatty Liver, Atherosclerosis, Lipid Storage Diseases, Hypolipoproteinemia and Hyperlipoproteinemia.

UNIT- III: Liver and Kidney Function Test (19 Hours)

Liver Function Tests: Bilirubin metabolism and jaundice, Estimation of conjugated and total bilirubin in serum (Diazotization method). Detection of bilirubin and bile salts in urine (Fouchet's test and Hay's Sulphur test). Thymol turbidity test, prothrombin time, serum enzymes in liver disease serum transaminases (SGPT & SGOT) and lactate dehydrogenase (LDH). Kidney Function Tests: Measurement of urine pH, volume, specific gravity, osmolality, sediments in urine, inulin, urea and creatinine clearance tests. Concentration and dilution tests. Phenol red test. Levels of plasma protein and its significance related to kidney function. Proteinuria.

UNIT-IV: Gastric Function Tests (18 Hours)

Composition of gastric juice -Hydrochloric acid (HCl), pepsin, intrinsic factor, mucus, and electrolytes. collection of gastric contents- Nasogastric intubation, fasting vs stimulated samples, examination of gastric residuum-Procedure, interpretation, clinical relevance, fractional test meal (FTM)-Procedure, indications, interpretation of results, stimulation test-alcohol, histamine stimulation and tubeless gastric analysis- Principle, advantages, and limitations.

UNIT-V: Clinical enzymology (18 Hours)

Enzymes of diagnostic importance- LDH- function, diagnostic significance in myocardial infarction, liver and muscle diseases, Creatine Kinase- clinical applications in cardiac and neuromuscular disorders, Transaminases- AST and ALT– clinical interpretation in liver and cardiac diseases, phosphatases- Alkaline Phosphatase and Acid Phosphatase– significance in bone, liver, and prostate conditions, Isoenzymes of LDH –Clinical applications and tissue distribution.

Total Lecture Hours-90

COURSE OUTCOME

The students are able to,

1. Understand the difference between plasma, serum, normal and abnormal constituents in various body fluids, Blood clotting mechanism and anticoagulants.
2. Acquire knowledge on the nature and function of various enzymes, normal levels and elevated levels in various diseases.
3. Comprehend that blood is a universal fluid for carrying different minerals, nutrients, proteins etc to and from various tissues.
4. Learn that many diseases result from imbalance in certain enzymes and helps in diagnosis of liver, cardiac, gastrointestinal, kidney diseases.
5. Make the students knowledgeable and potential human resource with basic understanding on clinical biochemistry.

TEXT BOOK(S)

1. Bruce Alberts, Alexander D. Johnson and Julian Lewis. 2014. Molecular Biology of the Cell, 6th edition, WW. Norton & Company Publishers, New York, USA.
2. Carl Burtis A. Edward Ashwood R. and David Bruns E. 2012. Textbook of Clinical Chemistry and Molecular Diagnosis, 5th edition, Springer Publishers, New York.
3. Chatterjee MN. and Ranashinde. 2012. Text Book of Medical Biochemistry, 8th edition, Jaypee Brothers Medical Publisher, New York.
4. Devlin TM. 2011. Textbook of Biochemistry with Clinical Correlations. 7th edition, John Wiley & Sons Publishers, New York.
5. Graham Basten. 2011. Introduction to Clinical Biochemistry, Interpreting Blood Results. Book Boon. 2nd edition, Bookboon.

REFERENCE BOOK(S)

1. Dennis Kasper and Eugene Braunwald. 2005. Principles of Internal Medicine. Harrison's Vol I & 2, 16th edition, McGraw-Hill Publishers, New York.
2. Harold Varley. 2006. Practical Clinical Biochemistry. 6th edition. CBS Publishers.
3. Lippincott William & Wilkins. 2018. Clinical Chemistry, Principles, Techniques, Correlations with Access. 8th edition. Michael Bishop, Edward Fody, & Larry Schoeff Publishers, Philadelphia.
4. Tata Mc Graw Hill Companies. 2001. The Metabolic & Molecular Basis of inherited Diseases, Vol 1, 8th edition, Vallersty Publishers, Mumbai.
5. Thomas M Devlin. 2006. Textbook of Biochemistry with Clinical Correlation. 2nd edition, Wiley & Sons Publishers, New York.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.ht>
2. <https://www.enpab.it/images/2018/EbookBiologia%20Clinica%2001Clinical%20Biochemistry%20and%20Metabolic%20Medicine%20-%20Martin%20Andrew%20Crook.pdf>
3. [http://www.student.oulu.fi/-taneliha/Harpers Illustrated Biochemistry \(29thEdition\).pdf](http://www.student.oulu.fi/-taneliha/Harpers Illustrated Biochemistry (29thEdition).pdf)
4. https://static1.squarespace.com/static/6019d0bc7dff866728d961d3/t/601a68429c231608a9b8f2a0/1612343363359/biochemistry_satyanarayana_ebook_free.pdf
5. <https://www.pdfdrive.com/biochemistry-books.html>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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CO 2	3	2	2	2	1	–	–	1	1	1	3	3	2	2
CO 3	3	2	2	1	1	–	–	–	1	1	3	2	1	1
CO 4	3	3	2	3	1	–	–	1	1	1	3	3	2	2
CO 5	3	2	2	2	2	1	1	1	1	2	3	3	3	2

S-Strong (3) M-Medium (2) L-Low (1)



SENGAMALA THAYAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: V-CP-V: Clinical Biochemistry Practical

Ins. Hrs./Week: 4

Course Credit: 4

Course Code: U24BC512P

1. Collection and preservation of blood and urine samples.
2. Estimation of creatinine by Jaffe's method (serum & urine)
3. Estimation of urea by diacetyl monoxime method (serum & urine)
4. Estimation of uric acid (serum & urine)
5. Estimation of cholesterol by Zak's method
6. Estimation of Glucose by Ortho Toluidine method
7. Estimation of Protein by Lowry's method
8. Estimation of Hemoglobin by Shali's / Drabkins method
9. Assay of SGPT and SGOT
10. Qualitative analysis of normal constituents of urine
Urea, Creatinine, Phosphorus, Calcium

Abnormal constituents

- a) Calcium
- b) Sugar (Glucose, fructose, pentose)
- c) Protein
- d) Amino acids (Tyrosine, Histidine, Tryptophan)
- e) Ketone bodies
- f) Bile pigments with clinical significance.

HEMATOLOGY

- a. RBC Counting
- b. Total and differential count of white blood cells
- c. Packed cell volume
- d. Erythrocyte sedimentation rate
- e. Blood clotting time
- f. Blood grouping

COURSE OUTCOMES

The students are able to,

1. Acquaint knowledge on collection of biological samples (urine, blood) and their preparation for diagnostic purpose
2. Assay the activity of various clinically important enzymes and relate their clinical importance.
3. Estimate the important biomolecules in biological samples and relate their clinical significance
4. Qualitatively analyze urine sample for normal and abnormal constituents in urine and interpret the results
5. Perform the routine haematological tests.

TEXT BOOK(S)

1. Jayaraman, J. (2011). *Laboratory manual in biochemistry* (3rd ed.). New Age International Pvt Ltd Publishers.
2. Sadasivam, S., & Manickam, A. (2009). *Biochemical methods* (3rd ed.). New Age Publishers.

3. Sawhney, S. K., & Singh, R. (2005). *Introductory practical biochemistry* (2nd ed.). Alpha Science International Ltd.
4. Plummer, T. (2001). *Practical biochemistry* (3rd ed.). McGraw Hill.
5. Pattabiraman, T. N. (1998). *Laboratory manual in biochemistry* (4th ed.). All India Publishers.
6. Rich, R. R. (2020). *Clinical immunology: Principles and practice* (5th ed.). Elsevier

REFERENCE BOOK(S)

1. Gowenlock, A. H. (1998). *Varley's practical clinical biochemistry* (6th ed.). CBS Publishers.
2. Godkar, B. (2020). *Textbook of medical laboratory technology* (Vols. 1 & 2, 3rd ed.). Bhalani Publisher.
3. Mukerjee, K. L. (1996). *Medical lab technology* (Vols. 1 & 2, 1st ed.). Tata McGraw-Hill.
4. Chawla, R. (2014). *Practical clinical biochemistry: Methods and interpretations* (4th ed.). Jaypee Brothers Medical Publishers.
5. Mukerjee, K. L. (1996). *Medical lab technology* (Vols. 1 & 2, 3rd ed.). Tata McGraw-Hill.
6. Chakravarty, A. K. (2016). *Immunology and immunotechnology* (1st ed.). Oxford Publishers.

E-RESOURCES

1. <https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors>
2. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistry-pdf.pdf?sequence=1&isAllowed=y
3. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistry-pdf.pdf?sequence=1&isAllowed=y
4. <https://www.pdfdrive.com/medical-biochemistry-4th-edition-medial-biochemistry-e194558015.html>
5. <https://www.pdfdrive.com/clinical-biochemistry-e33663835.html>
6. <https://www.cell.com/immunity/home>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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CO 3	3	3	3	3	2	1	—	2	1	1	3	3	3	2
CO 4	3	2	2	2	1	1	1	2	1	1	3	2	2	2
CO 5	3	2	3	3	2	2	1	2	1	2	3	3	3	2

S-Strong (3)

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: V-EC-I: Human Physiology

Ins. Hrs. /Week: 4

Course Credit: 3

Course Code: U24BCE51A

UNIT-I: Body fluids (12 Hours)

Extracellular fluid (ECF)-plasma, interstitial fluid and lymph; intracellular fluid. Osmolarity of body fluids, ionic composition, electrolytes and body buffer systems. Composition and functions of blood. Blood cells – types, morphology and functions. Structure and functions of haemoglobin. Haemopoiesis. Blood coagulation and blood groups.

UNIT-II: Respiratory and Circulatory Systems (12 Hours)

Overview of respiratory system, Types of respiration, Transport of respiratory gases, Exchange of respiratory gases in lungs and tissues –Chloride Shift & Bohr's effect, Lung surfactant. Circulatory System-Structure and functions of the Heart. Arterial and venous system, Cardiac cycle, Pace maker, Blood pressure and Factors affecting blood pressure.

UNIT- III: Nervous and Muscular Systems (12 Hours)

Structure of neuron, synaptic transmission, reflex action, neurotransmission- Resting membrane and Action potential. neurotransmitters- acetyl choline, Noradrenaline, Dopamine, Serotonin, Histamine, GABA, Substance P. Muscular system-structure and types of muscles - skeletal, smooth and cardiac muscles, muscle proteins-types and functions, mechanism of muscle contraction.

UNIT- IV: Digestive and Excretory Systems (12 Hours)

Digestive system-composition, functions of saliva, gastric pancreatic intestine and bile secretions, structure of digestive system, Digestion, absorption of carbohydrates, lipids, proteins. Excretory system-structure of nephron, mechanism of urine formation, concentration and acidification of urine. Role of kidneys in the maintenance of acid base balance.

