SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI

(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY, MADURAI
RE-ACCREDITED WITH 'A' GRADE (THIRD CYCLE) BY NAAC WITH CGPA 3.11)

Programme Scheme, Scheme of Examination and Syllabi

(From 2021-2022 Batch onwards)

Department of Biotechnology

UG Programme

Approved in the Academic Council – XIII held on 11/08/2021

Curriculum Design and Development Cell
Annexure K

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Curriculum Design and Development Cell

HOD	Dean of Pure Science	Dean of Academic Affairs	Principal

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI

DEPARTMENT OF BIOTECHNOLOGY

MEMBERS OF BOARD OF STUDIES

S.No.	Board Members	Name and Designation
1.	Chairman of the Board	Dr. M. Sujatha Head & Assistant Professor of Biotechnology Sri Kaliswari College (Autonomous), Sivakasi.
2.	University Nominee	Dr. M. Jayalakshmi Assistant Professor Department of Immunology School of Biological Sciences Madurai Kamaraj University, Madurai -625021
3.	Academic Expert 1.	Dr. S. Venkatesh Assistant Professor, Department of Biotechnology M.S University, Tirunelveli.
4.	Academic Expert 2.	Dr. G. Sridevi Assistant Professor, Department of Plant Biotechnology, School of Biotechnology, Madurai Kamaraj University, Madurai
5.	Industrialist	Mr. K. Aruldoss Happyman Natural manure, Organic fruits and Vegetables Pavali, Virudhunagar
6.	Alumna	Ms. S. Ranjini Assistant Professor, Department of Biotechnology, Arulmigu Kalasalingam College of Arts and Science Krishnankoil.
Members		
7.	Dr. R. Narayana Prakash	Guest Faculty in Biotechnology
9.	Mrs. P. Devi	Assistant Professor in Biotechnology
10.	Mrs. G. Mareeswari	Assistant Professor in Biotechnology
11.	Dr. V. Pradeepa	Assistant Professor in Biotechnology
12.	Dr. P. Suganya	Assistant Professor in Biotechnology
13.	Dr. A. Rajalakshmi	Assistant Professor in Biotechnology
14.	Mr. T. Victor Athisayam	Assistant Professor in Biotechnology
15.	Mr. R. Kalidoss	Assistant Professor in Biotechnology

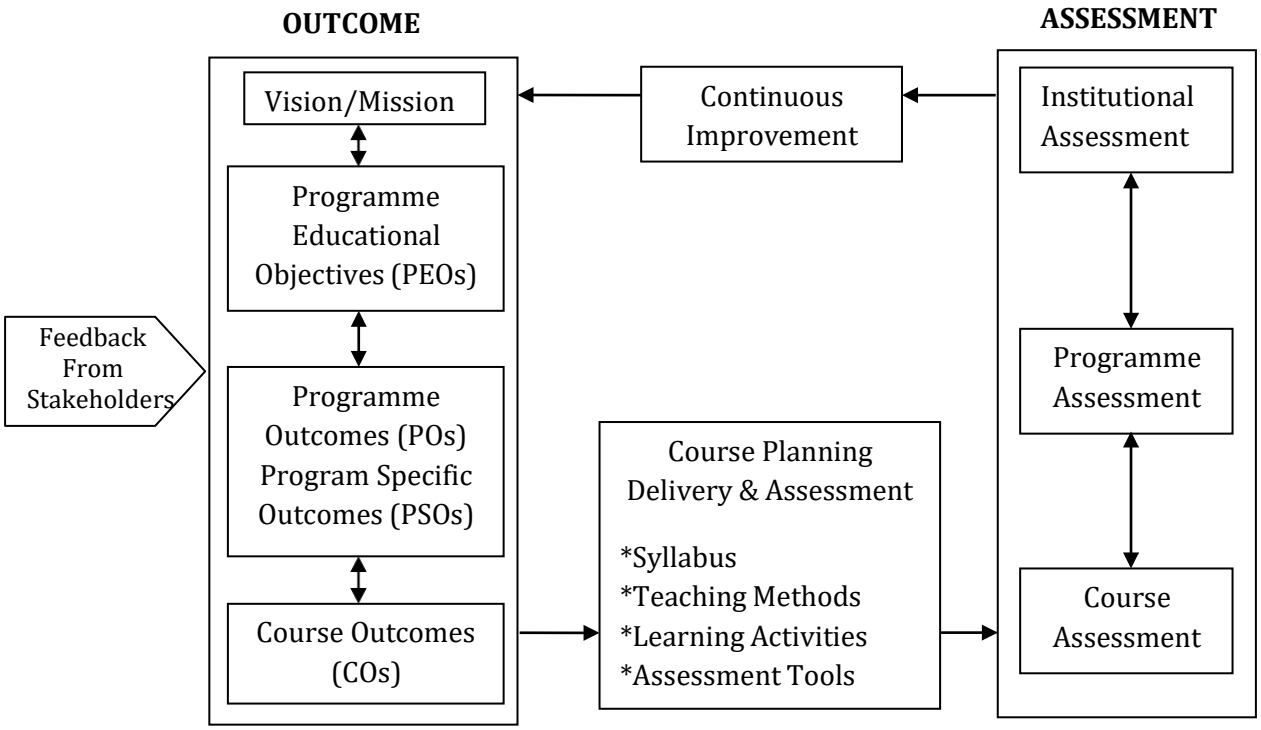
SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade (CGPA 3.11) by NAAC)
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc., Biotechnology
GUIDELINES FOR OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(From 2021-2022 Batch onwards)

INTRODUCTION

Sri Kaliswari College in its pursuit of imparting quality education has marked a remarkable growth in terms of academic excellence, infrastructure, student strength, ICT facilities, library and placement records since its establishment in 2000-2001.This institution constitutes an academic community that is committed to encourage the student community to experience and share knowledge, identify their potential, enhance the employability skills and enable them to pursue their goals. After the conferment of autonomous status in the year 2012, the college has so far gone for revision of the syllabi three times and is continually updating the syllabi to meet the needs and demands of the student community.

The institution in its success journey of imparting quality education has been Re-Accredited with A grade (CGPA 3.11) in its third cycle of accreditation by NAAC. As an added feather to its cap, the institution has taken a giant leap to embrace the Outcome-Based Education system to enable the student community to develop their knowledge, skill and attitude simultaneously through a focussed learning and help the graduates to compete with their global counterparts and prepare them for life.

I. OUTCOME-BASED EDUCATION (OBE) FRAMEWORK



II. VISION OF THE INSTITUTION

- To impart quality higher education to produce highly talented youth capable of developing the nation

III. MISSION OF THE INSTITUTION

- Ensuring quality in all aspects of the activities
- Developing the latent skills of the rural youth
- Providing value - based education to instill courage and confidence
- Nurturing the entrepreneurial skills of the rural youth
- Creating competency to meet global challenges
- Imbibing social awareness and social responsibilities

IV. VISION OF THE DEPARTMENT

- To impart quality higher education in the field of Biotechnology that intensely impact the existing paradigm of agriculture, industry, health care, and sustainable environment

V. MISSION OF THE DEPARTMENT

- To become a pioneer department of higher learning, imparting state of the art education, training, and research in the field of Biotechnology.
- To generate skilled manpower in different areas of Biotechnology to work in the Biotechnology related industries.
- To contribute to the advancement of science through applied research leading to the development of innovative products.

VI. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Graduates will

PEO1: demonstrate advance knowledge in the field of biotechnology and its cutting edge developments in a specific and emerging area.

PEO 2: acquire ability to use theoretical knowledge, practical skills, and recent technological tools in solving any technological challenges and problems in the social context and construct logical arguments using correct technical language

PEO 3: imbibe entrepreneurial traits to develop new products, processes, services and induce a desire to set-up a small-medium scale biotech based industrial system.

PEO 4: pursue higher education and enhance career opportunities in the industries and Pharma companies with global competency.

PEO 5: develop innovative technology by continuously updating their knowledge and demonstrate professional and ethical attitude with awareness of current issues for achieving personal and institutional growth.

VII. PROGRAMME OUTCOMES (POs)

Programme Outcomes are narrower statements that describe what students are expected to know and be able to do upon the graduation. These relate to the skills, knowledge and behavior that students acquire in their study through the programmes.

PO1: Disciplinary knowledge
Acquire comprehensive and scientific knowledge in the field of Science.

PO2: Critical thinking, Problem solving and Analytical reasoning
Develop students' ability of critical observation and capacity to apply the principles/facts of science to identify, analyse, evaluate and solve problems in order to draw realistic conclusions.

PO3: Scientific reasoning and Research related skills
Capability to involve in planning and conducting experiments, analyze the scientific research field, interpret and draw conclusions from experiments and investigate practically.

PO4: Communication skills and Digital literacy
Communicate effectively and articulate clearly the scientific ideas in written and oral form and make use of appropriate software for scientific computations and gain ICT skills to disseminate knowledge.

PO5: Ethics, Values and Multicultural competence
Embrace moral and ethical values and apply it with a sense of responsibility in the workplace and community and adopt objective, unbiased and truthful actions in all aspects of work.

PO6: Team Work, Leadership and Employability skills
Work effectively and respectfully in groups with enhanced inter-personal skills and exhibit qualities associated with leadership to build a team and achieve the vision and show proficiency in professional, employability and soft skills required for placements and higher educations

PO7: Self-directed and Life-long learning
Recognize the need and have the ability to engage in independent learning and be self-motivated and acquire knowledge through lifelong learning in the broadest context of technological change.

VIII. PROGRAMME SPECIFIC OUTCOMES (PSO) – B.Sc., BIOTECHNOLOGY

On successful completion of B.Sc., Biotechnology, the students will

PSO 1: acquire knowledge to understand various facets of molecular procedures and basics of Cell Biology, Microbiology, Biochemistry, Genomics, proteomics, plant and animal Biotechnology, Genetic Engineering, and Computational Biology.

PSO 2: Identify, analyze, and understand the problems related to life sciences and find suitable solutions with basic knowledge acquired in Biotechnology.

PSO 3: perform experiments as per established laboratory standards in the areas of Biotechnology and provide suitable scientific conclusions.

PSO 4: equip reading, presenting, communicating and writing scientific ideas and learn to use computer software to tabulate and interpret the Biological data.

PSO 5: learn ethical principles and show commitment to professional ethics and responsibilities with an understanding of the social, ethical, legal, and cultural aspects of society.

PSO 6: evolve managerial and leadership skill to start-up Biotech farms and skills for career and starting up own firms and function effectively as an individual, and as a member or leader in diverse teams, and multidisciplinary settings

PSO 7: acquire the ability to engage in an independent and life-long learning in the broadest context of socio-technological changes.

IX. PO-PSO Mapping Matrix – B.Sc., BIOTECHNOLOGY

PO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
PO1	✓						
PO2		✓					
PO3			✓				
PO4				✓			
PO5					✓		
PO6						✓	
PO7							✓

X. PO-PEO Mapping Matrix – B.Sc., BIOTECHNOLOGY

PO \ PEO	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	✓	✓			✓
PO2		✓	✓		
PO3		✓	✓		✓
PO4	✓	✓		✓	
PO5		✓	✓	✓	✓
PO6		✓	✓	✓	
PO7				✓	✓

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade (CGPA 3.11) by NAAC)
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc., Biotechnology

REGULATIONS

Duration of the Programme **:** Three years (equivalent to six semesters)

Eligibility

Candidate should have passed the Higher Secondary Examinations conducted by the Board of Higher Secondary Education, Government of Tamil Nadu or any other examination accepted by the Syndicate of the Madurai Kamaraj University, Madurai as its equivalent.

a) Biology/ Physics/ Chemistry as Subjects in the higher secondary education

b) Candidates should have secured at least 60% in the above subjects and above in aggregates

c) A relaxation of 10% marks in the aggregate will be given to SC/ST candidates

Medium of Instruction : English

Age Limit

Maximum age limit : 21 Years

Age Relaxation

SC/ SCA/ST/BC/BCM/MBC/DNC & Women : 3 years age relaxation
Differently-Abled Students : 5 years age relaxation

Transitory Permission

Students joined from 2021 - 2024 may be permitted to write their examinations in this pattern up to April 2029.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SCHEME OF EXAMINATION

For UG Programme, the internal and external marks are distributed as follows:
For all Theory Courses : Internal Marks: 40; External Marks: 60
For all Practical Courses, Project and Internship : Internal Marks: 50; External Marks: 50

Internal Mark Distribution for Theory Courses

Assessment Type	Marks	Scheme of Assessment
Internal Test	15 marks	Two Internal Tests and 1 Model Exam will be conducted and average of the best two will be considered
Written Assignment	5 marks	One Written Assignment will be given
E-Assignment/ Case Studies/ Reviews/ Field Assignments/ Poster Presentations/ Portfolios	5 marks	Any one of the Assignments will be given
Quiz	5 marks	One Quiz Test will be conducted
Viva/ Oral Exam/ Group Discussion/ Role Play	10 marks	Test will be conducted in any one of the Oral Mode

Internal Mark Distribution for Practical Courses

Assessment Type	Marks	Scheme of Assessment
Lab work /Program Execution	40 marks	Two Internal Tests will be conducted and the average of the two will be considered
Observation/Record Notebook	5 marks	Assessment will be done during every practical class
Viva –Voce / Lab Quiz	5 marks	Two Lab Quiz Tests/viva-voce will be conducted and the average of the two will be considered

External Mark Distribution for Practical Courses

Assessment Type	Marks	Scheme of Assessment
Lab work/Program Execution	40 marks	End result of the Practical
Viva –Voce	10 marks	Oral Mode Test

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology/ M.Sc. Biotechnology
QUESTION PAPER PATTERN

Internal Test – 30 Marks – 1 hr Duration

S.No	Type of Questions	Marks
1.	Objectives type Questions: Multiple Choice – 4 questions Answer in a Word/Sentence – 4 questions	 04 04
2.	Short Answer–3 questions –either or type	3x4=12
3.	Long Answer–1 question – either or type	1x10=10

Summative Examinations – 60 Marks -3 hrs Duration

S.No	Type of Questions	Marks
1.	Objective type Questions: Multiple Choice – 5 questions Answer in a Word/Sentence – 5 questions	 05 05
2.	Short Answer 5 questions – either or type	5x4=20
3.	Long Answer 3 questions – either or type	3x10=30

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc., Biotechnology

Attainment of Course outcomes

Attainment of Course outcomes is computed using Direct and Indirect assessment methods. Direct Method of Assessment is based on performance of the students in the Continuous Internal Assessment Tests, Summative Examinations and supporting activities such as Seminar, Assignment, Case study, Group Discussion, Quiz, etc., and Indirect Method of Assessment is based on periodical feedback from the students at the end of each course.

Weightage of Direct and Indirect Assessment in computation of attainment of each course is 70% for Direct Assessment and 30% for Indirect Assessment.

Direct Assessment of Course outcome attainment

i) Rubrics:

Internal Assessment contributes 60% and Summative Examinations Assessment contributes 40% to the Direct Assessment of a course outcome for Theory Courses. For the Practical Courses, Internal Assessment contributes 70% and Summative Examinations Assessment contributes 30% to the Direct Assessment of a course outcome.

ii) Setting of Target:

50% of the maximum mark is set as target of Internal Assessment tools and the average mark of the class is set as target of Summative Examinations Assessment.

Formula for calculating percentage attainment of each course outcome

Based on the result of Summative Examinations and Internal Assessment tools, the number of students scoring more than the target is found out.

For each Internal Assessment Tools,

$$\text{Percentage attainment of each course outcome} = \frac{\text{No. of. Students who scored more than the target in the concerned course outcome}}{\text{Total Number of Students}} \times 100$$

$$\text{Percentage attainment of each Course outcome for Internal Assessment tools} = \text{Average of percentage attainment of all Internal Assessment tools}$$

For Summative Examinations,

$$\text{Percentage attainment of each Course outcome} = \frac{\text{No. of. Students who scored more than the target in the concerned co}}{\text{Total Number of Students}} \times 100$$

Formula for calculating Attainment Percentage of Course outcome of acourse

Percentage Attainment of Course outcome for Internal Assessment tools = Average of percentage attainment of all Cos

Percentage Attainment of Course outcome for Summative Examinations = Average of percentage attainment of all Cos

Final Direct Assessment of Course

outcome AttainmentFor Theory Courses

Percentage Attainment of Course outcome through Direct Assessment = (0.6 x percentage attainment of CO for internal assessment tool) + (0.4 x percentage attainment of CO for summative examinations)

For Practical Courses

Percentage Attainment of Course outcome through Direct Assessment = 0.7 x percentage attainment of CO for Internal Assessment tools + 0.3 x percentage attainment of CO for Summative Examinations

Indirect Assessment of CO Attainment

The course outcome feedback is conducted at the end of every semester by distributing structured feedback questionnaire to the students. The analysis of this feedback questionnaire is done on the following score. The feedback forms will be sorted with various scores and feedbacks with a score more than 5.5 are considered as satisfactory level for calculations for indirect attainment.

A : 10-8.5 **B :** 8.4-7.0 **C :** 6.9-5.5 **D :** 5.4-4.0 **E :** 3.9-0

$$\text{Percentage attainment for each CO} = \frac{\text{Satisfaction Number}}{\text{Response Received}} \times 100$$

Percentage Attainment of CO of a course = Average of percentage attainment ofall COs

Final Assessment of CO attainment

Average course attainment = 0.7 x Direct assessment of CO attainment + 0.3 x Indirect assessment of CO attainment

Expected Level of Attainment for each of the Course Outcomes

CO	Level of Attainment
Above 70%	Excellent
60 -70 %	Very good
50-60 %	Good
40 – 50 %	Satisfactory
Below 40%	Not Satisfactory

Assessment of PO attainment

At the end of the each programme, the Direct PO Assessment is done fromthe CO Attainment of all courses. The Direct PO Attainment for a particular course is determined from the attainment values obtained for each course outcome related to that PO and the CO-PO mapping values.

$$\text{Weighted contribution of the course in attainment of each PO} = \frac{\text{Weighted Percentage of contribution of the course in attainmentof each PO}}{\text{average course attainment}} \times 100$$

Expected Level of Attainment for each of the Programme Outcomes

PO	Level of Attainment
Above 70%	Excellent
60 -70 %	Very good
50-60 %	Good
40 – 50 %	Satisfactory
Below 40%	Not Satisfactory

Attainment of Programme Educational Objectives (PEO)

PEOs are assessed after 3 to 4 years of graduation. Attainment is measured basedon the Feedback from Stakeholders

1. Alumni
2. Parents
3. Employer

The analysis of this feedback questionnaire is done on the following score. The feedback forms will be sorted with various scores and feedbacks with a score more than 5.5 are considered as satisfactory level for calculations for Indirect Attainment.

A : 10-8.5 **B :** 8.4-7.0 **C :** 6.9-5.5 **D :** 5.4-4.0 **E :** 3.9-0

$$\text{Percentage attainment of PEOs} = \frac{\text{Satisfaction number}}{\text{Response Received}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

PEO	Level of Attainment
Above 70%	Excellent
60 -70 %	Very good
50-60 %	Good
40 – 50 %	Satisfactory
Below 40%	Not Satisfactory

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DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc., Biotechnology
CURRICULUM STRUCTURE
OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(From 2021-2022 Batch onwards)

S. No	Courses	Sem I	Sem II	Sem III	Sem IV	Sem V	SemVI	Credits
I	Tamil / Hindi / French	6 (3)	6 (3)	6 (3)	6 (3)	-	-	12
II	English	6 (3)	6 (3)	6 (3)	6 (3)	-	-	12
III	Core Courses	4 (4) 4P (3)	4 (4) 4P (3)	4 (4) 4P (3)	4 (4) 4P (2)	5 (5) 5 (5) 5 (4) 5P (4)	5(5) 5 (5) 5 (5) 5P(4) 4P(3)	67
	Allied Courses	4(4) 2P(1)	4(4) 2P(1)	4(4) 2P(1)	4(4) 2P(1)	-	-	20
	Major Elective Courses	-	-	-	-	4(3) 4(3)	4(3)	9
	Self-paced Learning (Swayam Course)	-	-	-	(2)			2
IV	Ability Enhancement Compulsory Course AECC 1.Environmental Studies	2(1)	-	-	-	-	-	1
	2. Value Education	-	1(1)	-	-	-	-	1
	Non-Major Elective Courses	-	-	2 (1)	2 (1)	-	-	2
	Skill Enhancement Courses	2 (1)	2(2)	2 (2)	2(2)	2(2)	2 (2)	11
	Internship					(1)		1
	Disaster Management		1(1)					1
V	Extension	-	-	-	(1)	-	-	1
Total Hours (Per Week)/Credits		30(20)	30(22)	30(21)	30(23)	30(27)	30(27)	140 180

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DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc., Biotechnology
CURRICULUM PATTERN
OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(From 2021-2022 Batch onwards)
PROGRAMME CODE – UBT

Semester	Part	Course code	Course Name	Hours	Credits
I	I	21UTAL11	Tamil/Hindi – I	6	3
	II	21UENL11	Communicative English – I	6	3
	III	21UBTC11	**Core Course - I:** Cell Biology and Genetics	4	4
		21UBTC1P	**Core Course - II: Practical:** Cell Biology and Genetics	4	3
		21UBTA11	**Allied Course - I:** Chemistry - I	4	4
		21UBTA1P	**Allied Course - I: Practical:** Volumetric analysis	2	1
	IV	21UESR11	**Ability Enhancement Compulsory Course - I:** Environmental Studies	2	1
		21UBTS11	**Skill Enhancement Course - I:** Biotechnology and Human Welfare	2	1
			Total	**30**	**20**
II	I	21UTAL21	Tamil/Hindi – II	6	3
	II	21UENL21	Communicative English – II	6	3
	III	21UBTC21	**Core Course - III:** Biochemistry and Metabolism	4	4
		21UBTC2P	**Core Course - IV: Practical:** Biochemistry	4	3
		21UBTA21	**Allied Course - II:** Chemistry-II	4	4
		21UBTA2P	**Allied Course - II: Practical:** Organic analysis	2	1
	IV	21UVED21	**Ability Enhancement Compulsory Course - II:** Value Education	1	1
		21UBTS21	**Skill Enhancement Course - II:** Plant and Animal Physiology	2	2
		21UDMG21	**Disaster Management**	1	1
			Total	**30**	**22**
III	I	21UTAL31	Tamil/Hindi – III	6	3
	II	21UENL31	Communicative English – III	6	3
	III	21UBTC31	**Core Course - V:** Microbiology	4	4
		21UBTC3P	**Core Course - VI: Practical:** Microbiology	4	3
		21UBTA31	**Allied Course - III**: Biological Sciences	4	4
		21UBTA3P	**Allied Course - III**: **Practical:** Biological Sciences	2	1

	IV	21UBTN31	**Non Major Elective course - I**: Infectious Diseases	2	1
		21UBTS31	**Skill Enhancement Course - III: Practical:** Entrepreneurship in Biotechnology – I	2	2
			Total	**30**	**21**
IV	I	21UTAL41	Tamil/Hindi – IV	6	3
	II	21UENL41	Communicative English – IV	6	3
	III	21UBTC41	**Core Course - VII:** Molecular Biology and Microbial Genetics	4	4
		21UBTC4P	**Core Course - VIII: Practical:** Molecular Biology and Microbial Genetics	4	2
		21UBTA41	**Allied Course - IV:** Bioanalytical Tools	4	4
		21UBTA4P	**Allied Course - IV: Practical:** Bioanalytical Tools	2	1
		21UBTM41 21UBTM42	**Self-paced learning** (Swayam Course) 1Cell culture Technologies 2.Computer Aided Drug Designing		2
	IV	21UBTN41	**Non Major Elective course - II**: Mushroom Cultivation	2	1
		21UBTS41	**Skill Enhancement Course - IV: Practical:** Entrepreneurship in Biotechnology – II	2	2
	V		**Extension**	--	1
			Total	**30**	**23**
V	III	21UBTC51	**Core Course - IX:** Plant Biotechnology	5	5
		21UBTC52	**Core Course - X:** Animal Biotechnology	5	5
		21UBTC53	**Core Course - XI:** Food Biotechnology	5	4
		21UBTC5P	**Core Course - XII: Practical:** Plant, Animal and Food Biotechnology	5	4
		21UBTO51 21UBTO52 21UBTO53	**Major Elective Course – I** 1. Biostatistics 2. Biophysics 3. Bio – Instrumentation	4	3
		21UBTO54 21UBTO55 21UBTO56	**Major Elective Course – II** 1. Genetically Modified Organisms 2. Natural products 3. Medicinal Plants	4	3
	IV	21UBTS51	**Skill Enhancement Course - V:** Nanobiotechnology and Cancer Biology	2	2
		21UBTJ51	**Internship**	--	1
			Total	**30**	**27**
VI	III	21UBTC61	**Core Course - XIII:** Recombinant DNA Technology and Forensic Science	5	5
		21UBTC62	**Core Course - XIV:** Immunology and Immunotechnology	5	5
		21UBTC63	**Core Course - XV:** Industrial Biotechnology	5	5
		21UBTC6P	**Core Course - XVI: Practical:** Recombinant DNA Technology and Industrial Biotechnology	5	4

		21UBTC6Q	**Core Course -XVII: Practical:** Immunology and Immunotechnology	4	3
		21UBTO61 21UBTO62 21UBTO63	**Major Elective Course – III** 1. IPR, Bioethics and Biosafety 2.Evolutionary Biology 3. Stem Cell Biology	4	3
	IV	21UBTS61	**Skill Enhancement Course - VI:** Bioinformatics and Functional Genomics	2	2
			Total	**30**	**27**
			Total	**180**	**140**

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DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc., Biotechnology
OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(From 2021-2022 Batch onwards)

PROGRAMME ARTICULATION MATRIX (PAM)

Semester	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	21UTAL11	Tamil/Hindi – I	10	7	2	8	2	2	2
	21UENL11	Communicative English – I	10	7	2	8	2	2	3
	21UBTC11	**Core Course - I:** Cell Biology and Genetics	15	11	8	5	5	5	5
	21UBTC1P	**Core Course - II: Practical:** Cell Biology and Genetics	13	13	12	8	0	0	0
	21UBTA11	**Allied Course - I:** Chemistry – I	15	10	05	04	02	03	02
	21UBTA1P	**Allied Course - I: Practical:** Volumetric analysis	15	10	5	2	2	4	3
	21UESR11	**Ability Enhancement Compulsory Course - I:** Environmental Studies	8	5	1	7	8	5	5
	21UBTS11	**Skill Enhancement Course - I:** Biotechnology and Human Welfare	9	9	7	7	3	2	3
II	21UTAL21	Tamil/Hindi – II	10	08	02	08	02	02	02
	21UENL21	Communicative English – II	10	08	02	08	02	02	03
	21UBTC21	**Core Course - III:** Biochemistry and Metabolism	13	12	7	4	0	0	10
	21UBTC2P	**Core Course - IV: Practical:** Biochemistry	15	10	9	4	3	4	5
	21UBTA21	**Allied Course - II:** Chemistry-II	15	10	05	04	02	03	02
	21UBTA2P	**Allied Course - II: Practical:** Organic analysis	15	10	05	02	02	04	03
	21UVED21	**Ability Enhancement Compulsory Course - II:** Value Education	08	05	01	05	09	04	07
	21UBTS21	**Skill Enhancement Course - II:** Plant and Animal Physiology	11	8	7	5	2	0	5
	21UDMG21	**Disaster Management**	07	08	02	05	02	04	08
III	21UTAL31	Tamil/Hindi – III	10	8	2	8	2	2	2
	21UENL31	Communicative English – III	10	08	03	09	03	03	02
	21UBTC31	**Core Course - V:** Microbiology	12	10	8	5	6	5	5
	21UBTC3P	**Core Course - VI: Practical:** Microbiology	10	9	10	5	10	5	5
	21UBTA31	**Allied Course - III**: Biological Sciences	10	10	5	5	5	5	5
	21UBTA3P	**Allied Course - III**: **Practical:** Biological Sciences	10	5	10	5	0	10	10

