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

PG Programme

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

Curriculum Design and Development Cell Annexure K

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



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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

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S.No.	Board Members	Na	ame and Designation		
1.	Chairman of the	Dr. M. Sujatha	1		
	Board	Head & Assist	ant Professor of Biotechnology Sri		
		Kaliswari Coll	lege (Autonomous), Sivakasi.		
2.	University Nominee	Dr. M. Jayalak	shmi Assistant		
	-	Professor Dep	partment of		
		Immunology			
		School of Biol	ogical Sciences		
		Madurai Kamaraj University,			
		Madurai -625	021		
3.	Academic Expert 1.	Dr. S. Venkate	esh		
		Assistant Prof	fessor,		
		Department o	of Biotechnology		
		M.S University	у,		
	A stall stall - East and O	Tirunelveli.			
4.	Academic Expert 2.	Dr.G.Sridevi	ſ		
		Assistant Pion	lessor, A Diant Diatachnalagu		
		Department of Plant Biotechnology,			
		School of Biotechnology, Madurai Kamarai University Madurai			
5	Inductrialist	Mr.K.Aruldoss			
0.	maastrianst	Happyman Natural manure, Organic fruits and			
		Vegetables			
		Pavali,			
		Virudhunagar			
6.	Alumna	Ms.S. Ranjini			
		Assistant Prof	fessor,		
		Department o	of Biotechnology,		
		Arulmigu Kal	asalingam College of Arts and		
		Science			
L		Krishnankoil.			
Mem	bers	-	, ,		
7.	Dr. R. Narayana Prakas	h (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	<i>H</i>	Assistant Professor in Biotechnology		
13.	Dr. A. Kajalakshmi	<i>H</i>	Assistant Professor in Biotechnology		
14.	Mr. T. Victor Athisayan	<u>1 / / / / / / / / / / / / / / / / / / /</u>	Assistant Professor in Biotechnolog		
15.	Mr. R. Kalidoss	l l	Assistant Professor in Biotechnology		

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

DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.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 focused 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 in still 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

PEO 1: demonstrate comprehensive knowledge of basic and applied aspects of Biotechnology and allied fields

PEO 2: apply the knowledge and skills in the process of research, its methodology, structure, and tools and use them to design, conduct the experiments interpret and analyze the data for the development of innovative products within the realistic constraints.

PEO 3: acquire ability to use theoretical knowledge, practical skills, and recent technological tools in solving any technological challenges and problems in the social context

PEO 4: strengthen the employability skills necessary to take up a profession in the field of Industry, Academy, Research, and Entrepreneurship.

PEO 5: develop critical thinking, entrepreneurship abilities, ethical values, and lifelong learning skills towards holistic approaches contributing to the welfare of the society.

VII. PROGRAMME OUTCOMES (POs)

PO1: Disciplinary knowledge

Acquire specialized and scientific knowledge in the field of Science.

PO2: Critical thinking, Problem solving and Analytical reasoning

Engage in critical investigation through principle approaches or methods and draw realistic conclusions of problems by employing highly developed analytical and quantitative skills.

PO3: Scientific reasoning and Research related skills

Ability to analyze, draw conclusions from qualitative/quantitative data and critically evaluate ideas and also acquire necessary research skills to carry out an experiment or investigation.

PO4: Communication skills and Digital literacy

Communicate effectively on scientific achievements, basic concepts and recent developments with society at large and make use of appropriate software to prepare project report.

PO5: Ethics, Values and Multicultural competence

Embrace ethical principles in all their activities, commit to professional and research ethics and practice tolerance and respect differences.

PO6: Team Work, Leadership and Employability skills

Recognize the opportunities and contribute positively in collaborative scientific research and acquire the pre-requisite skills required for placements and higher education.

P07: Self-directed and Life-long learning

Recognize the need for engaging in independent and life-long learning in the emerging areas of the field of specialization.

VIII. PROGRAMME SPECIFIC OUTCOMES (PSOs) – M.Sc. BIOTECHNOLOGY

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

PSO 1: acquire knowledge and nuances of applied aspects of Biotechnology – cell and molecular biology, microbial technology, genomics, proteomics, genetic engineering, advanced plant and animal sciences, computational biology, etc.

PSO 2: exhibit critical thinking and analytical skills on the broad spectrum of Biotechnology, so as to meet the global demands of industry and academia.

PSO 3: administer skill sets to use research-based knowledge including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.

PSO 4: equip themselves to read, write, and prepare scientific papers and present effectively in various forums and to tabulate and interpret the Biological data using computer software.

PSO 5: appraise the impact of the biological solutions/needs in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development and show commitment to professional ethics and moral values.

PSO 6: exhibit contemporary knowledge and skills in Biotechnology to work in the pharmaceutical and biotechnological industries and function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

PSO 7: obtain ability to think independently and develop lifelong learning skills in data collection, analysis, evaluation of the Biotechnological concepts, and apply them in real-time situations.