UNIT-V: Reproductive System (12 Hours)

Oogenesis, spermatogenesis, capacitation and transport of sperm- blood-testis barrier. Fertilization, early development, implantation, placentation and parturition.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Explain the composition and functions of body fluids.
2. Describe the physiology of the respiratory system and circulatory systems.
3. Illustrate the organization and physiological roles of the nervous and muscular systems.
4. Discuss the structure and functions of the digestive and excretory systems.
5. Assess the physiological events of human reproduction.

TEXT BOOK(S)

1. Jain, A. K. (2019). *Textbook of physiology with free QA physiology* (Vols. 1 & 2, 8th ed.). Arya Medical (APC) Publishers.
2. Martini, F. H., & Nath, J. L. (2009). *Fundamentals of anatomy & physiology* (11th ed.). Pearson Benjamin Cummings.
3. John, N. A. (2019). *Chatterjee's human physiology* (Vols. 1 & 2, 13th ed.). Kalyani Mukerjee Publications.
4. Pal, G. K. (2019). *Comprehensive textbook of medical physiology* (Vols. 1 & 2, 2nd ed.). Jaypee Medical Publishers.
5. Subramaniam, S., Kutty, M., & Singh, H. D. (2006). *Textbook of human physiology* (6th ed.). S. Chand & Company.

REFERENCE BOOK(S)

1. Guyton, A. C., & Hall, J. E. (2006). *Textbook of medical physiology* (11th ed.). Saunders.
2. Shalya, S. (2000). *Human physiology: Systemic & applied* (1st ed.). CBS Publishers.
3. Silverthorn, D. U. (2016). *Human physiology: An integrated approach* (6th ed.). Pearson.
4. Ralston, S. H., Penman, I. D., Strachan, M. W. J., & Hobson, R. P. (2018). *Davidson's principles and practice of medicine* (23rd ed.). Elsevier.
5. West, E. S., Todd, W. R., Mason, H. S., & Bruggen, J. T. V. (2011). *Textbook of biochemistry* (4th ed.). Oxford IBH Publishers.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.pdfdrive.com/biochemistrystrayer-e25312085.html>
3. <https://www.pdfdrive.com/essentials-human-physiology-e1543905.html>
4. <https://www.pdfdrive.com/human-physiology-from-cells-to-systems-168189400.html>
5. <https://www.pdfdrive.com/human-anatomy-physiology-e51197.html>
6. <https://www.pdfdrive.com/essentials-of-medical-physiology-6th-edition-e32299678.html>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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CO 3	3	2	2	2	1	1	—	1	—	1	3	2	2	1
CO 4	3	2	2	1	1	—	1	1	—	1	3	2	1	2
CO 5	3	2	2	3	1	—	—	1	1	2	3	3	2	1

S-Strong (3)

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI- 614016
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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: V-EC- I: Plant Biochemistry and Plant Therapeutics

Ins. Hrs. /Week: 4

Course Credit: 3

Course Code: U24BCE51B

UNIT- I: Photosynthesis (12 Hours)

Photosynthesis apparatus, pigments of photosynthesis, photo chemical reaction, photosynthetic electron transport chain, path of carbon in photosynthesis- Calvin cycle, Hatch – lack pathway (4 ways) CAM path way, significance of photosynthesis.

UNIT-II: Secondary metabolites (12 Hours)

Structure, Types, Sources, Biosynthesis and function of phenolics, tannins, lignins, terpenes and alkaloids. Medicinal properties of secondary metabolite

UNIT- III: Plant hormones (12 Hours)

Structure and function of plant hormones such as ethylene, cytokines, auxins, Abscic acid, Florigin and Gibberlins.

UNIT- IV: Oxidative stress markers (12 Hours)

Free radicals, types, production, free radical induced damages, lipid peroxidation, reactive oxygen species, antioxidant defense system, enzymatic and non-enzymatic antioxidants, role of antioxidants in prevention of disease, phytochemicals as antioxidants.

UNIT- V: Plant therapeutics (12 Hours)

Bioactive principles in herbs, plants with antidiabetic, anticancer, antibacterial, antiviral, anti-malaria and anti-inflammatory properties.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Gain knowledge on photosynthetic apparatus, pigments present, pathways, and significance of photosynthesis
2. Learn in detail about the structure, types, sources, biosynthesis and functions of secondary metabolites.
3. Understand the structure and functions of plant hormones.
4. Discuss about free radicals, types and its harmful effects. Role of enzymatic and non-enzymatic antioxidant in defence mechanism, prevention in disease.
5. Identify the plants with antidiabetic, anticancer, antibacterial, antiviral, anti-malaria and anti- inflammatory properties.

TEXT BOOK(S)

1. Verma, S. K., and Mohit Verma. *A Textbook of Plant Physiology, Biochemistry and Biotechnology*. S. Chand Publishing, 2008.
2. Sinha, Rajendra Kumar. *Modern Plant Physiology*. Narosa Publishing House, 2004.
3. Pandey, S. N., and B. K. Sinha. *Plant Physiology*. 4th ed., Vikas Publishing House, 2009.
4. Noggle, George Raymond, and George J. Fritz. *Introductory Plant Physiology*. Prentice Hall of India, 1983.
5. Kumar, H. D. *Plant Metabolism*. Affiliated East-West Press, 2005.

REFERENCE BOOK(S)

1. Taiz, Lincoln, *Plant Physiology and Development*. 6th ed., Sinauer Associates, 2015.
2. Devlin, Robert M., and Francis H. Witham. *Plant Physiology*. CBS Publishers, 1986.
3. Buchanan, Bob B., Wilhelm Gruissem, and Russell L. Jones. *Biochemistry and Molecular Biology of Plants*. 2nd ed., Wiley Blackwell, 2015.
4. Salisbury, Frank B., and Cleon W. Ross. *Plant Physiology*. 4th ed., Wadsworth Publishing, 1992.
5. Heldt, Hans-Walter, and Birgit Piechulla. *Plant Biochemistry*. 4th ed., Academic Press, 2010.

E-RESOURCES

1. <https://www.ncbi.nlm.nih.gov/books/>.
2. <https://academic.oup.com/plphys>.
3. <https://www.ncbi.nlm.nih.gov/pmc/>.
4. <https://www.khanacademy.org/science/biology/photosynthesis>.
5. <https://www.coursera.org/courses?query=plant%20biology>.

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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CO 3	3	2	1	1	1	–	–	–	1	1	3	2	1	1
CO 4	3	3	3	2	1	–	–	2	2	1	3	3	2	1
CO 5	3	2	2	2	1	–	1	2	2	2	3	3	2	2

S-Strong (3)**M-Medium (2)****L-Low (1)**

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: V-EC- I: Food and Nutrition

Ins. Hrs. /Week: 4

Course Credit: 3

Course Code: U24BCE51C

UNIT-I: Fundamentals of Food Composition and Preservation (12 Hours)

Sources, food composition, properties and storage of common foods. Functions of food in relation to health- classification of foods based on nutrients. Food preservation- reasons for preserving foods, methods of preservation – an understanding of the principle involved, food additive in processed food and their effects. Food groups to provide nutritive requirement for normal health- body building foods, energy foods and protective foods.

UNIT-II: Nutrient Requirements and Energy Metabolism (12 Hours)

Basics for computing nutrient requirements: latest concepts in dietary recommendations, RDA – ICMR and WHO: their uses and limitations. Definition of unit of energy – cal, RQ, SDA and NPU. Energy metabolism: Basal and resting metabolism – influencing factors, Methods to determine energy requirements and expenditure. The sources and functions of essential nutrients – proteins (high biological and low biological value), carbohydrates and fats. Sources and functions of dietary fibre, Pro and Prebiotics.

UNIT-III: Vitamins and Minerals in Human Nutrition (12 Hours)

Micro and macro mineral nutrients: Distribution sources, metabolic functions and deficiency manifestations – Calcium, Phosphorus, Sodium, Potassium, Iron, Copper, Selenium and Zinc. Fat and water soluble vitamins – Occurrence, properties and function – Hyber and Hypovitaminosis. Role of Vitamin as Antioxidant.

UNIT- IV: Nutrition across the Life Cycle (12 Hours)

Nutrition through life cycle. Special needs of Infants, children, adolescents, pregnant and lactating women, convalescents and old persons

UNIT- V: Principles of Diet Therapy and Clinical Nutrition (12 Hours)

Principles of diet therapy. Diet during stressed conditions- laborers. Patients- therapeutic diets for anemia, malnutrition, obesity, diabetes mellitus and allergy.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to

1. Interpret and apply nutrition concepts to evaluate and improve the nutritional health of communities.
2. Interpret and apply nutrition concepts to evaluate and improve the nutritional health of individuals with medical conditions.
3. Identify and apply food principles to food and nutrition systems.
4. Apply management principles to evaluate human, physical and fiscal resources in organizations.
5. Integrate knowledge and skills in food and nutrition with professional issues affecting the nutrition and/or dietetics fields.

TEXT BOOK(S)

1. Garrow, J. S., W. P. T. James, and A. Ralph. Human Nutrition and Dietetics. 10th ed., Churchill Livingstone, 2000.
2. Ross, A. Catherine, et al., editors. Modern Nutrition in Health and Disease. 11th ed., Lippincott Williams & Wilkins, 2012.
3. Srilakshmi, B. Nutrition Science. 4th ed., New Age International Publishers, 2019.
4. Srilakshmi, B. Food Science. 7th ed., New Age International Publishers, 2018.
5. Swaminathan, M. *Handbook of Food and Nutrition*. 5th ed., BAPPCO, 2004

REFERENCE BOOK(S)

1. Mann, Jim, and Stewart Truswell, editors. Essentials of Human Nutrition. 5th ed., Oxford University Press, 2017.
2. Khanna, Kumud, et al. Textbook of Nutrition and Dietetics. Phoenix Publishing House, 2014.
3. Whitney, Eleanor, and Sharon Rady Rolfes. Understanding Nutrition. 15th ed., Cengage Learning, 2019.
4. Gibney, Michael J., et al. Introduction to Human Nutrition. 2nd ed., Wiley-Blackwell, 2009.
5. Berdanier, Carolyn D., et al. Handbook of Nutrition and Food. 3rd ed., CRC Press, 2014.
6. Shils, Maurice E., et al. Modern Nutrition in Health and Disease. 10th ed., Lippincott Williams & Wilkins, 2005.

E-RESOURCES

1. <http://www.fao.org/nutrition/en/>.
2. <https://www.nin.res.in>.
3. <https://www.who.int/health-topics/nutrition>.
4. <https://nutrition.org/>.
5. <https://open.umn.edu/opentextbooks/textbooks/human-nutrition>.

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	2	2	1	1	2	2	2	3	2	2	2
CO 2	3	3	2	2	2	1	1	2	2	2	3	3	2	2
CO 3	3	2	2	1	2	1	1	1	2	1	3	2	2	2
CO 4	2	2	1	2	2	2	1	2	1	2	2	2	2	1
CO 5	3	3	2	3	3	2	2	3	2	3	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY



Semester: V-EC-II: Research Methodology

Ins. Hrs. / Week: 4

Course Credit: 3

Course Code: U24BCE52A

UNIT-I: Research

(12 Hours)

Characteristics and types of Research, Research Methods versus Methodology, Research designs in Biochemistry: experimental, *in vitro*, *in vivo*, *in situ*, clinical trials. Identification and criteria of selecting a research problem (Hypothesis); Formulation of objectives; Research plan and its components.