	21UBTN31	**Non Major Elective course - I**: Infectious Diseases	9	5	0	8	0	5	5
	21UBTS31	**Skill Enhancement Course - III: Practical:** Entrepreneurship in Biotechnology – I	5	5	5	5	5	10	5
IV	21UTAL41	Tamil/Hindi – IV	10	8	2	9	2	2	2
	21UENL41	Communicative English – IV	10	09	03	08	02	03	03
	21UBTC41	**Core Course - VII:** Molecular Biology and Microbial Genetics	15	10	10	5	2	5	5
	21UBTC4P	**Core Course - VIII: Practical:** Molecular Biology and Microbial Genetics	10	9	10	5	4	5	5
	21UBTA41	**Allied Course - IV:** Bioanalytical Tools	10	13	10	5	5	5	5
	21UBTA4P	**Allied Course - IV: Practical:** Bioanalytical Tools	10	9	10	5	3	5	5
	21UBTM41 21UBTM42	**Self-paced learning** (Swayam Course) 1Cell culture Technologies 2. Computer Aided Drug Designing	13	10	5	9	1	2	7
	21UBTN41	**Non Major Elective course - II**: Mushroom Cultivation	9	5	0	8	0	5	5
	21UBTS41	**Skill Enhancement Course - IV: Practical:** Entrepreneurship in Biotechnology – II	5	5	5	5	5	10	5
		Extension	08	02	01	07	09	08	05
V	21UBTC51	**Core Course - IX:** Plant Biotechnology	13	11	9	5	2	5	5
	21UBTC52	**Core Course - X:** Animal Biotechnology	13	11	9	5	2	5	5
	21UBTC53	**Core Course - XI:** Food Biotechnology	11	10	8	5	5	6	5
	21UBTC5P	**Core Course - XII: Practical:** Plant, Animal and Food Biotechnology	12	10	10	5	5	4	4
	21UBTO51 21UBTO52 21UBTO53	**Major Elective Course – I** 1. Biostatistics 2. Biophysics 3. Bio – Instrumentation	10	11	5	5	7	5	6
	21UBTO54 21UBTO55 21UBTO56	**Major Elective Course – II** 1. Genetically Modified Organisms 2. Natural products 3. Medicinal Plants	10	11	5	5	7	5	6
	21UBTS51	**Skill Enhancement Course - V:** Nanobiotechnology and Cancer Biology	10	5	5	5	5	5	5
	21UBTJ51	**Internship**	8	12	4	7	1	5	8
VI	21UBTC61	**Core Course - XIII:** Recombinant DNA Technology and Forensic Science	15	11	11	5	2	5	5
	21UBTC62	**Core Course - XIV:** Immunology and Immunotechnology	15	10	10	6	5	4	4
	21UBTC63	**Core Course - XV:** Industrial Biotechnology	13	10	11	5	5	4	4
	21UBTC6P	**Core Course - XVI: Practical:** Recombinant DNA Technology and Industrial Biotechnology	15	12	12	6	2	5	5

	21UBTC6Q	**Core Course -XVII: Practical:** Immunology and Immunotechnology	15	10	10	6	5	5	4
	21UBTO61 21UBTO62 21UBTO63	**Major Elective Course – III** 1IPR, Bioethics and Biosafety 2Evolutionary Biology 3. Stem Cell Biology	10	10	10	5	5	5	5
	21UBTS61	**Skill Enhancement Course - VI:** Bioinformatics and Functional Genomics	5	5	8	5	5	5	5
Total Weightage of all Courses Contributing to PO			**550**	**440**	**308**	**290**	**175**	**214**	**230**

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi
(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade (CGPA 3.11) by NAAC)
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc., Biotechnology
OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(From 2021-2022 Batch onwards)

PROGRAMME ARTICULATION MATRIX – WEIGHTED PERCENTAGE

Semester	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7
I	21UTAL11	Tamil/Hindi – I	1.82	1.59	0.65	2.76	1.14	0.93	0.87
	21UENL11	Communicative English – I	1.82	1.59	0.65	2.77	1.14	0.93	1.3
	21UBTC11	**Core Course - I:** Cell Biology and Genetics	2.73	2.5	2.6	1.72	2.86	2.34	2.17
	21UBTC1P	**Core Course - II: Practical:** Cell Biology and Genetics	2.36	2.95	3.9	2.76	0	0	0
	21UBTA11	**Allied Course - I:** Chemistry – I	2.73	2.27	1.62	1.38	1.14	1.4	0.87
	21UBTA1P	**Allied Course - I: Practical:** Volumetric analysis	2.73	2.27	1.62	0.69	1.14	1.87	1.3
	21UESR11	**Ability Enhancement Compulsory Course - I:** Environmental Studies	1.45	1.14	0.32	2.41	4.57	2.34	2.17
	21UBTS11	**Skill Enhancement Course - I:** Biotechnology and Human Welfare	1.64	2.05	2.27	2.41	1.71	0.93	1.3
II	21UTAL21	Tamil/Hindi – II	1.82	1.82	0.65	2.76	1.14	0.93	0.87
	21UENL21	Communicative English – II	1.82	1.82	0.65	2.76	1.14	0.93	1.3
	21UBTC21	**Core Course - III:** Biochemistry and Metabolism	2.36	2.73	2.27	1.38	0	0	4.35
	21UBTC2P	**Core Course - IV: Practical:** Biochemistry	2.73	2.27	2.92	1.38	1.71	1.87	2.17
	21UBTA21	**Allied Course - II:** Chemistry-II	2.73	2.27	1.62	1.38	1.14	1.4	0.87
	21UBTA2P	**Allied Course - II: Practical:** Organic analysis	2.73	2.27	1.62	0.69	1.14	1.87	1.3
	21UVED21	**Ability Enhancement Compulsory Course - II:** Value Education	1.45	1.14	0.32	1.72	5.14	1.87	3.04
	21UBTS21	**Skill Enhancement Course - II:** Plant and Animal Physiology	2	1.82	2.27	1.72	1.14	0	2.17

	21UDMG21	**Disaster Management**	1.27	1.82	0.65	1.72	1.14	1.87	3.48
III	21UTAL31	Tamil/Hindi – III	1.82	1.82	0.65	2.76	1.14	0.93	0.87
	21UENL31	Communicative English – III	1.82	1.82	0.97	3.11	1.71	1.4	0.87
	21UBTC31	**Core Course - V:** Microbiology	2.18	2.27	2.6	1.72	3.43	2.34	2.17
	21UBTC3P	**Core Course - VI: Practical:** Microbiology	1.82	2.05	3.25	1.72	5.71	2.34	2.17
	21UBTA31	**Allied Course - III**: Biological Sciences	1.82	2.27	1.62	1.72	2.86	2.34	2.17
	21UBTA3P	**Allied Course - III**: **Practical:** Biological Sciences	1.82	1.14	3.25	1.72	0	4.67	4.35
	21UBTN31	**Non Major Elective course - I**: Infectious Diseases	1.64	1.14	0	2.76	0	2.34	2.17
	21UBTS31	**Skill Enhancement Course - III: Practical:** Entrepreneurship in Biotechnology – I	0.91	1.14	1.62	1.72	2.86	4.67	2.17
IV	21UTAL41	Tamil/Hindi – IV	1.82	1.82	0.65	3.1	1.14	0.93	0.87
	21UENL41	Communicative English – IV	1.82	2.05	0.97	2.76	1.14	1.4	1.3
	21UBTC41	**Core Course - VII:** Molecular Biology and Microbial Genetics	2.73	2.27	3.25	1.72	1.14	2.34	2.17
	21UBTC4P	**Core Course - VIII: Practical:** Molecular Biology and Microbial Genetics	1.82	2.05	3.25	1.72	2.29	2.34	2.17
	21UBTA41	**Allied Course - IV:** Bioanalytical Tools	1.82	2.95	3.25	1.72	2.86	2.34	2.17
	21UBTA4P	**Allied Course - IV: Practical:** Bioanalytical Tools	1.82	2.05	3.25	1.72	1.71	2.34	2.17
	21UBTM41 21UBTM42	**Self-paced learning** (Swayam Course) 1. Cell culture Technologies 2. Computer Aided DrugDesigning	2.36	2.27	1.62	3.11	0.57	0.93	3.04
	21UBTN41	**Non Major Elective course - II**: Mushroom Cultivation	1.64	1.14	0	2.76	0	2.34	2.17
	21UBTS41	**Skill Enhancement Course - IV: Practical:** Entrepreneurship in Biotechnology – II	0.91	1.14	1.62	1.72	2.86	4.67	2.17
		Extension	1.45	0.45	0.32	2.41	5.14	3.74	2.17

	21UBTC51	**Core Course - IX:** Plant Biotechnology	2.36	2.5	2.92	1.72	1.14	2.34	2.17
	21UBTC52	**Core Course - X:** Animal Biotechnology	2.36	2.5	2.92	1.72	1.14	2.34	2.17
	21UBTC53	**Core Course - XI:** Food Biotechnology	2	2.27	2.6	1.72	2.86	2.8	2.17
V	21UBTC5P	**Core Course - XII: Practical:** Plant, Animal and Food Biotechnology	2.18	2.27	3.25	1.72	2.86	1.87	1.74
	21UBTO51 21UBTO52 21UBTO53	**Major Elective Course – I** 1. Biostatistics 2. Biophysics 3. Bio – Instrumentation	1.82	2.5	1.62	1.72	4	2.34	2.61
	21UBTO54 21UBTO55 21UBTO56	**Major Elective Course – II** 1. Genetically Modified Organisms 2. Natural products 3. Medicinal Plants	1.82	2.5	1.62	1.72	4	2.34	2.61
	21UBTS51	**Skill Enhancement Course - V:** Nanobiotechnology and Cancer Biology	1.82	1.14	1.62	1.72	2.86	2.34	2.17
	21UBTJ51	**Internship**	1.45	2.73	1.3	2.41	0.57	2.34	3.48
VI	21UBTC61	**Core Course - XIII:** Recombinant DNA Technology and Forensic Science	2.73	2.5	3.57	1.72	1.14	2.34	2.17
	21UBTC62	**Core Course - XIV:** Immunology and Immunotechnology	2.36	2.27	3.57	1.72	2.86	1.87	1.74
	21UBTC63	**Core Course - XV:** Industrial Biotechnology	2.36	2.27	3.57	1.72	2.86	1.87	1.74
	21UBTC6P	**Core Course - XVI: Practical:** Recombinant DNA Technology and Industrial Biotechnology	2.73	2.73	3.9	2.07	1.14	2.34	2.17
	21UBTC6Q	**Core Course -XVII: Practical:** Immunology and Immunotechnology	2.73	2.27	3.25	2.07	2.86	2.34	1.74
	21UBTO61 21UBTO62 21UBTO63	**Major Elective Course – III** 1. IPR, Bioethics and Biosafety 2Evolutionary Biology 3. Stem Cell Biology	1.82	2.27	3.25	1.72	2.86	2.34	2.17
	21UBTS61	**Skill Enhancement Course - VI:** Bioinformatics and Functional Genomics	0.91	1.14	2.6	1.72	2.86	2.34	2.17
Total Weighted Percentage of Course Contribution to Pos			**100**	**100**	**100**	**100**	**100**	**100**	**100**

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF TAMIL
UG Programme - B.A./B.SC./BCA
SEMESTER - I
பொதுத்தமிழ் - I (21UTAL11)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 6 **INT.MARKS : 40**
CREDITS : 3 **EXT.MARKS : 60**
DURATION : 90 hrs **MAX.MARKS : 100**

நோக்கம்

தற்கால இலக்கியவகைமைகளைஅறிமுகப்படுத்தும் நோக்கில் இத்தாள் வடிவமைக்கப்பட்டுள்ளது.

கற்றலின் பயன்கள்

இத்தாளைவெற்றிகரமாகமுடித்தவுடன் மாணவர்கள்,

CO1[K1]: நவீன இலக்கியவகைமைகளைஅடையாளம் காண்பர்.

CO2[K2]: மொழி இலக்கணஅறிவினைப் புரிந்துகொண்டுபிழை இன்றிஎழுதும் திறன்பெறுவர்.

CO3[K3]:இக்கால இலக்கியங்களின் கருத்தம்சங்களைதம் வாழ்நிலையோடு பொருத்திப்பார்ப்பர்.

CO4[K5]: நவீன இலக்கியங்கள் படைப்பதற்குஅடிப்படையாகஅமைந்தமுறைமை குறித்துமதிப்பீடுசெய்துஅவற்றைவிமர்சிப்பர்.

CO5[K6]: உலகளாவியகவிதைநாடகப் படைப்புகளைக் கற்றுப் படைப்பர்.

CO-PO Mapping Table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	-	2	-	-	-
CO2[K2]	2	2	-	2	-	-	-
CO3[K3]	2	1	-	2	1	-	-
CO4[K5]	2	1	1	1	1	1	1
CO5[K6]	2	1	1	1	-	1	1
Weightage of the course	10	7	2	8	2	2	2
Weighted percentage of Course Contribution to Pos	**1.82**	**1.59**	**0.65**	**2.76**	**1.14**	**0.93**	**0.87**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

கூறு I **(18hrs)**

மரபுக்கவிதை: மரபுக்கவிதையின் தோற்றமும் வளர்ச்சியும்,**பாரதியார்**:யாமறிந்தமொழிகளிலே,பகைவனுக்குஅருள்வாய்.**பாரதிதாசன்**:வீரத் தமிழன்,தொழிலாளர் விண்ணப்பம்.**கவிமணி**:ஒற்றுமையேஉயிர்நிலை. **நாமக்கல் கவிஞர்:**பெண் மனம்.**முடியரசன்**:தமிழ் தான் என் பேர்.**கண்ணதாசன்:**யாத்திரை.**பட்டுக்கோட்டை:**சின்னப்பயலே.....

கூறுII **(18hrs)**

புதுக்கவிதை:புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் - ஹைக்கூவின் தோற்றமும் வளர்ச்சியும். **அப்துல் ரகுமான்** - பாருக்குள்ளேநல்லநாடு. **நா.காமராசர்:**கண்.**மு.மேத்தா:**கால்களால் நடந்தகதை.**வைரமுத்து:**ஐந்துபெரிது ஆறு சிறிது, **பா.விஜய்:**பேனாபேசுச்சு. **கனிமொழி**:கருவறைவாசனை.**ஹைக்கூ கவிதை:** இ.பரிமளம் -அமுதபாரதி - பா.உதயகண்ணன் - இ.ரா.இரவி - மணிவேலன்- புதுவைசீனு.தமிழ்மணி-புதுவைத்தமிழ்நெஞ்சன் - அறிவுமதி- ஸ்ரீரசா-தங்கம் மூர்த்தி - புதுக்கவிதை - ஹைக்கூ படைப்பதற்குப் பயிற்சிஅளித்தல்.

கூறு III **(18hrs)**

நாடகம்:நாடகத்தின் தோற்றமும் வளர்ச்சியும்,புராண இலக்கியநாடகங்கள் - **ஜெயந்திநாகராஜன்:**திருநாவுக்கரசர் - திருஞானசம்பந்தர்.

கூறு IV **(18hrs)**

நாடகம்:புராண இலக்கியநாடகங்கள் - ஜெயந்திநாகராஜன் 1. மாணிக்கவாசகர் 2. கண்ணப்பநாயனார் 3. மெய்ப்பொருள் நாயனார்,நாடகம் படைப்பதற்குப் பயிற்சிஅளித்தல்.

கூறு V **(18hrs)**

இலக்கணம் :முதல், சார்பெழுத்துக்கள் - மொழிமுதல், மொழி இறுதிஎழுத்துக்கள் - வல்லினம் மிகும், மிகா இடங்கள்.

பாடநூல்கள்

1. *தொகுப்பு நூல்*,தமிழியல்துறை,ஸ்ரீ காளீஸ்வரிகல்லூரி (தன்னாட்சி),சிவகாசி.
2. ஜெயந்திநாகராஜன்.*புராண இலக்கியநாடகங்கள்*,தாமரைபப்ளிகேஷன்ஸ்,சென்னை,2014.
3. வாசுதேவன்,கா.*பன்முகநோக்கில் தமிழ் இலக்கியவரலாறு*,தேவன் பதிப்பகம்,திருச்சிராப்பள்ளி,2017.

பார்வை நூல்கள்

1. சுதந்திரமுத்து, மு.*படைப்புக் கலை*,அறிவுப் பதிப்பகம்,சென்னை,2008.
2. பாக்கியமேரி.*தமிழ் இலக்கியவரலாறு*,நியூ செஞ்சுரி புக் ஹவுஸ்,சென்னை,2011.
3. ஸ்ரீதரன்,என்.*பிழையின்றித் தமிழ் எழுதுவோம்*,ஸ்ரீ நந்தினிபதிப்பகம்,சென்னை, 2008.

வலைப்பதிவுகள்(Web Sources)

1. https://youtu.be/6mrdbprILo8
2. https://youtu.be/QYizo6YwBXl
3. https://youtu.be/-oUmlDvHvQg
4. https://youtu.be/3sY76BTiqPQ
5. https://youtu.be/xLosPsqJ6W0

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF ENGLISH
UG Programme - B.A./B.Com./ B.B.A./B.SC./BCA
SEMESTER- I
COMMUNICATIVE ENGLISH - I (21UENL11)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 6 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course helps the learners to develop their communication skills in English through listening, speaking, reading, and writing practices.

Course Outcomes (CO)

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

CO1[K1]: relate and state ideas by reading and listening to simple recorded conversations and fables

CO2[K2]: demonstrate communicative skills through simple Descriptions, Requests and Instructions

CO3[K3]: apply knowledge of word power and grammar rules in Formal and Informal letter writings

CO4[K4]: analyze fairy tales and folk tales to develop language skills through literature

CO5[K6]: construct grammatically correct and meaningful simple sentences in English

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	-	2	-	-	-
CO2[K2]	2	2	-	2	-	-	-
CO3[K3]	2	1	-	2	1	-	1
CO4[K4]	2	1	1	1	1	1	1
CO5[K6]	2	1	1	1	-	1	1
Weightage of the course	10	07	02	08	02	02	03
Weighted percentage of Course contribution to Pos	**1.82**	**1.59**	**0.65**	**2.77**	**1.14**	**0.93**	**1.3**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I - LISTENING AND SPEAKING **(18 hrs)**

A. Listening

Listening to simple conversations in everyday contexts
Listening to fables
Listening to News Bulletin

B. Speaking

Introducing oneself and others
Describing persons, places, things, daily routines, health and symptoms
Asking for time and date
Asking for directions and giving directions
Giving instructions and seeking clarifications
Making requests and responding to requests
Thanking someone and responding to thanks

UNIT II - READING AND WRITING **(18 hrs)**

A. Reading

Interpreting pictures/maps/pie-charts/tables/flow charts /diagrams
Skimming or scanning through the texts

B. Writing

Hints Developing
Story Completion/ completing the story based on given outline.
Letter Writing: Informal letters- Family, Friends and Relatives
Formal letters: Leave letters and Apology Letter

UNIT III - WORD POWER **(18 hrs)**

Prefixes and Suffixes
Homophones and Homonyms
Words related to Parts of the Body & their functions, Cries of Animals, Young Ones of Animals
Connotative and Denotative words
Contextual Usage of words
Puzzles and Anagrams

UNIT IV - GRAMMAR **(18 hrs)**

Nouns-Kinds, Number and Gender
Pronouns-Kinds
Adjectives- Kinds
Verbs-Regular and Irregular verbs, Transitive and Intransitive Verbs
Adverbs- Kinds and Position of Adverbs

UNIT V - LANGUAGE THROUGH LITERATURE (18 hrs)

Fairy Tales, Folk Tales and Legendary Heroes

Fairy Tales

The Pied Piper of Hamelin

The Ugly Duckling

Hansel and Gretel

Folk Tales

Alibaba and the Forty Thieves

Aladdin and the Magic Lamp

The Town Mouse and the Country Mouse

Legendary Heroes

Chhatrapati Shivaji Maharaj- Shivaji's great escape

Mahatma Gandhi- Mohandas takes a spelling test

Tenali Raman- The Stolen Brinjal

Akbar and Birbal- Re-Union

TEXTBOOKS

1. Carthy Mc., and Felicity O'Dell. *English Vocabulary in Use (Upper intermediate)*. UK: Cambridge University Press, 2005.
2. Pillai, Radhakrishna, and K.Rajeevan. *Spoken English for You (Level One)*. Chennai: Emerald Publishers, 2009.
3. Sreelekshmi. *Folk Tales- A WonderWorld of 150 Stories for Children*. Kerala: SL Publishers, 2004.

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1. Babu, Sundara. *Leo's Tenali Raman Stories*. Chennai: Leo Book Publishers, 2015.
2. Kalyani V. *Fairy Tales 1*. Kerala: Sisco Publishers, 2004.
3. *Life Skills* (Jeevan Kaushal) *Facilitators' Guidelines*. New Delhi: University Grants Commission, 2021.
4. Sadanand, Kamalesh and Susheela Punitha. *Spoken English- A Foundation Course for Speakers of Tamil*. Mumbai: Orient Blackswan, 2009.
5. Taylor, Grant. *English Conversation Practice*. New Delhi: Tata McGraw Hill Publishers, 2001.

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2. https://kathakids.com/great-personalities/stories-of-mahatma-gandhi/
3. https://www.infoplease.com/dictionary/brewers/animals-cries
4. https://www.zooborns.com/zooborns/baby-animal-names.html
5. https://learnenglish.britishcouncil.org/general-english/stories
6. https://www.talkenglish.com/lessonindex.aspx
7. https://www.englishhelper.com/
8. https://www.englishpage.com/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - I
CORE COURSE - I: CELL BIOLOGY AND GENETICS (21UBTC11)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to different areas of cellular biology including structure and function of prokaryotic and eukaryotic cells, membrane and organelle structure and function, chemical composition of the cell, cell organelles and cellular communication.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: define the cell regulations and gene interactions
CO2[K2]: illustrate the structure and functions of cellular components
CO3[K3]: determine the factors responsible for inherited disorders
CO4[K4]: compare the different stages of cell cycles
CO5[K4]: differentiate linkage and crossing over

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	1	1	1	1	1	1
CO2[K2]	3	2	2	1	1	1	1
CO3[K3]	3	2	1	1	1	1	1
CO4[K4]	3	3	2	1	1	1	1
CO5[K4]	3	3	2	1	1	1	1
Weightage of the course	15	11	08	05	05	05	05
Weighted percentage of Course contribution to POs	**2.73**	**2.5**	**2.6**	**1.72**	**2.86**	**2.34**	**2.17**

Based on the level of contribution ('3'- High, '2'- Medium, '1' - Low ' - ' No Correlation

UNIT I **(12 hrs)**

Biogenesis theory of origin of life - physical structure of prokaryotic and eukaryotic - plant and animal cells - Cytoskeletal structures and Cytoskeleton movements - diffusion, osmosis, active transport, nutrient transport - intra cellular transport.

UNIT II **(12 hrs)**

Biochemical composition of cell – structural organization and functions of cell organelles; Mitochondria, chloroplast, endoplasmic reticulum, Golgi complex, lysosomes, vacuoles, ribosomes, peroxisomes, centrioles and cytosols - Phases, Mechanism and regulations of cell division.

UNIT III **(12 hrs)**

Cell cycle - mitosis and meiosis, Dynamics of cell division.Significance of mitosis and meiosis.Cell growth - normal and abnormal cell growth (cancer) - Necrosis - Apoptosis - therapeutic interventions of uncontrolled growth; difference between necrosis and apoptosis.

UNIT IV **(12 hrs)**

History of Classical and Modern Genetics, Mendelian laws of inheritance - Monohybrid and Dihybrid - laws of Segregation, Independent Assortment, Dominance relations, Multiple alleles, Incomplete dominance, Over dominance - concept of gene - allele, multiple allele, Pseudo allele, complementation tests.

UNIT V **(12 hrs)**

Sex determination in plants, animals, chromosomal disorders – sex linked inheritance – Disorders of Coagulation, colour blindness, haemophilia - linkage and crossing over.

TEXTBOOKS

1. Gardner, Eldon John. *Principles of genetics*. No. 4. London, UK, John Wiley & Sons, Inc., 2006.
2. Verma, P. S., and Agarwal V.K. *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology: Evoloution and Ecology*. S. Chand Publishing, 2006.
3. Janet iwasa, Wallace marshall. *Cell and molecular biology: concepts and experiments*. John Wiley & Sons, 2015.

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1. James Darnet, Harvey Lodish and David Baltimore.*Molecular Cell biology*. Scientific American Books Ins, 2016.
2. Gupta, P.K.*Cell and Molecular biology*.Rastogi publication, India, Second edition, 2017.

3. Brown, Terence A. *Introduction to genetics: a molecular approach*. Garland Science, 2012.
4. Pierce, Benjamin A. *Genetics: a conceptual approach*. Macmillan, 2012.

Web Sources

1. https://www.ncbi.nlm.nih.gov/books/NBK9893/
2. https://www.khanacademy.org/test - prep/mcat/cells/eukaryotic cells/v/characteristics - of - eukaryotic - cells
3. https://www.slideshare.net/vijayavinbr/apoptosis - signalling
4. https://www.youtube.com/watch?v=4_7HDfBHhnM
5. https://www.csun.edu/~cmalone/pdf360/Ch04 - 2extensions.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG programme –B. Sc. Biotechnology
SEMESTER - I
CORE COURSE - II: PRACTICAL: CELL BIOLOGY AND GENETICS (21UBTC1P)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 50**
CREDITS : 3 **EXT. MARKS : 50**
DURATION : 60 hrs **MAX. MARKS : 100**

Preamble

This course enables the learners to acquire practical knowledge of cells and cell division in plants.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: demonstrate the preparation of mounting cytogenetic techniques
CO2[K3]: apply basic knowledge of cells and genes
CO3[K4]: distinguish internal structural organization of plant and animal cells
CO4[K5]: evaluate the stages of cell division in plants
CO5[K6]: perform monohybrid and dihybrid cross

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	3	1	-	-	-
CO2[K3]	3	2	1	2	-	-	-
CO3[K4]	2	3	2	2	-	-	-
CO4[K5]	2	2	3	2	-	-	-
CO5[K6]	3	3	3	1	-	-	-
Weightage of the course	13	13	12	08	0	0	0
Weighted percentage of Course contribution to POs	**2.36**	**2.95**	**3.9**	**2.76**	**0**	**0**	**0**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

Experiments

Cell Biology

1. Parts and functioning of compound microscope.
2. Study the different living and non - living cell inclusions - Starch grains, Raphides and Cystolith.
3. Study of mitosis by smear technique using onion root tip.
4. Study of different stages of meiosis from permanent slides.
5. Study of different types of giant chromosome – Polytene and Lampbrush
6. Preparation of polytene chromosomes (Chironomous larvae salivary gland) squash preparation.
7. Microtomy (Demo).

Genetics

1. Mendel's Monohybrid, Dihybrid Experiment.
2. Incomplete dominance and Test cross ratio.

REFERENCES

Books

1. Palanivelu, P. *Analytical biochemistry and separation techniques*, MKU, Madurai, 2012.
2. Gunasekaran, P.*Laboratory Manual in Microbiology*. New Age International, 2007.
3. Khan N.A and Singh K.N. *Laboratory manual of Biochemistry*. Daya publishing house, 2020.
4. Felix Valentin.*Principles and Techniques of Practical Biochemistry*. Arcler, Press, 2015.
5. Douglas, A Skoog, F.James Holler and Stanley R. Crouch*Principles of Instrumental Analysis*. Cengagelearning publishers, seventh Edition, 2020.

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1. https://www.microscopeworld.com/t - parts.aspx
2. https://www.youtube.com/watch?v=Z1N - Ma2lGIU
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2818712/
4. https://www.youtube.com/watch?v=MRIQZPCX45I

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI

DEPARTMENT OF CHEMISTRY

UG Programme – B.Sc. Biotechnology

SEMESTER - I

ALLIED COURSE -I: CHEMISTRY - I (21UBTA11)

(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This course explains various types of adsorption, photochemistry and enable the students to gain knowledge on periodic properties.

Course Outcomes (CO)

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

CO1 [K1]: list out the types of adsorptions, chemical bonding and various kinds of oils and fats

CO2 [K2]: differentiate types of chemical bonding and photophysical processes

CO3 [K3]: present the concepts of adsorption, photochemistry, periodicity in properties and chemical bonding

CO4 [K4]: distinguish between soaps and detergents, oils and fats, photochemical and thermochemical reactions, absorption and adsorption

CO5 [K4]: analyze hybridization and structure of compounds and quality of soaps.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K1]	3	2	1	-	-	1	-
CO2 [K2]	3	2	1	1	-	-	-
CO3 [K3]	3	2	1	1	1	1	1
CO4 [K4]	3	2	1	1	-	-	1
CO5 [K4]	3	2	1	1	1	1	-
Weightage of the course	15	10	05	04	02	03	02
Weighted percentage of Course contribution to Pos	**2.73**	**2.27**	**1.62**	**1.38**	**1.14**	**1.4**	**0.87**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – ADSORPTION **(12 hrs)**

Adsorption - Adsorbent – Adsorbate - Definition with Illustration - Characteristics of Adsorption – Types of Adsorption – Physisorption – Chemisorption –Difference between Physisorption and Chemisorption – Factors Affecting Adsorption - Adsorption Isotherms – FreundlichAdsorption Isotherm – Application of Adsorption.

UNIT II – PHOTO CHEMISTRY **(12 hrs)**

Thermochemical Reactions – Photochemical Reactions – Difference between Photochemical Reaction and Thermochemical Reactions – Laws of Photochemistry, Grothus–Draper Law – Stark-Einstein Law - Quantum Efficiency – Causes of High and Low Quantum Efficiency - Determination of Quantum Efficiency – Photophysical Processes – Jablonski Diagram – Fluorescence – Phosphorescene – Chemiluminescence.