IX. PO-PSO Mapping Matrix – M.Sc. Biotechnology

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
PO PSO							
	•						
PO1	1						
PO2		 ✓ 					
PO3			1				
PO4				1			
PO5					1		
PO6						1	
PO7							1

X. PO-PEO Mapping Matrix – M.Sc. Biotechnology

	PEO1	PEO2	PEO3	PEO4	PEO5
PO PEO					
P01	· •	\checkmark	✓		
P02		\checkmark	✓		\checkmark
P03		\checkmark	~	~	~
P04		~		~	
P05			\checkmark	\checkmark	\checkmark
P06			\checkmark	\checkmark	\checkmark
P07		~			\checkmark

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

REGULATIONS

Duration of the Programme

: Two years (equivalent to four

semesters)

Eligibility

Candidate should have passed B.Sc. degree in Botany, Zoology, Biochemistry, Biotechnology or any branch of Life sciences, Chemistry, Mathematics and Physics with any subject in Life sciences as ancillary subject.

Candidates secured at least 60% of marks in aggregate are eligible to apply. A relaxation of 10% marks in the aggregate will be given to SC/ST/PH students.

Medium of Instruction : English

Age Limit

Maximum age limit

: No Age limit

Transitory Permission

Students joined from 2021 - 2023 may be permitted to write their examinations in this pattern up to April 2026.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF ENGLISH PG Programme - M.Sc. Biotechnology SCHEME OF EXAMINATION

For PG Programme, the Internal and External marks are distributed as follows:

For all Theory Courses : Internal Marks: 40; External Marks: 60

For all Practical Courses and Project: 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/ 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
Seminar	5 marks	One Seminarfor each course

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 ENGLISH PG Programme – M.Sc. Biotechnology QUESTION PAPER PATTERN

Internal Test - 40 Marks - 1 hr 45 mins Duration

S.No	Type of Questions	Marks
1.	Objective type Questions	
	Multiple Choice -4 questions	04
	Answer in a Word/Sentence-4 questions	04
2.	Short Answer –3 questions –either or type	3x4=12
3.	Long Answer-2 questions-either or type	2x10=20

Summative Examinations - 60 Marks - 3 hrs Duration

S.No	Type of Questions	Marks
1.	Objective type Questions:	
	Multiple Choice – 5 questions	05
	Answer in a Word/Sentence– 5 questions	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 PG Programme - M.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,

Percentage attainment of each course outcome =	No. of. Students who scored more than the target in the concerned course outcome	v100
	Total Number of Students	~100

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

For Summative Examinations,

Percentage attainment of each Course outcome = No. of. Students who scored more than the target in the concerned CO Total Number of Students *100

Formula for calculating Attainment Percentage of Course outcome of a course

Percentage Attainment of Course outcome for Internal Assessment tools		Average of percentage attainmen of all COs		
Percentage Attainment of Course outcome for Summative Examinations	=	Average attainment	of t of all COs	percentage

Final Direct Assessment of Course outcome Attainment

For Theory Courses

Percentage Attainment of Course outcome through Direct Assessment	=	<pre>(0.6 x percentage attainment of CO for internal assessment tool) + (0.4 x percentage attainment of CO for summative examinations)</pre>
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
Percentage at	tainment for each CO	C	=	Satisfac Respon	tion Number se Received	×100	I

Percentage Attainment of CO of a course = Average of percentage attainment of all 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

СО	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 from the 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.

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

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

Expected Level of Attainment for each of the Programme Educational Objectives

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

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology CURRICULUM STRUCTURE OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM (From 2021-2022 Batch onwards)

Courses	Sem I	Sem II	Sem III	Sem IV	Credits
Core Courses	6(5) 6(5) 6(5) 6P(4)	6(5) 6(5) 6(5) 6P(4)	6(5) 6(5) 6(5) 6P(4)	5(5) 5(5) 5(4)	71
Elective Courses	6(4)		6(4)		8
Non -Major Elective	-	6(4)			4
Self paced Learning (Swayam Courses)	-		(3)		3
Project	-			15(4)	4
Total hours (Per Week)/ Credits	30(23)	30(23)	30(26)	30(18)	90 120

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology CURRICULUM PATTERN OUTCOME-BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM (From 2021-2022 Batch onwards) PROGRAMME CODE – PBT