UNIT- II: Experimental design

(12 Hours)

Objective, Design of work, Guidelines for design of experiments, Literature Search - Databases for literature search, Material and methods, Designing biological experiments, Compilation and documentation of data.

UNIT- III: Statistical Analysis

(12 Hours)

Measures of variation - standard deviation, Non-linear regression, Standard error. Analysis of variance for one-way and two-way classified data and multiple comparison procedures. Significance - students "t" test, chi-square test. Dunnet's test.

UNIT-IV: Computing Technologies in Research

(10 Hours)

Basics of MS word, MS Excel: tabulation, calculation and data analysis, preparation of graphs, histograms and charts. Use of statistical software SPSS. Power Point: preparation of presentations and scientific poster designing

UNIT-V: Scientific writing for journals

(14 Hours)

Preparation of Abstract, Impact factor, h-index, i-10 index, citation index, Dissertation/Thesis writing: format, content and chapterization, drafting titles & sub-titles, captions and legends. Writing results, discussion and conclusions. Bibliography and references, referencing style - Harvard and Vancouver systems and acknowledgement. Copyediting, Objectives of copy editing (correctness, consistency, coherence and clarity), editing your own paper (fixing grammar and usage errors, basic punctuation, consistent style and clear sentences), creating and using a style sheet for effective copyediting, tools available (MS Editor, Grammarly, Quilbot).

Total Lecture Hours-60

COURSE OUTCOME

The students are able to

1. Acquire awareness of ethical aspects on research and development including plagiarism issues and equal opportunities/equal treatment
2. Develop skills in identification of research problem.
3. Apply the methods while working on a research project work and appreciate the technique of result analysis, interpretation and writing the report
4. Discuss the methods of processing of data in research studies, classify and explain the various methods of central tendency and dispersion, determine the measures of asymmetry in research
5. Explain the basic concepts in testing of hypothesis, types of errors, steps and limitations of hypothesis testing

TEXT BOOK(S)

1. Antonisamy S. Prasanna Premkumar and Solomon Christopher. (2017). Principles and Practice of Biostatistics, 1st Edition, Elsevier Publishers, India.
2. Bratati Banerjee. (2018). Methods in Biostatistics For Medical Students and Research Workers, 9th Edition, Jaypee Brothers Medical Publishers, New Delhi.
3. Indranil Shah and Boddy Paul. (2020). Essentials of Biostatistics & Research Methodology, 3rd Edition, Academic Publishers, Kolkata.
4. Prasanth K. (2017). Guide to Research Methodology and Biostatistics, 1st Edition, CBS Publishers, New Delhi.
5. Veer Bala Rastogi. (2015). Biostatistics, 3rd Edition, Medtech Publishers, USA.

REFERENCE BOOK(S)

1. Dubey Diwedi and Usman Srivastava. (2019). Biostatistics and Research Methodology, 1st Edition, Vikas & Co Publishers, Noida.
2. Gupta SP. (2017). Statistical Methods, 43rd Edition, Sultan Chand & Sons Publishers, New Delhi.
3. Sharma Suresh. (2016). Research Methodology and Biostatistics: A Comprehensive Guide for Health Care Professionals, 1st Edition, Elsevier Publishers, India.
4. Wayne W Daniel. (2012). Biostatistics: A Foundation for Analysis in the Health Sciences, (Wiley Series in Probability and Statistics), 10th Edition, John & Wiley Publishers, New Jersey.
5. Wayne W. Daniel and Chad L. Cross. (2014). Biostatistics: Basic Concepts and Methodology for the Health Sciences, 10th Edition, Wiley Publishers, New Jersey.
6. Kothari C R, (2023) Research Methodology-Methods and Techniques, New Age International publisher.
7. Vivek Kumar. (2023). Discover the Editor in You. Copyediting as a career, ISBN: 9789394887312.

E-RESOURCES

1. <https://digitalguardian.com/blog/what-data-classification-data-classification-definition>
2. <https://www.formpl.us/blog/research-report>
3. <https://www.mooc-list.com/tags/biostatistics>
4. <https://www.mooc-list.com/tags/researchmethodology>
5. https://www.westga.edu/academics/research/vrc/assets/docs/tests_of_significance_notes.pdf

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	1	2	1	1	2	3	1	1	2	1	1	2
CO 2	3	3	2	3	1	1	–	1	–	2	3	2	2	2
CO 3	3	3	3	3	2	1	–	1	–	2	3	2	3	2
CO 4	2	3	3	2	1	–	–	–	–	1	3	1	2	1
CO 5	2	3	3	2	1	–	–	–	–	1	2	1	2	1

S-Strong (3)

M-Medium (2)

L-Low (1)

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)



SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: V-EC- II: Biotechnology

Ins. Hrs./Week: 4

Course Credit: 3

Course Code: U24BCE52B

UNIT – I: Bioprocess and Fermentation Technology (12 Hours)

Bioprocess Technology: Bioprocess – Basic principles of microbial growth. Types, design and operation of fermenters. Fermentation culture medium – carbon, nitrogen and vitamin sources. Antifoaming devices. Downstream processing – separation, concentration, purification, modification and drying. Production of vitamin B12, penicillin, streptomycin and alcohol.

UNIT-II: Plant Tissue culture (12 Hours)

Plant tissue culture- basic requirements for culture, M S medium, callus culture, protoplast culture. Vectors – Ti plasmid (cointegration vector and binary vector), Viral vectors- TMV, CaMV and their applications. Transgenic plants – pest resistant, herbicide resistant and stress tolerant plants.

UNIT- III: Animal Tissue culture (12 Hours)

Animal cell lines and organ culture - culture methods and applications. Transgenic animals: transgenic mice- Production and its applications. Stem cell technology: definition, types, and applications.

UNIT- IV: Advanced Molecular Biology Techniques (12 Hours)

Polymerase Chain Reaction– Principle, components, and mechanism, Types of PCR – Conventional PCR, RT-PCR, qPCR, Multiplex PCR and their comparative applications. Southern Blotting – Principle, methodology, and application in DNA analysis and gene identification. Northern Blotting – Principle, methodology, and application in RNA expression studies.

UNIT-V: Basics of Nanotechnology (12 Hours)

Introduction to nanotechnology, nanoscale dimensions, and unique properties of nanomaterials. Classification of nanomaterials and methods of synthesis including top-down, bottom-up, and green synthesis approaches. Basic characterization techniques such as UV–Visible spectroscopy, XRD, SEM, and TEM. Applications of nanotechnology in drug delivery, diagnostics, biosensors, and biomedical research. Safety, toxicological aspects, ethical concerns, and future prospects of nanotechnology.

Total Instruction Hours-60

COURSE OUTCOME

The students are able to,

1. Acquire knowledge on rDNA technology, DNA manipulation, and use of restriction endonuclease
2. Get acquainted with the use of cloning and vectors in plant tissue culture
3. Understand the methods for production of proteins using recombinant DNA technology and their applications, basics of tissue culture, transgenesis, stem cell technology, risks, and safety aspects and patenting in biotechnology
4. Gain knowledge about the importance of gene and gene manipulation technologies

5. Know the concept fermentation technology and its applications.

TEXT BOOK(S)

1. Alberts, Bruce, et al. *Molecular Biology of the Cell*. 6th ed., Garland Science, 2014.
2. Glick, Bernard R., and Jack J. Pasternak. *Molecular Biotechnology: Principles and Applications of Recombinant DNA*. 5th ed., ASM Press, 2017.
3. Berg, Jeremy M., John L. Tymoczko, and Lubert Stryer. *Biochemistry*. 8th ed., W.H. Freeman and Company, 2015. Provides foundational knowledge on biochemistry, including molecular techniques and their applications.
4. Karp, Gerald. *Cell and Molecular Biology: Concepts and Experiments*. 8th ed., Wiley, 2016.
5. Watson, James D., et al. *Molecular Biology of the Gene*. 7th ed., Pearson, 2013. In-depth discussion on molecular biology, including gene cloning and molecular techniques.

REFERENCE BOOK(S)

1. Basu, Anindya, and S. S. Sree Kumari. *Biotechnology: Principles and Processes*. Jaypee Brothers Medical Publishers, 2007.
2. Ranga, M. M. *Animal Biotechnology*. 2nd ed., Agrobios (India), 2002. Discusses animal tissue culture and the production of transgenic animals.
3. Bajaj, Y. P. S. *Biotechnology in Agriculture and Forestry*. Springer-Verlag, 1990. Explores plant tissue culture techniques and their applications in agriculture.
4. Stanbury, Peter F., Allan Whitaker, and Stephen J. Hall. *Principles of Fermentation Technology*. 3rd ed., Elsevier, 2013.
5. Benson, Harold J. *Microbiological Applications: Laboratory Manual in General Microbiology*. 12th ed., McGraw-Hill Education, 2017.

E-RESOURCES

1. <https://iu.pressbooks.pub/iul211molbiosmehta/chapter/recombinant-dna-technology/>
2. <https://www.cbsetuts.com/genetic-engineering-and-recombinant-dna-technology/>
3. https://www.bankofbiology.com/2020/07/biotechnology-principles-and-processes_28.html
4. <https://www.mybiosource.com/learn/recombinant-DNA-Technology/>
5. <https://www.biologydiscussion.com/genetic-engineering/genetic-engineering-definition-and-strategies-genetics/65458>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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CO 4	3	3	2	3	1	1	–	2	1	2	3	3	2	2
CO 5	3	2	2	3	2	1	–	2	3	2	3	3	3	2

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: V-EC- II: Genetic Engineering

Ins. Hrs./Week: 4

Course Credit: 3

Course Code: U24BCE52C

UNIT - I: Restriction Enzymes and Cloning Vectors (12 Hours)

Restriction Enzymes & Cloning Vehicles: Generation of foreign DNA molecules - Enzymes used in Genetic Engineering - restriction enzymes - their types and target sites; cutting and joining DNA molecules - linkers, adaptors, homopolymers; Cloning and expression vectors: Plasmids – bacteriophages (M13 and λ) PUC vectors yeast vectors, YAC, BAC, Human artificial chromosomes, Ti plasmid, SV40, baculoviruses, adenoviruses, papilloma viruses and retroviruses.

UNIT -II: Gene Transfer and Screening Techniques (12 Hours)

Gene Transfer methods: Introduction of DNA into living cells: Basic principles - mechanism of natural gene transfer by Agrobacterium, viral vectors and particle gun method; Biolistics, electroporation, microinjection, and liposome mediated method, calcium phosphate method and lipofection. Selection and Screening of transformants: Insertional inactivation Immunological screening, Gene silencing - RNA interference. DNA Hybridization. Northern, Southern, Western Blotting and PCR- Principle, technique and applications.

UNIT- III: Plant Genetic Engineering and Tissue Culture (12 Hours)

Plant Tissue Culture: Plant cell and tissue culture – culture media and cell culture. Tissue culture, micropropagation and somaclonal variation. Protoplast culture – isolation and purification of protoplasts, protoplast fusion, genetic modification of protoplasts. Use of reporter genes in transformed plant cells. Transgenic plant technology– genetic engineering of plants for pest resistance, virus resistance, Herbicide tolerance, stress tolerance and delay of fruit ripening. Use of plants to produce commercially important proteins, antibodies, viral antigens and peptide hormones.