UNIT III – PERIODIC TABLE AND PERIODICITY IN PROPERTIES **(12 hrs)**

Long Form of Periodic Table – Division of Elements into s, p, d and f Blocks – Definition and Periodic Trends of Various Periodic Properties -Covalent Radius - Ionic Radius – Ionization Energy - Electron Affinity – Electronegativity – Factors Affecting Ionization Energy – Factors Affecting Electron Affinity – Determination of Electronegativity – Pauling Approach – Mullikan Approach – Application of Electronegativity.

UNIT IV – CHEMICAL BONDING **(12 hrs)**

Chemical Bonding – Types of Bonding –Covalent Bonding – Overlapping – s-s Overlapping – s-p Overlapping, p-p Overlapping - VB Theory and its Limitation – Hybridization – Definition, Characteristics and Determination – Hybridization of BeH_2, BF_3 andCH_4- MO Theory – Postulates – MOT of H_2, He_2, N_2, O_2.

UNIT V – FATS AND OILS **(12 hrs)**

Fats and Oils – Definition, Properties and Analysis of Fats and Oils – Difference between Fats and Oils –Manufacture of Vanaspati – Soaps – Definition – Manufacture of Soaps by – Kettle Process – Cleaning Action of Soaps – Synthetic Detergents – Synthetic Detergents verses Soaps.

TEXTBOOKS

1. Arun Bhal and B. S. Bhal. *A Text Book of Organic Chemistry*. New Delhi: S. Chand & Company, 2013.
2. Arun Bhal and B.S. Bhal. *Essential of Physical Chemistry.* New Delhi: S.Chand & Company, 2013.
3. B. R. Puri, L. R. Sharma and K. C. Kalia, *Principles of Inorganic Chemistry*. Milstones publishers & distributors, 2013.

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1. B. R. Puri, L. R. Sharma and Madan S. Pathania *Text Book of Physical Chemistry.* Jalandar: Vishal Publishing and Co, 2008.
2. P. L. Soni. *Text Book of Organic Chemistry*. New Delhi: S.Chand and Company, 2008.

Web Sources

1. https://www.youtube.com/watch?v=8QH853ffG2U
2. https://www.youtube.com/watch?v=8VBs_xf7yLs
3. https://www.youtube.com/watch?v=NPvWSo0Us9A

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
UG Programme – B.Sc. Biotechnology
SEMESTER - I
ALLIED COURSE - I: PRACTICAL: VOLUMETRIC ANALYSIS (21UBTA1P)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 2 **INT. MARKS : 50**
CREDIT : 1 **EXT. MARKS: 50**
DURATION : 30 hrs **MAX. MARKS: 100**

Preamble

This course enables the students to acquire practical skill in quantitative estimation of inorganic compounds by volumetric method.

Course Outcomes (CO)

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

CO1 [K2]: estimate oxalic acid by acidimetric and permanganometric method
CO2 [K3]: choose suitable indicator for carrying out volumetric estimation
CO3 [K4]: apply acidimetric and alkalimetric method for the quantitative volumetric estimation of acids and bases
CO4 [K5]: measure quantitatively the amount of inorganic compound accurately with the help of colour change of the indicator
CO5 [K6]: plan various volumetric procedures for the estimation of any inorganic compounds.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K2]	3	2	1	-	-	-	1
CO2 [K3]	3	2	1	1	-	1	-
CO3[K4]	3	2	1	-	-	1	-
CO4 [K5]	3	2	1	1	1	1	1
CO5 [K6]	3	2	1	-	1	1	1
Weightage of the course	15	10	05	02	02	04	03
Weighted percentage of course contribution to Pos	**2.73**	**2.27**	**1.62**	**0.69**	**1.14**	**1.87**	**1.3**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

VOLUMETRIC ANALYSIS

LIST OF EXPERIMENTS

I. ACIDIMETRY AND ALKALIMETRY

1. Estimation of Na_2CO_3
2. Estimation of NaOH / KOH
3. Estimation of Oxalic acid
4. Estimation of Hydrochloric acid

II. REDOX TITRATIONS

A. Permanganometry

5. Estimation of Oxalic acid
6. Estimation of Ferrous Ammonium Sulphate

B. Dichrometry

7. Estimation of Ferrous Ion
8. Estimation of Potassium Dichromate

REFERENCE

Book

G. H. Jeffery, J. Bassett, J. Mendham and R, C Denney, *Vogel's Quantitative Chemical Analysis*. England: Longman Scientific and Technical.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
UG PROGRAMME
SEMESTER- I
ABILITY ENHANCEMENT COMPULSORY COURSE I : ENVIRONMENTAL STUDIES (21UESR11)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK : 2 **INT. MARKS: 40**
CREDIT : 1 **EXT. MARKS: 60**
DURATION : 30 hrs **MAX. MARKS :100**

Preamble

This course familiarizes the learners with the essentials of Environmental Studies by focusing on variety of environmental issues and factors affecting environment.

Course Outcomes (CO)

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

CO1[K1]: recognize the importance of environment and role of Individuals in its protection.

CO2[K2]: explain the key concepts of Ecosystem, Food Web and Bio geochemical.

CO3[K3]: apply the right measures for the sustainable use of natural resources.

CO4[K4]: analyse the ethical, cross-cultural, and historical context of environmental issues and the links between Human and Natural Systems.

CO5[K4]: examine the impact of human action on the biological environment

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K1]	2	1	-	2	2	1	1
CO2 [K2]	2	1	-	2	1	1	1
CO3 [K3]	2	1	-	1	1	1	1
CO4 [K4]	1	1	1	1	2	1	1
CO5 [K4]	1	1	-	1	2	1	1
Weightage of the course	08	5	1	7	08	05	05
Weighted percentage of Course contribution to Pos	**1.45**	**1.14**	**0.32**	**2.41**	**4.57**	**2.34**	**2.17**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(6 hrs)**

Structure of earth and its components: Atmosphere – Lithosphere – Hydrosphere – Biosphere. Renewable and non-renewable resources – Forest, water and energy resources.

UNIT II **(6 hrs)**

Ecosystem: Concept of ecosystem – Terrestrial and aquatic. Structure and function – Energy flow in the ecosystem – Food chain and food web – Ecological pyramids – Bio-geo chemical cycle – carbon and nitrogen cycle.

UNIT III **(6 hrs)**

Biodiversity: Introduction – Definition: genetic, species and ecosystem diversity. Indian Biodiversity Hotspots. Threats to biodiversity – Conservation of Biodiversity – In-situ and Ex-situ conservation strategies. IUCN Red list Categories.

UNIT IV **(6 hrs)**

Pollution: Definition – causes – effects and control measures of Air – Water – Noise – soil – nuclear pollution. Global issues – Global warming – acid rain – Ozone layer depletion. Water conservation – rain water harvesting and water recycling – solid waste management.

UNIT V **(6 hrs)**

Human Population and Environment: Population growth, variation among nations. Road safety awareness. Environment and human health. Human Rights. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Contribution of students and teachers in adoption of villages and steps to be taken for green villages.

TEXTBOOKS

1. Dharmaraj, J. *Text book of Environmental studies*, S. Chand and Co. New Delhi, 1995.
2. Susila Appadurai. *Environmental Studies*, New Century Book House, 2012.

REFERENCES

Books

1. Agarwal, K.C. *Environmental Biology*, Nidi publication Ltd, Bikaner, 2001.
2. Odum, E.P. *Fundamentals of Ecology*, W.B. Saunders Co. USA, 1971.
3. Miller, T.G. *Environmental sciences*, Wadsworth Publishing Co, New Delhi. 2004.

Web Sources

1. https://www.adcidl.com/pdf/India-Road, Traffic-Signs.pdf.
2. https://www.youtube.com/watch?v=QewEi2U1jLs
3. https://byjus.com/biology/endemic-species/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER – I
SKILL ENHANCEMENT COURSE - I: BIOTECHNOLOGY AND HUMAN WELFARE
(21UBTS11)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 2 **INT. MARKS : 40**
CREDIT : 1 **EXT. MARKS : 60**
DURATION : 30 hrs **MAX. MARKS : 100**

Preamble

This course familiarizes the learners with the role of Biotechnology in relation to human welfare.

Course Outcomes (CO)

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

CO1[K1]: outline the Biotechnological tools and their products for commercial purposes

CO2[K2]: explain the basic techniques of Biotechnology.

CO3[K3]: determine the steps involved in gene cloning

CO4[K4]: analyse the role of Biotechnology in Pollution control

CO5[K4]: differentiate the primary and secondary metabolites

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	1	2	1	1	1
CO2[K2]	2	1	1	1	-	-	-
CO3[K3]	2	2	2	1	1	1	1
CO4[K4]	1	2	1	1	-	-	-
CO5[K4]	2	2	2	2	1	-	1
Weightage of the course	09	09	07	07	03	02	03
Weighted percentage of Course contribution to POs	**1.64**	**2.05**	**2.27**	**2.41**	**1.71**	**0.93**	**1.3**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

UNIT I **(6 hrs)**

Introduction - History and Scope of Biotechnology - branches of Biotechnology - Applications and recent developments in Biotechnology - Biotechnology industry in India.

UNIT II **(6 hrs)**

Basic concepts - Central dogma of Molecular biology - Nucleic acids - Structure and function ofDNA and RNA.Gene, Codon and Anticodon.

UNIT III **(6 hrs)**

Genetic engineering - Enzymes involved in genetic engineering and their function - Steps in Gene Cloning - Tools - Gel Electrophoresis - Agarose, SDS PAGE.

UNIT IV **(6 hrs)**

Production of microbial biomass - *Spirulina* - SCP. Primary and Secondary metabolites - Vitamins (Riboflavin) - Amino acids (L - Glutamic acid) - Antibiotic (Penicillin and Streptomycin) from bacterial and fungal strains. Mushroom Cultivation, Vermicompost technology.

UNIT V **(6 hrs)**

Role of Biotechnology in Pollution control. Biological waste water treatment - Sewage treatment - Primary - Secondary - Tertiary treatment.Biodegradation - Xenobiotics - Biomining – Bioleaching.

TEXTBOOKS

1. Dubey, R.C. *Advanced Biotechnology*. New Delhi : S. Chand and Co. Pvt. Ltd, 2014.
2. InduShekhar Thakur. *Environmental biotechnology: basic concepts and applications*. Dreamtech Press 2019.
3. Chatterji and Adhar Kumar. *Introduction to environmental biotechnology*. PHI Learning Pvt. Ltd., 2011.

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1. Satyanarayana,U, and Chakrapani,U. *Essentials of biochemistry*. Kolkata : Book and Allied, India, 2019.
2. Veer balarastogi. *Principles of molecular biology*. Medtech Publishers, 2016.
3. Primrose, S.B.,Twyman, R.M. and Old, R. K. *Principles of Gene Manipulation*. John Wiley Blackwell , Seventh Edition, 2014.
4. Rapley, Ralph, and David Whitehouse. *Molecular biology and biotechnology*. Royal Society of Chemistry, 2015.

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1. https://nptel.ac.in/content/storage2/courses/102101007/downloads/PPT/LEC - 02 - PPT.pdf
2. https://nptel.ac.in/courses/102/105/102105058/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF TAMIL
UG Programme - B.A/B.SC/BCA
SEMESTER - II
பொதுத்தமிழ் - II (21UTAL21)
(From 2021-2022 Batch onwards)

HOURS / WEEK: 6 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

நோக்கம்

சமய இலக்கியம் தோன்றியதற்கானகாலப்பின்னணிமற்றும் சமயம் சார்ந்த இலக்கியங்களைமாணவர்களுக்குஅறிவுறுத்தலும்,பல்வேறுகாலகட்டசிறுகதை இலக்கியங்களைஎடுத்துரைக்கும் நோக்கோடுஅமைக்கப்பட்டுள்ளது.

கற்றலின் பயன்கள்

இத்தாளைவெற்றிகரமாகமுடித்தவுடன் மாணவர்கள்,

CO1[K1]: பல்வேறுசமயம் சார்ந்த இலக்கியவரலாற்றினைஅறிவர்.

CO2[K2]:இறைஉருவங்களையும் புராணக்கருத்துக்களையும் கூறுவர்.

CO3[K3]:சமயப்பாடல்களின் அமைப்பினையும் நோக்கத்தினையும் தெளிவாக விளக்குவர்.

CO4[K4]:தமிழ்ச் சிறுகதைகளின் பொருண்மைகளைப்பாகுபடுத்துவர்.

CO5[K4]:சொல்லிலக்கணத்தைப் புரிந்துகொண்டுபிழையின்றிஎழுதும் திறனைப் பெறுவர்.

CO-PO Mapping Table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	-	1	-	-	-
CO2[K2]	2	1	-	1	1	-	-
CO3[K3]	2	2	-	2	-	1	-
CO4[K4]	2	2	1	2	1	-	1
CO5[K4]	2	2	1	2	-	1	1
Weightage of the Course	10	8	2	8	2	2	2
Weighted percentage of Course Contribution to POs	1.82	1.82	0.65	2.76	1.14	0.93	0.87

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

கூறுI **(18hrs)**

சைவ இலக்கியவரலாறு - **திருஞானசம்பந்தர்**: முதல் திருமுறை- திருப்பிரமபுரம் - தோடுடையசெவியன் (10 பாடல்கள்). **திருநாவுக்கரசர்:**நான்காம் திருமுறை - திருவதிகைவீரட்டானம் - கூற்றாயினவாறுவிலக்ககலீர் (10 பாடல்கள்).**சுந்தரர்:**ஏழாம் திருமுறை - திருவெண்ணெய்நல்லூர் பதிகம் - பித்தாபிறைசூடி (10 பாடல்கள்). **மாணிக்கவாசகர்:**குயிற்பத்து (10 பாடல்கள்).

கூறு II **(18hrs)**

வைணவ இலக்கியவரலாறு - **ஆண்டாள்**: திருப்பாவைமுழுவதும் (30 பாடல்கள்) - **நம்மாழ்வார்**: நான்காம் திருமொழி - நான்காம் பத்து - மண்ணையிருந்துதுழாவி.

கூறுIII **(18hrs)**

கிறிஸ்தவ, இஸ்லாமிய இலக்கியவரலாறு - **கண்ணதாசன்:**இயேசுகாவியம் - மலைப்பொழிவு (முழுவதும்) - **குணங்குடியார்:**நந்தீஸ்வரக்கண்ணி (51 பாடல்கள்).

கூறுIV **(18hrs)**

சிறுகதைதோற்றம் வளர்ச்சி (தேர்ந்தெடுக்கப்பட்ட 10 சிறுகதைகள்) - **புதுமைப்பித்தன்:**அகல்யை..பி.எஸ். ராமையா: நட்ஷத்திரக் குழந்தைகள் **த.ஜெயகாந்தன்:**அக்ரஹாரத்துப்பூனை. **வண்ணதாசன்**:ஒருசிறு இசை.**வண்ணநிலவன்:**கரையும் உருவங்கள்.. **கு.அழகிரிசாமி**: அன்பளிப்பு. **விஞ்ஞானி**: முன்னை இட்டதீ.**ஆதவன்:** கறுப்புஅம்பாகதை. **மேலாண்மைபொன்னுச்சாமி**: அன்பெழுத்து. **நாஞ்சில் நாடன்**: சூடியபூ சூடற்க

கூறுV **(18hrs)**

இலக்கணம்: சொல்விளக்கம்,சொற்பாகுபாடு (பெயர்ச்சொல்,வினைச்சொல், இடைச்சொல்,உரிச்சொல்) - அறுவகைவினா - எண்வகைவிடை - மொழிப்பயிற்சி: மயங்கொலிப்பிழைகள் (லகர,ளகர,ழகரவேறுபாடு,ரகர,றகரவேறுபாடு - ணகர,னகரவேறுபாடு).

பாடநூல்கள்

1. *தொகுப்புநூல்*,தமிழியல்துறை,ஸ்ரீ காளீஸ்வரிகல்லூரி (தன்னாட்சி),சிவகாசி.
2. வாசுதேவன்,கா.*பன்முகநோக்கில் தமிழ் இலக்கியவரலாறு*,தேவன் பதிப்பகம்,திருச்சிராப்பள்ளி,பன்னிரெண்டாம் பதிப்பு: 2017.

பார்வை நூல்கள்

1. அப்துல்ரகுமான் (குறிப்புரை*).குணங்குடியார்பாடற்கோவை*,மணிவாசகர்பதிப்பகம்,சென்னை, 2002.
2. பாக்கியமேரி. *தமிழ் இலக்கியவரலாறு*,நியூ செஞ்சுரி புக் ஹவுஸ்,சென்னை,நான்காம் பதிப்பு: 2011.
3. ஜெகத்ரட்சகன், எஸ்.*நாலாயிரதிவ்யப் பிரபந்தம்*,முல்லைநிலையம்,சென்னை,முதற்பதிப்பு: 1993.
4. ஸ்ரீமத் கந்தசாமித்தம்பிரான் சாமிகள் (பதி.ஆ.). *மூவர் தேவாரம்*,ஞானசம்பந்தம் பதிப்பகம்,மயிலாடுதுறை, இரண்டாம் பதிப்பு: 1997.

வலைப்பதிவுகள் (Web Sources)

1. https://youtu.be/FPlNGftQnAo
2. https://youtu.be/Rj0S6KOruvA
3. https://youtu.be/Z8xgO8ff44g
4. https://youtu.be/PxeeauHz5CQ
5. https://youtu.be/TLU6MO9YEkA

6. https://podhutamizh.blogspot.com/2017/09/blog-post_42.html
7. https://youtu.be/vZ1FrQuhn_w

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF ENGLISH
UG Programme - B.A./B.Com./ B.B.A./B.SC./BCA
SEMESTER- II
COMMUNICATIVE ENGLISH - II (21UENL21)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course helps the learners to develop their communication skills in English through listening, reading, speaking and writing practices.

Course Outcomes (CO)

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

CO1[K1]: relate and state ideas by reading and listening to recorded interviews and news

CO2[K2]: demonstrate effective speaking skills by offering suggestions, seeking permission and reporting ongoing activities

CO3[K3]: apply knowledge of word power and grammar rules through proverb expansion and paragraph writings

CO4[K4]: analyze simple poems and short stories to develop language skills through literature

CO5[K6]: construct grammatically correct and logically coherent paragraphs

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K1]	2	1	-	1	-	-	-
CO2 [K2]	2	2	-	1	1	-	1
CO3 [K3]	2	2	-	2	-	1	-
CO4 [K4]	2	2	1	2	1	-	1
CO5 [K6]	2	1	1	2	-	1	1
Weightage of the course	10	08	02	08	02	02	03
Weighted percentage of Course contribution to POs	1.82	1.82	0.65	2.77	1.14	0.93	1.3

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation

UNIT I - LISTENING AND SPEAKING **(18 hrs)**

A. Listening

Listening to interviews

Listening to news reading

Listening to instructions-download apps in mobile handsets, cooking, sending e-mail

B. Speaking

Inviting person, offering suggestion and seeking permission

Making complaints and asking apology

Expressing likes, dislikes, hopes, wishes, regrets, sympathy, offering condolences, compliments and praising

Reporting conversations, facts, meetings/interviews, ongoing activities and future plans

Talking about the weather, past &future events, interesting plans and arrangements

UNIT II - READING AND WRITING **(18 hrs)**

A. Reading

Reading advertisements

Reading notices

Reading short passages

B. Writing

Proverb Expansion

Paragraph Writing

Essay writing

UNIT III - WORD POWER **(18 hrs)**

Synonyms & Antonyms

Misspelt words

Words related to- House, Clothing, Food, Education, Speaking, Holidays and Sports

UNIT IV - GRAMMAR **(18 hrs)**

Preposition and its kinds

Conjunction and its kinds

Articles

Tenses

UNIT V - LANGUAGE THROUGH LITERATURE **(18 hrs)**

A. Poetry

Sarojini Naidu	-	The Queen's Rival
John Masefield	-	Laugh and be Merry
Alfred Noyes	-	The Highwayman

B. Short Story

Somerset Maugham	-	The Ant and the Grasshopper
Katherine Mansfield	-	A Cup of Tea

TEXTBOOKS

1. Carthy Mc., and Felicity O'Dell. *English Vocabulary in Use (Upper intermediate)*. UK: Cambridge University Press, 2005.
2. Pillai, Radhakrishna and K.Rajeevan. *Spoken English for You (Level One)*. Chennai: Emerald Publishers, 2009.
3. Pillai, Radhakrishna. *Emerald English Grammar and Composition.* Chennai: Emerald Publishers, 2016.

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Books

1. *Life Skills (Jeevan Kaushal) Facilitators' Guidelines*. New Delhi: University Grants Commission, 2021.
2. Radha, Alamelu et.al. *Situational Grammar and Composition.* Chennai : New Century Book House Pvt. Ltd,2008.
3. Sadanand, Kamalesh and Susheela Punitha. *Spoken English- A Foundation Course for speakers of Tamil*. Mumbai: Orient Blackswan, 2009.
4. Subramanian A.E. *Gifts to Posterity.* Chennai*: Anu Chitra Publications*, 2003.
5. Taylor, Grant. *English Conversation Practice*. New Delhi: Tata McGraw Hill Publishers, 2001.
6. Tilak, Raghukul. *Sarojini Naidu Selected Poems.* New Delhi: Educational Publishers, 2009.

Web Sources

1. https://allpoetry.com/Laugh-and-be-Merry
2. https://lincolnprep.wildapricot.org/resources/Reading%20Selections%20for%20Reading%20Competion/The%20Highwayman.pdf
3. https://learnenglish.britishcouncil.org/general-english/stories
4. https://www.talkenglish.com/lessonindex.aspx
5. https://www.englishhelper.com/
6. https://www.englishpage.com/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - II
CORE COURSE - III: BIOCHEMISTRY AND METABOLISM (21UBTC21)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 60 hrs **MAX. MARKS : 100**

Preamble

This course introduces the learners to the structure, function of specific molecules, pathways and their interactions with emphasis on regulation of chemical reactions in living cells.

Course Outcomes (CO)

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

CO1[K1]: describe the catabolic reactions of carbohydrates, lipids and amino acids

CO2[K2]: explain the properties of Biomolecules

CO3[K3]: determine the mechanism of enzyme actions

CO4[K4]: analyse the role of enzymes in metabolic pathways

CO5[K4]: classify biomolecules based on structure and function

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	-	1	-	-	2
CO2[K2]	3	2	1	-	-	-	2
CO3[K3]	3	2	2	1	-	-	2
CO4[K4]	2	3	2	1	-	-	2
CO5[K4]	2	3	2	1	-	-	2
Weightage of the course	13	12	07	04	0	0	10
Weighted /;percentage of Course contribution to POs	**2.36**	**2.73**	**2.27**	**1.38**	**0**	**0**	**4.35**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

UNIT I **(12 hrs)**

Carbohydrates: Structure, Function, Classification and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides.Glycolysis,Gluconeogenesis,Glycogenesis,GlycogenolysisPentose phosphate pathway, TCA cycle and Oxidative phosphorylation.

UNIT II **(12 hrs)**

Structure & Function, properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins.Deamination, Decarboxylation and Transamination reaction.Urea cycle and metabolism of Non essential Amino acids.

UNIT III **(12 hrs)**

Structure and functions, Classification, nomenclature and properties of fatty acids, Biosynthesis of Saturated fatty acids.Beta oxidation of fatty acids.

UNIT IV **(12 hrs)**

Structure of Nucleosides & Nucleotides and Double helical model of DNA, Physical & chemical properties of Nucleic acids, Biologically important nucleotides, Denova Synthesis of Purine and Pyrimidine Biosynthesis.

UNIT V **(12 hrs)**

Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, common features of active sites.Vitamins – Classification**,** Sources and Functions of Water and Fat Soluble vitamins, Minerals - Sources and Functions of Zinc, Copper, Iron.

TEXTBOOKS

1. Ambika, S. *Fundamentals of biochemistry for medical students*. Wolters Kluwer publishing, 2016.
2. Jain, J. L, Sunjay Jain and Nitin Jain. *Fundamentals of biochemistry*. S. Chand Publishing, 2016.
3. Satyanarayana, U., and U. Chakrapani. *Essentials of biochemistry*. Book and Allied, Kolkata, India, 2019.

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1. Moran, Laurence A. *Principles of biochemistry*. 2014.
2. Cox, Michael M., and David L. Nelson. *Lehninger principles of biochemistry*. Vol. 5. New York: Wh Freeman, 2017.
3. Murray, Robert K. *Harper's illustrated biochemistry*. Mcgraw-hill, 2014.
4. Voet, Donald, Judith G. Voet, and Charlotte W. Pratt. *Fundamentals of biochemistry: life at the molecular level*. No. 577.1 VOE. 2013.

Web Sources

1. https://youtu.be/DhwAp6yQHQI
2. https://youtu.be/CyYaX0vFdhI

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - II
CORE COURSE - IV: PRACTICAL: BIOCHEMISTRY (21UBTC2P)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 50**
CREDITS : 3 **EXT. MARKS : 50**
DURATION : 60 hrs **MAX. MARKS : 100**

Preamble

This course equips the learners with experimental knowledge on estimation of Biomolecules and enzymes.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: illustrate the principles of instruments used in biochemistry
CO2[K3]: perform the analytical techniques for the estimation of Biomolecules
CO3[K4]: analyse the chromatographic techniques to separate Biomolecules
CO4[K5]: evaluate the effect of physical factors in enzyme synthesis
CO5[K6]: prepare phosphate and acetate buffers

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	1	-	-	-	1
CO2[K3]	3	2	2	1	-	1	1
CO3[K4]	3	2	2	1	1	1	1
CO4[K5]	3	2	2	1	1	1	1
CO5[K6]	3	2	2	1	1	1	1
Weightage of the course	15	10	09	04	03	04	05
Weighted percentage of Course contribution to POs	**2.73**	**2.27**	**2.92**	**1.38**	**1.71**	**1.87**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

Experiments

1. Colorimeter and Spectrophotometer (Principle and Its Application)
2. pH meter Principle and application.
3. Preparation of Phosphate and acetate buffers.
4. Estimation of Glucose by DNSA Method.
5. Estimation of Protein by Lowry's Method.
6. Estimation of Lipids.
7. Separation of aminoacids by Paper Chromatography
8. Effect of pH and Temperature on Salivary amylase activity.

REFERENCES

Books

1. Pattambiraman T.N. *Laboratory manual for Biochemistry*. All India Publishers and Distributors.2015
2. Joy, P. P., S. Surya, and C. Aswathy. *Laboratory Manual of Biochemistry*. Pineapple Research Station. 2015.

Web Sources

1. https://www.slideshare.net/sardar1109/bscii - semester - biotechnology - biochemistry - lab - manual

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
UG Programme – B.Sc. Biotechnology
SEMESTER - II
ALLIED COURSE - II: CHEMISTRY - II (21UBTA21)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This course enables the students to gain knowledge on catalyst, electrochemistry, acids, bases, polymers and dyes.

Course Outcomes (CO)

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

CO1 [K1]: describe catalysis, terms in electrochemistry, nuclear reactions, types of polymers and dyes

CO2 [K2]: illustrate the fundamental concepts of electrochemistry and nuclear chemistry

CO3 [K3]: make use of the various concepts of acids, bases and theory of dyes

CO4 [K4]: compare nuclear fission and fusion, homogeneous and heterogeneous catalysts

CO5 [K4]: classify polymers and dyes based on structure and properties of different types of polymers and its application.

CO-PO Mapping table (Course Articulation Matrix)

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K1]	3	2	1	-	-	1	-
CO2 [K2]	3	2	1	1	-	-	-
CO3 [K3]	3	2	1	1	1	1	1
CO4 [K4]	3	2	1	1	-	-	1
CO5 [K4]	3	2	1	1	1	1	-
Weightage of the course	15	10	05	04	02	03	02
Weighted percentage of Course contribution to Pos	**2.73**	**2.27**	**1.62**	**1.38**	**1.14**	**1.4**	**0.87**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – CATALYSIS **(12 hrs)**

Catalysis – Definition- Characteristics of Catalysis – Types of Catalysis – Homogeneous Catalysis – Intermediate Formation Theory – Heterogeneous Catalysis – Adsorption Theory - Promotors – Auto Catalyst – Positive Catalyst - Negative Catalyst – Catalytic Poisons –Enzyme Catalysis – Mechanism of Enzyme Catalysis – Characteristics of EnzymeCatalysis -Michalies – MentonEquation.

UNIT II – ELECTRO CHEMISTRY **(12 hrs)**

Electrolysis – Definition –Faraday's Law of Electrolysis –Electrolytes – Conductance of Electrolytes – Specific Conductance –Equivalent Conductance – Molar Conductance – Equivalent Conductance on Infinite Dilution – Strong Electrolytes – Weak Electrolytes – pH – Buffer – Buffer Action – Henderson Equation to Determine the pH of Buffer.