Semester	Course code	Course Name	Hours	Credits
	21PBTC11	Core Course - I: Cell and Developmental Biology	6	5
	21PBTC12	Core Course - II: Biomolecules	6	5
Ι	21PBTC13	Core Course - III: Microbiology and Microbial Genetics	6	5
	21PBTC1P	Core Course - IV: Practical: Biomolecules, Microbiology	6	4
		and Microbial Genetics		
		Elective Courses - I:		
	21PBT011	1. Inheritance and Evolutionary Biology		
	21PBT012	2. Stem Cell Biology	6	4
	21PBT013	3. Enzymes and Enzyme Technology		
		Total	30	23
	21PBTC21	Core Course - V: Immunology and Immunotechnology	6	5
	21PBTC22	Core Course - VI: Genetic Engineering	6	5
II	21PBTC23	Core Course - VII: Bioinformatics	6	5
	21PBTC2P	Core Course - VIII: Practical: Immunology and Genetic	6	4
		Engineering		
	21PBTN21	Non Major Elective Course - I: Food Science	6	4
		Total	30	23
	21PBTC31	Core Course - IX: Plant and Animal Biotechnology	6	5
	21PBTC32	Core Course - X: Bioprocess Technology	6	5
III	21PBTC33	Core Course - XI: Agricultural and Environmental	6	5
		Biotechnology		
	21PBTC3P	Core Course - XII: Practical – III: Plant, Animal and	6	4
		Bioprocess Technology		
		Elective Course - II:		
	21PBT031	1. IPR, Bioethics and Biosafety	6	4
	21PBT032	2. Molecular Oncology		
	21PBT033	3. Industrial Safety and regulations		
		Self-paced Learning (Swayam course)		
	21PBTM31	1. Forests and their Management		3
	21PBTM32	2. Applied Environmental Microbiology		
	1	Total	30	26
	21PBTC41	Core Course - XIII: Bioinstrumentation and Biostatistics	5	5
IV	21PBTC42	Core Course - XIV: Genomics and Proteomics	5	5
	21PBTC43	Core Course - XV: Research Methodology	5	4
	21PBTJ41	Project	15	4
		Total	30	18
		Over all Total	120	90

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

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology (From 2021-2022 Batch onwards)

PROGRAMME ARTICULATION MATRIX (PAM)

Semester	Course code	Course Name	P01	P02	РО3	P04	P05	P06	P07
	21PBTC11	Core Course - I: Cell and Developmental Biology	15	10	10	5	2	5	5
Ι	21PBTC12	Core Course - II: Biomolecules	12	10	10	5	0	10	4
	21PBTC13	CoreCourseIII:MicrobiologyandMicrobial Genetics	11	13	8	10	6	4	8
	21PBTC1P	Core Course - IV: Practical: Biomolecules, Microbiology and Microbial Genetics	15	10	8	6	7	5	5
	21PBTO11 21PBTO12 21PBTO13	Elective Courses – I 1. Inheritance and Evolutionary Biology 2. Stem Cell Biology 3. Enzymes and Enzyme Technology	12	12	8	5	8	2	5
II	21PBTC21	Core Course - V: Immunology and Immunotechnology	15	9	8	6	5	5	4
	21PBTC22	Core Course - VI: Genetic Engineering	12	11	12	5	7	3	4
	21PBTC23	Core Course - VII: Bioinformatics	12	11	12	9	0	5	5
	21PBTC2P	Core Course - VIII: Practical : Immunology and Genetic Engineering	14	12	11	7	4	5	6
	21PBTN21	Non Major Elective Course - I: Food Science	12	7	2	9	0	7	7
	21PBTC31	Core Course - IX: Plant and Animal Biotechnology	13	14	10	5	7	5	5
III	21PBTC32	Core Course - X: Bioprocess Technology	13	12	10	10	1	8	4

	21PBTC33	Core Course - XI: Agricultural and	12	14	10	5	5	5	5
		Environmental Biotechnology							
		Core Course - XII:	15	12	12	6	2	5	5
	21PBTC3P	Practical – III: Plant,							
		Animal and Bioprocess							
		Technology	10	10	0	-	11	_	10
	21007021	Liective Lourse - II:	10	10	8	5	11	5	10
	21601031	Riosafety							
	21PBT032	2. Molecular Oncology							
	21PBT033	3. Industrial Safety and							
		regulations							
		Self-paced Learning	13	10	10	9	3	2	8
		(Swayam course)							
	21PBTM31	1. Forests and their							
	210071022	Management							
	ZIPBIM32	2. Applied Environmental							
		Core Course - XIII:	12	10	10	7	5	6	6
IV	21PBTC41	Bioinstrumentation and	14	10	10	,	5	0	0
		Biostatistics							
	21PBTC42	Core Course - XIV:	12	15	12	5	4	7	5
		Genomics and Proteomics							
	21PBTC43	Core Course - XV:	15	10	15	10	4	4	2
		Research Methodology							
	21PBTJ41	Project	15	13	12	5	5	5	5
Tot	al Weightage	e of all Courses	260	225	198	134	86	103	108
Con	tributing to	РО							

SRI KALISWARI COLLEGE (AUTONOMOUS), Sivakasi DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. BIOTECHNOLOGY (From 2021-2022 Batch onwards)