UNIT-IV: Transgenic Animals and Gene Therapy (12 Hours)

Transgenic animal: In vitro fertilization and embryo transfer. Animal vaccines – production of vaccine for foot and mouth disease of cattle. Development of transgenic animals – retroviral, microinjection and embryonic stem cell methods. Applications of transgenic animals. Gene therapy – ex vivo and in vivo. Hazards and safety aspects of genetic engineering.

UNIT- V: Recombinant DNA technology (12 Hours)

Recombinant DNA technology - Principles of gene cloning: restriction endonucleases and other enzymes used in manipulating DNA molecules. Ligation of DNA molecules, DNA ligase, linkers and adapters, homopolymer tailing, end labeling and construction maps of PBR322, λ bacteriophage.

Total Instruction Hours-60

COURSE OUTCOME

The students are able to,

1. Acquire knowledge of tools and strategies used in genetic engineering.
2. Understand applications of recombinant DNA technology and genetic engineering, from academic and industrial perspective.
3. Use and apply the knowledge of genetic engineering in problem solving and in practice.
4. Learn the basics of classical, molecular and evolutionary genetics.
5. Learn about genome, the types and significance of repeats in the genome.

TEXT BOOK(S):

1. Principles of Gene Manipulation by S.B. Primrose, RM Twyman and RW Old (6th Edition)
2. Principles of Gene Manipulation and Genomics SEVENTH EDITION S.B. Primrose and R.M. Twyman
3. Biotechnology by BD Singh
4. Recombinant DNA: A Short Course by JD Watson, J. Tooze and DT Kurtz.
5. From Genes to Genomes: Concepts and Applications of DNA Technology by JW Dale and M Schantz
6. Molecular Biotechnology: Principles & Applications of Recombinant DNA Glick BR and Pasternak JJ

REFERENCE BOOK(S):

1. Introduction to Biotechnology Brown, Campbell and Priest Blackwell Science.1987
2. A Textbook on Biotechnology H.D. Kumar 2nd edition East West Press.1998.
3. Molecular Biotechnology: Principles and Applications of Recombinant DNA, Glick B.R. and Pasternak J.J. 3rd Edition, ASM Press, Washington, D.C.2003.
4. From Genes to clones Winnaecker VCH Publication.1987.
5. Elements of Biotechnology P.K. Gupta, Rastogi Publication.1998
6. Molecular Biology and Biotechnology. Walker and Gingold. 3rd ed. Panima, Publishings.1999.
7. Plant Biotechnology. Ignacimuthu, Oxford & IBH publishing company.2004
8. Recombinant DNA Technology, James watson, Michael Gilman Scientific American Publ, WH Freeman & Company 2nd edition.1992
9. Industrial Microbiology AH Patel, Macmillan India Reprint 2005.

E-RESOURCES

1. <https://www.ncbi.nlm.nih.gov/books/NBK21054/>.
2. <https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009/>
3. <https://www.khanacademy.org/science/biology/biotech-dna-technology>
4. <https://www.nature.com/scitable/topic/genetic-engineering-7/>
5. <https://www.addgene.org/education/>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
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CO 3	3	3	3	3	2	1	–	1	1	2	3	3	3	2
CO 4	3	2	2	2	1	–	–	–	1	2	3	2	2	2
CO 5	3	2	2	3	1	–	–	–	1	2	3	3	2	3

S-Strong (3)

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: V: Environmental Studies

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code: 24UGCES

Unit: 1 The Multidisciplinary nature of environmental studies

Definition- scope and importance.

(2 lectures)

Need for public awareness

Unit: 2 Natural Resources

Renewable and non-renewable resources:

Natural resources and associated problems.

- Forest resources: use and over-exploitation- deforestation- case studies. Timber extraction- mining- dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water- floods- drought- conflicts over water- dams benefits and problems.
- Mineral resources: Use and exploitation- environmental effects of extracting and using mineral resources- case studies.
- Food resources: World food problems- changes caused by agriculture and overgrazing- effects of modern agriculture- fertilizer-pesticide problems- water logging- salinity- case studies.
- Energy resources: Growing energy needs- renewable and non-renewable energy sources- use of alternate energy sources. Case studies.
- Land resources: Land as a resources- land degradation- man induced Landslides- soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit: 3 Ecosystems

(8 lectures)

Concept of an ecosystem.

Structure and function of an ecosystem.

Producers- consumers and decomposers

Energy flow in the ecosystem

Ecological succession.

Food chains- food webs and ecological pyramids

Introduction- types- characteristic features- structure and function of the following ecosystem:-

- Forest ecosystem
- Grassland ecosystem
- Desert ecosystem
- Aquatic ecosystems- (ponds- streams- lakes- rivers- oceans- estuaries)

Unit: 4 Biodiversity and its conservation

(6 lectures)

Introduction- Definition: Genetic- species and ecosystem diversity Biogeographical classification of India

Value of biodiversity: consumptive use- productive use- social- ethical- aesthetic and option values

Biodiversity at global- National and local levels India as a mega-diversity nation

Hot-spots of biodiversity

Threats to biodiversity: habitat loss- poaching of wildlife- man-wildlife conflicts.
Endangered and endemic species of India
Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
Biological Diversity Act 2002/ BD Rules- 2004

Unit: 5 Environmental Pollution

(8 lectures)

Definition

Causes- effects and control measures of:

- a. Air Pollution
- b. Water Pollution
- c. Soil Pollution
- d. Marine Pollution
- e. Noise pollution
- f. Thermal Pollution
- g. Nuclear hazards

Solid waste Management: Causes- effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution

Pollution case studies

Disaster management: floods- earthquake- cyclone and landslides.

Ill-Effects of Fireworks: Firework and Celebrations- Health Hazards- Types of Fire- Firework and Safety

Unit: 6 Social Issues and the Environment

(8 lectures)

From Unsustainable to Sustainable development.

Urban problems related to energy.

Water conservation- rain water harvesting- watershed management.

Resettlement and rehabilitation of people; its problems and concerns.

Case studies

Environmental ethics: Issues and possible solutions.

Climate change- global warming- acid rain- ozone layer depletion- nuclear accidents and holocaust.

Case studies.

Wasteland reclamation.

Consumerism and waste products.

Environment Protection Act.

Air (Prevention and Control of Pollution) Act.

Water (Prevention and Control of Pollution) Act.

Wildlife Protection Act.

Forest Conservation Act.

Issues involved in enforcement of environmental legislation Public awareness.

Unit: 7 Human Population and the Environment

(7 lectures)

Population growth- variation among nations.

Population explosion: Family Welfare Programmes

Environment and human health

Human Rights - Value Education

HIV/ AIDS - Women and Child Welfare

Role of Information Technology in Environment and human health

Case studies.

Unit: 8 Field Work

Visit to a local area to document environmental assets-river / forest/ grassland/ hill / mountain

COURSE OUTCOMES

The students will be able to

1. Understand the environmental importance including interactions across local to global scales.
2. The learners to update and analyze environmental relationships and interactions of environmental components
3. The student to gain knowledge on importance of natural resources in a systematic way.
4. The course content is introduce the concept of renewable and non-renewable energy resources and its scenario in India and at global level
5. The students will know the relationship between biodiversity and ecosystem functions- direct and indirect values of biodiversity resources and their bio prospecting opportunities.
6. The learners can gain awareness related on environmental pollution- causes and pollution control with case studies.
7. Student to obtain the environmental ethics and gain knowledge about the sustainable development.
8. Learners should realize the environmental legislation and policies of national and international regime and know the regulations applicable to industries and other organizations with significant Environmental aspects.

REFERENCES

1. Agarwal- K.C. 2001 Environmental Biology- Nidi Public Ltd Bikaner.
2. Bharucha Erach- The Biodiversity of India- Mapin Publishing Pvt Ltd- Ahamedabad. 380013- India- E-mail: mapin@icenet.net(R)
3. Brunner R.C. 1989- Hazardous Waste Incineration- McGraw Hill Inc 480 p
4. Clark R.S. Marine Pollution- Clanderson Press Oxford (TB)
5. Cunningham- W.P.Cooper- T.H.Gorhani E & Hepworth- M.T. 2001.
6. De A.K. Environmental Chemistry- Wiley Eastern Ltd
7. Down to Earth- Centre for Science and Environment (R)
8. Gleick- H.P. 1993. Water in crisis- Pacific Institute for Studies in Dev- Environment & Security. Stockholm Env. Institute Oxford University- Press 473p.
9. Hawkins- R.E. Encyclopedia of India Natural History- Bombay Natural History Society- Bombay (R)
10. Heywood- V.H & Watson- R.T. 1995. Global Biodiversity Assessment. Cambridge University Press
11. Jadhav- H & Bhosale- V.M. 1995. Environmental Protection and Laws Himalaya Pub. House- Delhi
12. Mckinney- M.L. & Schoch R.M. 1996. Environmental Science systems & Solutions- Web enhanced edition 639 p.
13. Mhaskar A.K. Matter Hazardous- Techno-Science Publications (TB)
14. Miller T.G. Jr. Environmental Science- Wadsworth Publishing Co. (TB)
15. Odum- E.P. 1971 Fundamentals of Ecology. W.B. Saunders Co. USA. 574 p
16. Rao MN & Datta- A.K. 1987 Waste Water treatment- Oxford & IBH Publication Co. Pvt Ltd 345 p.
17. Sharma B.K. 2001 Environmental chemistry Goel Publ House- Meerut.
18. Survey of the Environment- The Hindu (M).
19. Townsend C. Harper- J and Michael Begon- Essentials of Ecology- Blackwell science (TB)
20. Trivedi R.K. Handbook of Environmental Laws- Rules- Guidelines- Compliances and Standards- Vol. I and II- Enviro Media (R).

21. Trivedi R.K. and P.K. Goel- Introduction to air pollution- Techno-Science Publications (TB).
22. Wagner K.D. 1998 Environmental Management. W.B. Saunders Co. Philadelphia USA499 p
(M) Magazine (R) Reference (TB) Textbook
23. <http://nbaindia.org/uploaded/Biodiversityindia/Legal/33%20Biological%20Diversity%20>

SEMESTER VI

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)



SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: VI-CC- VIII: Molecular Biology

Ins. Hrs./Week: 6

Course Credit: 4

Course Code: U24BC613

UNIT- I: Central Dogma of molecular Biology (19 Hours)

DNA as the unit of inheritance. Experimental evidences by Griffith's transforming principle, Avery, McLeod and McCarthy's experiment, and Hershey and Chase Experiment. Replication in prokaryotes: Modes of replication. Meselson and Stahl's experimental proof for semiconservative replication. Mechanism of Replication – Initiation, events at Ori C, Elongation – replication fork, semi discontinuous replication, Okazaki fragments, and termination. Bidirectional replication, Inhibitors of replication. Models of replication-theta, rolling circle and D loop model.

UNIT -II: Transcription (17 Hours)

Mechanism of transcription: DNA dependent RNA polymerase(s), recognition, binding and initiation sites, TATA/ Pribnow box, elongation and termination. Post-transcriptional modifications; inhibitors of transcription. RNA splicing and processing of mRNA, tRNA and rRNA. Reverse transcription.