UNIT III – NUCLEAR CHEMISTRY **(12 hrs)**

Fundamental Composition of Nucleus – Mass Defect – Binding Energy - Radioactivity – Comparison of α, β and γ rays – Nuclear Fission – Nuclear Reactor - Nuclear Fusion – Stellar Energy – Proton – Proton Cycle, Carbon – Nitrogen Cycle – Application of Radioactive Isotopes in Medicine – Industry – Agriculture – Radiocarbon Dating – Nuclear Waste Disposal Management.

UNIT IV – POLYMERS **(12 hrs)**

Polymers – Definition – Classification of Polymers – Addition and Condensation Polymers – Preparation, Properties and Uses of Polyethylene, Polystyrene, PVC, Teflon, Nylon 66 – Thermoplastics and Thermosetting Polymers - Definition - Preparation, Properties and Uses of Bakelite – Natural and Synthetic Rubbers - Preparation, Properties and Uses of Neoprene and Buna – S.

UNIT V – DYES **(12 hrs)**

Dyes - Definition – Characteristics of Dyes - Color and Constitution Theory of Dyes – Chromophore – Auxochrome Theory –Classification of Dyes Based on Structure and Applications – Preparation of Congo Red, Bismark Brown, Malachite Green , Alizarine and Indigo.

TEXTBOOKS

1. Arun Bhal and Bhal. B.S. *A Text Book of Organic Chemistry*. New Delhi: S.Chand & Company, 2013.
2. Arun Bhal and Bhal. B.S. *Essential of Physical Chemistry.* New Delhi: S.Chand & Company, 2013.
3. Puri, B. R. Sharma L. R. and Kalia, K. C. *Principles of Inorganic Chemistry*, Milstones publishers & distributors, 2013.

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1. Puri, B. R. Sharma L. R. and Madan S. Pathania. *Text Book of Physical Chemistry.* Jalandar: Vishal Publishing and Co, 2008.
2. Soni P. L. *Text Book of Organic Chemistry*, NewDelhi: S.Chand and Company, 2008
3. Arnikar, H. I. Essentials of Nuclear Chemistry, 3rd Edition. Wiley Eastern Ltd., New Delhi.

Web Sources

1. https://www.youtube.com/watch?v=lWVX2ofyOIY
2. https://www.youtube.com/watch?v=kOK_0dYr4S4
3. https://www.youtube.com/watch?v=vZ02XIyflJY

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF CHEMISTRY
UG Programme – B.Sc. Biotechnology
SEMESTER - II
ALLIED COURSE - II: PRACTICAL: ORGANIC ANALYSIS (21UBTA2P)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 2 **INT. MARKS : 50**
CREDIT : 1 **EXT. MARKS: 50**
DURATION : 30 hrs **MAX. MARKS: 100**

Preamble

This lab course enables the students to acquire practical skill on qualitative analysis of simple organic compounds.

Course Outcomes (CO)

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

CO1 [K2]: recognize the analytical procedure to identify the given organic compounds

CO2 [K3]: determine the saturation/unsaturation nature of given organic compounds

CO3 [K4]: inspect the aliphatic/aromatic and nature of given organic compounds

CO4 [K5]: predict elements (other than C, H and O) present in the given compound

CO5 [K6]: perform systematic analysis and report the functional groups present in the given organic compound.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K2]	3	2	1	-	-	-	1
CO2 [K3]	3	2	1	1	-	1	-
CO3 [K4]	3	2	1	-	-	1	-
CO4 [K5]	3	2	1	1	1	1	1
CO5 [K6]	3	2	1	-	1	1	1
Weightage of the course	15	10	05	02	02	04	03
Weighted percentage of course contribution to Pos	**2.73**	**2.27**	**1.62**	**0.69**	**1.14**	**1.87**	**1.3**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

ANALYSIS OF ORGANIC COMPOUNDS

1. Aromatic Mono and Bi carboxylic acids
2. Aromatic Phenol
3. Aromatic Ester
4. Aromatic Amines
5. Aromatic Aldehydes
6. Aromatic Ketones
7. Aliphatic Diamide, Diamide Containing Sulphur
8. Aliphatic Carbohydrate

REFERENCE

Book

1. B. S. Furniss, A.J. Hannford, P.W.G. Smith, A. R. Tatchell, *Vogel's Textbook of Practical Organic Chemistry,* Longman Scientific and Technical, England.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
UG PROGRAMME
SEMESTER –II
ABILITY ENHANCEMENT COMPULSORY COURSE: II -VALUE EDUCATION
(21UVED21)
(From 2021 - 2022 Batch onwards)

HOURS/WEEK: 1 **INT. MARKS : 40**
CREDIT : 1 **EXT. MARKS : 60**
DURATION : 15 hrs **MAX. MARKS: 100**

Preamble

This course aims to promote the values of peace, non-violence, religious tolerance and secular thinking among the learners and equip the learners for a harmonious living in the multi-cultural pluralistic society.

Course Outcomes (CO)

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

CO1[K1]: identify the basic human values and ethics necessary for harmonious Human relationship

CO2[K2]: explain the significance of social values and religious tolerance to live in Peace

CO3[K3]: articulate the life-changing principles of brotherhood, honesty, loyalty and community solidarity

CO4[K4]: analyse emotional, social, spiritual attribute to acquire well balanced Personality

CO5[K4]: examine the importance of harmonious living in the multi-cultural Pluralistic society.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K1]	2	1	-	1	1	-	2
CO2 [K2]	2	1	-	1	2	1	2
CO3 [K3]	2	1	-	1	2	1	1
CO4 [K4]	1	1	1	1	2	1	1
CO5 [K4]	1	1	-	1	2	1	1
Weightage of the Course	08	05	01	05	09	04	07
Weighted percentage of Course contribution to POs	**1.45**	**1.14**	**0.32**	**1.72**	**5.14**	**1.87**	**3.04**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I – VALUES AND INDIVIDUAL (3 hrs)

Meaning of values – classification of values – Need for value education – Personal values like adaptability, courage, cheerfulness, dignity of labour and self control – Self discipline - Self Confidence - Self initiative - Social values like sacrifice, forgiveness, Honesty, good manners, tolerance, friendship, hospitality, cooperation and civic sense – Moral values like purity, dedication, punctuality, loyalty, truthfulness and sense of duty.

UNIT II – VALUES AND SOCIETY (3 hrs)

Definition of society – democracy – secularism – socialism – Human rights – social integration – Social Justice – Role models: Akbar, Balagangadhar Tilak, Abdul Kalam, Mother Teresa.

UNIT III – VALUES AND RELIGIONS (3 hrs)

Values in Hinduism, Christianity, Islam and Buddhism – Need for religious harmony inter faith dialogue – Role Models: Vivekananda, Narayana Guru, Aravindar, Tagore, Vallalar Ramalingar, Gandhi.

UNIT IV – VALUES AND NATIONAL INTEGRATION (3 hrs)

Secularism and National Integration – Message from the life of Gandhiji, Nehru, Bharathi, Subash Chandra Bose, Sarojini Naidu etc.

UNIT V – VALUES AND SCIENCE (3 hrs)

Indian Gurus – Indian Scientists – Indian Universities – Indian Mathematicians and World Scientists – Science and Religion – Science, Technology development and values – Science and Human values.

TEXTBOOK

1. Pitchaikani Prabhaharan, A. Babu Franklin, M.Archanadevi, *Value education*, Sri Kaliswari college (Autonomous), Sivakasi, 2017.

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Books

1. Subramanyam, K. *Values in Education*, Ramana Publications, 1995
2. Swamy Chidbhavananda, *Indian National Education*, Publication by Ramakirshna Tapovanam.
3. அறிஞர் குழு (தொகுப்பு). *வாழ்வியல் விழுமியங்கள்*, உலக சமுதாய சேவா சங்கம், ஆழியாறு.

Web Sources

1. https://www.youtube.com/watch?v=ruKY3GqBvYQ.

2. https://www.republicworld.com/technology-news/science/15-famous-indian-scientists-list-know-what-were-their-innovations.html.
3. https://www.youtube.com/watch?v=M9_l9DDvEsw

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER II
SKILL ENHANCEMENT COURSE - II: PLANT AND ANIMAL PHYSIOLOGY
(21UBTS21)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 2 **INT. MARKS : 40**
CREDITS : 2 **EXT. MARKS : 60**
DURATION : 30 hrs **MAX. MARKS : 100**

Preamble

This course familiarizes the learners with the physiological process in plants and mechanism of anabolic and catabolic reactions.

Course Outcomes (CO)

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

CO1[K1]: describe the mechanism of digestion of food materials in animals
CO2[K2]: illustrate various physiological processes in plants
CO3[K3]: determine the mechanism of circulation in animals
CO4[K4]: discriminate the metabolic pathways in plants
CO5[K4]: analyse the process of photosynthesis in plants.

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	1	1	-	1
CO2[K2]	3	1	1	1	-	-	1
CO3[K3]	3	1	1	1	1	-	1
CO4[K4]	1	2	2	1	-	-	1
CO5[K4]	1	2	2	1	-	-	1
Weightage of the course	11	08	07	05	02	0	05
Weighted percentage of Course contribution to POs	**2**	**1.82**	**2.27**	**1.72**	**1.14**	**0**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation

UNIT I **(6 hrs)**

Cell as a physiological unit.Osmosis, Imbibition.Diffusion, D.P.D. Water potential, Absorption of water, (active & passive). Plasmolysis, cohesion, tension and transpiration pull theory, Mechanism of stomatal march, Guttation and antitranspirants.

UNIT II **(6 hrs)**

Photosynthesis - Electron transport chain. Photophosphorylation, carbon fixation.Photorespiration - Crassulacean Acid Metabolism.Physiological effects and mode of action of Plant hormones.Nutrition - Macronutrients and micronutrients and their uptake by plants.

UNIT III **(6 hrs)**

Physiology of digestion -Absorption and assimilation of digested food materials – Hormonal control of digestion – Basal Metabolic Rate (BMR).Excretion – structure of kidney – mechanism of urine formation.

UNIT IV **(6 hrs)**

Ultra structure of Skeletal muscle – mechanism of muscle contraction. Structure of Neuron.Endocrine and exocrine glands – Pituitary, Thyroid, Adrenal, Ovary, Testis.

UNIT V **(6 hrs)**

Structure of Respiratory system, mechanism of breathing. Circulatory System: Structure and function of Heart – origin and conduction of Heart beat – Composition of blood and its function.

TEXTBOOKS

1. Taiz, Lincoln. *Plant physiology and development*. No. Ed. 6. Sinauer Associates Incorporated, 2015.
2. Moyes, C.D. & Schulte, P.M. *Principles of Animal Physiology*. Pearson Education, India, 2016.
3. Verma, S. K &Verma, M. *Plant Physiology, Biochemistry and Biotechnology*. S.Chand& Company, Ltd., New Delhi, 2012.
4. Arumugam, N &Kuttikan, A.M. *Animal Physiology*. Saras Publication, 2014.

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Books

1. Salisbury and Ross.*Plant Physiology*. CBS Publisher 3rd, 2006.
2. Noggle, Glen Ray, and George John Fritz. *Introductory plant physiology*. No. Ed. 2. Prentice-Hall Inc., 1983.
3. MohammadPessarakli. *Handbook of plant and crop physiology*. CRC press, third edition, 2014.
4. Rastogi, S. C. *Essentials of animal physiology*. New Age International, 2019.

5. Verma, P. S., B. S. Tyagi, and V. K. Agarwal. *Animal physiology*. S. Chand Publishing, 2000.

Web Sources

1. https://youtu.be/UBm2wUCxE0o
2. https://youtu.be/fyCY5DN-lkA

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
UG PROGRAMME
SEMESTER – II
DISASTER MANAGEMENT (21UDMG21)
(From 2021-2022 Batch onwards)

HOURS/WEEK	**: 1**	**INT. MARKS**	**: 40**
CREDIT	**: 1**	**EXT. MARKS**	**: 60**
DURATION	**: 15 hrs**	**MAX. MARKS**	**: 100**

Preamble

This course introduces the learners to know the causes and impact of disasters and the agencies for disaster management in India.

Course Outcomes (CO)

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

CO1[K1]: outline the causes and impact of disasters.

CO2[K2]: explain the features of national policy on disaster management.

CO3[K3]:present the issues in rehabilitation.

CO4[K4]:classify the mitigation measures.

CO5[K5]:assess the role of the agencies for disaster management.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	1	1	-	2	2
CO2[K2]	2	1	-	1	-	-	1
CO3[K3]	1	2	1	1	-	-	2
CO4[K4]	1	2	-	1	1	2	2
CO5[K5]	1	2	-	1	1	-	1
Weightage of the course	07	08	02	05	02	04	08
Weighted percentage of Course contribution to POs	**1.27**	**1.82**	**0.65**	**1.72**	**1.14**	**1.87**	**3.48**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I **(3 hrs)**

Introduction – Disaster – Hazards – Causes and Impact of Disasters – Levels ofDisaster – Casual Factors of Disaster – Phases of a Disaster.

UNIT II **(3 hrs)**

Disaster Mitigation – Risk Reduction Measures – Mitigation Actions – DisasterManagement Cycle – Classification of Mitigation Measures.

UNIT III **(3 hrs)**

Disaster Preparedness and Planning – Objectives – Strategies – Elements of DisasterPreparedness – Principles of Disaster Planning.

UNIT IV **(3 hrs)**

Disaster Rehabilitation – Issues in Rehabilitation – Objectives – Approaches –Elements of a Rehabilitation Programme.

UNIT V **(3 hrs)**

Framework Disaster Management in India – Features of National Policy on DisasterManagement – Primary and Secondary Relief Functions of Central Government – DisasterManagement Act 2005 – Agencies for Disaster Management: India Red Cross Society,NIDM – Bharat Scouts and Guides, India Paramilitary Forces.

TEXTBOOK

1. Satish Modh. *Introduction to Disaster Management*. New Delhi: Macmillan Publishers India Limited, 1st Edition, 2015.

REFERENCES

Books

1. Balamurugan P K and Ajith Kumar S. *Disaster Management*. Chennai: New Century Book House Private Limited, 1st Edition, 2020.
2. Dasgupta R.*Disaster Management and Rehabilitation.* New Delhi: Mittal Publications, 1st Edition, 2010.
3. NarayananB.*Disaster Management*. NewDelhi: A.P.H. Publishing Corporation,1st Edition, 2009.

Web Sources

1. https://nptel.ac.in/courses/105/104/105104183/
2. https://nidm.gov.in/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF TAMIL
UG Programme - B.A/B.Sc/BCA
SEMESTER - III
பொதுத்தமிழ் - III (21UTAL31)
(From 2021-2022 Batch onwards)

HOURS / WEEK : 6 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS : 100**

நோக்கம்

காப்பியம்,சிற்றிலக்கியம்,உரைநடைஉள்ளிட்ட இலக்கியவகைகளைஅறிமுகம் செய்து,அவற்றைச் சமூக,சமயச் சூழலில் விளங்கவைத்து,யாப்பு,அணிஉள்ளிட்டமொழிக் கட்டமைப்புகளைஉணர்த்தி,உரைநடை மூலம்படைப்பாளராகும் தகுதியைப் பெறவைத்து,பல்வேறுநிகழ்வுகளில் நடைபெறும் போட்டிகளில் பங்கேற்கச் செய்யும் வகையில் இத்தாள் வடிவமைக்கப்பட்டுள்ளது.

கற்றலின் பயன்கள்

இத்தாளைவெற்றிகரமாகமுடித்தவுடன் மாணவர்கள்,

CO1[K1]:காப்பியங்களில் கூறப்பட்டுள்ளவாழ்வியல் நெறிகளாகியஅறம்,பொருள், இன்பம்,வீடுஆகியவற்றைப் பற்றிஅறிவர்.

CO2[K2]:செய்யுட்களில் இடம்பெறும் அணிநலன்களைக் காண்பர்.

CO3[K3]:யாப்புமரபைக் கற்றுணர்ந்துகவிதையை இனம் காணும் ஆற்றலைப் பெறுவர்.

CO4[K4]:சிற்றிலக்கியங்கள் உணர்த்தும் சமூகத்தையும் விழுமியத்தையும் விவாதிக்கும் திறனைப் பெறுவர்.

CO5[K4]:சமயங்கள் உணர்த்தும் அறக்கருத்துக்களைப் பகுப்பாய்வுசெய்வர்.

CO-PO Mapping Table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	-	1	-	-	-
CO2[K2]	2	1	-	1	-	-	-
CO3[K3]	2	2	-	2	1	-	-
CO4[K4]	2	2	1	2	-	1	1
CO5[K4]	2	2	1	2	1	1	1
Weightage of the Course	10	8	2	8	2	2	2
Weighted percentage of Course Contribution to Pos	**1.82**	**1.82**	**0.65**	**2.76**	**1.14**	**0.93**	**0.87**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

கூறுI **(18 hrs)**

காப்பியம்I:காப்பிய இலக்கியவரலாறு,சிலப்பதிகாரம் - அடைக்கலக்காதை (முழுவதும்) - மணிமேகலை - பளிக்கறைபுக்ககாதை (முழுவதும்) - சீவகசிந்தாமணி - காந்தர்வதத்தையார் இலம்பகம் (தேர்ந்தெடுக்கப்பட்ட 15 பாடல்கள்) - சிலைத்தொழிற் (657),கருங்கொடிப் புருவம் (658),திருமலர்க் கமலத் (662),விடுகணைவிசையின் (701),கழித்தவேலேறு (715),தடங்கணாள் பணியினால் (716),சுரந்துவானம் (717),நீர்நின் றளகிற் (718),கல்சேர் பூண்கொள் (719), இருநிலமடந்தை (720),தீந்தொடைநரம்பின் (721),பணிவரும் (722),விண்ணவர் வியப்ப (729),பருந்தும் நிழலும் (730),பண்ணொன்றுபாட (735)

கூறு II **(18 hrs)**

காப்பியம் II:திருவிளையாடற்புராணம் - கடல் சுவறவேல்விட்டபடலம் முழுவதும் - (19 பாடல்கள்) - கம்பராமாயணம் - ஆரணியகாண்டம் - சவரிபிறப்புநீங்குபடலம் முழுவதும் (9 பாடல்கள்) - பாரதிதாசன் - சஞ்சீவிபர்வதத்தின் சாரல் (முழுவதும்)

கூறு III **(18 hrs)**

சிற்றிலக்கியம்:சிற்றிலக்கியவரலாறு,காரைக்காலம்மையார் - அற்புதத் திருவந்தாதி - (1-15 பாடல்கள்) - மீனாட்சியம்மைபிள்ளைத்தமிழ்-வருகைப்பருவம் (10 பாடல்கள்) - முக்கூடற்பள்ளு - குடிமை - பெருமை (12-22 பாடல்கள்)

கூறு IV **(18 hrs)**

உரைநடை:உரைநடையின் தோற்றமும் வளர்ச்சியும்,சொல்லின்செல்வன் - க.நஞ்சையன்,படிப்பதுஎப்படி? - ம.திருமலை,தொல்காப்பியத்தில் கோளியல் நெறி - ச.பாரிஜாதம்,பாவேந்தரின் சமுதாயப் பார்வை - பாக்கியமேரி, இசையும் இயல்பும் - கி.ஈஸ்வரி,கம்பராமாயணத்தில் உறவுகள் - பெ.மகேஸ்வரி

கூறு V **(18 hrs)**

யாப்பு:பாவின் பொதுவிலக்கணமும் வகைகளும்(வெண்பா - ஆசிரியப்பா - கலிப்பா - வஞ்சிப்பா)**அணிகள்:**உவமையணி - உருவகஅணி - பிறிதுமொழிதல் அணி - வேற்றுமையணி - தற்குறிப்பேற்றஅணி - சிலேடைஅணி

பாடநூல்

1. *தொகுப்பு நூல்*,தமிழியல்துறை,ஸ்ரீ காளீஸ்வரிகல்லூரி (தன்னாட்சி),சிவகாசி.

பார்வைநூல்கள்

1. சீனிவாசன், ரா. *சீவகசிந்தாமணி*,அணியகம்,சென்னை, 2000.
2. தமிழண்ணல்.*புதியநோக்கில் தமிழ் இலக்கியவரலாறு*,மீனாட்சிபுத்தகநிலையம்,மதுரை,2008.
3. ஜகந்நாதன். கி.வா. *தமிழ்க் காப்பியங்கள் (ஆராய்ச்சி)*,அமுதநிலையம் லிமிடெட்,சென்னை, 1991.

வலைப்பதிவுகள்(Web Sources)

1. https://youtu.be/AY7R2D2GGQA
2. https://youtu.be/hmqTbZjrnu0
3. www.tamilvu.org/ta/courses-degree-c031-c0313-html-c03132I1-18030
4. https://ta.m.wikipedia.org/wiki/தமிழில்சிற்றிலக்கியங்கள்
5. https://youtu.be/Q7du9EglmBg

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF ENGLISH
UG Programme - B.A./B.SC./BCA
SEMESTER- III
COMMUNICATIVE ENGLISH - III (21UENL31)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS : 100**

Preamble

This course helps the learners to develop their communication skills in English through listening, speaking, reading and writing practices.

Course Outcomes (CO)

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

CO1[K1]: relate and state ideas by reading simple poems and listening to telephonic conversations

CO2[K2]: demonstrate effective speaking skills by making speech presentations, discussing television programmes and sports events

CO3[K3]: apply knowledge of word power and grammar rules through diary writing, dialogue writing and writing newspaper reports

CO4[K4]: analyze short fiction to develop language skills through literature

CO5[K6]: construct grammatically correct and logically coherent essays on global problems and environmental issues

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	-	2	-	-	-
CO2[K2]	2	2	-	2	1	1	-
CO3[K3]	2	2	1	2	1	1	-
CO4[K4]	2	2	1	2	-	-	1
CO5[K6]	2	1	1	1	1	1	1
Weightage of the course	10	08	03	09	03	03	02
Weighted percentage of Course contribution to POs	**1.82**	**1.82**	**0.97**	**3.11**	**1.71**	**1.4**	**0.87**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I -LISTENING AND SPEAKING **(18 hrs)**

A. Listening

Listening to short speech

Listening to telephonic conversation

Listening to poetry

B. Speaking

Telephone etiquette in telephone conversation

Answering the Telephone and asking for someone

Making enquiries on the phone, Leaving messages

Presentation: Global Warming, Pollution, Women Empowerment, Communicable Diseases, System of Education, Economy, Industry, Government etc

Discussion: Television Programmes, Lessons, College facilities, Local facilities, Sports-watching or Playing, Types of food, Types of transport.

UNIT II - READING AND WRITING **(18 hrs)**

Reading: Comprehension Passages: Newspaper articles, Reports and Paraphrase Stories.

Writing: Diary Writing**,** Dialogue Writing**,** Report Writing: Newspaper Reports, Field visits, Meetings and Future Plans

UNIT III - WORD POWER **(18 hrs)**

Portmanteau words

Idioms & Phrases

Words related to- Work, Time, Distance and Dimension, Environment, The Natural World and Global Problems

UNIT IV - GRAMMAR **(18 hrs)**

Sentence-Subject and Predicate

Kinds of Sentences

Sentence Patterns

Question Words and Framing Questions

Question Tags

Degrees of Comparison

Voice

UNIT V - LANGUAGE THROUGH LITERATURE **(18 hrs)**

Abridged version of Fiction

Alexandre Dumas	- The Count of Monte Cristo
Charles Dickens	- Oliver Twist
R.M.Ballantyne	- The Coral Island

TEXTBOOKS

1. Dickens, Charles. *Oliver, Twist*. Chennai: Nesting Books Publishing and Distributors (p) Ltd, 2018.
2. Dumas, Alexandre. The *Count of Monte Cristo*. Chennai: Nesting Books Publishing and Distributors (p) Ltd, 2018.
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1. *Life Skills* (Jeevan Kaushal) *Facilitators' Guidelines*. New Delhi: University Grants Commission, 2021.
2. Dickens, Charles. *Oliver Twist*. Bangalore: Vasan Publications, 2011.
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4. Taylor, Grant. *English Conversation Practice*. New Delhi: Tata McGraw Hill Publishers, 2001.

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3. https://blog.hubspot.com/service/phone-etiquette
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SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - III
CORE COURSE - V: MICROBIOLOGY (21UBTC31)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 60 hrs **MAX. MARKS :100**

Preamble

This course introduces the learners to the classification and multifarious habitats of microbes and also emphasis the microbial interactions and its cellular functions.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: describe the principles and working mechanism of microscopes
CO2[K2]: differentiate the microorganisms based on their morphology
CO3[K3]: determine the aspects of microbial nutrition and growth
CO4[K4]: classify and identify the microorganisms taxonomically
CO5[K5]: appraise the diversity of microorganisms

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	1	-	1	1
CO2[K2]	3	2	1	1	1	1	1
CO3[K3]	2	2	2	1	1	1	1
CO4[K4]	2	2	2	1	2	1	1
CO5[K5]	2	2	2	1	2	1	1
Weightage of the course	12	10	08	05	06	05	05
Weighted /;percentage of Course contribution to POs	**2.18**	**2.27**	**2.6**	**1.72**	**3.43**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

UNIT I **(12 hrs)**

History and Scope of Microbiology - Principles and Applications of Light microscope - Simple - Compound - Dark field - Phase Contrast Microscope - Fluorescent Microscope - Confocal Laser Scanning Microscopes and Electron Microscopes – TEM (Transmission Electron Microscope) - SEM.

UNIT II **(12hrs)**

Classification of Microorganisms – Domain, Kingdom Concept – Classification of Bacteria - Bergey's Manual – Fungi Alexopoulus – Algae - Viruses Baltimore classification.

UNIT III **(12 hrs)**

General Structure of Bacteria, Fungi and Algae - Nutritional Requirement - Nutritional Types of Microorganisms - Bacterial Growth Curve - Microbiological Methods - Stain and Staining Methods - Sterilization Methods.

UNIT IV **(12 hrs)**

Cultural Characteristics, Morphology and Pathogenesis of Bacteria - *Escherichia coli, Salmonella,Mycobacterium*. Fungi - *Aspergillus, Candida, Mucor mycosis*.Morphology and Pathogenesis of Viruses - HIV,HBV, SARS, Corona Virus (Covid19), Virions and Prions.

UNIT V **(12 hrs)**

Interactions between Microorganisms - Mutualism, Commensalism, Antagonism, Exploitation, Parasitism and Symbiosis, Biofertilizers - Rhizobia, Cyanobacteria, Arbuscularmycorrhizae and Biopesticides.Application of microorganisms in Biosensors,Biogas production, Bioremediation, Bioleaching and Biocontrol.

TEXTBOOKS

1. Sharma P.D. *A Text Book for University Students*.Rastogi Publications, Third Edition, 2015.
2. Ananthanarayanan and J. Panicker. *Text book of Microbiology*. University Press Publishers, Ninth edition, 2013.
3. Ananthanarayanan and J. Panicker. *Text book of Microbiology for nurses*. University Press Publishers, 2010.
4. Dubey R.C and D.K. Maheswari. *A Text book of Microbiology*. S.Chand Publication, Fourth edition, 2013.

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1. Prescott, Lansing M., John P. Harley, and Donald A. Klein. *Microbiology*.ke-6. Mc. Grow-Hill. New York, 2019.

2. Gerar J. Tortora, Berdell R. Funke, Christine and L. Case. *Microbiology - An Introduction*. Benjamin Cummings , Tenth Edition ,2016.
3. Michael J.Pelczar, C.S.Chan and Noel R.Krieg. *Microbiology*. McGrew - Hill publication,2001.

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2. https://youtu.be/zlRXDi - 6j - Y
3. https://youtu.be/m27ouF6xfZg

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - III
CORE COURSE - VI: PRACTICAL: MICROBIOLOGY (21UBTC3P)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS : 50**
CREDITS : 3 **EXT. MARKS : 50**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This course provides technical skill in pure culture techniques and also provides skill based knowledge in identification of microbes using staining and biochemical techniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: demonstrate the safe practices in a microbiology laboratory
CO2[K3]: perform the techniques for pure culture isolation and maintenance
CO3[K4]:distinguish the microorganisms morphologically by using staining techniques
CO4[K5]: choose the selective media for the cultivation of microbes
CO5[K6]: elaborate the antibacterial potential of microorganisms

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	2	1	2	1	2	1	1
CO2[K3]	2	2	2	1	2	1	1
CO3[K4]	2	2	2	1	2	1	1
CO4[K5]	2	2	2	1	2	1	1
CO5[K6]	2	2	2	1	2	1	1
Weightage of the course	10	09	10	05	10	05	05
Weighted percentage of Course contribution to POs	**1.82**	**2.05**	**3.25**	**1.72**	**5.71**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

Experiments

1. Microbiological Techniques - Media Preparation, Sterilization Techniques, Streaking Techniques, Patching.
2. Isolation of Microorganisms from Soil, Water, Air by Spread Plate and Pour Plate Methods.
3. Isolation and identification of Rhizobium from root nodules
4. Staining Techniques - Gram Staining
   Flagella Staining
   Endospore Staining
5. Biochemical Tests – IMViC Reaction
   Starch Hydrolysis
   Catalase Test
   Oxidase Test
   Acid and Gas Production Test
6. Test of microorganisms for Enzymes –Lipase, Protease and Amylase.
7. Isolation of Extremophils – Psychrophiles, Halophiles.
8. Anti - bacterial Potential of Natural Products by agar well diffusion method.
9. Motility test – Hanging Drop Method

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1. Garg F.C. *Experimental Microbiology*. CBS Publisher, 2017.
2. Nikunjpatel and Nikulchavada. Experimental microbiology, Educreation publishing, 2019.
3. Cappuccino J.G., and N. Sherman. *Microbiology: A Laboratory Manual.* Addison - Wesley, 2002.
4. Paul Vos and George Garrity. Bergey's Manual of Systematic Bacteriology, springer, *2011*
5. Holt J.G. and N.R.Krieg. *Bergey's Manual of Determinative Bacteriology*. Ninth edition, 2000.