PROGRAMME ARTICULATION MATRIX – WEIGHTED PERCENTAGE

m est	Course code	Course Name	P01	P02	P03	P04	P05	P06	P07
	21PBTC11	Core Course - I: Cell and Developmental Biology	5.77	4.44	5.05	3.73	2.33	4.85	4.63
Ι	21PBTC12	Core Course - II: Biomolecules	4.62	4.44	5.05	3.73	0	9.71	3.7
	21PBTC13	CoreCourse-III:MicrobiologyandMicrobial Genetics	4.23	5.78	4.04	7.46	6.98	3.88	7.41
	21PBTC1P	Core Course - IV: Practical: Biomolecules, Microbiology and Microbial Genetics	5.77	4.44	4.04	4.48	8.14	4.85	4.63
	21PBTO11 21PBTO12 21PBTO13	Elective Courses - I: 1. Inheritance and Evolutionary Biology 2. Stem Cell Biology 3. Enzymes and Enzyme	4.62	5.33	4.04	3.73	9.3	1.94	4.63
II	21PBTC21	Core Course - V: Immunology and Immunotechnology	5.77	4	4.04	4.48	5.81	4.85	3.7
	21PBTC22	Core Course - VI: Genetic Engineering	4.62	4.89	6.06	3.73	8.14	2.91	3.7
	21PBTC23	Core Course - VII: Bioinformatics	4.62	4.89	6.06	6.72	0	4.85	4.63
	21PBTC2P	Core Course - VIII: Practical : Immunology and Genetic Engineering	5.38	5.33	5.56	5.22	4.65	4.85	5.56
	21PBTN21	Non Major Elective Course - I: Food Science	4.62	3.11	1.01	6.72	0	6.8	6.48
	21PBTC31	Core Course - IX: Plant and Animal Biotechnology	5	6.22	5.05	3.73	8.14	4.85	4.63
III	21PBTC32	CoreCourse-X:Bioprocess Technology	5	5.33	5.05	7.46	1.16	7.77	3.7
	21PBTC33	Core Course - XI: Agricultural and Environmental Biotechnology	4.62	6.22	5.05	3.73	5.81	4.85	4.63

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

	21PBTC3P	Core Course - XII:	5.77	5.33	6.06	4.48	2.33	4.85	4.63
		Practical – III : Plant,							
		Animal and Bioprocess							
		Technology							
		Elective Course - II:	3.85	4.44	4.04	3.73	12.79	4.85	9.26
	21PBT031	1. IPR, Bioethics and							
		Biosafety							
	21PBT032	2. Molecular Oncology							
	21PBT033	3. Industrial Safety and							
		regulations							
		Self-paced Learning	5	4.44	5.05	6.72	3.49	1.94	7.41
		(Swayam course)							
	21PBTM31	1. Forests and their							
		Management							
	21PBTM32	2. Applied Environmental							
		Microbiology							
	21PBTC41	Core Course - XIII:	4.62	4.44	5.05	5.22	5.81	5.83	5.56
IV		Bioinstrumentation and							
		Biostatistics							
	21PBTC42	Core Course - XIV:	4.62	6.67	6.06	3.73	4.65	6.8	4.63
		Genomics and Proteomics							
	21PBTC43	Core Course - XV:	5.77	4.44	7.58	7.46	4.65	3.88	1.85
		Research Methodology							
	21PBTJ41	Project	5.77	5.78	6.06	3.73	5.81	4.85	4.63
Total Weighted percentage of Course			100	100	100	100	100	100	100
Con	tribution to	Pos							

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - I CORE COURSE - I: CELL AND DEVELOPMENTAL BIOLOGY (21PBTC11) (From 2021-2022 Batch onwards) HOURS/WEEK : 6 INT.MARKS : 40 CREDITS : 5 EXT. MARKS : 60 DURATION : 90hrs MAX.MARKS :100

Preamble

This course introduces the learners to Molecular structure and functions of cells and various cell organelles with multiple stages of differentiation and development in Plants and Animals.

Course outcomes (CO)

On Successful completion of the course, the learners will be able to CO1[K2]: illustrate the structure of cell organelles and their function CO2[K3]: determine the stages in development of Zygotes CO3[K4]: compare and contrast the events of cell cycle and its regulation CO4[K4]: analyse the transport mechanism across plasma membrane CO5[K5]: assess the role of hormones and receptors in cell signalling

11	0			,			
PO	P01	P02	PO3	P04	P05	P06	P07
со							
CO1[K2]	3	2	2	1	1	1	1
CO2[K3]	3	2	2	1	1	1	1
CO3[K4]	3	2	2	1	-	1	1
CO4[K4]	3	2	2	1	-	1	1
CO5[K5]	3	2	2	1	-	1	1
Weightage	15	10	10	05	02	05	05
of the							
course							
Weighted	5.77	4.44	5.05	3.73	2.33	4.85	4.63
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

UNIT I

Ultra Structure of Prokarvotic and Eukarvotes - Structure and Organization of Prokaryotic and Eukaryotic Chromosomes - Heterochromatin and Euchromatin.Mitochondria and Chloroplast Genome Organization and Its Inheritance.Molecular Events of Cell Division and Cell Cycle - Regulation of Cell Cycle Events - Apoptosis and Necrosis.