UNIT - III: Protein synthesis (18 Hours)

Genetic Code and its characteristics, Wobble hypothesis. Translation: Adaptor role of tRNA, Activation of amino acids, Initiation, elongation and termination of protein synthesis, post-translational modifications and inhibitors of protein synthesis.

UNIT-IV: Regulation of Gene Expression in Prokaryotes (18 Hours)

Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, regulation of lac operon and trp operon.

UNIT-V: Mutation (18 Hours)

Types-Nutritional, Lethal, Conditional mutants. Missense mutation and other point mutations. Spontaneous mutations; chemical and radiation – induced mutations. DNA repair: Direct repair, Photoreactivation, Excision repair, Mismatch repair, Recombination repair and SOS repair.

Total Instruction Hours-90

COURSE OUTCOME

The students are able to,

1. Illustrate the Central Dogma of molecular biology, explain the multiplication of DNA in the cell and describe the types and modes of replication.
2. Elaborate the mechanism of transcribing DNA into RNA, discuss the formation of different types of RNA.
3. Decipher the genetic code and summarize the process of translation.
4. Comprehend the principles of gene expression and explain the concept of operon in prokaryotes.
5. Distinguish the types of mutations and explain the various mechanisms of DNA repair.

TEXT BOOK(S)

1. Bruce Alberts, Alexander D. Johnson and Julian Lewis. 2014. Molecular Biology of the Cell, 6th edition, WW. Norton & Company Publishers, New York, USA.
2. Cooper GM. And RE. Hausman. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington Publishers, Augusta, Georgia.
3. Geoffrey Cooper and Robert E Harsman. 2004. The Cell-A Molecular Approach, 1st edition. ASM Press Publishers, Washington, United States.
4. James D. Watson, A. Baker Tania, P. Bell Stephen, Gann Alexander, Levine Michael and Losick Richard. 2017. Molecular Biology of the Gene, 7th edition, Pearson Education Publishers, New York, USA.
5. Rastogi SC. 2011. Cell and Molecular Biology, 3rd edition, New age International publisher, New Delhi, India.
6. David Freifelder. 2008. Molecular Biology, 2nd edition, Narosa publishing house Publishers, India.

REFERENCE BOOK(S)

1. Alberts B., Johnson A., Lewis J., Mofgan D., Raff M., Roberts Kand Walter P. 2014. Molecular Biology of the Cell. 6th edition. Garland Science, New York, USA.
2. Allison A. Lizabeth. 2012. Fundamental Molecular Biology, 2nd edition. J Willey and Sons, Hoboken, New Jersey.
3. Berg JM, Tymoczko JL, Gatto GJ and Stryer L. 2015. Biochemistry, 8th edition, WH Freeman & Co., New York, USA.
4. David Nelson L. and Michael Cox. 2021. Lehninger Principles of Biochemistry. 8th edition, WH. Freeman & Co Ltd Publishers, New York, USA.
5. Freifelder D and Malacinski GM. 2010. Essentials of Molecular Biology, 4th edition, John and Bartlett Publishing, UK.

E-RESOURCES

1. <https://agrilife.org/gold/files/2012/09/Lecture-26.pdf>
2. https://static1.squarespace.com/static/6019d0bc7dff866728d961d3/t/601a68429c231608a9b8f2a0/1612343363359/biochemistry_satyanarayana_ebook_free.pdf
3. <https://drive.google.com/file/d/1tghNWPYuqPiqKlRl1ZzUrFwcoMiuoMa/>
4. [http://www.freebookcentre.net/biology-books-download/BASICS-ON-MOLECULAR• BIOLOGY-\(PDF-52P\).html](http://www.freebookcentre.net/biology-books-download/BASICS-ON-MOLECULAR• BIOLOGY-(PDF-52P).html)
5. [http://www.freebookcentre.net/biology-books-download/Basics-of-molecular-cell• biology-\(PDF-36P\).html](http://www.freebookcentre.net/biology-books-download/Basics-of-molecular-cell• biology-(PDF-36P).html)

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	3	2	1	–	–	1	2	3	3	2	2
CO 2	3	2	2	3	2	1	–	–	1	2	3	3	2	2
CO 3	3	3	3	2	2	1	–	–	–	2	3	3	2	2
CO 4	3	2	2	3	2	1	1	2	1	2	3	3	3	2
CO 5	3	3	3	3	2	1	–	2	1	2	3	3	3	2

S-Strong (3)

M-Medium (2)

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: VI-CP- VI: Molecular Biology Practical

Ins. Hrs. /Week: 6

Course Credit: 4

Course Code: U24BC614P

PRACTICALS

1. Extraction of DNA from animal source.
2. Quantification of DNA from animal source.
3. Extraction of RNA from animal source.
4. Quantification of RNA from animal source.
5. Extraction of Protein from animal source.
6. Quantification of Protein from animal source.
7. Isolation of genomic DNA from plant cells.
8. Agarose gel electrophoresis of DNA.
9. Polyacrylamide gel electrophoresis (PAGE) for nucleic acids
10. Polyacrylamide gel electrophoresis (PAGE) for proteins.
11. Principle and setup of PCR amplification.

COURSE OUTCOME

The students are able to,

1. Isolate high-quality DNA, RNA, and protein from animal and plant tissues using standard molecular biology techniques.
2. Quantify nucleic acids and proteins using spectrophotometric and colorimetric methods and interpret the data.
3. Demonstrate competency in electrophoresis techniques for DNA, RNA, and proteins using agarose and polyacrylamide gels.
4. Understand and set up Polymerase Chain Reaction (PCR) amplification and explain its molecular basis and applications.
5. Evaluate experimental data and troubleshoot common problems in DNA/RNA/protein handling procedures.

REFERENCE BOOK(S)

1. Sambrook, Joseph, and David W. Russell. Molecular Cloning: A Laboratory Manual. 3rd ed., Cold Spring Harbor Laboratory Press, 2001.
2. Ausubel, Frederick M., et al. Current Protocols in Molecular Biology. Wiley, 1995–2020.
3. Green, Michael R., and Joseph Sambrook. Molecular Cloning: A Laboratory Manual. 4th ed., Cold Spring Harbor Laboratory Press, 2012.
4. Wilson, Keith, and John Walker. Principles and Techniques of Biochemistry and Molecular Biology. 7th ed., Cambridge University Press, 2010.
5. Mount, David W. Bioinformatics: Sequence and Genome Analysis. 2nd ed., Cold Spring Harbor Laboratory Press, 2004.

TEXT BOOK(S)

1. Nelson, David L., and Michael M. Cox. Lehninger Principles of Biochemistry. 7th ed., W. H. Freeman, 2017.
2. Voet, Donald, and Judith G. Voet. Biochemistry. 5th ed., Wiley, 2011.
3. Brown, Terence A. Gene Cloning and DNA Analysis: An Introduction. 7th ed., Wiley-

Blackwell, 2016.

4. Watson, James D., et al. Molecular Biology of the Gene. 7th ed., Pearson, 2013.
5. Glick, Bernard R., and Jack J. Pasternak. Molecular Biotechnology: Principles and Applications of Recombinant DNA. 4th ed., ASM Press, 2010.

E-RESOURCES

1. <https://reach.cdc.gov/course/basic-molecular-biology-module-3-nucleic-acid-extraction>.
2. <https://www.thermofisher.com/in/en/home/brands/thermo-scientific/molecular-biology/molecular-biology-learning-center/molecular-biology-resource-library.html>.
3. <https://www.bio-rad.com/en-us/a/edu/dna-pcr-agarose-gel-electrophoresis>.
4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6425773>.
5. <https://www.labster.com/simulations/molecular-biology>.

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CO 3	3	2	3	3	2	2	1	—	1	1	3	3	3	2
CO 4	3	3	2	3	2	1	—	—	1	2	3	3	2	2
CO 5	3	3	3	3	2	2	1	1	1	2	3	3	3	3

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: VI-EC-III: Endocrinology

Ins. Hrs. / Week: 4

Course Credit: 3

Course Code: U24BCE63A

UNIT-I: Hormones and Receptors

(12 Hours)

Hormones- Definition, Classification, Biosynthesis, Circulation and Degradation. Hormone receptors: Intracellular receptors - cytoplasmic and nuclear receptors. Cell surface receptors- ion channels, G-protein coupled receptors (GPCR), receptor kinases (tyr, ser/thr). Second messengers – cyclic nucleotides (cAMP, cGMP), lipids (phosphatidyl inositol diphosphate and DAG), calcium ions, Calmodulin and NO.

UNIT-II: Thyroid and Parathyroid hormones

(12 Hours)

Hormones of the thyroid: Biosynthesis, regulation, transport and biological actions of thyroid hormones. Hyperthyroidism and hypothyroidism. Antithyroid agents. Parathyroid hormone- Biosynthesis and biological actions. Hyperparathyroidism and hypoparathyroidism. Calcitonin and Calcitriol- Biosynthesis and functions. Paget's disease. Ricket's and osteomalacia.

UNIT-III: Hypothalamus and Pituitary hormones

(12 Hours)

Hypothalamic releasing factors. Anterior pituitary hormones-actions-Growth promoting and lactogenic hormones. Glycoprotein hormones-TSH and Gonadotrophins, POMC family- ACTH, Endorphins and MSH. Posterior pituitary hormones-Vasopressin and oxytocin-synthesis and biological effects. Pituitary diseases-Gigantism, Acromegaly, Dwarfism and Diabetes insipidus.

UNIT-IV: G.I. and Pancreatic hormones

(12 Hours)

G.I. hormones: Brief account of gastrointestinal hormones. Insulin- Biosynthesis, regulation of secretion and biological actions. Mechanism of action of insulin. Glucagon- Biosynthesis, regulation of secretion and biological actions. Somatostatin, pancreatic polypeptide and Insulin like growth factors.

UNIT V: Adrenal and Gonadal hormones

(12 Hours)

Adrenal hormones- Glucocorticoids, Mineralocorticoids- synthesis and biological effects. Catecholamines: biosynthesis and biological effects. Gonadal hormones-Androgens and estrogens. Ovarian cycle. Abnormal secretion of adrenal hormones-Addison's disease. Cushing's syndrome, Congenital adrenal hyperplasia and Pheochromocytoma.

Total Lecture Hours- 60

COURSE OUTCOME

The students are able to,

- 1.Acquire knowledge about classification, synthesis and circulation of hormones and receptors.
- 2.Illustrate the synthesis and biological actions of hormones from thyroid and parathyroid glands.
- 3.Acquire knowledge about pituitary and hypothalamic hormones.
- 4.Understand the role of the G.I and pancreatic endocrine cells in the regulation of blood glucose.
- 5.Identify the hormones released by the adrenal and gonads origin, their biological actions and disorders.