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1. https://www.youtube.com/watch?v=AZS2wb7pMo4
2. https://gpatindia.com/imvic - tests - principle - procedure - and - results - notes - for - microbiology - exam/
3. https://www.youtube.com/watch?v=9FosVBK2yuI

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc, Biotechnology
SEMESTER - III
ALLIED COURSE - III: BIOLOGICAL SCIENCES (21UBTA31)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This course familiarizes the learners with the classification, morphology, Life cycle and economic importance of algae, fungi, gymnosperms, angiosperms, Invertebrates and Chordates.

Course Outcomes (CO)

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

CO1[K1]: list out the economic importance of plants and microorganisms

CO2[K2]: illustrate the systems of classification

CO3[K3]: dramatize the general characters and life cycle of algae, fungi, plants, Invertebrates and chordates

CO4[K4]: differentiate the dicot plants from monocot plants

CO5[K5]: assess the evolutionary changes that occur in simple to complex organisms

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	1	1	1	1	1
CO2[K2]	2	2	1	1	1	1	1
CO3[K3]	2	2	1	1	1	1	1
CO4[K4]	2	2	1	1	1	1	1
CO5[K5]	2	2	1	1	1	1	1
Weightage of the course	10	10	05	05	05	05	05
Weighted /;percentage of Course contribution to POs	**1.82**	**2.27**	**1.62**	**1.72**	**2.86**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

UNIT I **(12 hrs)**

Classification: Artificial, Natural and Phylogenetic system of classification - Bentham and Hooker system of classification –ICN Nomenclature - Binomial System. Preparation of Herbarium and its importance.

UNIT II **(12 hrs)**

Structure, Morphology and economic importance of Algae - *Sargassum*and Fungi - Yeast. General characters and classification (up to class level) of Bryophytes: Structure, Morphology and economic importance of *Marchantia.*

UNIT III **(12 hrs)**

General Characters, Classification, Morphology and economic importance of the following: Pteridophytes - *Selaginella;* Gymnosperms - *Pinus:* Angiosperms - Dicot family - Malvaceae and Monocot family – Musaceae - *Musa paradisiaca*.

UNIT IV **(12 hrs)**

Classification of Invertebrata (Upto class level)**.**Phylum Protoza - General Characters - Life Cycle of Malarial Parasite - Phylum – Coelenterata - General Characters - Coral formation and Types. Phylum Helminthes – Life cycle of Taeniasolium and Ascaris. Phylum Anaelida - General Characters - Vermitechnology.Phylum Arthropoda and Phylum Mollusca – General characters.

UNIT V **(12 hrs)**

Classification of Chordata (Upto class level).General Characters of Chordata and Prochordata Class – Pisces - General Characters - Fish Culture.Class - Amphibia - General Characters – Class - Reptilia - General Characters - Poisonous Snakes.Class - Aves and Mammalia - General Characters.

TEXTBOOKS

1. E.L.Jordan.*Invertebrate Zoology*. S.Chand Publication, New Delhi, 2010.
2. E.L.Jordan. *Chordate Zoology*.S.Chand Publication, New Delhi, 2010.
3. Susilkumar Mukherjee. *College Botany*. New central Book agency Publisher, 2012.
4. Annie Ragland and V. Kumaresan. *Botany for Degree students*. Saras publication, 2014.

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1. Pandey S.B.*Botany for Degree students*. S Chand & company, New Delhi, 2010.
2. Smith G.M. *Cryptogamic botany*. Volume I and II, Tata McGraw Hill, India, 2009.
3. Subramanyam. *Modern plant Taxonomy*. Vikas Publishing House, New Delhi, 2003.

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SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - III
ALLIED COURSE - III: PRACTICAL: BIOLOGICAL SCIENCES (21UBTA3P)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 2 **INT. MARKS : 50**
CREDIT : 1 **EXT. MARKS : 50**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This course enables the learners to demonstrate the major features of animal biology and also emphasis the biological concepts related to plants and plant - like organisms.

Course Outcomes (CO)

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

CO1[K2]: explain the vegetative and reproductive structures of algae, fungi and plants

CO2[K3]: perform the dissection of dicot flowers

CO3[K4]: distinguish animals based on their morphology

CO4[K5]: assess the external, digestive and reproductive system of animals

CO5[K6]: elaborate physiological characteristics of plants and animals

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	2	1	2	1	-	2	2
CO2[K3]	2	1	2	1	-	2	2
CO3[K4]	2	1	2	1	-	2	2
CO4[K5]	2	1	2	1	-	2	2
CO5[K6]	2	1	2	1	-	2	2
Weightage of the course	10	05	10	05	-	10	10
Weighted percentage of Course contribution to POs	**1.82**	**1.14**	**3.25**	**1.72**	**0**	**4.67**	**4.35**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

Experiments

Botany:

1. Vegetative structure and reproductive structure in *Sargassum*, *Yeast*, *Marchantia*.
2. Vegetative structure and reproductive structure in *Selaginella*, *Pinus*.
3. Dissection and study of any available Dicot flower.

Zoology:

1. Cockroach - External, digestive and reproductive system (Virtual dissection).
2. Mounting of Honey Bee mouth parts.
3. Mounting of Placoid scales of Shark.
4. Frog–Arterial and Venous system (Virtual dissection).
5. Morphology of Amoeba, Euglena, Hydra, Liver fluke, *Taenia,*Ascaris, Earth worm, Prawn, Pila, Star fish, *Catla, Tilapia*, frog, Calotes, Pigeon and Rat (Spotters).

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1. Ashok Bendre, M and Ashok kumar. *A Text Book of Practical Botany*. Volume I and II. Rastogi Publications, India, 2009.
2. Verma, P.S. and V.K. Agarwal. *A manual of Practical Zoology*; Invertebrates and Vertebrates. S. Chand and Co., New Delhi, 2009.
3. Pandey, B.P. *Modern Practical Botany*. Volume I and II. S. Chand and Co., New Delhi, 1999.
4. Lal, S.S.*A Text book of vertebrate zoology*. Raj pal Publishers, New Delhi, India, 2008.

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2. http://www.auburn.edu/academic/classes/biol/1030/rajamani/Topic%2016%20BIOL1030NR.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - III
NON MAJOR ELECTIVE COURSE - I: INFECTIOUS DISEASES (21UBTN31)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 2 **INT. MARKS : 40**
CREDIT : 1 **EXT. MARKS : 60**
DURATION : 30hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to infectious disease epidemiology, outbreak, laboratory diagnosis, mode of transmission, and assessment of vaccine effectiveness.

Course Outcomes (CO)

On Successful completion of the course, the learners will be able to
CO1[K1]: describe the principles of infectious diseases.
CO2[K2]: explain the epidemiology of infectious diseases
CO3[K3]:determine the diagnosis and treatment of various diseases
CO4[K4]: differentiate communicable and noncommunicable diseases
CO5[K4]: analyse the mode of transmission of pathogens

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	-	2	-	1	1
CO2[K2]	2	1	-	2	-	1	1
CO3[K3]	2	1	-	2	-	1	1
CO4[K4]	2	1	-	1	-	1	1
CO5[K4]	1	1	-	1	-	1	1
Weightage of the course	09	05	-	08	-	05	05
Weighted percentage of Course contribution to POs	**1.64**	**1.14**	**0**	**2.76**	**0**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

UNIT I **(6 hrs)**

Introduction to infectious diseases - frequency of disease, characteristics of infectious diseases, disease cycle and transmission of pathogen.Pathogenesis, occurrence, epidemiology, diagnosis and treatment of *Streptococcus,* Mycobacterial Diseases, *Salmonella* infections *and Leptospirosis*.Histoplasmosis, Aspergillosis and Candidiasis.

UNIT II **(6 hrs)**

Pathogenesis, occurrence, epidemiology, diagnosis and management of AIDS, Hepatitis B and Influenza virus infections: H1N1, Chikunguinea, Dengue, Covid 19.

UNIT III **(6 hrs)**

Pathogenesis, occurrence, epidemiology, diagnosis and treatment of malaria, amoebiasis and ascariasis.

UNIT IV **(6 hrs)**

Differences between communicable and non - communicable diseases.Coronary heart disease, Hypertension, Rheumatic heart diseases, stroke, and Cancer. Diabetes mellitus, glucose tolerance tests, sugar levels in blood. Disorder of Lipids: Atherosclerosis, Obesity.

UNIT V **(6 hrs)**

Disorders of liver and kidney: Jaundice, liver cirrhosis, Kidney failure, Normal Functions of liver and kidney. Inborn Errors of Metabolism: Phenylketonuria, alkaptonuria, albinism, Sickle cell anaemia.

TEXTBOOKS

1. William F. Wright. *Essentials of Clinical Infectious Diseases*. Springer Publishers, 2018.
2. Pelzer Jr, E.C.S. Chan and N.R. Kreig. *Microbiology*. McGraw Hill Inc, New York, 2001.
3. AmbikaShanmugam.*Fundamentals of Biochemistry for Medical students*, Wolter Kluwer India PVt. Ltd. 2016.

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1. Dubey R.C and D.K.Maheshwari. *A text book of Microbiology*. S.Chand&Company, New Delhi, 2013.
2. Rajesh Bhatia and Rattan Lal. *Essentials of Medical Microbiology*.Jaypee Brothers, Fourth edition, New Delhi, 2008.
3. Roger Webber. *Communicable Diseases Epidemiology and control*. Cab International publishers, 2004.

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SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc Biotechnology
SEMESTER - III
SKILL ENHANCEMENT COURSE - III: PRACTICAL:
ENTREPRENEURSHIP IN BIOTECHNOLOGY – I (21UBTS31)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 2 **INT. MARKS : 50**
CREDITS : 2 **EXT. MARKS : 50**
DURATION : 30 hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to the basic concepts of developing entrepreneurship quality, so as to produce biologically generated value added products for human welfare.

Course Outcomes (CO)

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

CO1[K2]: explain the techniques used in the culture of edible mushrooms
CO2[K3]: determine the commercially important algae for mass production
CO3[K4]: analyse the factors influencing Spirullina cultivation
CO4[K5]: appraise the advance methods involved in silk production
CO5[K6]: elaborate the life cycle of Honey bee

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	1	1	1	1	1	2	1
CO2[K3]	1	1	1	1	1	2	1
CO3[K4]	1	1	1	1	1	2	1
CO4[K5]	1	1	1	1	1	2	1
CO5[K6]	1	1	1	1	1	2	1
Weightage of the course	05	05	05	05	05	10	05
Weighted /;percentage of Course contribution to POs	**0.91**	**1.14**	**1.62**	**1.72**	**2.86**	**4.67**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

Experiments

1. Cultivation of Oyster Mushroom from agricultural wastes
   Construction of Mushroom shed, Spawn preparation, Substrate preparation (Paddy straw), sterilization, harvesting,

2. Azolla cultivation
   Identification and selection of mother culture, Cultivation methods, Media preparation, Preparation of culture tank, harvesting, Filtration, Processing and marketing.

3. Spirullina cultivation
   Identification and selection of mother culture, Cultivation methods, Media preparation, Preparation of culture tank, harvesting, Filtration, Processing and Marketing.

4. Sericulture – Construction of silk worm rearing shed, Mori culture, Silk worm rearing, harvesting silk worm cocoon and marketing.

5. Apiculture – Structure of Beehives, colony of honeybees, Life cycle and types- Male worker and Queen, Maintenance of Bee colony, Honey extraction and marketing.

REFERENCES

Books

1. Tradd Cotter.*Organic Mushroom Farming and Mycoremediation: Simple to Advanced and Experimental Techniques for Indoor and Outdoor Cultivation*. Chelsea Green Publishing, USA, 2014.
2. Dinesh Chandra, A. and D. Muralikrishnan. *Medicinal Mushrooms: Recent Progress in Research and Development*. Springer, Singapore, 2019.
3. Amos Richmond. *Handbook of Microalgal Culture: Biotechnology and Applied Phycology*. John Wiley & Sons, 2008.
4. Aruga, H. *Principles of Sericulture*. India: Taylor & Francis, 1994.
5. Conrad, R., Nabhan, G. P. *Natural Beekeeping: Organic Approaches to Modern Apiculture*, 2nd Edition. United States: Chelsea Green Publishing, 2013.

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2. https://www.youtube.com/ad14ac4a - 48e1 - 4f65 - 8c51 - 05c272dc2ad9'
3. https://www.youtube.com/watch?v=UFuaFk8zEug

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF TAMIL
UG Programme - B.A./B.SC./BCA
SEMESTER-IV
பொதுத்தமிழ் - IV (21UTAL41)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 90hrs **MAX. MARKS: 100**

நோக்கம்

சங்கஇலக்கியங்களின் மேன்மைகளையும் வாழ்வியல் அறங்களையும் மாணவர்களுக்குஎடுத்துரைப்பதையும் புதினஇலக்கியத்தைஅறிமுகப்படுத்துவதையும் நோக்கமாகக் கொண்டு இத்தாள் வடிவமைக்கப்பட்டுள்ளது.

கற்றலின் பயன்கள்

இத்தாளைவெற்றிகரமாகமுடித்தவுடன் மாணவர்கள்,

CO1[K1]:புதின இலக்கியவகைகளைஅடையாளம் காண்பர்.
CO2[K2]:சங்க இலக்கியங்களில் உள்ளஅறக்கருத்துக்களைஎடுத்துரைப்பர்.
CO3[K3]: அக,புற இலக்கணங்களைக் கற்பர்.
CO4[K4]:சங்க இலக்கியங்களின் வாயிலாகமக்களின் வாழ்க்கைமுறையினைப் பாகுபடுத்துவர்.
CO5[K5]:பண்டையதமிழ் இலக்கியஆளுமைகளைமதிப்பிடுவர்.

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	-	1	-	-	-
CO2[K2]	2	1	-	2	-	-	-
CO3[K3]	2	2	-	2	1	-	1
CO4[K4]	2	2	1	2	1	1	-
CO5[K5]	2	2	1	2	-	1	1
Weightage of the course	10	8	2	9	2	2	2
Weighted percentage of Course contribution to POs	**1.82**	**1.82**	**0.65**	**3.1**	**1.14**	**0.93**	**0.87**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

கூறு I **(18 hrs)**

எட்டுத்தொகை இலக்கியவரலாறு - **குறிஞ்சித்திணை - நற்றிணை:**ஓங்குமலைநாட(55) - கழுதுகால்கிளர(255). **முல்லைத்திணை - குறுந்தொகை:**பெருந்தண் மாரிப்(94),மடவவாழிமஞ்ஞை(251). **மருதத்திணைகலித்தொகை:**அகன்துறைஅணிபெற(73), புள்இமிழ் அகல் வயல்(79). **நெய்தல் திணை -ஐங்குறுநூறு:**தாய்க்குஉரைத்தபத்து(10 பாடல்கள்).**பாலைத்திணை - அகநானூறு:** வளம்கெழுதிருநகர்ப்(17),கடல்முகந்துகொண்டகமஞ்சூல்(43). **பரிபாடல்**: வையை - வளிபொருமின்னொடு(12).**புறநானூறு**: இரும்பனைவெண்தோடு(45) - எமக்கேகலங்கல் (298),**பதிற்றுப்பத்து:**ஐந்தாம்பத்தில் மாமலைமுழக்கின்.

கூறு II **(18 hrs)**

பத்துப்பாட்டு இலக்கியவரலாறு- **பத்துப்பாட்டு:**குறிஞ்சிப்பாட்டு (முழுவதும்)

கூறு III **(18 hrs)**

சங்கமருவியகால இலக்கியவரலாறு- **திரிகடுகம்:**தற்புகழ்ச்சிக்குக் கூடாதவை - தொல் அவையும்(8) -புகழுக்குரிய மூவர் - மண்ணின் மேல் வான்(16),வீடுபேறுஅடையும் வழிகள் - பற்று(22) -கற்றறிந்தார் கடமை - நுண்மொழிநோக்கிப்பொருள்(32),நல்லோர் நெறி- சான்றாருள் சான்றான் எனப்படுதல்(82). **நாலடியார்**: கூடாநட்பு (231-240).**இனியவைநாற்பது**: உடையான் வழக்கினிது(2) -மானம் அழிந்தபின்(13) - குழவிதளர்நடை(14) -பிறன்கைப் பொருள்வெளவான்(21) - வருவாய் அறிந்து (22). **இன்னாநாற்பது:** உண்ணாதுவைக்கும்(16) -மாரிநாள் கூவும்(20) - யானையில் மன்னாக்(22) - சிறையில்லா மூதூரின்(23) - ஏமம்இல் மூதூர்(24).**திருக்குறள்**:அறத்துப்பால் - புகழ், இன்பத்துப்பால் - குறிப்பறிதல் (அதிகாரங்கள் முழுவதும்).

கூறு IV **(18 hrs)**

புதின இலக்கியவரலாறு,கூட்டுக்குஞ்சுகள் - இராஜம் கிருஷ்ணன்.

கூறு V **(18 hrs)**

இலக்கணம் - தொல்காப்பியர் குறிப்பிடும் திணைக்கோட்பாடுகள் - அகப்பொருள் - புறப்பொருள் - உள்ளுறை - இறைச்சி - விண்ணப்பம் - புகார் - பாராட்டுக் கடிதங்கள் - அறிக்கை - செய்திஎழுதுதல்.

பாடநூல்கள்

1. *தொகுப்பு நூல்*,தமிழியல்துறை,ஸ்ரீ காளீஸ்வரிகல்லூரி (தன்னாட்சி),சிவகாசி.
2. இராஜம் கிருஷ்ணன். *கூட்டுக்குஞ்சுகள்*,நியூ செஞ்சுரிபுத்தகநிலையம்,சென்னை, 2011.
3. வாசுதேவன்,கா. *பன்முகநோக்கில் தமிழ் இலக்கியவரலாறு*,தேவன் பதிப்பகம்,திருச்சிராப்பள்ளி, 2017.

பார்வை நூல்கள்

1. சுப்பிரமணியன், க. *சங்ககாலச் சமுதாயம்*,ஜனசக்திஅச்சகம்,சென்னை, 1993.
2. பாலசுப்பிரமணியன் சிற்பி&நீலபத்மநாபன் (பதி.),*புதியதமிழ் இலக்கியவரலாறு.* மணமலர்ப் பதிப்பகம்,சென்னை,2000.
3. பாலசுப்பிரமணியன்,சி.*தமிழ் இலக்கியவரலாறு*,மண்மலர்ப் பதிப்பகம்,சென்னை,2003.
4. மோகன், இரா. *பத்துப்பாட்டு மூலமும் உரையும்*,நியூ செஞ்சுரிபுத்தகநிலையம்,சென்னை,2004.

வலைப்பதிவுகள்(Web Sources)

1. https://youtu.be/Gv84KCknV_g
2. https://youtu.be/B42bzKeb-aI
3. https://youtu.be/sLE4yH-7PeE
4. https://youtu.be/wdlw8CyEBP8

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF ENGLISH
UG Programme - B.A./B.SC./BCA
SEMESTER- IV
COMMUNICATIVE ENGLISH - IV (21UENL41)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 6 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 90 hrs **MAX. MARKS: 100**

Preamble

This course helps the learners to develop their communication skills in English through listening, reading, speaking and writing practices.

Course Outcomes (CO)

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

CO1[K1]: relate and state ideas by listening to lectures and reading narratives

CO2[K2]: demonstrate effective speaking skills through group discussions and answering interview questions

CO3[K3]: apply knowledge of word power and grammar rules through drafting Memorandum, Minutes of the meetings and Agenda

CO4[K4]: analyze tales from Shakespeare to develop language skills through literature

CO5[K6]: construct grammatically correct and meaningful sentences for Covering letters and Resume Writing and thereby preparing students towards employability

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	-	1	-	-	-
CO2[K2]	2	1	-	1	-	-	-
CO3[K3]	2	2	1	2	1	1	1
CO4[K4]	2	2	1	2	1	1	1
CO5[K6]	2	3	1	2	-	1	1
Weightage of the course	10	09	03	08	02	03	03
Weighted percentage of Course contribution to POs	**1.82**	**2.05**	**0.97**	**2.76**	**1.14**	**1.4**	**1.3**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

UNIT I - LISTENING AND SPEAKING **(18 hrs)**

LISTENING

Listening to lectures

Listening to commentaries

Listening to narratives

SPEAKING

Welcome address and Vote of Thanks

Role Play

Anchoring

Group discussion

Interview questions

UNIT II - READING AND WRITING **(18 hrs)**

Reading Newspaper- articles, letter to editor, sports and entertainment

WRITING

Drafting:

Memorandum

Minutes of the meeting

Agenda

Resume writing & Covering letter

UNIT III - WORD POWER **(18 hrs)**

Words often confused

Analogy

Words related to- Health and Medicine, Pleasant and Unpleasant feelings, Success and Failure, Science and Technology and Travel

UNIT IV - GRAMMAR **(18 hrs)**

Identify Phrases and Clauses

Transformation of Sentences: Reported speech, Simple, Compound and Complex Sentences

Error Spotting

UNIT V - LANGUAGE THROUGH LITERATURE **(18 hrs)**

TALES FROM SHAKESPEARE

Romeo and Juliet

A Midsummer Night's Dream

The Merchant of Venice

King Lear

Macbeth

TEXTBOOKS

1. Carthy Mc., and Felicity O'Dell. *English Vocabulary in Use (Upper intermediate)*. UK: Cambridge University Press, 2005.
2. Pillai, Radhakrishna G., and K.Rajeevan. *Spoken English for You (Level One)*. Chennai: Emerald Publishers, 2009.
3. Pillai, Radhakrishna G. *Emerald English Grammar and Composition.* Chennai: Emerald Publishers, 2016.

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Books

1. *Life Skills (Jeevan Kaushal) Facilitators' Guidelines*. New Delhi: University Grants Commission, 2021.
2. Radha, Alamelu and Kasthuri Bai. *Situational Grammar and Composition.* Chennai: New Century Book House Pvt. Ltd, 2008.
3. Sadanand, Kamalesh and Susheela Punitha. *Spoken English- A Foundation Course for speakers of Tamil*. Mumbai: Orient Blackswan, 2009.
4. Taylor, Grant. *English Conversation Practice*. New Delhi: Tata McGraw Hill Publishers, 2001.

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1. https://www.litcharts.com/how-to-guides/shakespeare-research-resources
2. https://steffesziri.files.wordpress.com/2019/04/illustrated-stories-from-shakespeare-0.pdf
3. https://www.talkenglish.com/lessonindex.aspx
4. https://www.englishhelper.com/
5. https://www.englishpage.com/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - IV
CORE COURSE - VII: MOLECULAR BIOLOGY AND MICROBIAL GENETICS
(21UBTC41)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This course familiarizes the learners withthe structure and functions of biologically important molecules and molecular events that govern cell function and also focuses on the fundamental genetic concepts of microorganisms.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: outline the concepts of central dogma of cell
CO2[K2]: illustrate the causes of genetic variations by mutation
CO3[K3]: determine the role of enzymes in molecular events
CO4[K4]: analyse the factors and mechanisms in DNA damage and Repair
CO5[K5]: justify the benefits of transposable elements in microbial genetics

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	-	1	1
CO2[K2]	3	2	2	1	-	1	1
CO3[K3]	3	2	2	1	-	1	1
CO4[K4]	3	2	2	1	1	1	1
CO5[K5]	3	2	2	1	1	1	1
Weightage of the course	15	10	10	05	02	05	05
Weighted percentage of Course contribution to POs	**2.73**	**2.27**	**3.25**	**1.72**	**1.14**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation

UNIT I **(12 hrs)**

Structure and functions of Nucleic Acid. Discovery of DNA and its Replication: Prokaryotic and eukaryotic DNA replication. Genetic information passes from DNA to RNA. Transcription, initiation, elongation and termination.Enzymes involved in transcription. Post Transcriptional Modification. Inhibitors of RNA synthesis.

UNIT II **(12 hrs)**

Genetic code. Translation: initiation, elongation and termination Significance of ribozymes- Post translational Modification - Gene regulation in prokaryotes: lac operon, ara operon and trp operon. Models of recombination.Genetic disorder- Chromosomal aberrations.

UNIT III **(12 hrs)**

Plasmids - Plasmid types. Gene transfer mechanisms: - Conjugation: Principle, types - F - mediated and Hfr mediated mechanism. Transformation: Definition, process and mechanism. Transduction - Generalised and specialized transduction. Applications of Lytic and Lysogenic phages in gene transfer. Transfection of phage DNA.

UNIT IV **(12 hrs)**

The modern concept of gene.Genetic variation by Mutation - Definition, types, insertion, deletion, addition, rearrangement. Mutagenesis - types - site directed mutagenesis, base analogue mutants and tautomerization. DNA damage (pyridine dimers, alkylation and deamination) and repair mechanism - photo reactivation, direct repair of nicks, excision repair, mismatch repair, recombination repair, SOS repair mechanisms.

UNIT V **(12 hrs)**

Site specific recombination mechanisms and their use in microbial genetics: Transposable genetic elements - Identification of Transposition - IS elements, Composite transposons,Tn3, Tn5, Tn9, Tn10 and Mu phage. Transposition mechanism.

TEXTBOOKS

1. Karp G. *Cell and Molecular Biology: Concepts and Experiments*. 7th edition, John Wiley and Sons. Inc, 2013.
2. Larry R. Snyder, Joseph E. Peters, Tina M. Henkin, Wendy Champness. *Molecular Genetics of Bacteria*.3rd edition, American Society for Microbiology, Washington, D. C, 2013.
3. Brown T. A. *Genomes 4* .Garland Science Publishing, 2017.

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1. James D Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine and Richard Losick, Benjamin Cummings.*Molecular Biology of the Gene*. 2017.
2. Malacinski G. M. *Essentials of Molecular Biology.* Fourth Edition Jones &Bartlett Publishers, 2015*.*
3. Peter J. Russel. *Genetics –A Molecular Approach,* 2016.

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2. https://yeastwonderfulworld.wordpress.com/microbial - genetics/
3. https://www.educator.com/biology/microbiology/carpenter/microbial - genetics.php

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - IV
CORE COURSE - VIII: PRACTICAL:
MOLECULAR BIOLOGY AND MICROBIAL GENETICS (21UBTC4P)
(From 2021-2022 Batch onwards)

HOURS/WEEK :4 **INT. MARKS : 50**
CREDITS :2 **EXT. MARKS : 50**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This course enables the learnersto get experimental knowledge on isolation and quantification nucleic acid from biological samples and also provides practical skills on microbial gene transfer techniques.

Course Outcomes (CO)

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

CO1[K2]: demonstrate the principles of electrophoresis

CO2[K3]: perform nucleic acids isolation and quantification from biological samples

CO3[K4]: examine the effect of mutagens in the isolation of auxotrophic mutants

CO4[K5]: assess the role of enzymes in microbial genetics

CO5[K6]: elaborate the microbial gene transfer techniques

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	2	1	2	1	-	1	1
CO2[K3]	2	2	2	1	1	1	1
CO3[K4]	2	2	2	1	1	1	1
CO4[K5]	2	2	2	1	1	1	1
CO5[K6]	2	2	2	1	1	1	1
Weightage of the course	10	09	10	05	04	05	05
Weighted percentage of Course contribution to POs	**1.82**	**2.05**	**3.25**	**1.72**	**2.29**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

Experiments

1. Growth curve of bacteria and calculation of generation time
2. Isolation of genomic DNA and RNA from plants, animals, bacteria and quantification
3. Isolation of plasmid DNA from Bacteria
4. Separation of nucleic acids by agarose gel electrophoresis.
5. Elution of DNA from gel
6. Bacterial Conjugation
7. Bacterial transformation
8. Isolation of phage and phage titration
9. Isolation of auxotrophic mutant
10. Bacterial gene inhibition and β gal assay

REFERENCES

Books

1. Miller, Jeffrey H. *A short course in bacterial genetics: a laboratory manual and handbook for Escherichia coli and related bacteria*. Trends in Biochemical Sciences - Library Compendium, 2009.
2. Cappuccino, James G., and Natalie Sherman. *Microbiology: a laboratory manual*, 2014.
3. Green, Michael R., Howard Hughes, Joseph Sambrook, and Peter MacCallum. *Molecular cloning: a laboratory manual*, 2012.