UNIT II

Plasma Membrane - Transport Across Membrane - Passive Diffusion -Osmosis - Active Transport - Ion Channels - ABC Transporters - Na⁺ And K⁺ Pump -Ca²⁺Atpase Pump - Co-Transport – Symport – Antiport - Cell To Cell Interactions -Cell Adhesion - Integrins - Selectins - Cadherins - Cell Junction - Tight and Gap Junctions – Desmosomes – Plasmodesmata - Cell Signalling - Role of Secondary Messengers - Protein Localization and Targeting.

UNIT III

Cell Signalling Hormones and Their Receptors - Cell Surface Receptor -Signalling Through G-Protein Coupled Receptors - Signal Transduction Pathways - Second Messengers - Regulation of Signalling Pathways - Bacterial and Plant Two-Component Systems - Light Signalling in Plants, Bacterial Chemotaxis and **Ouorum Sensing.**

UNIT IV

Basic Concepts of Development – Potency – Commitment – Specification – Induction - Competence - Determination and Differentiation - Morphogenetic Gradients. Cell Fate And Cell Lineages. Stem cells. Production of Gametes - Cell Surface Molecules in Sperm - Egg Recognition in Animals - Embryo Sac Development and Zygote Formation - Cleavage - Blastula Formation - Embryonic Fields - Gastrulation and Formation of Germ Layers in Animals – Embryogenesis.

UNIT V

Cell Aggregation and Differentiation - Axes And Pattern Formation in Drosophila, Amphibia and Chick. Organogenesis – Vulva Formation In*Caenorhabditiselegans*, Eve Lens Induction, Limb Development and Regeneration in Vertebrates, Differentiation of Neurons. Post Embryonic Development- Larval Formation, Metamorphosis. Environmental Regulation of Normal Development.Sex Determination.Programmed Cell Death - Aging and Senescence.

(18 hrs)

(18 hrs)

(18hrs)

(18 hrs)

(18 hrs)

TEXTBOOKS

- 1. Ajay Paul M.*Text book of cell and molecular biology*. Kolkata : Books and Allied Pvt. Ltd,2015.
- 2. Gupta P.K. *Cell and Molecular biology*. India :Rastogi publication, Fifth edition, 2016.
- 3. Alberts B, Johnson A, Lewis J, Raff M, Roberts K and Walter P. *Molecular Biology of the cell*. New York : W.W. Norton, Sixth edition, 2014.

REFERENCES

Books

- 1. Scott F.Gilbert, Michel J.F Barresi. *Developmental Biology*. International eleventh edition, 2017.
- 2. De Robertis, E.D.P, E.M.F. De Robertis. *Cell and molecular biology.* Eighth International edition, 2017.
- 3. Krebs, Jocelyn E, Elliott S, Goldstein and Stephen T. *Lewin's genes XII*. Jones & Bartlett Learning, 2017.

Web Sources

- 1. <u>https://bio.libretexts.org/Bookshelves/Introductory and General Biology/</u> <u>Book%3A General Biology (Boundless)/32%3A Plant Reproductive Develo</u> <u>pment and Structure/32.2%3A Pollination and Fertilization/32.2D%3A D</u> <u>ouble Fertilization in Plants</u>
- 2. <u>https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2117903/</u>
- 3. <u>https://www.researchgate.net/publication/320913000 Senescence and aging Causes consequences and therapeutic avenues</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - I CORE COURSE - II: BIOMOLECULES (21PBTC12) (From 2021-2022 Batch onwards)

HOURS/WEEK: 6 CREDITS : 5 DURATION : 90hrs INT.MARKS :40 EXT.MARKS :60 MAX.MARKS :100

Preamble

This course introduces the learners to structure, function and metabolic pathway of different biomolecules in cell.

Course outcomes (CO)

On Successful completion of the course, the learners will be able to CO1[K2]: explain the structure, properties and functions of biomolecules CO2[K3]: determine the metabolic pathways and its energetics CO3[K4]: classify biomolecules based on their structure CO4[K4]: appraise the role of enzymes in different metabolic pathways CO5[K5]: assess the different metabolic process of biomolecule level in cell

P0	P01	PO2	P03	P04	P05	P06	P07
C0							
CO1[K2]	3	1	2	1	-	2	1
CO2[K3]	3	2	1	1	-	2	1
CO3[K4]	2	2	1	1	-	2	1
CO4[K4]	2	2	3	1	-	2	-
CO5[K5]	2	3	3	1	-	2	1
Weightage	12	10	10	05	0	10	04
of the							
course							
Weighted	4.62	4.44	5.05	3.73	0	9.71	3.7
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

UNIT I

Thermodynamics - Law of Thermodynamics, Concept of Free Energy, Entropy, Enthalpy and their Relationship. Enzymes - Nomemenclature And Classification of Enzymes, Holoenzyme, Apoenzyme, Cofactors, Coenzyme, Prosthetic Groups, Metalloenzymes, Monomeric &Oligomericenzymes, Activation Energy and Transition State, Enzyme Activity, Specific Activity, Common Features of Active Sites, Enzyme Specificity- Types & Theories of Enzymes.