TEXT BOOK(S)

1. Mac E. Hadley, Jon E. Levine, Jonathan Levine, 2009, Endocrinology, 6th edition. Benjamin Cummings Publishers, USA.
2. Nagini S. 2007. Text Book of Biochemistry, 2nd edition, Scitech publishers, India.
3. Norman Levin, 2019. Manual of Endocrinology and Metabolism, 5th edition, Wolters Kluwer Publishers, New York.
4. Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell. 2003. Harper's Illustrated Biochemistry, 26th edition, McGraw-Hill Medical Publishers, New York.
5. Smith EL, Hill RL, Robert LI. Lefkowitz RJ, Philip H, and Abraham W. 1983. Principles of Biochemistry: Mammalian Biochemistry, 7th edition, McGraw-Hill Education Publishers, New York.

REFERENCE BOOK(S)

1. Arthur C. Guyton and Hall, 2006. Text Book of Medical Physiology, 11th edition, Elsevier India pvt. Ltd., New Delhi.
2. Bernhard K and Winfried B. 2016. Hormones and the Endocrine System: A text Book of Endocrinology, 1st edition, Springer Nature Publishers, Switzerland.
3. De Robertis and De Robertis, 2001. Cell and Molecular Biology, 8th edition, Wolters Kluwer Publishers, India.
4. Lary Jameson J. 2017. Harrison's Endocrinology, 20th edition, McGraw Hill Publishers, New York.
5. Melmed S, Polonsky KS, Larsen PR, Kronenberg HM. 2016. Williams Textbook of Endocrinology, 13th edition, Elsevier Publishers, India.
6. Wilson and Foster, 1992. Textbook of Endocrinology, 8th edition. W. B. Saunders publishers, USA.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.pdfdrive.com/textbook-of-biochemistry-with-clinical-correlations-e184776201.html>
3. <https://www.news-medical.net/health/Pituitary-Gland-Hormones-and-Functions.aspx>
4. <https://www.pdfdrive.com/williams-textbook-of-endocrinology-expert-consult-e189818749.html>
5. <https://www.pdfdrive.com/harrison-endocrinology-e34584578.html>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
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CO 2	3	2	2	2	1	–	–	–	–	1	3	3	2	1
CO 3	3	2	1	2	1	–	–	–	–	1	3	2	2	1
CO 4	3	3	2	3	1	–	–	1	1	1	3	3	2	1
CO 5	3	2	2	2	1	–	–	1	1	1	3	3	2	1

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SENGAMALA THAYAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY



Semester: VI-EC-III: Biochemical Pharmacology

Ins. Hrs. / Week: 4

Course Credit: 3

Course Code: U24BCE63B

UNIT-I: Drugs (14 Hours)

Classification based on sources, routes of drug administration - Oral/Enteral, Parenteral and Local application. Absorption of drugs, factors influencing drug absorption, distribution and excretion of drugs.

UNIT-II: Drug metabolism (12 Hours)

Phase I and Phase II reactions, role of cytochrome P₄₅₀, non- microsomal reactions of drug metabolism. Factors influencing drug metabolism. Therapeutic index.

UNIT-III: Drug allergy, Drug tolerance (10 Hours)

IC 50, LD50 of a drug, Drug intolerance, Drug addiction, Drug abuses and their biological effects. Drug resistance - biochemical mechanism.

UNIT-IV: Therapeutic Drugs (14 Hours)

Analgesics and Non-steroidal anti-inflammatory drugs (NSAIDs) – Aspirin and Acetaminophen. Insulin, Oral antidiabetic drugs - Sulfonylureas, Biguanides. Antihypertensive drugs - ACE inhibitors, Calcium channel blockers. Anti-cancer agents – Antimetabolites.

UNIT-V: Antibiotics (10 Hours)

Definition, Examples and Biochemical mode of action of penicillin, streptomycin, tetracyclines and chloramphenicol.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Classify the different routes of drug administration, describe the absorption, distribution, metabolism and excretion of drugs.
2. Illustrate the metabolism of drugs, classify the microsomal and non- microsomal reactions and explain the role of cytochromes.
3. List out the various adverse response and side effects of drugs.
4. Justify the use of synthetic drugs and elucidate its pharmacological actions and its adverse effects for different disease.
5. Highlight the importance and explain the mode of action of important antibiotics.

TEXT BOOK(S)

1. Sharma, H. L., and K. K. Sharma. *Principles of Pharmacology*. 2nd ed., Paras Medical Publisher, 2011.
2. Satoskar, R. S., S. D. Bhandarkar, and Nirmala Rege. *Pharmacology and Pharmacotherapeutics*. 25th ed., Elsevier India, 2018.
3. Bhattacharya, S. K. *Concepts in Pharmacology*. 2nd ed., Elsevier India, 2008.
4. Barar, F. S. K. *Essentials of Pharmacotherapeutics*. 1st ed., S. Chand Publishing, 2000.
5. Reiss, Barry S. *Pharmacology: Principles and Applications*. 2nd ed., Saunders, 2003.

REFERENCE BOOK(S)

1. Rang, H. P., et al. *Rang and Dale's Pharmacology*. 9th ed., Elsevier, 2019.
2. Goodman, Louis Sanford, et al. *Goodman & Gilman's: The Pharmacological Basis of Therapeutics*. 13th ed., McGraw-Hill Education, 2018.
3. Katzung, Bertram G. *Basic and Clinical Pharmacology*. 15th ed., McGraw-Hill Education, 2021.
4. Brunton, Laurence L., et al. *Goodman & Gilman's Manual of Pharmacology and Therapeutics*. 2nd ed., McGraw-Hill Education, 2014.
5. Tripathi, K. D. *Essentials of Medical Pharmacology*. 8th ed., Jaypee Brothers Medical Publishers, 2018.

E-RESOURCES

1. <https://www.khanacademy.org/science/health-and-medicine/pharmacology>.
2. <https://www.ncbi.nlm.nih.gov/pmc/>.
3. <https://druginfo.nlm.nih.gov/>.
4. <https://medlineplus.gov/druginformation.html>.
5. <https://www.pharmacologyeducation.org/>.

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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CO 2	3	3	3	2	1	–	–	1	1	1	3	3	3	2
CO 3	3	2	2	1	1	–	1	3	1	1	3	2	2	1
CO 4	3	3	2	2	1	–	–	2	1	1	3	3	2	2
CO 5	3	2	2	2	1	–	1	2	1	1	3	3	2	2

S-Strong (3)

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: VI-EC-III: Genetics

Ins. Hrs. / Week: 4

Credit: 3

Course Code: U24BCE63C

UNIT-I: Introduction to Genetics (12 Hours)

Brief history/basic concepts of genetics, Cell division and chromosomes. Mendelian genetics/monohybrid, dihybrid cross. Mendelian genetics/trihybrid cross, probability. Modification of Mendelian ratios/incomplete and codominance. Structure of Gene.

UNIT-II: Chromosome abnormalities (12 Hours)

Diploid chromosomes number- Sex differentiation and sex determination. The X chromosomes, Barr bodies, the Lyon hypothesis. Aneuploidy and polyploidy: Gene deletion, duplication, inversions and translocation. Sex Linkage in Drosophila and Man, Sex Influenced and Sex Limited Genes - Non-Disjunction and Gynandromorphs.

UNIT-III: Nature and Function of Genetic Material (12 Hours)

Fine Structure of the Gene - Cistron, Recon, Muton - Mutation - Molecular Basis of Mutation, Types of Mutation, Mutagens, Mutable and Mutator Genes. Chromosomal Aberrations - Numerical and Structural Examples from Human.

UNIT-IV: Applied Genetics (12 Hours)

Animal Breeding - Heterosis, Inbreeding, Out Breeding, Out Crossing, Hybrid Vigour. Population Genetics, Evolutionary genetics, Hardy Weinberg Law - Gene Frequency, Factors Affecting Gene Frequency, Eugenics, Euphenics and Euthenics, Bioethics.

UNIT-V: Practice problems (12 Hours)

Genetic Principles and their application in medical practice; Syndromes and disorders: definition and their genetic basis- Cystic fibrosis and Tay Sach's Syndrome; Phenylketonuria and Galactosemia; Ethical issues with clinical genetics.

Total Lecture Hours- 60

COURSE OUTCOME

The students are able to,

1. Identify and describe the process and purposes of the cell cycle, meiosis, and mitosis, as well as predict the outcomes of these processes.
2. Transmission genetics problems, make accurate predictions about inheritance of genetic traits, and map the locations of genes.
3. Identify the parts, structure, and dimensions of DNA molecules, RNA molecules, and chromosomes, and be able to categorize DNA as well as describe how DNA is stored.
4. Describe what causes and consequences of DNA sequence changes and how cells prevent these changes, as well as make predictions about the causes and effects of changes in DNA.
5. Describe applications and techniques of modern genetic technology, as well as select the correct techniques to solve practical genetic problems.

TEXT BOOK(S)

1. Griffiths, Anthony J. F., et al. *Introduction to Genetic Analysis*. 12th ed., W. H. Freeman, 2020.
2. Klug, William S., et al. *Concepts of Genetics*. 12th ed., Pearson Education, 2021.
3. Snustad, D. Peter, and Michael J. Simmons. *Principles of Genetics*. 7th ed., Wiley, 2020.
4. Brooker, Robert J. *Genetics: Analysis and Principles*. 7th ed., McGraw-Hill Education, 2021.
5. Hartl, Daniel L., and Elizabeth W. Jones. *Genetics: Analysis of Genes and Genomes*. 8th ed., Jones & Bartlett Learning, 2018.

REFERENCE BOOK(S)

1. Pierce, Benjamin A. *Genetics: A Conceptual Approach*. 6th ed., W. H. Freeman, 2018.
2. Strachan, Tom, and Andrew Read. *Human Molecular Genetics*. 5th ed., Garland Science, 2018.
3. Turnpenny, Peter D., and Sian Ellard. *Emery's Elements of Medical Genetics*. 15th ed., Elsevier, 2017.
4. Brown, Terence A. *Genomes*. 4th ed., Garland Science, 2017.
5. Allis, C. David, et al., editors. *Epigenetics*. 2nd ed., Cold Spring Harbor Laboratory Press, 2015.

E-RESOURCES

1. <https://www.genome.gov>
2. <https://www.yourgenome.org>
3. <https://www.omim.org>
4. <https://medlineplus.gov/genetics>
5. <https://www.nature.com/scitable>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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CO 3	3	2	3	2	1	–	–	–	–	1	3	3	2	2
CO 4	3	3	3	3	1	–	–	1	1	2	3	3	3	2
CO 5	3	3	2	3	2	1	1	1	1	2	3	3	3	3

S-Strong (3)

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SENGAMALA THAYAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF MICROBIOLOGY
B.Sc., BIOCHEMISTRY

Semester: VI-EC-IV: Immunology

Ins. Hrs. /Week: 4

Course Credit: 3

Course Code: U24BCE64A

UNIT-I: Immune system (12 Hours)

Structure and function of primary lymphoid organs (thymus, bone marrow), secondary lymphoid organs (spleen, lymph node), Cells involved in immune system- Functions- Phagocytosis -Inflammation

UNIT-II: Immune cells (12 Hours)

Antigens - Nature, Immunogens, haptens, cross reactions- Immunoglobulin- types- structure and function. Cells involved in antibody formation, Clonal selection theory, Co-operation of T-cell with B-cell. Differentiation of T and B lymphocyte -Humoral and cell mediated immunity. Monoclonal antibody – Production and application in biology.