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2. http://www.uwyo.edu/molb2021/ files/docs/lab lecture notes/lecture - 13 - student - version.pdf
3. https://www.thermofisher.com/in/en/home/life - science/dna - rna - purification - analysis/protocol - videos.html

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG PROGRAMME – B.SC
SEMESTER - IV
ALLIED COURSE - IV: BIOANALYTICAL TOOLS (21UBTA41)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to und the principles and working mechanism of Bioanalytical instruments and tools to interpret the experimental data.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: state the principles and working mechanism of microscopes
CO2[K2]: explain the principles and applications of chromatography and spectrometry
CO3[K3]: apply the electrophoresis technique in separation of biomolecules
CO4[K4]: analyse the role of radioactive isotopes in bioanalytical techniques
CO5[K5]: appraise the importance of biosensors

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	2	1	1	1	1
CO2[K2]	2	2	2	1	1	1	1
CO3[K3]	2	3	2	1	1	1	1
CO4[K4]	2	3	2	1	1	1	1
CO5[K5]	2	3	2	1	1	1	1
Weightage of the course	10	13	10	05	05	05	05
Weighted percentage of Course contribution to POs	**1.82**	**2.95**	**3.25**	**1.72**	**2.86**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

UNIT I **(12 hrs)**

Microscopy - Simple and Compound Microscopy - Phase contrast and Confocal Microscopy - Fluorescence microscopy - Electron microscopy (SEM and TEM) – Centrifugation Techniques.

UNIT II **(12 hrs)**

Spectroscopy - UV and Visible Spectroscopy - Fluorescence spectroscopy - Mass spectroscopy - NMR Spectroscopy - ESR – Atomic Absorption spectroscopy - Raman spectroscopy.

UNIT III **(12 hrs)**

Chromatography - Principle and application of Paper chromatography - Thin Layer chromatography - HPLC - HPTLC - Gas Chromatography - Affinity and Ion Exchange chromatography - LCMS - Gel filtration chromatography.

UNIT IV **(12 hrs)**

Introduction to Electrophoresis - starch gel, Poly acrylamide gel (Native and SDS - PAGE), Agarose gel electrophoresis – Immunoelectrophoresis.Basic principle and instrumentation of 2D gel, MALDI - TOF, Blotting techniques.

UNIT V **(12 hrs)**

Radio isotopic Techniques - Introduction to Radioisotopic technique and their biological application - Autoradiography - GM Counter - Solid and Liquid Scintillation Counter.

TEXTBOOKS

1. Greenberg, D.M. *Metabolic Pathways*. Vols. 2 and 3. Burlington Elsevier Science, 2012.
2. Nelson, D.L, Cox, M.M, and Lehninger, A.L.*Principles of Biochemistry*. Worth Publishers, Freeman, 2013.
3. Voet, D, Voet, J.G,and Pratt, C.W. *Principles of Biochemistry*. Singapore: John Wiley & Sons, 2013.

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1. Wilson, J. M. Walker. *Principles and techniques of biochemistry and molecular biology.* CambridgeUniversity Press, Cambridge, UK: New York, 7th ed., 2009.
2. Boyer R. F. *Biochemistry laboratory: modern theory and techniques.* Prentice Hall, Boston, 2nd ed., 2012.
3. KatochR. *Analytical techniques in biochemistry and molecular biology.* Springer, New York, 2011.

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SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - IV
ALLIED COURSE - IV: PRACTICAL: BIOANALYTICAL TOOLS (21UBTA4P)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 2 **INT. MARKS : 50**
CREDIT : 1 **EXT. MARKS : 50**
DURATION : 30 hrs **MAX. MARKS : 100**

Preamble

This course provides the technical skills of basic and advanced techniques employed in quantitative and qualitative analysis of bio molecules.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: estimate the lipids and antioxidants in biological samples
CO2[K3]: apply the knowledge of blotting techniques in identification of proteins
CO3[K4]: examine the morphology of plant and animal tissues using microscopes
CO4[K5]: choose the appropriate technique for the separation of plant pigments
CO5[K6]: prepare subcellular fractions from rat liver cells

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	2	2	2	1	1	1	1
CO2[K3]	2	2	2	1	1	1	1
CO3[K4]	2	1	2	1	-	1	1
CO4[K5]	2	2	2	1	-	1	1
CO5[K6]	2	2	2	1	1	1	1
Weightage of the course	10	09	10	05	03	05	05
Weighted percentage of Course contribution to POs	**1.82**	**2.05**	**3.25**	**1.72**	**1.71**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

Experiments

1. Separation of proteins by SDS PAGE
2. Estimation of Lipids in blood sample
3. Preparation of subcellular fractions of liver cells
4. Estimation of total antioxidant using ELISA Reader
5. Examination of plant and Animal tissue morphology using compound Microscope
6. Separation of blood serum using Centrifugation technique.
7. Separation of Plant pigments by Thin Layer chromatography
8. Blotting techniques - Western
9. Microtome - Temporary and permanent slide preparation

REFERENCES

Books

1. Palanivelu P. *Analytical biochemistry and separation techniques*. MKU, Madurai, 2012.
2. Douglas A Skoog, F. James Holler, Timothy A.Nieman. *Principles of Instrumental Analysis*. Brooks Cole publishers,Seventh Edition, 2017.

Web Sources

1. https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf
2. https://nptel.ac.in/courses/104/104/104104066/
3. https://nptel.ac.in/courses/103/108/103108100/#

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - IV
SELF PACED LEARNING (SWAYAM COURSE)
CELL CULTURE TECHNOLOGIES (21UBTM41)
(From 2021-2022 Batch onwards)

CREDITS : 2 **EXT. MARKS : 100**
DURATION : 8 Weeks **MAX. MARKS : 100**

Preamble

This course provides the learners with an opportunity for a lifelong learning by meeting the demand in terms of knowledge, skills, and competencies.

Course outcome (CO)

On successful completion of this course learners will be able to

CO1[K1]: identify the background and the key words in cell culture technologies
CO2[K2]: demonstrate independent and self-paced learning for clear understandingof the concept
CO3[K3]: develop computer and communication skills to broaden their knowledge in the course
CO4[K3]: use high quality reading resources, communication tools and technology to send assignments and to take up test
CO5 [K4]: analyse critically and apply technical skills to comprehend the ideas or theoriesin the video lectures

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	2	-	-	2
CO2[K2]	3	2	1	1	-	-	2
CO3[K3]	3	2	1	2	1	1	1
CO4[K3]	2	2	1	2	-	-	1
CO5[K4]	2	2	1	2	-	1	1
Weightage of the course	13	10	05	09	01	02	07
Weighted percentage of Course contribution to Pos	**2.36**	**2.27**	**1.62**	**3.11**	**0.57**	**0.93**	**3.04**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

Course layout

Week 1: Introduction & biology of cultured cells
Week 2: Equipments, aseptic techniques, safety protocols
Week 3: Culture vessels & media development
Week 4: Serum - free medium development & sterilization
Week 5: Primary culture, secondary culture, cloning & selection
Week 6: Cell separation, characterization, differentiation & transformation
Week 7: Contamination, cryo - preservation &cyto - toxicity
Week 8: Organo - typic culture & specialized cell culture techniques

REFERENCES

1. Freshney, R. Ian. *Culture of animal cells: a manual of basic technique and specialized applications*. John Wiley & Sons, 2015.
2. Guy, Heather. *Cell culture technology: Recent advances and future prospects*. Biomedical Scientist, 2012.
3. Buckmann, A. F.*Vertebrate cell culture II and enzyme technology*. Springer-Verlag, 1989.
4. Butler, Michael. *Animal cell culture and technology*. Taylor & Francis, 2004.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - IV
SELF PACED LEARNING (SWAYAM COURSE)
COMPUTER AIDED DRUG DESIGNING (21UBTM42)
(From 2021-2022 Batch onwards)

CREDITS : 2 **EXT. MARKS : 100**
DURATION : 8 Weeks **MAX. MARKS : 100**

Preamble

This course provides the learners with an opportunity for a lifelong learning by meeting the demand in terms of knowledge, skills, and competencies.

Course outcome (CO)

On successful completion of this course learners will be able to

CO1[K1]: identify the background and the key words in cell culture technologies
CO2[K2]: demonstrate independent and self-paced learning for clear Understanding of the concept
CO3[K3]: develop computer and communication skills to broaden their knowledge in the course
CO4[K3]: use high quality reading resources, communication tools and technology to send assignments and to take up test
CO5 [K4]: analyse critically and apply technical skills to comprehend the ideas ortheoriesin the video lectures

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	2	-	-	2
CO2[K2]	3	2	1	1	-	-	2
CO3[K3]	3	2	1	2	1	1	1
CO4[K3]	2	2	1	2	-	-	1
CO5[K4]	2	2	1	2	-	1	1
Weightage of the course	13	10	05	09	01	02	07
Weighted percentage of Course contribution to Pos	**2.36**	**2.27**	**1.62**	**3.11**	**0.57**	**0.93**	**3.04**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

Course layout

Week 1: Introduction to drug discovery
Week 2: Structure and property
Week 3: ADME - rules
Week 4: Force field/MM/QM
Week 5: Boundary conditions/Conformation
Week 6: QSAR/Pharmacophore
Week 7: Enzymes/proteins structures/docking
Week 8: PK/PD

REFERENCES

1. Voit, E. O. *A first course in systems biology*. New York: Garland Science, 2012.
2. Klipp, Edda. *Systems biology: a textbook*. John Wiley & Sons, 2016.
3. Sehgal and Sheikh Arslan. *Quick guideline for computational drug design*. Bentham Science Publishers, 2018.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - IV
NON MAJOR ELECTIVE COURSE – II: MUSHROOM CULTIVATION (21UBTN41)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 2 **INT.MARKS : 40**
CREDIT : 1 **EXT.MARKS : 60**
DURATION : 30hrs **MAX.MARKS: 100**

Preamble:

This course introduces the learners to the characteristics of different mushrooms and their cultivation methods and also the methods of preparation of Value added products to become an entrepreneur.

Course Outcomes (CO)

On Successful completion of the course, the learners will be able to

CO1[K1]: describe the general structure and Morphology of Mushrooms and their nutritional values

CO2[K2]: classify edible and non - edible mushrooms

CO3[K3]: apply various control measures for Pests and disease

CO4[K4]: examine the opportunities in preparing Value added products and their market value.

CO5[K4]: analyse suitable method to cultivate mushrooms

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	-	2	-	1	1
CO2[K2]	2	1	-	2	-	1	1
CO3[K3]	2	1	-	2	-	1	1
CO4[K4]	2	1	-	1	-	1	1
CO5[K4]	1	1	-	1	-	1	1
Weightage of the course	09	05	-	08	-	05	05
Weighted percentage of Course contribution to POs	**1.64**	**1.14**	**0**	**2.76**	**0**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

UNIT I **(6 hrs)**

Introduction - General characters of Mushroom– Morphology and Habitat of *Agaricus*, Common edible and Non edible mushroom.

UNIT II **(6 hrs)**

Nutritive value of edible mushroom**:** Protein, Vitamin minerals carbohydrates and fats Energy value of mushroom.

UNIT III **(6 hrs)**

Methods of spawn production–Factors determining the Spawn production, Storage of spawn.

UNIT IV **(6 hrs)**

Methods of cultivation and harvesting–Oyster mushroom, White Button Mushroom, Milky Mushroomand Paddy straw mushroom.

UNIT V **(6 hrs)**

Diseases and Pests control measures, Preservation methods of Mushroom, Preparation of Value added products from mushroom. Role of mushroom in compost preparation.

TEXTBOOKS

1. TripathiD.P.*Mushroom Cultivation*, CBS Publishers. 2017.
2. SubataBiswas, M.Datta and S.V Ngachan. *Mushroom A Manual for Cultivation*. Prentice Hall India , 2012.
3. RajanS and N.Sivakumar. *Mushroom Technology*. CBS Publishers, Second Edition**,** 2020.

REFERENCES

Books

1. PraveendharT. *Mushroom cultivation and Marketing*. Narendra Publishing, 2019.
2. Paul Stamets. *Growing Gourmet and Medicinal Mushrooms*. Ten speed Press, Third Edition, 2011.
3. Tradd and Cotter.*Organic Mushroom Farming and Mycoremediation*. Chelsea Green Publishing Company, 2014.

Web Sources

1. https://www.youtube.com/watch?v=oiVZ2APGSNQ
2. https://onlinecourses.swayam2.ac.in/nos20_ge07/preview
3. https://www.zpd7icar.nic.in/download/Mushroom%20Training%20Mannual.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - IV
SKILL ENHANCEMENT COURSE - IV: PRACTICAL:
ENTREPRENEURSHIP IN BIOTECHNOLOGY - II (21UBTS41)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 2 **INT. MARKS : 50**
CREDITS : 2 **EXT. MARKS : 50**
DURATION : 30 hrs **MAX. MARKS : 100**

Preamble

This course enables the learners to take up entrepreneurshipinbiotechnology anddevelop biologically produced value added products for the advancement of human welfare.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: explain the techniques used in vermicomposting
CO2[K3]:determine the commercially important microorganisms for wine production
CO3[K4]: analyse the factors affecting aquaculture
CO4[K5]: appraise the advance methods involved in aquaculture
CO5[K6]: elaborate the role of microorganisms in biogas production

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	1	1	1	1	1	2	1
CO2[K3]	1	1	1	1	1	2	1
CO3[K4]	1	1	1	1	1	2	1
CO4[K5]	1	1	1	1	1	2	1
CO5[K6]	1	1	1	1	1	2	1
Weightage of the course	05	05	05	05	05	10	05
Weighted /;percentage of Course contribution to POs	**0.91**	**1.14**	**1.62**	**1.72**	**2.86**	**4.67**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

Experiments

1. Aquaculture (Fish)
   Selection of land area, Pond design and construction, selection of fish species, Feeding, Harvesting, Marketing
2. Vermicomposting
   Preparation of bin or pit, Compost addition, selection of species, addition of earth worms, watering, harvesting
3. Biogas production
   Collection of Biomass (cow dung), construction of tank, slurry preparation, Mixing, Hydrolysis, Acidogenesis, Acetogenesis, Methanogenesis, Production, Processing, Kegging
4. Sauerkraut production
   Shredding of cabbage, salting. Microorganisms involved in fermentation, Process of fermentation.
5. Wine production
   Viticulture, harvesting, Addition of preservatives, crushing, fermentation, draining, pressing, mixing, clarification, aging and bottling.

REFERENCES

Books

1. Tidwell, J. H. *Aquaculture production systems* (Vol. 434). Oxford, Wiley – Blackwell, 2012.
2. Kiyasudeen, K., Ibrahim, M. H., Quaik, S., & Ismail, S. A. *Prospects of organic waste management and the significance of earthworms*. Springer, 2015.
3. Wellinger, A., Murphy, J. D., & Baxter, D. *The biogas handbook: science, production and applications*. Elsevier, 2013.
4. Bamforth, C. W., & Ward, R. E. *The Oxford handbook of food fermentations*. Oxford Handbooks, 2014.
5. Kosseva, M. R., Joshi, V. K., &Panesar, P. S. *Science and technology of fruit wine production*. Academic Press, 2016.

Web Sources

1. https://www.youtube.com/watch?v=6C8tCXIf6BY
2. https://nptel.ac.in/courses/126/105/126105014/
3. https://youtu.be/EfcEOLQDQu0

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
UG Programme
SEMESTER III & IV
PART V – EXTENSION
(From 2021 -2022 Batch Onwards)

HOURS/WEEK: 2
CREDIT : 1
DURATION : 60 hrs **INT. MARKS: 100**

Preamble

This course aims to promote holistic development among the youth by defining their roles and responsibilities towards ones family and their society and enables them to acquire professional skills and ethics.

Course Outcomes (CO)

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

CO1 [K1]: recognize the importance of community service through training and education

CO2 [K2]: interpret ecological concerns, consumer rights, gender issues & legal protection

CO3 [K3]: develop team spirit, verbal/non verbal communication and organizational ethics by participating in community service

CO4 [K4]: examine the necessity of professional skills & community-oriented services for a holistic development

CO5 [K6]: create awareness on human rights, legal rights, First Aid, Physical fitness and wellbeing

CO-PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 [K1]	2	-	-	2	2	1	1
CO2 [K2]	2	1	-	2	1	1	1
CO3 [K3]	2	-	-	1	2	2	1
CO4 [K4]	1	1	1	1	2	2	1
CO5 [K6]	1	-	-	1	2	2	1
Weightage of the course	08	02	01	07	09	08	05
Weighted percentage of Course contribution to Pos	**1.45**	**0.45**	**0.32**	**2.41**	**5.14**	**3.74**	**2.17**

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' No Correlation)

Details of the Courses

1	National Cadet Corps (NCC)	– 190 hrs
2	National Service Scheme (NSS)	– 240 hrs
3	Physical Education	
4	Red Ribbon Club (RRC)	
5	Youth Red Cross (YRC)	
6	Fine Arts Club	
7	Library and Information Service Club	
8	Yoga Club	
9	ECO Club	
10	Consumer Club	
11	Human Rights Club	
12	Women Empowerment Cell	
13	Legal Awareness League	

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - V
CORE COURSE - IX: PLANT BIOTECHNOLOGY (21UBTC51)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 5 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 75hrs **MAX. MARKS : 100**

Preamble

This course enriches the knowledge of students in plant genome organization and Plant tissue culture techniques and it also emphasize the application of genetic engineering in crop production.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: outline the organization and structural features of plant genome
CO2[K2]: illustrate the types of culturing plant tissue
CO3[K3]: choose the appropriate method for gene transfer in plants
CO4[K4]:analyse the role of markers and reporters in gene expression
CO5[K5]: appraise the applications of genetic engineering in crop development

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	1	-	1	1
CO2[K2]	3	3	2	1	-	1	1
CO3[K3]	3	2	2	1	1	1	1
CO4[K4]	2	2	2	1	1	1	1
CO5[K5]	2	2	2	1	-	1	1
Weightage of the course	13	11	09	05	02	05	05
Weighted percentage of Course contribution to POs	**2.36**	**2.5**	**2.92**	**1.72**	**1.14**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(15hrs)**

Structural features of a higher plant genome - Gene families - Chloroplast organization - Photosystem I and Photosystem II - Mitochondrial genome organization - Evolutionary relationship of chloroplast and mitochondria. Cytoplasmic male sterility.

UNIT II **(15hrs)**

Planthormones–Culture media - Sterilization - Totipotency - Pluripotency - Dedifferentiation, Rediferrentiation - Micropropagation - Somatic embryogenesis - Somoclonal variation - Somatic hybridization - Types of culture - Callus, Suspension, Protoplast and anther culture. Molecular Symbiotic nitrogen fixation in legumes by Rhizobia.

UNIT III **(15hrs)**

Natural genetic Engineers(*Agrobacterium tumefaciens*) and their use in the development of transgenic plants (BtBrinjal, Bt Cotton)- Ti plasmid vector - plant viral vector - Direct transformation by physical methods – Binary vectors used in plant transformation - Selectable markers, reporter genes and promoters used in plant vectors.

UNIT IV **(15hrs)**

Genetic engineering of plants for virus resistance, pest resistance, herbicide tolerance, biotic and abiotic stress tolerance.Management aspects of plant genetic engineering.RNA editing and gene silencing in plants, Terminator gene technology.

UNIT V **(15hrs)**

Plant as a Bioreactor – Plantibodies, Edible Vaccies, Improvement of crop yieldand quality – fruit ripening, improved nutrition (Golden rice)and enhance the photosynthesis.Molecular farming of carbohydrates, proteinsand lipids.

TEXTBOOKS

1. Buchanan, B.B., W.Gruissen and R.L. Jones. *Biochemistry and Molecular Biology of Plants*. American Society of Plant Biology, Rock wille, MD, USA,2015.
2. Don Grierson and S.N. Covey Blackie. *Plant Genetic Engineering*. Springer, 2015.
3. Sathyanarayana U. *Biotechnology*. Books and allied Pvt. Ltd. India, 2010.

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Books

1. Adrian Slater, Nigel W.Scott and Mark R.Fowler. *Plant Biotechnology: The Genetic Manipulation of Plants.*Oxford University Press,2008.

2. Lea P.J and Leegood R.C. *Plant Biochemistry and Molecular Biology.*JohnWiley&Sons.Inc, 1998.
3. ChawlaH.S. Introduction to plant biotechnology. Oxford and IBH pulishingCo.Pvt. Ltd, New Delhi, 2012.

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1. https://onlinelibrary.wiley.com/doi/full/10.1111/tpj.14578
2. https://www.toppr.com/guides/biology/improvement - in - food - reSources/improvement - in - crop - yields/
3. https://www.youtube.com/watch?v=j - RnuPUZq7k

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - V
CORE COURSE - X: ANIMAL BIOTECHNOLOGY (21UBTC52)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 5 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS :60**
DURATION : 75hrs **MAX. MARKS : 100**

Preamble

This Course familiarizes the learners with the Animal tissue culture techniques and production of cell lines and molecular pharming.

Course Outcomes (CO)

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

CO1[K1]: outline the concepts in animal tissue culture

CO2[K2]: illustrate the ethical issues related to animal studies

CO3[K3]: apply the gene transfer techniques to develop transgenic animals

CO4[K4]:analyse the role of viral vectors in gene transfer

CO5[K4]:differentiate primary and secondary cell lines

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	1	-	1	1
CO2[K2]	3	3	2	1	-	1	1
CO3[K3]	3	2	2	1	1	1	1
CO4[K4]	2	2	2	1	1	1	1
CO5[K4]	2	2	2	1	-	1	1
Weightage of the course	13	11	09	05	02	05	05
Weighted percentage of Course contribution to POs	**2.36**	**2.5**	**2.92**	**1.72**	**1.14**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(15hrs)**

History and Scope of Animal tissue culture.Design & layout of ATC laboratory. Requirements for Animal cell culture, washing, sterilization of animal tissue culture glassware. Types of media, ingredients of media.

UNIT II **(15hrs)**

Basic Techniques of mammalian cell culture; Disaggregation of animal tissue.Primary culture & secondary culture.Organ culture, Embryo culture.Maintenance of cell culture.Common cell culture contaminants.Cultivation & Maintenance of Fibroblast cell lines, HeLa cell lines, A549, MCF 7, ZR751, Hep G2.

UNIT III **(15hrs)**

Biology of viral vectors.Eg.SV40, Adenovirus, Retrovirus, Vaccinia virus.Baculovirus vectors and its use for biocontrol.Transformation of animal cells.

UNIT IV **(15hrs)**

Transgenesis – Methods of introducing new genes into animal cell - Genetic Engineering for the production of regulatory proteins, blood products, vaccines and hormones and Cell culture based vaccines.

UNIT V **(15hrs)**

Gene knockout and Animal Model for human genetic disorders - Zebra fish, *C.elegans* and Mice.Gene therapy - Ex vivo and in vivo.Molecular pharming.Ethical consideration of gene transfer in Animal cells - CPCSEA, IAEC, IBSC, IEC.

TEXTBOOKS

1. Sathyanarayana U. *Biotechnology*. Books and allied Pvt. Ltd, 2010.
2. Glick and Pasternak. *Molecular Biotechnology*. ASM Press, Fourth edition, 2010.
3. SinghB, S K Gautam and M S Chauhan. *Text Book of Animal Biotechnology.*Teri Press,2015.

REFERENCES

Books

1. Bernard R Glick and Cheryl L. Patten.*Molecular Biotechnology*. American Society for Microbiology, 2017.
2. Yadav, PR. *Cell culture*. Discovery Publishing House, 2008.
3. Dubey, R.C. A *Text of Biotechnology*. S.Chand, and company Ltd, 2014.

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1. https://www.slideshare.net/damarisb/transgenic - animals - 27039475.
2. https://www.slideshare.net/watashiwasanelle/molecular - pharming.

3. https://www.slideshare.net/RIZWANABBAS3/animal - cell - tissue - culture

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - V
CORE COURSE - XI: FOOD BIOTECHNOLOGY (21UBTC53)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 5 **INT. MARKS : 40**
CREDITS : 4 **EXT. MARKS : 60**
DURATION : 75hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to the modern techniques in food biotechnologyand food safety and quality management.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: outline the nutritive value of foods
CO2[K2]: illustrate the food safety guidelines
CO3[K3]: determine the impact of adulterants in food
CO4[K4]: analyse the food borne infections caused by food pathogens
CO5[K4]: classify the methods of preservation

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	1	1	1	1	1
CO2[K2]	2	2	1	1	1	1	1
CO3[K3]	2	2	2	1	1	2	1
CO4[K4]	2	2	2	1	1	1	1
CO5[K4]	2	2	2	1	1	1	1
Weightage of the course	11	10	08	05	05	06	05
Weighted percentage of Course contribution to Pos	**2**	**2.27**	**2.6**	**1.72**	**2.86**	**2.8**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(15hrs)**

Scope of food biotechnology – Prebiotics and Probiotics and their application - Future prospects of biotechnology and food industry - Nutritive value of food, microbes in food biotechnology, fermented foods - types, and changes of fermentation during the process and nutritive value of fermented foods.

UNIT II **(15hrs)**

Metabolic Engineering of microorganisms for Food Ingredients, Application of ELISA Assays for Detection and Quantification of Toxins in Foods, Biochemical Markers for Antioxidant Functionality, Genetics of Dairy Starter Cultures, Genetic Engineering of Baker's Yeast, Application of Transgenic Fish Technology in Sea Food Production.

UNIT III **(15hrs)**

Methods of preservation - Physical (Irradiation, Drying, Heat Processing, Chilling And Freezing, High Pressure and Modification of Atmosphere, Canning, Smoking) - Chemical (Sodium Benzoate Class I and II) - Food sanitation - Good manufacturing practices - Hazard analysis - Critical control points - Personnel hygiene.

UNIT IV **(15hrs)**

General Principles Underlying Spoilage: Contamination - Spoilage and Preservation of different kinds of foods - Vegetable and Fruits – Meat and Meat Products – Fish and Other Sea Foods – Eggs and Poultry –Milk and Milk Products. Food Borne Infections - Staphylococcal –*Brucella* – *Bacillus* – *Clostridium* – *Escherichia* - *Salmonella* (B) Fungal: Mycotoxins Including Aflatoxins, (C) Viral: Hepatitis (D) Protozoa: Amoebiasis.

UNIT V **(15hrs)**

Adulteration, food safety, food additives (Natural and artifical) - definition, types and functions, adulteration detection system and sensors, Biosensors for Food Quality Assessment: International Aspects of the Quality, The Food Safety and Standards Authority of India (FSSAI), FDA, BIS.

TEXTBOOKS

1. KalidasShetty, GopinadhanPaliyath, Anthony Pometto and Robert E. Levin. *FoodBiotechnology*. CRC Press, 2005.
2. SinoshSkariyachan and Abhilash M.*Introduction to Food Biotechnology*. CBS Publisher &Distributors P Ltd, 1st edition, 2012.
3. Byong H. Lee. *Fundamentals of Food Biotechnology*. 2nd Edition, Wiley - Blackwell, 2014.

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1. Gustavo F. Gutierrez–Lopez. *Food Science and Food Biotechnology*. CRC Press, 2003.
2. Vinod K. Joshi and R. S. Singh.*Food Biotechnology*. I K International Publishing House, FirstEdition, 2012.
3. Watson, K. *Industrial Biotechnology*. Volume 1, CBS Publisher & Distributors P Ltd, 2016.

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2. https://nptel.ac.in/courses/102/106/102106022/
3. https://nptel.ac.in/courses/102/105/102105058/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - V
CORE COURSE - XII: PRACTICAL: PLANT, ANIMAL AND FOOD BIOTECHNOLOGY (21UBTC5P)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 5 **INT. MARKS : 50**
CREDITS : 4 **EXT.MARKS : 50**
DURATION : 75hrs **MAX.MARKS : 100**

Preamble

This course provides practical knowledge on techniques of culturing plant and animal cells and also provides skill based knowledge on isolation and identification of microbes in food samples.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: illustrate the types of media in plant and animal tissue culture
CO2[K3]:apply the concepts and principles of Plant tissue culture to develop the plant hybrids
CO3[K4]: analyse the cell viability and cytotoxicity of animal cells
CO4[K5]:assess the microbial population in different food samples
CO5[K6]:develop primary cell lines from chick embryo

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	1	1	1	1
CO2[K3]	3	2	2	1	1	1	-
CO3[K4]	2	2	2	1	1	1	1
CO4[K5]	2	2	2	1	1	-	1
CO5[K6]	2	2	2	1	1	1	1
Weightage of the course	12	10	10	05	05	04	04
Weighted percentage of Course contribution to Pos	**2.18**	**2.27**	**3.25**	**1.72**	**2.86**	**1.87**	**1.74**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

Experiments

1. Preparation of media for Plant tissue culture
2. Preparation of Callus culture
3. Morphogenesis of root and shoot system
4. Isolation and purification of protoplasts
5. Anther/ovule culture preparation
6. Micropropagation and Hardening.
7. Synthetic seed preparation
8. Preparation of Animal tissue culture Media, Equipments and sterilization.
9. Preparation of Chick embryo Cell lines
10. Testing the viability of the cells
11. Cryopreservation
12. Analysis of Bacterial Counts in Food samples.
13. Isolation of Lipolytic Organisms from Butter.
14. Milk reduction test using Resazurin
15. Detection of Coliform Bacteria in Water – MPN test
16. Food adulteration analysis.
17. Isolation of *Lactobacillus* from curd

REFERENCES

Books

1. Josie Ho. *Plant tissue culture, Techniques and Experiments*. Intelliz Press, First edition, 2016.
2. Pal Maliga,Daniel F K Lessug Anthony R,Loil helm Gruissm and Joseph E varner. *Methods in plant Molecular Biology, A Laboratory Course Manual*. Cold Spring Harbour Laboratory press, 1994.
3. ThatoiDr. H. N. *Practical Biotechnology: Principles and Protocols*. Dreamtech, 2020.
4. MahajanR.K..RituMahajan and Dr. J. Sharma. *Practical Manual of Biotechnology*. Vayu Education of India; First edition, 2010.