UNIT II

Carbohydrates - Classification, structure and functions, Metabolism of carbohydrates - Starch, Glycogen, Glycolysis, Entnerdoudoroff pathway, Gluconeogenesis, Glycogenesis, Glycogenolysis, HMP pathway, TCA cycle, ATP synthesis and Electron transport chain, Photophosphorylation, Photosynthesis.

UNIT III

Lipids - Classification, structure, functions, Degradation, Regulation and Biosynthesis of saturated fattyacids, Triglycerides, phospholipids and sterols, Catabolism of fattyacids - oxidation, catabolism of triglycerides and phospholipids, Structure and functions of Glycolipids and Lipoproteins.

UNIT IV

Nucleic acids - Classification, structure, functions, Biosynthesis of Purines and pyrimidines.Aminoacids - Classification and structure, peptides and polypeptides, Metabolism of aminoacids. Proteins - Primary, secondary, tertiary, quaternary structure, Classification and functions, Protein folding, Ramachandran plot.

UNIT V

Synthesis and application of Heterocyclic Compounds and secondary metabolites: Prostaglandins, Leukotrienes, Thromboxanes, Alkaloids and Flavonoids.

TEXTBOOKS

- 1. JainJ.L, Sunjay Jain and Nitin Jain. *Fundamentals of Biochemistry*. S.Chand and company Ltd, Sixth Edition, 2016.
- 2. Lehninger.A.L, Nelson.D.L and Cox M.M. *Principles of Biochemistry*, NewYork : W.H. Freeman and company, Fourth Edition, 2017.
- 3. Jain, J. L, Sunjay Jain and Nitin Jain. *Fundamentals of biochemistry*. S. Chand Publishing, 2016.
- 4. Satyanarayana, U, and Chakrapani U. *Essentials of biochemistry*. Book and Allied, Kolkata, India, 2019.

21PBT23

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

REFERENCES

Books

- Cox, Michael M., and David L. Nelson. *Lehninger principles of biochemistry*.Vol. 5. New York: Wh Freeman, 2017.
- 2. Murray, Robert K. Harper's illustrated biochemistry. Mcgraw-hill, 2014.
- 3. Voet, Donald, Judith G. Voet, and Charlotte W. Pratt. *Fundamentals of biochemistry: life at the molecular level*. John wiley and sons, 2013.
- 4. LubertStryer. *Biochemistry*. Stanford university, New York :W.H.Freeman company,2015.

Web Sources

- 1. <u>https://nptel.ac.in/content/storage2/courses/112105129/pdf/RAC%20L</u> ecture%204.pdf
- 2. <u>https://nptel.ac.in/courses/104/105/102105034/</u>
- 3. <u>https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod11.pdf</u>
- 4. https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod10.pdf

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - I CORE COURSE - III: MICROBIOLOGY AND MICROBIAL GENETICS (21PBTC13) (From 2021-2022 Batch onwards)

HOURS/WEEK: 6 CREDITS : 5 DURATION : 90 hrs INT. MARKS : 40 EXT. MARKS : 60 MAX. MARKS:100

Preamble

This course introduces the learners to morphology, reproduction and properties of microorganisms with an emphasis on the advances in microbial genes, genomes, and gene expression.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to CO1[K2]: explain the structure and nutritional requirements of microorganisms CO2[K3]: determine the role of microbial pathogens in human diseases CO3[K4]: analyse the microbial mechanisms to regulate gene expression CO4[K5]: appraise the methods involved in gene transfer CO5[K5]: justify the microbial role in bioremediation and pollution control

P0	P01	PO2	PO3	P04	P05	P06	P07
C0							
CO1[K2]	3	2	-	2	-	-	1
CO2[K3]	3	2	1	2	2	1	2
CO3[K4]	2	3	2	2	1	1	2
CO4[K5]	2	3	3	2	2	1	2
CO5[K5]	1	3	2	2	1	1	1
Weightage	11	13	08	10	06	04	08
of the course							
Weighted	4.23	5.78	4.04	7.46	6.98	3.88	7.41
/;percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

UNIT I

History and scope of Microbiology - Principles, Structure and applications of Microscopes. Classification of Bacteria (Bergey's Manual) - Growth Conditions - Microbial Nutritions - Factors influencing and affecting Microbial Growth -Psychrophiles, Mesophiles, Thermophiles and Hyperthermophiles -Antimicrobial Chemotherapy

UNIT II

Molecular Taxonomy and Current Methods of Microbial Identification for Systemic Studies-Epigenetics.Bacterial pathogens –*Streptococcus and Escherichia*.Viral pathogens - Rabies virus, Hepatitis B virus, Fungi – *Aspergillusfumigates,Candidaalbicans*. Protozoan - *Plasmodium vivax, Entamoebahistolytica*, Nosocomial Infections.