UNIT-III- Immunity (12 Hours)

Immunity and its types-Innate, Acquired, active and passive- Natural and Artificial - Commonly used toxoid vaccines, killed vaccines, live attenuated vaccines, rDNA vaccines, DNA and subunit vaccines

UNIT- IV: Immune regulation (12 Hours)

Hypersensitivity – Immediate (Type 1) and Delayed (Type IV), Auto- immune diseases with examples. Organ specific and systemic autoimmunity. SLE and RA. Transplantation – Types of Grafts, structure and functions of MHC, graft Vs host reaction, immunosuppressive agents.

UNIT- V: Immunotechniques (12 Hours)

Antigen-antibody reactions, General features of Antigen Antibody reactions. Precipitation, Immuno diffusion, SID and DID -Oudin Procedure, Oakley Fulthorpe Procedure, Radio immunodiffusion, Ouchterlony double diffusion, CIE, Rocket electrophoresis, Agglutination- Coomb's test. Complement Fixation test-Wasserman's reaction, RIA, ELISA.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Associate structure and function of the organs involved in our body's natural Defence
2. Classify antigens and antibodies and the role of lymphocytes in defending the host
3. Describe the types of immunity and the uses of vaccines
4. Understand the immune related diseases and mechanism of transplantation
5. Examine the immunological tests and relate it to the immune status of an Individual

TEXT BOOK(S)

1. Anil K. Sharma. 2019. Immunology: An Introductory Textbook, 1st edition, Jenny Stanford Publishers, California.

2. Gupta SK. 2017. Essentials of Immunology, 2nd edition, ARYA Publishers, New Delhi.
3. Kenneth Murphy. 2017. Janeway's Immunobiology, 9th edition, W.W. Norton & Company Publishers, New York.
4. Mohanty SK. 2019. Essentials of Microbiology & Immunology, 1st edition, Paras Medical Publishers, New Delhi.
5. Robert R. Rich. 2020. Clinical Immunology- Principles And Practice, 5th edition, Elsevier Publishers, India.
6. Shyamasree Ghosh. 2020. Computational Immunology Basics, 1st edition, CRC Press Publishers, England.

REFERENCE BOOK(S)

1. Abul K. Abbas, Andrew H. Lichtman, and Shiv Pillai. 2020. Cellular and Molecular Immunology, 10th edition, Elsevier Publishers, India.
2. Ashim K. Chakravarty. 2016. Immunology and Immunotechnology, 1st edition, Oxford Publishers, England.
3. Jenni Punt, Sharon A Stranford, Patricia P Jones and Judith A Owen. 2019. Kuby Immunology, 8th edition, Macmillan Education Publishers, London.
4. Peter J. Delves, Seamus J. Martin, Dennis R. Burton and Ivan M. Roitt. 2016. Roitt's Essential Immunology, 13th edition, Wiley-Blackwell Publishers, New Jersey.
5. Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne, Janis Kuby. 2002. Immunology, 5th edition, W.H.Freeman Publishers, New York.

E-RESOURCES

1. <https://www.nature.com/ni/video>
2. <https://www.cell.com/immunity/home>
3. [https://www.wpunj.edu/sec/vsec/science courses/bio/BIOimmuANIM .html](https://www.wpunj.edu/sec/vsec/science%20courses/bio/BIOimmuANIM.html)
4. <https://www.youtube.com/watch?v=K09xzIQ8zsg>
5. https://nptel.ac.in/content/syllabus_pdf/102105083.pdf

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: VI-EC- IV: Bioinformatics

Ins. Hrs./Week: 4

Course Credit: 3

Course Code: U24BCE64B

UNIT- I: Introduction to Bioinformatics (12 Hours)

Bioinformatics and its applications. –Genome, Metabolome-Definition and its applications. Metabolome-Metabolome database-E.coli metabolome database, Human Metabolome database. Transcriptome-Definition and applications.

UNIT-II: Biological Databases (12 Hours)

Biological Databases - definition, types and examples –, Nucleotide sequence database (NCBI, EMBL, Genbank, DDBJ) Protein sequence database- SwissProt, TrEMBL, Structural Database-PDB, Metabolic database-KEGG.

UNIT-III: Sequence Alignment (12 Hours)

Local and Global alignment-Dot matrix analysis, PAM, BLOSUM. Dynamic Programming, Needleman- Wunch algorithm, Smith waterman algorithm. Heuristic methods of sequence alignment.

UNIT-IV: Secondary data tools in Biology (12 Hours)

BLAST-features, types (BLASTP, BLASTN, BLASTX), PSI BLAST, result format. DNA Microarray-Procedure and applications.

UNIT-V: Structural genomics (12 Hours)

Whole genome sequencing (Shotgun approach), Comparative genomics-tools for genome comparison, VISTA servers and precomputed tools. Molecular visualization tools. RASMOL, Swiss PDB viewer. Nutrigenomics-Definition and applications.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Introduce the fundamentals of Bioinformatics and its applications Genome, metabolome & Transcriptome.
2. Classify biological database and to correlate the different file formats used by nucleic acid protein database, structural and metabolic database.
3. Develop algorithms for interpreting biological data.
4. Discuss the concepts of sequence alignment and its types. Understand the tool used to detect the expression of genes.
5. Apply the various tools employed in genomic study and protein visualization. Analyse the entire genome by shot gun method.

TEXT BOOK(S)

1. Mount, David W. *Bioinformatics: Sequence and Genome Analysis*. 2nd ed., Cold Spring Harbor Laboratory Press, 2004.
2. Lesk, Arthur M. *Introduction to Bioinformatics*. 5th ed., Oxford University Press, 2019.
3. Pevsner, Jonathan. *Bioinformatics and Functional Genomics*. 3rd ed., Wiley-Blackwell, 2015.
4. Rastogi, S. C., N. Mendiratta, and P. Rastogi. *Bioinformatics: Concepts, Skills, and Applications*. 2nd ed., CBS Publishers, 2008.
5. Baldi, Pierre, and Soren Brunak. *Bioinformatics: The Machine Learning Approach*. 2nd ed., MIT Press, 2001.

REFERENCE BOOK(S)

1. Baxevanis, Andreas D., and B. F. Francis Ouellette, editors. *Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins*. 3rd ed., Wiley-Interscience, 2005.
2. Claverie, Jean-Michel, and Cedric Notredame. *Bioinformatics for Dummies*. 2nd ed., Wiley Publishing, 2007.
3. Higgs, Paul G., and Teresa K. Attwood. *Bioinformatics and Molecular Evolution*. Wiley-Blackwell, 2005.
4. Campbell, A. Malcolm, and Laurie J. Heyer. *Discovering Genomics, Proteomics, and Bioinformatics*. 2nd ed., Benjamin Cummings, 2006.
5. Misra, Basant K. *Fundamentals of Bioinformatics*. 1st ed., Cengage Learning India, 2010.

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3. <https://www.hmdb.ca>
4. <https://www.kegg.jp>
5. <https://www.rcsb.org>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	2	2	1	—	—	1	2	3	3	2	3
CO 2	3	2	2	2	2	1	2	—	1	2	3	3	2	3
CO 3	3	3	3	3	2	1	—	1	1	2	3	3	3	2
CO 4	3	3	3	2	2	1	—	—	1	2	3	3	3	3
CO 5	3	3	3	3	2	1	—	—	1	3	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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(For the Candidates admitted in the academic year 2024 – 2025)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: VI-EC- IV: Pharmaceutical Biochemistry

Ins. Hrs./Week: 4

Course Credit: 3

Course Code: U24BCE64C

UNIT-I: Principles of Pharmacodynamics and Pharmacokinetics (12 Hours)

Pharmacodynamics and Kinetics: History of Drugs, Classification of drugs, routes of drug administration, absorption and distribution of drugs, factors influencing drug absorption and elimination of drugs. Toxicity assessment: acute, sub chronic, chronic exposure, determination of ED50 and LD50 values.

UNIT-II: Drug-Receptor Interactions and Mechanisms of Drug Action (13 Hours)

Drug- Receptor interactions: Receptor- definition, Agonist and antagonist. Types of receptor - G-protein coupled receptor, Receptors with intrinsic ion channel, Enzymatic receptors, receptors regulating gene expression, involvements of binding forces in drug receptor interaction, drug action not mediated by receptors.

UNIT-III: Drug Metabolism and Biotransformation (12 Hours)

Drug metabolism: Phase I reactions - role of Cytochrome P450. Microsomal and Non microsomal reactions. Phase II reactions-Conjugation reactions. Physiological importance of xenobiotic metabolism.

UNIT-IV: Chemotherapy and Anticancer Agents (10 Hours)

Chemotherapy: Basic concept. Mode of action of antimicrobial drugs- antibacterial, antifungal, antiviral and antimalarial drugs. Cancer chemotherapy: Cancer and principles of cancer chemotherapy. Mode of action of anticancer drugs- antimetabolites, antibiotics, alkylating agents and other agents.

UNIT-V: Drugs Acting on Organ Systems and Adverse Drug Reactions (13 Hours)

Drugs acting on various systems: CNS-sedative- hypnotic, GI tract- drugs for peptic ulcer, diarrhea and constipation. Miscellaneous drugs - antiseptic, disinfectant, chelating agents. Adverse drug reactions and drug induced side effects, biological effects of drug abuse and drug dependence, drug tolerance and intolerance.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to

1. Understand the principles of drug absorption, distribution, metabolism, and elimination.
2. Explain the interaction between drugs and receptors and the resulting pharmacological effects.
3. Demonstrate knowledge of drug metabolism, including phase I and phase II enzymatic reactions.
4. Analyze the mechanisms of action of antimicrobial and anticancer drugs and their therapeutic applications.

- Identify drugs acting on different physiological systems and assess adverse drug reactions and drug dependence.

TEXTBOOK(S)

- Rang, H. P., et al. *Rang and Dale's Pharmacology*. 9th ed., Elsevier, 2019.
- Tripathi, K. D. *Essentials of Medical Pharmacology*. 8th ed., Jaypee Brothers Medical Publishers, 2019.
- Sharma, H. L., and K. K. Sharma. *Principles of Pharmacology*. 2nd ed., Paras Medical Publisher, 2014.
- Satoskar, R. S., et al. *Pharmacology and Pharmacotherapeutics*. 25th ed., Elsevier India, 2021.
- Bhattacharya, S. K. *Textbook of Pharmacology*. 4th ed., Elsevier India, 2020.

REFERENCE BOOKS

- Goodman, Louis S., and Alfred Gilman. *The Pharmacological Basis of Therapeutics*. 13th ed., McGraw-Hill Education, 2018.
- Katzung, Bertram G., et al. *Basic and Clinical Pharmacology*. 15th ed., McGraw-Hill Education, 2021.
- Golan, David E., et al. *Principles of Pharmacology: The Pathophysiologic Basis of Drug Therapy*. 4th ed., Wolters Kluwer, 2016.
- Brody, Thomas M., et al. *Human Pharmacology: Molecular to Clinical*. 5th ed., Mosby, 2010.
- Neal, Michael J. *Medical Pharmacology at a Glance*. 8th ed., Wiley-Blackwell, 2015.