Web Sources

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2. https://nptel.ac.in/content/storage2/courses/102103012/pdf/mod6.pdf
3. https://microbenotes.com/milk - pasteurization - methods - steps - significance/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - V
MAJOR ELECTIVE COURSE – I:BIOSTATISTICS (21UBTO51)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 60hrs **MAX. MARKS: 100**

Preamble

This course introduces the learners to a variety of statistical methods of use in describing and analysing biological data.

Course outcomes (CO)

On Successful completion of the course, the learners will be able to
CO1[K1]:outline the basic concepts in Statistics methods
CO2[K2]: illustrate the methods in collection and representation of data
CO3[K3]:apply appropriate statistical methods for analysing one or two variables
CO4[K4]:analyse the role of software packages in statistical analysis
CO5[K4]:differentiate parametric and nonparametric statistics

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	-	1	-	-	1
CO2[K2]	2	2	1	1	2	1	-
CO3[K3]	2	3	2	1	3	2	2
CO4[K4]	2	2	1	1	1	1	2
CO5[K4]	2	2	1	1	1	1	1
Weightage of the course	10	11	05	05	07	05	06
Weighted percentage of Course contribution to Pos	**1.82**	**2.5**	**1.62**	**1.72**	**4**	**2.34**	**2.61**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(12hrs)**

Concepts of Statistics - Descriptive, Inferential Biostatistics, Statistical Methods, Biological Measurement, Functions of Statistics, Limitations of Statistics.

UNIT II **(12hrs)**

Collection of Data, Sampling size, Sampling and Sampling design, Classification and Tabulation, Diagrammatic Representation and Graphic Representation of Data.

UNIT III **(12hrs)**

Measures of Central Tendency - Mean (Weighted, Harmonic, Geometric Mean), Median, Mode. Measures of Dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation.

UNIT IV **(12hrs)**

Co - Efficient of Variation, Co - Efficient of Quartile Deviation, Co - Efficient of Mean Deviation Statistical Methods **-** Skewness, Kurtosis, Moments**.** Correlation - Simple, Rank and Karl Pearson's Correlation; Regression Analysis**.**Probability - Addition and Multiplication TheoremTheoretical Distributions - Binomial, Poisson and Normal Distribution.

UNIT V **(12hrs)**

Parametric and Nonparametric Statistics **-** Hypothesis Testing –Null Hypothesis, Alternate Hypothesis, Type I and II Errors**.** Chi - Square Test, Students T - Test - Paired and UnpairedANOVA - One Way Classification and Two Way Classification**.**Software Packages (SPSS) for Data Analysis.

TEXTBOOKS

1. Ramakrishnan. P. *Biostatistics*. Saras publications, India, 2010.
2. SundarRao P.S.S and Richard J. *Introduction to Biostatistics and Research methods*. Fifth edition, PHI Learning Pvt.Ltd, 2012.
3. HanmanthRao P and Janardhan K. *Fundamentals of Biostatistics*.Dreamtech Press, 2019.

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1. Jerold H. Zar. *Biostatistical Analysis*. Pearson education, Singapore, 2004.
2. Irfan Ali Khan and AtiyaKhanum. *Fundamentals of Biostatistics*. Ukkaz Publications, 2003.
3. Pillai R.S.N. and Bagavathi V. *Statistics – Theory and practice*. S. Chand and Co Ltd, New Delhi, 2003.

Web Sources

1. https://youtu.be/cKQaKy6fjAQ
2. https://youtu.be/0JJCGDIbUyU
3. https://youtu.be/IEz4nRUhOpY

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - V
MAJOR ELECTIVE COURSE - I: BIOPHYSICS (21UBTO52)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 60hrs **MAX. MARKS : 100**

Preamble

This course makes the students to understand biology in a quantitative way, using experimental techniques, theories, and concepts developed from different areas of physics.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: outline the basic principles of biophysics
CO2[K2]: demonstratethe theoretical aspects of biophysical techniques
CO3[K3]: apply suitable biophysical technique to analyse biological samples
CO4[K4]: determine the role of radiolabelling techniques to detect in radioisotopes
CO5[K4]: analysethe molecular structure of biomolecules using spectroscopy

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	-	1	-	-	1
CO2[K2]	2	2	1	1	2	1	-
CO3[K3]	2	3	2	1	3	2	2
CO4[K4]	2	2	1	1	1	1	2
CO5[K4]	2	2	1	1	1	1	1
Weightage of the course	10	11	05	05	07	05	06
Weighted percentage of Course contribution to POs	**1.82**	**2.5**	**1.62**	**1.72**	**4**	**2.34**	**2.61**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(12hrs)**

History of Biophysics: invention, Analysis of Interactions – Proteins, Nucleic acids and polysaccharides – Association of macromolecules, Lipids in biological membranes – Proteins in biological membranes – Molecular mechanics and Dynamics**.**

UNIT II **(12hrs)**

Molecular structure determination using X - ray diffraction and NMR, Molecular analysis using light scattering , different types of mass spectrometry and surface plasma resonance methods.

UNIT III **(12hrs)**

Radiolabeling techniques: detection and measurement of different types of radioisotopes used in biology, incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material; safety guidelines.

UNIT IV **(12hrs)**

Visualization of cells and subcellular components by light microscopy, resolving power of different microscopes, microscopy of living cells, freeze etches and freeze - fracture methods for EM; imaging process methods in microscopy.

UNIT V **(12hrs)**

Biosensors - Principle and its applications - Electrochemical, Thermometric, Potentiometric - Optical, Piezo - electric and Amperometric Biosensors. GM Counter, Scintillation Counter, Autoradiography, Flow Cytometry.

TEXTBOOKS

1. Vasanthapattabhi and N. Gauthammm. *Biophysics*. NarosaPublishng House, 2003.
2. ArumugamN and V. Kumaresan. *Biophysics and Bioinstrumentation*. Saras Publications, 2013.
3. Ramakrishnan. P. *Biostatistics*.Saras Publications, India, 2010.

REFERENCES

Books

1. Simon R. Cherry, James A. Sorenson. *Physics in nuclear medicine*. Saunders, 4th edition, 2012.
2. Wilson and Walkers. *Principles and Techniques of Biochemistry and Molecular Biology*, 4th edition.Himalaya Publishing House Pvt. Ltd, 2018.

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2. https://nptel.ac.in/courses/112/104/112104029/
3. https://www.leica - microsystems.com/science - lab/brief - introduction - to - freeze - fracture - and - etching/
4. https://nptel.ac.in/courses/104/101/104101117/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology.
SEMESTER - V
MAJOR ELECTIVE COURSE - I: BIOINSTRUMENTATION (21UBTO53)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 4 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 60hrs **MAX. MARKS: 100**

Preamble

This course familiarizes the learners with theprinciples and working mechanism of Instruments related to biotechnology.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: outline the basic principles of bioinstruments
CO2[K2]: demonstrate the working mechanism of bioinstruments
CO3[K3]: apply suitable chromatographic techniques to separate biological samples
CO4[K4]: determine the role of various detectors in measuring radioactivity
CO5[K4]: analyse applications of cryopreservation technique in tissue processing

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	-	1	-	-	1
CO2[K2]	2	2	1	1	2	1	-
CO3[K3]	2	3	2	1	3	2	2
CO4[K4]	2	2	1	1	1	1	2
CO5[K4]	2	2	1	1	1	1	1
Weightage of the course	10	11	05	05	07	05	06
Weighted percentage of Course contribution to POs	**1.82**	**2.5**	**1.62**	**1.72**	**4**	**2.34**	**2.61**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(12hrs)**

Autoclave principle and its types – simple, steam jacketed and high pre - vacuum sterilizers. pHmeter – concept and its usage. Haemocytometer - principle and its applications.Colorimeter, Spectrophotometer - beer lamberts law - instrumentation and applications.

UNIT II **(12hrs)**

Microscopy principle and types – simple, compound, light, phase contrast and fluorescence. Electron microscope – Transmission Electron Microscope, Scanning Electron Microscope, Atomic Force Microscope, Emission electron microscope, field emission microscopy, field ion microscope.

UNIT III **(12hrs)**

Separation techniques – Principle and their types. Chromatography – principle and its types – Column chromatography, thin layer chromatography, Ion exchange chromatography, gel filtration.Electrophoresis – Agarose and SDS - PAGE.

UNIT IV **(12hrs)**

Radioactivity – rate and units of radioactivity – measurement of radioactivity (gas ionization, scintillation and semiconductor detectors. Radioimmunoassays – Principle and procedure, advantages and disadvantages. ELISA – Principle, procedure and applications. Flow cytometry – Principle and clinical applications of flow cytometry.

UNIT V **(12hrs)**

Cryopreservation – principle and procedures – cryoprotectants. Fixation – reagents for fixation – tissue processing and embedding – impregnation and embedding - Factors affecting the impregnation of the reagents and clearing – microtome and knives – preparation of slides.

TEXTBOOKS

1. Boyer R. *Modern experimental Biochemistry*. Pearson education publication, Singapore, 2014.
2. Jayaraman, J. *Laboratory Manual in Biochemistry*. New Age International (P) Limited Publishers, New Delhi, 2011.
3. Knoll, G.F. *Radiation detection and measurement*. John Willey & Sons publishers, 2010.

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Books

1. Bajpai P.K.*Biological instrumentation and methodology.* S. Chand & Company Ltd.,New Delhi, 2010.

2. ChatwalG.R and M. Arora. *Biophysics*. Himalaya Publishing House, New Delhi, 2011.

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2. https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod2.pdf
3. https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod3.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - V
MAJOR ELECTIVE COURSE - II: GENETICALLY MODIFIED ORGANISMS
(21UBTO54)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT.MARKS : 40**
CREDITS : 3 **EXT.MARKS : 60**
DURATION : 60hrs **MAX.MARKS: 100**

Preamble

This course familiarizes the learners with the production methods of genetically modified organisms and it also emphasize the applications of GMO in Human welfare.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: describe the methods for producing GMO
CO2[K2]: illustrate the ethical issues related to GMO
CO3[K3]: apply gene manipulation technique in crop productivity
CO4[K4]: analyse theimportance of GMO in environmental protection
CO5[K5]: evaluate the Biosafety concerns of genetically modified crops

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	-	1	-	-	1
CO2[K2]	2	2	1	1	2	1	-
CO3[K3]	2	3	2	1	3	2	2
CO4[K4]	2	2	1	1	1	1	2
CO5[K5]	2	2	1	1	1	1	1
Weightage of the course	10	11	05	05	07	05	06
Weighted percentage of Course contribution to POs	**1.82**	**2.5**	**1.62**	**1.72**	**4**	**2.34**	**2.61**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(12hrs)**

Recombinant DNA technology - Introduction and strategies, Methods of transferring gene to Microbes, Plant and animal. Applications of Gene Manipulation in various field.

UNIT II **(12hrs)**

Genetically modified Bacteria in production of enzymes, amino acids, flavorings, required for food industry – Therapeutically important products – Bioremediation. Genetically modified Virus in Gene therapy and Vector construction – Genetically modified organism in Biofuel production.

UNIT III **(12hrs)**

Transgenic crops - Herbicide resistance, male sterility and heterocyst, pest resistance,disease resistance, drought and salinity resistance Cultivation of genetically modified crops - Global and Indian status.

UNIT IV **(12hrs)**

Genetic engineering for the delay of fruit ripening, plant oil quality, Plantibody production, Golden rice, pharmaceutically useful proteins from plants.Genetically modified animals – Mice, Cow, Sheep, Goat, Pig, Fish, Insects - Model organism and therapeutically important products.

UNIT V **(12hrs)**

Regulations for preparing genetically modified organism - Biosafety concerns of genetically modified crops – Ethical concern of genetically modified organisms – Merits and Demerits of GMO.

TEXTBOOKS

1. Dubey, R.C. *Advanced Biotechnology*. S.Chand and company Pvt. Ltd, Revised edition, 2014.
2. Piguet P, P.Poindrom, *Genetically modified organism and genetic engineering and Research and Therapy.*Biovalley Monographs, 2014.
3. Slater A. and Scott, N.W. *Plant Biotechnology - The genetic manipulation of plants*, Oxford University press, Second Edition, 2010.

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1. Balasubramanian D. *Concepts in Biotechnology*. Costed - Ibn - University Press, Hyderabad, 2004.
2. Das H.K. *Text Book of Biotechnology*. Wiley Dream Tech India Pvt. Ltd., New Delhi, 2017.
3. David.E.Newton. *GMO Food*. ABC CLIO Publishers,2014.

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3. https://nptel.ac.in/content/storage2/courses/104108056/module9/PNR%20lecture%2036.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology.
SEMESTER – V
MAJOR ELECTIVE COURSE - II: NATURAL PRODUCTS (21UBTO55)
(From 2021-2022 Batch onwards)

HOURS/WEEK:4 **INT. MARKS : 40**
CREDITS :3 **EXT. MARKS : 60**
DURATION :60hrs **MAX. MARKS : 100**

Preamble

This course introduces the learners to the metabolites and synthesis process of natural crops and also emphasizes the metabolic engineering of plant species and its products through biotechnological techniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]:outline the scope of metabolites produced by plants
CO2[K2]: illustrate the methods of synthesis of secondary metabolites
CO3[K3]:determine the biotechnological applications of metabolites
CO4[K4]: analyse the role of metabolic engineering for the production of plant products
CO5[K5]: appraise the functions of primary and secondary metaboloites

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	-	1	-	-	1
CO2[K2]	2	2	1	1	2	1	-
CO3[K3]	2	3	2	1	3	2	2
CO4[K4]	2	2	1	1	1	1	2
CO5[K5]	2	2	1	1	1	1	1
Weightage of the course	10	11	05	05	07	05	06
Weighted percentage of Course contribution to POs	**1.82**	**2.5**	**1.62**	**1.72**	**4**	**2.34**	**2.61**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(12hrs)**

Primary and secondary metabolites - terpenoids - Synthesis of IPP - Prenyltransferace and terpene synthase reactions - Modification of terpenoid skeletons - Transgenic terpenoid production.

UNIT II **(12hrs)**

Alkaloids – Introduction, Structural elucidation, Properties, types, Biosynthesis, Processing and biotechnological applications of alkaloids.

UNIT III **(12hrs)**

Terpenoids - Introduction, Structural elucidation, Properties, types, Biosynthesis, Processing and biotechnological applications of terpenoids.

UNIT IV **(12hrs)**

Biosynthesis of lignans, lignins, and suberization - Flavonoids, coumarines, stilbenes, styrylpyrones and arylpyrones.

UNIT V **(12hrs)**

Metabolic engineering of phenylpropanoid production - Enhanced fibres, pigments, pharamaceuticals and flavouring agents.

TEXTBOOKS

1. Jain, J. L.*Fundamentals of biochemistry*. S. Chand Publishing, 2016.
2. Sathyanarayana U. *Biotechnology*. Books and allied Pvt. Ltd. India, 2010.
3. Garrett, Reginald H. and Charles M, Grisham. *Biochemistry*, 2012.

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1. Andrew Leach. *Molecular Modeling*. Pearson education Publishing, Second Edition, USA, 2009.
2. Westhead T.K.*Instant notes on Bioinformatics*. VIVA Publishers, New Delhi, 2012.

Web Sources

1. https://youtu.be/6UENBbP - 1OA
2. https://youtu.be/09JIofqwCsQ

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology.
SEMESTER - V
MAJOR ELECTIVE COURSE - II: MEDICINAL PLANTS (21UBTO56)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 60hrs **MAX. MARKS : 100**

Preamble:

This course introduces the learners to the significant medicinal plants and their cultivation practices along with applications and processing techniques.

Course Outcomes (CO)

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

CO1[K1]: identify medicinal plants (family/genus - level)

. **CO2[K2]:**demonstrate the importance of medicinal plants

CO3[K3]: apply suitable techniques for the processing of medicinal plants

CO4[K4]: analyse the role of role of ethnobotany in modern Medicine

CO5[K5]:assess the economic importance of medicinal plants

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	-	1	-	-	1
CO2[K2]	2	2	1	1	2	1	-
CO3[K3]	2	3	2	1	3	2	2
CO4[K4]	2	2	1	1	1	1	2
CO5[K5]	2	2	1	1	1	1	1
Weightage of the course	10	11	05	05	07	05	06
Weighted percentage of Course contribution to POs	**1.82**	**2.5**	**1.62**	**1.72**	**4**	**2.34**	**2.61**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' No Correlation)

UNIT I **(12hrs)**

Introduction – History - Importance of Medicinal plants - Medical practices in India: Ayurvedha – Siddha – Unani Homeopathy – Allopathy. - opportunities.

UNIT II **(12hrs)**

An overview of selected medicinal plants: Morphology, vernacular and botanical name, useful part and active principles, ancient formulations andphytotherapeutics of Root *(Asparagusracemosus&Gloriosasuperba)* Leaf *(Beetle, Azadirachtaindica)* Bulb *(Allium cepa, Alliumsativum)* Rhizome*(Zingiberofficianale, Curcuma longa)* Fruit *(Solanumnigrum, Solanumxanthocarpum)* Seed*(Trigonellafoenumgraceum.Cuminumcyminum)* Oil seed *(Cocusnucifera, Ricinuscommunis).*

UNIT III **(12hrs)**

Ethnobotany and Folk lore medical practices:Ethnic communities in Tamil Nadu and their medicinal plant usage – patented products (Kani Tribe) – popular folklore medicines – methods of documenting the ethnobotanical knowledge – AICRPE. Economic importance of cultivation of medicinal plants.

UNIT IV **(12hrs)**

Medicinal plants;Harvesting – processing – packaging – storage.Processing of medicinal plants - Decoction –Extraction, infusion, Maceration.Parts of medicinal plant to be used –Active Constituents of medicinal plants - preparation of herbal remedies.

UNIT V **(12hrs)**

Cultivation of medicinal plants: Propagules (Seed, leaf, stem, root, rhizome and bulbs).Cultivation of medicinal plant - *Aloe vera, Catharanthus and Sennaauriculata*processing and products recovery and its applications.

TEXTBOOKS

1. Sharma R. *Agro - techniques of medicinal plants.*Daya Publishing House, New Delhi, 2004.
2. Kokate C.K and Gokhale A.S. Cultivation of medicinal plants, NiraliPrakashan, 2018
3. Mathur N. *Medicinal plants of India.* RBSA publishers, New Delhi, 2010.
4. Azhar Ali Farooqi and B.S. Sreeramu. *Cultivation of medicinal and Aromatic Crops*. University press, India, 2004.
5. Purohit, S.S. and S.P. Vyas. *Medicinal Plant Cultivation - Scientific Approach.* Agrobios. India, 2006.

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1. Akerele, O, Heywood, V and Synge, H. *The conservation of medicinal plants.* Cambridge university press, Cambridge, 2009.
2. Chevallier, Andrew. *The encyclopedia of medicinal plants*,1996.
3. Cunningham, Anthony B. *Applied ethnobotany: people, wild plant use and conservation*. Earth scan, 2001.
4. Jain, Sudhanshu Kumar, and Robert A. DeFilipps. *Medicinal plants of India*. Reference Publications, 1991.
5. Wallis, Thomas Edward. *Textbook of pharmacognosy*, 2005.

Web Sources

1. https://www.nhp.gov.in/introduction - and - importance - of - medicinal - plants - and - herbs mtl
2. http://www.medicinalplants.in/
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3358962/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology.
SEMESTER - V
SKILL ENHANCEMENT COURSE - V: NANOBIOTECHNOLOGY AND CANCER BIOLOGY (21UBTS51)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 2 **INT. MARKS : 40**
CREDITS : 2 **EXT. MARKS :60**
DURATION : 30hrs **MAX. MARKS : 100**

Preamble

This Course introduces the learners to the synthesis, characterization and properties of materials of nanomaterial and the molecular and cellular mechanisms that lead to cancer.

Course outcomes (CO)

On Successful completion of the course, the learners will be able to
CO1[K1]: define the structural properties of nanomaterial
CO2[K2]: illustrate the different methods of nanomaterial synthesis
CO3[K3]: determine the application of nanoparticles in drug delivery and therapy
CO4[K4]: analysethe mechanisms of cancer development
CO5[K5]: assess the role of carcinogen in causing cancer

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	1	1	1	1	1	1
CO2[K2]	2	1	1	1	1	1	1
CO3[K3]	2	1	1	1	1	1	1
CO4[K4]	2	1	1	1	1	1	1
CO5[K5]	2	1	1	1	1	1	1
Weightage of the course	10	05	05	05	05	05	05
Weighted percentage of Course contribution to POs	**1.82**	**1.14**	**1.62**	**1.72**	**2.86**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(6hrs)**

History and Scope of Nanotechnology - Properties of Nanoparticles - Synthesis of Nanoparticles physical, Chemical methods and Biological Sources - Plant, Microorganism, Bacteria, Mushrooms and Fungi.

UNIT II **(6hrs)**

Characterization of Nanoparticles usingUV - spectroscopic analysis, Fourier transform infrared spectroscopy (FTIR),X - ray diffraction and Energy dispersive , Scanning Electron microscopy and Transmission Electron microscopy, Zeta potential, Atomic force microscopy and Scanning tunnelling microscopy.

UNIT III **(6hrs)**

Applications of Nanoparticles - Anticancerous, Antioxidant, Antiangiogenic activities of Nanoparticles–Nanoencapsulation, Nanomaterials in drug delivery and therapy - Nanocomposites - Uses and applications - Nanomedicine.

UNIT IV **(6hrs)**

Cancer cells and its properties. Classification of Cancer: Carcinoma - Sarcoma - Leukemia - Lymphoma. Cell cycle - Phases of cell cycle. Carcinogenic agents - Physical, Chemical agents.

UNIT V **(6hrs)**

Gene mutation in cancer development. Oncogenes: Properties& Characteristics. Breast, Lung, Liver cancer - Causes and preventive methods. Different forms of therapy: Chemotherapy, Radiation therapy and Immuno therapy - Advantages and Limitations.

TEXTBOOKS

1. ArunavaGoswami and Samrat Roy Choudhury. *Nanobiotechnology, Basic and AppliedAspects* Anthem Press, Delhi, India, 2017.
2. PradeepT .*A Textbook of Nanoscience and Nanotechnology*. New Delhi.: Tata McGraw Hill Education, 2012.
3. Bronchud M.H, Footy M.A., Giaccone G., Olopade O. and Workman P. *Principles of Molecular Oncology*. U.S.A.: Humana, 2008.

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1. Siddhartha Shrivastava. *Introductory Nanobiotechnology*. Pune: New Central Book Agency, 2013.
2. Bhupinder Singh, Rodney JY Ho, JagatR. Kanwar. *Emerging Trends in Nanobiomedicine*.US.CRC Press. 2018.

3. Deepak Chitkara, Anupama Mittal, Ram I. Mahato.*Molecular Medicines for Cancer: Concepts and Applications of Nanotechnology.* US: CRC Press. 2018.
4. Javier Camacho. *Molecular oncology: Principle and Recent Advances*. U.S.A: Bentham science, 2012.
5. MirzaQaiserBaig and ShilpaVahikar. *Concepts of Molecular Oncology*, Walnut Publication, India, 2018.

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1. https://nptel.ac.in/courses/118/107/118107015/
2. https://onlinecourses.nptel.ac.in/noc19_bt28/preview
3. https://www.youtube.com/watch?v=r9YnLo_ukRs

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology.
SEMESTER - V
INTERNSHIP (21UBTJ51)
(From 2021-2022 Batch onwards)

CREDIT : 1 **INT. MARKS : 50**
DURATION : 25 days **EXT. MARKS : 50**
MAX. MARKS : 100

Preamble

Thiscoursefamiliarizestherealworldexperiencethroughpractice-orientedand hands-on workingexperienceinthe industryand research laboratories tothelearners

CourseOutcomes(CO)

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

CO1[K2]: demonstrate depth of expertise in coherent area of biotechnology

CO2[K3]: employ technical information using scientific communications, scientific operations and procedures

CO3[K3]: develop effective oral and written communication skills in the field of biotechnology

CO4[K6]:develop hands on training experience and skill in biotechnology

CO5[K6]: create awareness on logistic and economic and realities of functioning in a work environment

CO-POMappingtable(CourseArticulationMatrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	-	1	1	1	2
CO2[K3]	2	3	-	1	-	1	2
CO3[K3]	2	2	-	2	-	1	1
CO4[K6]	-	2	1	-	-	1	1
CO5[K6]	1	3	3	3	-	1	2
Weightage of the course	08	12	04	07	01	05	08
Weighted percentage of Course contribution to POs	**1.45**	**2.73**	**1.3**	**2.41**	**0.57**	**2.34**	**3.48**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

Rules and Regulations

1. Each Student has to undergo minimum 25 days institutional/industry based training during the fourth semester summer vacation.
2. Internships could be undertaken in different organizations, industries and agencies approved by the department.
3. Students should keep a detailed record of activities performed and hrs spent in training and report the same to the Faculty Coordinator every week.
4. The Internship report should be of minimum 20 pages.
5. Attendance certificate from the organization has to be submitted to the HOD.
6. Two copies of the Internship report should be submitted.
7. The Internship carries 100 marks out of which 50 marks for Internal Assessment and 50 Marks for External Examination.
8. The student has to appear for Viva-voce.
9. The viva voce board shall consist of the Head of the Department and the Internal Examiner

The following rubrics will be taken into account for the evaluation of theTraining Programme :

Internal Assessment (50 Marks)	**External Examination(50 Marks)**
Training Report & Review : 40 Marks	Training Report : 20 Marks
Daily Log Report/Attendance : 5 Marks	Viva Voce : 30 Marks
PPT Presentation : 5 Marks	

Internship report must contain the following details:

- Title Page
- College Certificate Page
- Internship Certificate provided by the internship institution
- Declaration Page
- Acknowledgement
- Company Profile
- Organizational structure of the concern
- Weekly work plan
- List of figures, List of Tables
- Index
- Chapters

List of Chapters

1. Introduction
2. Nature of work
3. Role in the organization
4. Questionnaires and Observations about work
5. Operating Environment
6. Detailed Description of Technology used

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - VI
CORE COURSE - XIII: RECOMBINANT DNA TECHNOLOGY AND FORENSIC SCIENCE (21UBTC61)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 5 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 75hrs **MAX. MARKS: 100**

Preamble

This course familiarizes the learners with the tools used in Recombinant DNA technology and it also provides basic knowledge on DNA Finger printing and its applications.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: list out the enzymes used in recombinant DNA technology.
CO2[K2]: explain the biology of cloning vectors
CO3[K3]: choose the suitable method for finger print identification
CO4[K4]: distinguish the differences in the DNA patterns through DNA profiling
CO5[K4]: analyse different methods of DNA sequencing

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	3	2	1	-	1	1
CO2[K2]	3	2	2	1	-	1	1
CO3[K3]	3	2	2	1	-	1	1
CO4[K4]	3	2	2	1	2	1	1
CO5[K4]	3	2	3	1	-	1	1
Weightage of the course	15	11	11	05	02	05	05
Weighted percentage of Course contribution to POs	**2.73**	**2.5**	**3.57**	**1.72**	**1.14**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(15hrs)**

Introduction to rDNA technology: DNA modifying enzymes and their uses, Restriction enzymes – Discovery, types, use of type II restriction enzymes. - DNA cloning – sticky ends, blunt ends, homopolymeric tailing use of adaptors and linkers. Construction of Genomic DNA library and cDNA library.

UNIT II **(15hrs)**

Cloning vectors and their applications. Cloning vectors - Properties and their applications – Plasmids - Construction of pBR322, pUC18, Phagemids, M13 phage vector, Shuttle vectors - Expression vectors in *E. Coli* and yeast, Cosmids, Artificial chromosomes - BAC and YAC, Ti plasmid.

UNIT III **(15hrs)**

Preparation of radiolabeled/ fluorescent labeled DNA & RNA probes.Chemical synthesis of oligo nucleotides.Polymerase chain reaction - Mechanism and applications - Types of PCR.Blotting & hybridization techniques.DNA sequencing – Maxam – Gilbert method, Sanger methods, short gun sequencing, Automated DNA sequencing, NGS sequencing and analysis.