UNIT III

Biogas production - Microbial Leaching - Biodegradation of Xenobiotics -Solid waste management - Sewage treatment - Primary, Secondary and Tertiary treatment.Biofertilizer - Types and Its application - Role of Microorganism in Composting, Vermicomposting. Biopesticides - Types of Microbial pesticides -Mycorrhizae and Actinorrhizae.

UNIT IV

Genome organization of *E.coli*- Regulation of Gene expression in Prokaryotes, Operon concept- *lac, trp, ara* operon. Phage genetics: Lytic and Lysogenic cycles, Lamba DNA replication and Phage production, Decision between Lysis and Lysogeny. Transposable genetic elements - IS elements, Composite and Non composite transposons, Mechanism of Transposition, Transposable elements in Eukaryotes - Maize-Ac and Ds, SPM and DSPM elements, *Drosophila*-P elements-Retrotransposons.

UNITV

Genetics of Eukaryotes - Gene linkage and Chromosome mapping, Crossing over - Three point cross - Tetrad analysis. Organization of Chromosomes - Specialized chromosomes, Chromosome abnormalities, Quantitative Inheritance, Population Genetics, Development of Genetics using Drosophila as a model system - Somatic cell genetics.

TEXTBOOKS

- 1. Sharma.P.D, *Microbiology* : *A Text Book for University Students*. Rastogi Publications, 2016.
- 2. Watson J.D, Baker T.A, Bell S.P, Gann A, Levine M, and Losick R, Cummings B. *Molecular Biology of the Gene*. Pearson Publisher, seventh Edition, 2013.
- 3. Freifelder D. *Molecular Biology*. USA : Jones and Barlett Publishers, 2004.

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

REFERENCES

Books

- 1. Prescott, Lansing M., John P. Harley, and Donald A. Klein. *Microbiology*.ke-6. Mc. Grow-Hill. New York, 2019.
- 2. Cullis T, Burton,Guhman, S, Griffiths A and Suzuk D. *Genetics: A Beginner's guide*.One world publication Ltd, 2003.
- 3. Gerar J. Tortora, Berdell R. Funke, Christine and L. Case. *Microbiology An Introduction*. Benjamin Cummings , Tenth Edition ,2016.
- 4. Madigan Michael T, Martinko John M.*Biology of Microorganisms Microbiology.* Fourteenth Edition, Pearson publishers, 2017.

Web Sources

- 1. <u>https://nptel.ac.in/courses/102/103/102103015/</u>
- 2. https://dth.ac.in/medical/courses/Microbiology/block-1/1/index.php
- 3. <u>https://nptel.ac.in/content/storage2/courses/102103013/pdf/mod1.pdf</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - I CORE COURSE - IV: PRACTICAL: BIOMOLECULES, MICROBIOLOGY AND MICROBIAL GENETICS (21PBTC1P) (From 2021-2022 Batch onwards)

HOURS/WEE	K:6	INT. MARKS : 50
CREDITS	:4	EXT. MARKS: 50
DURATION	: 90 hrs	MAX. MARKS: 100

Preamble

This course familiarizes the learners with estimation of Biomolecules and enzymes and also equips the students with the staining and biochemical methods for identification and enumeration of microorganisms with a prominent microbial gene transfer techniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to CO1[K2]: illustrate the principles of bioanalytical instruments CO2[K3]: perform the analytical techniques for the estimation of biomolecules CO3[K4]:classify the bacteria based on morphology by staining techniques CO4[K5]: perform the biochemical tests for characterization of bacteria CO5[K6]: elaborate the microbial gene transfer techniques

	PO	P01	PO2	P03	P04	P05	P06	P07
со 🔨								
CO1[K2]		3	2	1	2	-	1	1
CO2[K3]		3	2	1	2	-	1	1
CO3[K4]		3	2	2	-	2	1	1
CO4[K5]		3	2	2	1	2	1	1
CO5[K6]		3	2	2	1	3	1	1
Weightag	e of	15	10	08	06	07	05	05
the course	e							
Weighted		5.77	4.44	4.04	4.48	8.14	4.85	4.63
percentag	ge of							
Course								
contribut	ion							
to POs								

CO-PO Mapping table (Course Articulation Matrix)

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

Experiments:

- 1. Principle and applications of Colorimeter, Spectrophotometer, pH meter and buffers.
- 2. Methods of Protein estimation (Lowry's, Bradford's method).
- 3. Thin layer chromatography, Paper chromatography and Column chromatography.
- 4. Extraction and purification of enzyme using Ammonium sulphate precipitation.
- 5. Effect of pH, Temperature and substrate concentration on Salivary amylase activity.
- 6. Estimation of Total antioxidant using DPPH assay.
- 7. Enumeration of Microorganisms from soil, water,air and food samples
- 8. Staining methods- Simple staining, Negative staining & Differential staining techniques
- 9. Biochemical characterization of Bacteria Catalase test, oxidase test, sugar fermentation, IMViC and starch hydrolysis
- 10. Growth curve analysis and measurement of growth rate.
- 11. Antibiotic susceptibility testing.
- 12. Bacterial Conjugation.
- 13. Isolation of Bacteriophage and plaque analysis.
- 14. Bacterial gene induction.