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- <https://pubchem.ncbi.nlm.nih.gov/>.
- <https://www.who.int/medicines/publications/essentialmedicines/en/>.
- <https://druginfo.nlm.nih.gov/drugportal/>.
- <https://medlineplus.gov/druginformation.html>.

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	2	1	—	—	—	1	1	3	3	2	2
CO 2	3	3	2	2	1	—	1	1	—	1	3	3	2	1
CO 3	3	2	3	3	1	—	—	1	1	1	3	3	3	2
CO 4	3	3	3	2	1	—	—	1	1	1	3	3	2	2
CO 5	3	3	2	2	2	1	1	2	1	2	3	3	2	2

S-Strong (3)

M-Medium (2)

L-Low (1)



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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: VI-Value Education

Ins. Hrs./Week: 2

Course Credit: 2

Course Code: 24UGVED

UNIT I: Philosophy of Life and Social Values (6 Hours)

Human Life on Earth (Kural 629), Purpose of Life (Kural 46), Meaning and Philosophy of Life (Kural 131, 226), Family (Kural 45), Peace in Family (Kural 1025), Society (Kural 446), The Law of Life (Kural 952), Brotherhood (Kural 807), Five responsibilities/duties of Man.

UNIT II: Human Values and Citizenship (6 Hours)

Aim of education and value education, Evolution of value oriented education, Concept of Human values, Types of Values, Character Formation, Components of Value Education, A.P.J. Kalam's ten points for enlightened citizenship, Role of media in value building.

UNIT III: Value Education towards National and Global Development (6 Hours)

Constitutional or national values, Social values, Professional values, Religious values, Aesthetic values, National Integration and International Understanding.

UNIT IV: Yoga and Health (6 Hours)

Definition, Meaning, Scope of Yoga, Aims and objectives of Yoga, Yoga Education with modern context, Different traditions and schools of Yoga, Yoga practices: Asanas, Pranayama and Meditation.

UNIT V: Human Rights (6 Hours)

Concept of Human Rights, Indian and international perspectives, Evolution of Human Rights, Constitutional Provisions, Rights of Women and Children, Peace and harmony.

Total Lecture Hours-30

COURSE OUTCOMES

The students are able to,

1. Apply values in Thirukkural in family and society.
2. Develop character formation and citizenship.
3. Be secular, sincere, respectful and moral.
4. Practice yoga and meditation for mental health.
5. Follow constitutional rights.

TEXT BOOK(S)

1. Grose, D. N. (2005). *A textbook of value education*. New Delhi, India: Dominant Publishers.
2. Gawande, E. N. (2002). *Value oriented education: Vision for better living*. New Delhi, India: Sarup & Sons.
3. Levin, L. (1998). *Human rights: Questions and answers* (3rd ed.). New Delhi, India: National Book Trust.

4. Chandrasekaran, K. (1999). *Sound health through yoga*. Sedapatti, India: Prem Kalyan Publications.
5. Kuvalayananda, S., & Vinekar, S. L. (1963). *Yogic therapy: Its basic principles and methods*. New Delhi, India: Government of India, Ministry of Health.

REFERENCE BOOK(S)

1. Pope, G. U. (Trans.). (2006). *The Tirukkural of Tiruvalluvar* (Reprint ed.). New Delhi, India: Asian Educational Services.
2. Levin, L. (1998). *Human rights: Questions and answers* (3rd ed.). New Delhi, India: National Book Trust.
3. Krishna Iyer, V. R. (1994). *Dialectics and dynamics of human rights in India*. New Delhi, India: Eastern Law House.
4. Kuvalayananda, S., & Vinekar, S. L. (1963). *Yogic therapy: Its basic principles and methods*. New Delhi, India: Ministry of Health, Government of India.
5. Chandrasekaran, K. (1999). *Sound health through yoga*. Sedapatti, India: Prem Kalyan Publications.
6. Grose, D. N. (2005). *A textbook of value education*. New Delhi, India: Dominant Publishers.
7. Gawande, E. N. (2002). *Value oriented education: Vision for better living*. New Delhi, India: Sarup & Sons.
8. Brain Trust Aliyar. (2004). *Value education for health, happiness and harmony*. Erode, India: Vethathiri Publications.

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4. <https://www.theyogainstitute.org>
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7. www.ohchr.org
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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: VI-PCC: Bioentrepreneurship

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code: U24PCBC61

UNIT-I: Introduction to Bio entrepreneurship (4 Hours)

Types of industries – Biopharma, Bio agriculture and CRO; Introduction to Trademarks, Copyrights and patents.

UNIT- II: Business Plan, Budgeting and Funding Idea or opportunity (6 Hours)

Business proposal preparation; funds/support from Government agencies like MSME/banks, DBT, BIRAC, Start-up and make in India Initiative; dispute resolution skills; external environment changes; avoiding/managing crisis; Decision making ability.

UNIT- III: Market Strategy (6 Hours)

Basics of market forecast for the industry; distribution channels – franchising, policies, promotion, advertising, branding and market; Introduction to information technology for business administration and Expansion.

UNIT- IV: Legal Requirements, Finance and Accounting (7 Hours)

Registration of company in India; Ministry of Corporate Affairs (MCA); basics in accounting; introduction to concepts of balance sheet, profit and loss statement, double entry, bookkeeping; finance and break-even analysis; difficulties of entrepreneurship in India.

UNIT- V: Entrepreneurship Development and Quality Standards (7 Hours)

Role of knowledge centres such as universities, innovation centres, research institutions (public & private) and business incubators in Entrepreneurship development; quality control and quality assurance; Definition, role and importance of CDSCO, NBA, GLP, GCP, GMP.

Total Lecture Hours-30

COURSE OUTCOME

The students are able to,

1. Understand the concept and scope for entrepreneurship.
2. Identify various operations involved in a venture creation.
3. Gather funding and launching a winning business.
4. Nurture the organization and harvest the rewards.
5. Illustrate about the Business incubator centres and Bio entrepreneurship.

TEXT BOOK(S)

1. Hisrich, Robert D., Michael P. Peters, and Dean A. Shepherd. *Entrepreneurship*. 10th ed., McGraw-Hill Education, 2016.
2. Kuratko, Donald F. *Entrepreneurship: Theory, Process, Practice*. 11th ed., Cengage Learning, 2020.
3. Shimasaki, Craig D. *Biotechnology Entrepreneurship: Starting, Managing, and Leading Biotech Companies*. 2nd ed., Academic Press, 2020.

4. Desai, Vasant. *Dynamics of Entrepreneurial Development and Management*. 6th ed., Himalaya Publishing House, 2011.
5. Barringer, Bruce R., and R. Duane Ireland. *Entrepreneurship: Successfully Launching New Ventures*. 6th ed., Pearson Education, 2018.

REFERENCE BOOK(S)

1. Burns, Paul. *Corporate Entrepreneurship: Innovation and Strategy in Large Organizations*. 3rd ed., Red Globe Press, 2017.
2. Jain, P.C. *Handbook of Entrepreneurship Development*. Oxford Book Company, 2014.
3. Morris, Michael H., *The Entrepreneurial Mindset: Strategies for Continuously Creating Opportunity in an Age of Uncertainty*. 2nd ed., Edward Elgar Publishing, 2020.
4. Peters, Thomas J., and Robert H. Waterman Jr. *In Search of Excellence: Lessons from America's Best-Run Companies*. HarperBusiness, 2006.
5. Sarasvathy, Saras D. *Effectuation: Elements of Entrepreneurial Expertise*. Edward Elgar Publishing, 2008.

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2. <https://www.startupindia.gov.in>
3. <https://cdsco.gov.in>
4. <https://www.mca.gov.in>
5. <https://birac.nic.in>

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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CO 3	3	2	3	3	1	–	–	1	1	1	3	3	3	2
CO 4	3	3	3	2	1	–	–	1	1	1	3	3	2	2
CO 5	3	3	2	2	2	1	1	2	1	2	3	3	2	2

S-Strong (3) M-Medium (2) L-Low (1)



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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: VI-Gender Studies

Ins. Hrs./Week: 1

Course Credit: 1

Course Code: 24UGGS

UNIT- I: Introduction to Gender Studies Concepts (6 Hours)

Gender Spectrum, Sex-Gender distinction, Biological Determinism, Patriarchy, Feminism, Gender Socialization and Stereotyping, Gender Discrimination, Gender Division of Labour, Gender Sensitivity, Gender Equity, Equality, Gender Mainstreaming and Gender Analysis.

UNIT- II: UGC Initiatives on Women's Studies (6 Hours)

Definition of Women's Studies, Gender Studies, UGC initiatives and guidelines, Beijing Conference, UN Initiatives, CEDAW, SDG 5 and targets.

UNIT- III: Areas of Gender Discrimination (6 Hours)

Gender Socialization, Sex Ratio, Health and Nutrition, Literacy and Education, Employment, Governance, Politics, Property Rights, Gender-based Violence, Family, Caste, Class, Religion, State, Market, Media, Judiciary.

UNIT-IV: Women Development and Gender Empowerment (6 Hours)

Towards Equality Report (1974), International Women's Decade, International Women's Year, National Policy for Empowerment of Women (2001).

UNIT-V: Women's Movements and Safeguarding Mechanism (6 Hours)

National and State Commission for Women, All Women Police Stations, Family Courts, Legislations safeguarding women, Transgender Policy, Constitutional amendments for women's political participation.

COURSE OUTCOME

The students are able to,

1. Explain the fundamental concepts of gender studies, gender equity, and gender sensitivity.
2. Describe national and international initiatives, policies, and frameworks related to women's studies and gender development.
3. Identify major areas of gender discrimination and their impact on society.
4. Analyze women's development, empowerment strategies, and the role of government policies.
5. Evaluate women's movements, legal safeguards, and contemporary issues related to gender justice and equality.

TEXT BOOK(S)

1. Bhasin, K. (2004). *Understanding gender* (Gender Basics Series). New Delhi, India: Women Unlimited.
2. Bhasin, K. (2004). *Exploring masculinity* (Gender Basics Series). New Delhi, India: Women Unlimited.
3. Bhasin, K. (2003). *What is patriarchy?* New Delhi, India: Women Unlimited.
4. Arya, S. (2000). *Women, gender equality and the state*. New Delhi, India: Deep & Deep Publications.

5. Chakravarti, U. (2003). *Gendering caste through a feminist lens*. New Delhi, India: Sage Publications.

REFERENCE BOOK(S)

1. Mishra, O. P. (2001). *Law relating to women and child*. Allahabad, India: Central Law Agency.
2. Bhattacharya, M. (2002). *Sexual violence and law*. Kolkata, India: West Bengal Commission for Women.
3. Sakshi. (1999). *Sexual harassment at the workplace: A guide*. New Delhi, India: Sakshi.
4. Nair, J. (2005). *Women and law in India*. New Delhi, India: National Book Trust.
5. Rege, S. (2006). *Writing caste/writing gender: Narrating Dalit women's testimonios*. New Delhi, India: Zubaan.

E-RESOURCES

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2. <https://www.un.org/sustainabledevelopment/gender-equality>
3. <https://www.ohchr.org>
4. <https://www.ncw.nic.in>
5. <https://www.ugc.gov.in>