UNIT IV **(15hrs)**

Origin & History of fingerprints, Principles of Fingerprint identification, Searching, location and significance of fingerprints in criminal investigation. Biological significance of skin pattern, Types of fingerprints, Fingerprint characteristics: class and individual, Collection, lifting and preservation of fingerprints, Photography of latent fingerprints.

UNIT V **(15hrs)**

Methods of lifting and developing latent fingerprints – Physical methods - Powder method (Black, silver, florescent, red, yellow), Iodine fuming etc. Chemical methods - Ninhydrin, Silver nitrate method, Glue fuming, VMD, SPR. Extraction of DNA from blood and biological material.DNA markers – mini and micro satellite markers – STR. Genetic linkage mapping; RFLP and AFLP analysis.

TEXTBOOKS

1. Kelly M. Elkins *Forensic DNA Biology: A Laboratory Manual* Academic press, USA, 2012.
2. Dubey R.C. *Text book of Advanced Biotechnology,* S.Chand Publication, 2014.
3. Carroll S.B, J. Doebley, A.J.F. Griffith and S.R. Wessler. *An introduction to genetic analysis.*Eleven edition, WH Freeman and Co, Germany, 2015.

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Books

1. Primrose S.B and R.M. Twyman. *Principles of gene manipulation*. John Wiley Blackwell,2014.
2. Dale J.W, M.V. Schantz and N. *Plant, From Genes to Genomes: Concepts and Applications of DNA Technology.* Willey Publishers, 3rd edition, 2011.
3. Butler J.M. *Forensic DNA Typing; Biology, Technology, and Genetics of STR Markers*. Elsewire Academic Press, 2005.

Web Sources

1. https://www.wise - geek.com/what - is - forensic - dna - typing.htm
2. https://www.dnaforensics.in/tests/dna/peace - of - mind/dna - profiling - test/?msclkid=57035c3f8feb1747c3f33c622c0cc22a&utm_source=bing&utm_medium=cpc&utm_campaign=allindtarget&utm_term=dna%20forensics&utm_content=Dna - Analysis

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - VI
CORE COURSE - XIV: IMMUNOLOGY AND IMMUNOTECHNOLOGY
(21UBTC62)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 5 **INT.MARKS : 40**
CREDITS : 5 **EXT.MARKS : 60**
DURATION : 75hrs **MAX.MARKS: 100**

Preamble

This course familiarizes the learners with theorganization of Immune system and their functions in defeating infectious agents.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]: detail theorganization of the immune system and their functions
CO2[K2]:illustrate the types of Antigen and Immunoglobulin
CO3[K3]:choose the appropriate Immunotechnique for diagnosis
CO4[K4]:analyse the factors responsible for Immunodeficiency and auto immune disease
CO5[K4]: differentiate cell mediated and humoral immune response

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	2	1	-	1
CO2[K2]	3	2	2	1	1	1	-
CO3[K3]	3	2	2	1	1	-	1
CO4[K4]	3	2	2	1	1	1	1
CO5[K4]	3	2	2	1	1	2	1
Weightage of the course	15	10	10	06	05	04	04
Weighted percentage of Course contribution to POs	**2.73**	**2.27**	**3.25**	**2.07**	**2.86**	**1.87**	**1.74**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(15hrs)**

History and Scope of immunology - Overview of the immune system - Immunity - Types of immunity - Cells of the immune system - Memory Cells - Lymphoid organs - Primary and Secondary organs - B and T cell maturation, activation and differentiation - Antigen processing and presentation.

UNIT II **(15hrs)**

Antigens - Types and Characteristics - Haptens and Adjuvants - Structure, properties, types and functions of Immunoglobulins (Antibodies) - Immune response - Cell mediated immune response and humoral immune response - Complement systems - Activation and Biological role - Cytokine: properties, functions, Cytokine - related diseases - Interleukins: Structure, properties, types and functions.

UNIT III **(15hrs)**

B - cell and T - cell receptor - Antigen - Antibody interactions - Precipitation, Agglutination - Immunotechniques - Radial and Double immunodiffusion - Immunoelectrophoresis - Immunoprecipitation - Immunofluroscence - ELISA and its types - Flow cytometry - Western blotting.

UNIT IV **(15hrs)**

Tumor immunology - Immunity to infectious disease and infectious agents - Bacteria, virus and parasites - Immunodeficiency diseases - Autoimmunity - Hypersensitivity - Types, mechanism and disorders of hypersensitivity - Vaccines - Subunit, Attenuated and Recombinant vaccines.

UNIT V **(15hrs)**

Structure and functions of Class I and Class II MHC - HLA tissue typing and transplantation - Hybridoma technology - Principles, construction and purification of monoclonal antibodies and their applications - Immunohistochemistry.

TEXTBOOKS

1. Goldsby, R.A., Kindt, T.J., Osborne, B.A. and Kuby, J.*Immunology.* W.H. Freeman and Company, New York, Eighth Edition, 2019.
2. Tizard, I.R. *Immunology - An introduction*. Cengage learning Pvt Ltd, India, Tenth Edition, 2017.
3. AbulK.Abbas, Andrew H.Litchman and Shiv Pillai. *Basic Immunology*. Elsevier India, 6th edition, 2019.

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Books

1. Delves, P.J., Martin, S. J. Burton, D. R. and Roitt, I. M. *Essential Immunology*. Blackwell publishing, Thirteenth Edition, 2017.

2. Parija, S. C. *Textbook of Microbiology and Immunology*. Elsevier India, SecondEdition, 2013.
3. Zabriskie, J.B. *Essential Clinical Immunology*. Cambridge University Press, UK, Sixth edition, 2017.

Web Sources

1. https://aasldpubs.onlinelibrary.wiley.com/doi/pdf/10.1002/lt.20406
2. https://oncologypro.esmo.org/content/download/125607/2374999/file/2017 - ESMO - Preceptorship - I - O - TAAs - Cellular - Humoral - Response - Michele - Teng.pdf
3. https://pubs.rsc.org/en/content/chapterhtml/2019/bk9781788014373 - 00001?isbn=978 - 1 - 78801 - 437 - 3

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - VI
CORE COURSE - XV: INDUSTRIAL BIOTECHNOLOGY (21UBTC63)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 5 **INT. MARKS : 40**
CREDITS : 5 **EXT. MARKS : 60**
DURATION : 75hrs **MAX. MARKS: 100**

Preamble

This course familiarizes the learners with the Bioreactor design and types and the applications of industrial biotechnology in various field.

Course Outcomes (CO):

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

CO1[K1]: describe theconcepts of fermentation

CO2[K2]: illustrate the importance of strain improvement

CO3[K3]: choose the suitable downstream processing method for product recovery

CO4[K4]: analyse the role of microbes in Bioremediation and waste management

CO5[K5]: appraise the applications of Industrial Biotechnology

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	3	2	2	1	1	-	1
CO2[K2]	3	2	2	1	1	1	-
CO3[K3]	3	2	2	1	1	-	1
CO4[K4]	2	2	2	1	1	1	1
CO5[K5]	2	2	3	1	1	2	1
Weightage of the course	13	10	11	05	05	04	04
Weighted percentage of Course contribution to POs	**2.36**	**2.27**	**3.57**	**1.72**	**2.86**	**1.87**	**1.74**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(15hrs)**

Scope and Applications of Industrial Biotechnology - Isolation and screening of industrially important microbes - Improvement of strains for increased yield and other desirable characteristics - Preservation of industrial important microorganisms - General concept of fermentation process. Types of Fermentation - Batch, Fed Batch and Continuous Fermentation.

UNIT II **(15hrs)**

Bioreactor Design, Parts, Types and Functions - Airlift Bioreactors - Stirred Tank Bioreactors - Fluidized Bed Bioreactor - Packed - Bed Reactors. Bioprocess Control and Monitoring variables such as Temperature, Agitation, Pressure and pH.

UNIT III **(15hrs)**

Introduction to Large Scale Production of Recombinant Proteins (Insulin, Biopolymer) Using Bioreactors. Economics of large scale fermentation - Fermented Foods - Yoghurt, Butter Milk, Cheese - Fermented Beverages – Wine And Beer - Fermented Vegetables - Microbial Foods - Single Cell Protein (SCP) - Single Cell Oils (SCO) - Biodegradation and Bioremediation.

UNIT IV **(15hrs)**

Production of Primary and Secondary Metabolites including Vitamins (Riboflavin production), Amino Acids (Glutamate production) Commercial Products (Citric acid, Lactate, Vinegar), Antibiotic Production (Penicillin & Bacterial Toxoids).

UNIT V **(15hrs)**

Industrial application of enzymes - Proteases, Amylases, Pectinases, Cellulases, β -galactosidase - Product Recovery and Purification - Microbial Cell Removal, Foam Separation, Precipitation, Coagulation and Flocculation, Filtration, Centrifugation, Cell Disruption, Chromatography, Ultrafiltration, Crystallization.

TEXTBOOKS

1. WulfCrueger and AnnelieseCrueger.*A Textbook of Industrial Microbiology*. Punima Publishing Corporation, India, 2010.
2. Sathyanarayana U.*A Text book of Biotechnology*. Books and allied (P) ltd. India, 2010.
3. Stanbury. P.F, A.Whitaker and S.J.Hall.*Principles of Fermentation Technology*. Second Edition, Elsevier publication, 2012.

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1. Patel A. H. *Industrial Microbiology*, Second Edition. Laxmi publications, New Delhi, 2016.
2. Abhilashas, Mathuriya. *Industrial Biotechnology*.Ane Books Pvt. Ltd, 2009.
3. Ponmurugan P, Nithyaramasubramanian and M.Fredimoses. *Bioprocess technology and downstream processing*. Anjanaa Book house, 2012.

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1. https://nptel.ac.in/courses/102/105/102105058/
2. https://nptel.ac.in/content/syllabus_pdf/102105058.pdf
3. https://nptel.ac.in/courses/103/107/103107082/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER - VI
CORE COURSE - XVI: PRACTICAL: RECOMBINANT DNA TECHNOLOGY AND INDUSTRIAL BIOTECHNOLOGY (21UBTC6P)
(From 2021-2022 Batch onwards)

HOURS/WEEK: 5 **INT. MARKS : 50**
CREDITS : 4 **EXT. MARKS : 50**
DURATION : 75hrs **MAX. MARKS: 100**

Preamble

This course enables the learnersto have practical knowledge on isolation of DNA, RNA and Plasmid and it also enrich the knowledge of students with screening of industrially important microbes.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: explain the procedure to extract DNA from different biological sample
CO2[K3]: apply the electrophoresis technique to separate DNA,RNA and Plasmid
CO3[K4]: differentiate the recombinants from non - recombinants
CO4[K5]: choose the suitable method to isolate industrial important microbes
CO5[K6]: produce fermented beverages using small scale production

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	3	3	-	-	1	1
CO2[K3]	3	2	2	-	-	1	1
CO3[K4]	3	3	2	1	-	1	1
CO4[K5]	3	2	2	2	2	1	1
CO5[K6]	3	2	3	1	-	1	1
Weightage of the course	15	12	12	04	02	05	05
Weighted percentage of Course contribution to POs	**2.73**	**2.73**	**3.9**	**2.07**	**1.14**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

Experiments

1. Agarose gel electrophoresis
2. Isolation of genomic DNA from bacteria, blood, plant and animal tissue
3. Isolation of plasmid DNA (boiling lysis and alkaline lysis method)
4. Transformation – $CaCl_2$ method (Competent cell preparation)
5. Restriction digestion and ligation
6. Blue White screening
7. Polymerase chain reaction
8. Isolation of RNA
9. Southern Blotting
10. Isolation of industrially important strains from environment – Enzyme producers and Antibiotic producers.
11. Strain improvement – UV treatment.
12. Fermentation process – Batch and Fed batch fermentation.
13. Small scale production of Grape wine and their product recovery.

REFERENCES

Books

1. Fletcher L, E. Goss and P. Phelps. *Introduction to biotechnology – a laboratory manual*. 2011.
2. Pal Maliga,Daniel F K Lessug Anthony R,LoilhelmGruissm and Joseph E varner. *Methods in plant Molecular Biology.A Laboratory Course Manual*. Cold Spring Harbour Laboratory press,1998.
3. Harisha S. *Biotechnology procedures and experiments hand book*. Infinity Science Press, New Delhi,2007.
4. Stanton B. Gelvin, Robbert A. Schilperoort, D.P.S. Verma. *Plant Molecular Biology Manual.* Springer Netherlands,1998.

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2. https://ruo.mbl.co.jp/bio/e/support/method/sds - page.html
3. https://www.mblintl.com/reSources/scientific - reSources/fundamentals - for - planning - research/the - principle - and - method - of - sds - polyacrylamide - gel - electrophoresis - sds - page/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - VI
CORE COURSE– XVII:PRACTICAL: IMMUNOLOGY AND IMMUNOTECHNOLOGY (21UBTC6Q)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT.MARKS : 50**
CREDITS :3 **EXT.MARKS : 50**
DURATION : 90hrs **MAX.MARKS: 100**

Preamble

This course familiarizes the learners with the Immunotechniques, Blood grouping, ELISA and Western blotting.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K2]: demonstrate the Immunotechniques
CO2[K3]: perform ELISA
CO3[K4]:analyse the WBC and RBC count using heamocytometer
CO4[K5]: choose the appropriate bleeding and immunization method
CO5[K6]: prepare serum and complement

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K2]	3	2	2	2	1	-	1
CO2[K3]	3	2	2	1	1	2	-
CO3[K4]	3	2	2	1	1	-	1
CO4[K5]	3	2	2	1	1	1	1
CO5[K6]	3	2	2	1	1	2	1
Weightage of the course	15	10	10	06	05	05	04
Weighted percentage of Course contribution to POs	**2.73**	**2.27**	**3.25**	**2.07**	**2.86**	**2.34**	**1.74**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

Experiments

1. ABO blood group typing, Blood staining.
2. Enumeration of RBC and WBC count using haemocytometer.
3. Preparation of Antigen from Bacteria.
4. Immunization and Bleeding techniques, Serum and plasma preparation.
5. Isolation, separation and enumeration of B and T lymphocytes and Rosette assay.
6. Antigen - Antibody interactions:
    a. Haemagglutination.
    b. Immunodiffusion- Single, Double and Radial immunodiffusion.
    c. Electrophoresis – Classical, Counter Current and Rocket immunoelectrophoresis.
7. Isolation and purification of immunoglobulin G (IgG).
8. Enzyme linked immunosorbent assay (ELISA).
9. Western Blotting.
10. Observation of Histology slides.
11. Cell viability assay.

REFERENCES

Books

1. Sam–Yellow and Tobili. *Immunology: Over - view and Laboratory Manual*. Springer, 2021.
2. Gavin Spicket. *Oxford Hand book of Clinical Immunology and allergy*. Oxford University press, 4th edition, 2020.
3. Barbara Detrick and Robert G.Hamilton. *Manual of Molecular and Clinical Laboratory Immunology*. Wiley Publishers, 8th edition, 2016.

Web Sources

1. https://www.wiley.com/encz/Manual+of+Molecular+and+Clinical+Laboratory+Immunology%2C+8th+Edition - p - 9781555818715
2. https://www.asmscience.org/content/book/10.1128/9781555815905
3. https://www.springer.com/gp/book/9783030646851

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - VI
MAJOR ELECTIVE COURSE–III: IPR, BIOETHICS AND BIOSAFETY
(21UBTO61)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 60hrs **MAX. MARKS: 100**

Preamble

This Course introduces the learners to the importance of intellectual property rights and basic concepts of ethics and safety measures to be followed in industry and research activities.

Course outcomes (CO)

On Successful completion of the course, the learners will be able to
CO1[K1]: define various forms of intellectual property rights
CO2[K2]: illustrate guidelines of patenting the biological materials
CO3[K3]: determine the importance of biosafety measures to be followed in laboratory
CO4[K4]: analysethe ethical issues related to stem cell research and gene cloning
CO5[K4]: distinguish patentable and nonpatentable products

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	2	1	1	1	1
CO2[K2]	2	2	2	1	1	1	1
CO3[K3]	2	2	2	1	1	1	1
CO4[K4]	2	2	2	1	1	1	1
CO5[K4]	2	2	2	1	1	1	1
Weightage of the course	10	10	10	05	05	05	05
Weighted percentage of Course contribution to POs	**1.82**	**2.27**	**3.25**	**1.72**	**2.86**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' -' No Correlation

UNIT I **(12hrs)**

Introduction to IPR, types of IP (patent, copyrights, geographical indications, trademarks, trade secret, Industrial designs), treaties in IPR, Patent laws, Legislations covering IPR's in India, IPR Protection, patent filing in biotechnology, provisional and complete specification, patentable and non - patentable items.

UNIT II **(12hrs)**

Patent application - forms and guidelines, fee structure and time frames. Types of patent applications, Publication of patents - gazette of India.University/organizational rules in India and abroad, credit sharing by workers and financial incentives. Patent infringement - meaning, scope, litigation, case studies and examples.

UNITIII **(12hrs)**

Introduction to ethics - Definitions - Scope of Bioethics - Ethics of cloning and ethics of stem cell research - Ethical guidelines of transgenic plant, animal and recombinant microbes - DBT.

UNITIV **(12hrs)**

Bioethics and its Scope - Different approaches to ethics - Social and ethical implications - Public and Private sector organizations for Biosafety and Bioethics - Biosafety on GMO.

UNITV **(12hrs)**

Importance of Good Laboratory Practices and Good Manufacturing Practice (GMP). Biosafety guidelines in India evolved by DBT - Rules for the manufacture - Storage and disposal of medical waste, hazardous microorganisms and Electronic waste.

TEXTBOOKS

1. Dubey, R.C. *A text Book of Advanced Biotechnology*. S. Chand and Co. Pvt. Ltd, New Delhi, 2014.
2. Deepa G,Shomini P. *IPR, Biosafety and Bioethics*. Dorling Kindersley Pvt. Ltd. New Delhi, 2013.
3. Sing, K. *IPR on Biotech.* BCIL, New Delhi, 2010.

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1. Beier, F.K., Crespi R.S. and Straus, T. *Biotechnology and Patent protection.* Oxford and IBH Publishing Co. New Delhi, 2007.
2. Krishna, S. V.*Bioethics and Biosafty in Biotechnology*. New Age International Pvt. Ltd., New Delhi, 2007.

3. *Biosafety issues related to transgenic crops,* DBT guidelines, Biotech Consortium India Limited, New Delhi, 2010.

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SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - VI
MAJOR ELECTIVE COURSE – III: EVOLUTIONARY BIOLOGY (21PBTO62)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 4 **INT. MARKS : 40**
CREDITS : 3 **EXT. MARKS : 60**
DURATION : 60 hrs **MAX. MARKS: 100**

Preamble

This Course introduces the learners to the origin of life on earth and tracethe theories of Evolution.

Course outcomes (CO)

On Successful completion of the course, the learners will be able to

CO1[K1]: outline the concepts of life origin on earth

CO2[K2]: explain the theories of Evolution.

CO3[K3]: applyH - W Law to detect the allele and genotype frequencies in a population.

CO4[K4]: analyse the role of mass extinction in evolution.

CO5[K4]: differentiate the principles of Macro and Micro evolution

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	2	1	1	1	1
CO2[K2]	2	2	2	1	1	1	1
CO3[K3]	2	2	2	1	1	1	1
CO4[K4]	2	2	2	1	1	1	1
CO5[K4]	2	2	2	1	1	1	1
Weightage of the course	10	10	10	05	05	05	05
Weighted percentage of Course contribution to POs	**1.82**	**2.27**	**3.25**	**1.72**	**2.86**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(12hrs)**

Origin of life - RNA world, origin & diversification of prokaryotes & viruses.origin& diversification of eukaryotes & multicellularity**.** History of Life - Major Events in History of Life.Introduction to Evolutionary Theories - Lamarckism, Darwinism, Neo - Darwinism.

UNIT II **(12hrs)**

Direct Evidences of Evolution - Types of fossils, Incompleteness of fossil record, Dating of fossils. Processes of Evolutionary Change - Organic variations - Isolating Mechanisms; Natural selection - Types of natural selection - Directional, Stabilizing, Disruptive and Artificial selection.Species Concept - Biological species concept - Modes of speciation – Allopatric, Sympatric.

UNIT III **(12hrs)**

Macro - evolution - Macro - evolutionary Principles. Micro evolutionary changes - inter - population variations, clines, races, Species concept, isolating mechanisms. Extinction - Mass extinction - Causes, Names of five major extinctions - Role of extinction in evolution.

UNIT IV **(12hrs)**

Origin and evolution of Human, Unique hominin characteristics contrasted with primate characteristics, primate phylogeny from Dryopithecus leading to Homo sapiens, molecular analysis of human origin.

UNIT V **(12hrs)**

Population genetics: Hardy - Weinberg Law - application of law to human Population; Evolutionary forces upsetting H - W equilibrium. Genetic Drift - mechanism, founder's effect, bottleneck phenomenon - Role of Migration and Mutation in changing allele frequencies.

TEXTBOOKS

1. Carl Zimmer and Douglas Emlen. *Evolution: Making Sense of Life*. Willey, 2013.
2. Nicholas H.Barton and Derek E.G.Briggs. *Evolution.*Cold spring Harbor Laboratory press, 2011.
3. JonC.Heron, Scott andFreeman.*Evolutionary analysis.* Pearson education India, 2013.

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Books

1. Charles Darwin.*On the Origin of Species.*D.Appleton and company, 1888.
2. Kenneth V.Kadong. *An Introduction to Biological Evolution*. McGraw - Hill education,Second edition, 2007.

3. Campbell, N.A. and Reece J.B. *Biology*. IX Edition. Pearson, Benjamin, Cummings, 2011.

Web Sources

1. https://nptel.ac.in/courses/122/103/122103039/
2. https://nptel.ac.in/noc/courses/noc17/SEM2/noc17 - ch08/
3. https://nptel.ac.in/content/storage2/courses/122103039/pdf/mod2.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme – B.Sc. Biotechnology
SEMESTER VI
MAJOR ELECTIVE COURSE - III: STEM CELL BIOLOGY (21UBTO63)
(From 2021-2022 Batch onwards)

Hours/Week : 4 **INT.MARKS :40**
CREDITS :3 **EXT.MARKS :60**
DURATION :60 hrs **MAX.MARKS :100**

Preamble

This course familiarizes the learners with thestem cell biology and their role in medical applications.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to
CO1[K1]:list out the types of stem cells.
CO2[K2]:explain the basic properties and characterization of stem cells
CO3[K3]: determine the role of stem cells in tissue engineering
CO4[K4]:analyse the ethical consideration of stem cell research.
CO5[K4]: appraise the functions of Stem cell niches

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	2	2	2	1	1	1	1
CO2[K2]	2	2	2	1	1	1	1
CO3[K3]	2	2	2	1	1	1	1
CO4[K4]	2	2	2	1	1	1	1
CO5[K4]	2	2	2	1	1	1	1
Weightage of the course	10	10	10	05	05	05	05
Weighted percentage of Course contribution to POs	**1.82**	**2.27**	**3.25**	**1.72**	**2.86**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(12hrs)**

Stem cell concept - Properties of stem cell - Types of stem cell - Embryonic stem cell - Adult stem cells - Problem of differentiation.

UNIT II **(12hrs)**

Differentiation status of cells - Primordial germ cell - Skin cell - Gastrointestinal cells - Embryonic stem cell differentiation as a model to study haematopoietic and endothelial cell development.

UNIT III **(12hrs)**

Stem cell location and Classification - Neural stem cells - Stem cell niches - Germ line Epithelial and Epidermal and neural niches.

UNIT IV **(12hrs)**

Uses of Stem cells - Human stem cells - Renewal of stem cells - Stem cells and TissueEngineering - Embryonic stem cells and Gene therapy - Therapeutic cloning.

UNIT V **(12hrs)**

Single - Cell PCR methods for studying stem cells - Ethical and Social consideration of Stem cell Research.

TEXTBOOKS:

1. Munsie.M. The Australian Stem cell *Handbook*. National Stem Cell Foundation of Australia, 2015.
2. Mary L. Clarke and Jonathan Frampton. *Stem cell biology and application.* Garland science First edition,2020.
3. KursadTurksen. *Tissue specific stem cell Niche*. Springer softcover reprint of the original First edition, 2016.

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1. Edited by C.S.Potten, Clarke R.B .Tissue*Stem cells*, CRC Press, First edition2019.
2. Turksen, K. *Embryonic Stem Cells - Methods and Protocols*, Vol.185, Humana press,2012.
3. Dockendorff, B. *Stem Cell Century: Law and Policy for a Breakthrough Technology*, Vol.5. Journal of Health and Biomedical Law, 2009.

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3. https://nptel.ac.in/courses/102/106/102106036/

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
DEPARTMENT OF BIOTECHNOLOGY
UG Programme - B.Sc. Biotechnology
SEMESTER - VI
SKILL ENHANCEMENT COURSE - VI:
BIOINFORMATICS AND FUNCTIONAL GENOMICS (21UBTS61)
(From 2021-2022 Batch onwards)

HOURS/WEEK : 2 **INT. MARKS : 40**
CREDITS : 2 **EXT. MARKS : 60**
DURATION : 30 hrs **MAX. MARKS :100**

Preamble

This course enriches the learners with contemporary knowledge on Functional Genomics and the tools used in Bioinformatics for gene prediction and sequence alignment.

Course Outcomes (CO)

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

CO1[K1]: outline the scope and applications of Bioinformatics

CO2[K2]: explain the principles of Microarray technology

CO3[K3]: apply the bioinformatic tools in sequence alignment and molecular docking.

CO4[K4]:analyse the importance of bioinformatics in gene prediction

CO5[K5]: assess the protein interactions using two hybrid system

CO - PO Mapping table (Course Articulation Matrix)

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1[K1]	1	1	1	1	1	1	1
CO2[K2]	1	1	1	1	1	1	1
CO3[K3]	1	1	2	1	1	1	1
CO4[K4]	1	1	2	1	1	1	1
CO5[K5]	1	1	2	1	1	1	1
Weightage of the course	05	05	08	05	05	05	05
Weighted /;percentage of Course contribution to POs	**0.91**	**1.14**	**2.6**	**1.72**	**2.86**	**2.34**	**2.17**

Based on the level of contribution ('3' - High, '2' - Medium, '1' - Low ' - ' no correlation)

UNIT I **(6 hrs)**

Bioinformatics - Basic Concepts - Scope and Applications. Nucleic Acid Sequence Databases – EMBL - GenBank and DDBJ - Protein Sequence Databases – PIR, Swiss - PROT - Structural Databases–PDB - PubChem - File Formats– GenBank - FASTA file formats.

UNIT II **(6hrs)**

Sequence alignment - Pair wise, Local, Global Alignment - Multiple Sequence Alignment - Structure Analysis using EXPASY Tools - Amino acid composition analysis - Molecular weight - Hydrophobicity and Hydropathy profiles - Helical Wheel - Protein Secondary structure Prediction - GOR method.

UNIT III **(6hrs)**

Drug Discovery - High throughput Screening, Identification of Drug Targets - Phylogenetics – Metabolomics - Application of Mass Spectrometry - MALDI TOF and HPLC in metabolomics, Human Genome Project.

UNIT IV **(6hrs)**

Genomics - Definition - Construction of Genetic Maps - Physical Maps - RFLP - FISH to Identify Chromosome Landmarks - SAGE and Sequence Assembly - Sequence Annotation, DNA Micro array**:** Basic principles and Design, Applications and types - Genotyping/SNP detection - Detection technology - Computational analysis of micro array data**.**

UNIT V **(6hrs)**

Primary - secondary - Tertiary and Quaternary structure - Identification and Analysis of Proteins by 2D analysis - Yeast two hybrid system - Phage Display - Protein Interaction Maps - Protein Arrays - Definition - Applications - Diagnostics - Expression profiling.

TEXTBOOKS

1. Paul G and Teresa K. Attood. *Bioinformatics and molecular Evolution*.BlackwellPublishing, 2012.
2. David M. Mount. *Bioinformatics sequence and genome analysis*. Gold Spring HarborPress Publishers, England, 2009.
3. David Bowell and Joseph Sambrook. *DNA Microarrays*. Cold Spring Harbor Laboratory Press Publication, New York, 2009.
4. Irfan A KhannumAtiya. *Recent Advance in Bioinformatics*. Ukaaz Publication,2003.

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1. Andrew Leach. *Molecular Modeling*. Blackwell Publishing, Second Edition, USA, 2003.

2. Westhead T.K. *Instant notes on Bioinformatics*. VIVA Publishers, New Delhi, 2012.
3. Primrose S.B and TwymanR. *Principles of Genome Analysis and Genomics*, Blackwell,Washington, 2008.

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2. https://nptel.ac.in/courses/102/104/102104056/
3. https://nptel.ac.in/content/syllabus_pdf/102104056.pdf