REFERENCES

Books

- 1. Keith Wilson, John Waler. *Principles and Techniques of Practical Biochemistry*. Cambridge University Press, Fifth Edition, 2005.
- 2. Dr.P.Palanivelu. *Analytical biochemistry and separation techniques*. Twenty first Century Publications, 2000.
- 3. Garg F.C. *Experimental Microbiology*. CBS Publisher, 2017.
- 4. Nikunjpatel and Nikulchavada. Experimental microbiology, Educreation publishing, 2019.
- 5. S.Sadasivam and A.Manickam. *Biochemical methods*. New age international publishers, Second Edition, 2004.
- 6. J.G. Cappuccino and N. Sherman. *Microbiology: A Laboratory Manual* Addison Wesley, 2002.
- 7. J.G.Holt, N.R Krieg.*Bergey's Manual of Determinative Bacteriology*. Ninth Edition, 2000.

Web Sources

- 1. <u>https://nptel.ac.in/content/storage2/courses/102103013/pdf/mod6.pdf</u>
- 2. <u>https://nptel.ac.in/courses/102/103/102103015/</u>
- 3. <u>https://nptel.ac.in/content/storage2/courses/102103039/download/m</u> <u>odule1.pdf</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - I ELECTIVE COURSE - I: INHERITANCE AND EVOLUTIONARY BIOLOGY (21PBT011) (From 2021-2022 Batch onwards)

HOURS/WEEK : 6				
CREDITS	:4			
DURATION	: 90 hrs			

INT. MARKS : 40 EXT. MARKS : 60 MAX. MARKS: 100

Preamble

This course familiarises the students with concepts of inheritance and also emphasis the theories related to evolution.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to CO1[K2]: illustrate the concepts of inheritance with Mendelian principles CO2[K3]: apply the principles of inheritance at the molecular, cellular and organism levels

CO3[K4]: analyse the major events in the evolutionary time scale

CO4[K4]: examine the approaches and methods in human behaviour

CO5[K5]: assess historical and current knowledge regarding human heredity

P0	P01	P02	P03	P04	P05	P06	P07
со							
CO1[K2]	3	2	1	1	1	1	1
CO2[K3]	3	2	2	1	2	1	1
CO3[K4]	2	2	2	1	1	-	1
CO4[K4]	2	3	2	1	1	-	1
CO5[K5]	2	3	1	1	3	-	1
Weightage	12	12	08	05	08	2	5
of the							
course							
Weighted	4.62	5.33	4.04	3.73	9.3	1.94	4.63
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

UNIT I

Mendelian principles- Dominance, segregation, independent assortment, Allele, multiple alleles, pseudoallele.Complementation tests – Co-dominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, linkage and crossing over, Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids.

UNIT II

Inheritance of Mitochondrial and chloroplast genes - maternal inheritance-Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders. Polygenic inheritance, heritability and its measurements, QTL mapping.Lamarck - Darwin–concepts of variation, adaptation, struggle, fitness and natural selection, Spontaneity of mutations - The evolutionary synthesis.

UNIT III

Origin of basic biological molecules - Abiotic synthesis of organic monomers and polymers - Concept of Oparin and Haldane - Experiement of Miller (1953) - The first cell - Evolution of prokaryotes; Origin of eukaryotic cells; Evolution of unicellular eukaryotes.

UNIT IV

The evolutionary time scale - Eras, periods and epoch - Major events in the evolutionary time scale.Origin of unicellular and multi cellular organisms -Major groups of plants and animals - Stages in primate evolution including *Homo sapiens*

UNIT V

Approaches and methods in study of behaviour - Proximate and ultimate causation. Altruism and evolution - Group selection, Kin selection, Reciprocal altruism, Neural basis of learning, memory, cognition, sleep and arousal, Biological clocks.

TEXTBOOKS

- 1. Gardener A.J, Simmons M.J and Snusted. *Principles of Genetics*. NewYork : John Willey and sons,2012.
- 2. Snustad, Simmons. *Principal of Genetics*. John Wiley and Sons, Fourth Edition, 2008.
- 3. Tamarin M, Robert J Thomson. *Principles of Genetics*. Seventh Edition, 2012.

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

REFERENCES

Books

- 1. Hartwell, Leland*et al. Genetics: from genes to genomes*. McGraw-Hill Education, 2018.
- 2. Provine, William B. *The origin of Dobzhansky's Genetics and the Origin of Species.* Princeton University Press, 2014.
- 3. Slatkin, Montgomery. *Gene Flow and Population Structure- Ecological genetics*. Princeton University Press, 2017.

Web Sources

- 1. <u>https://onlinecourses.swayam2.ac.in/cec21_bt02/preview</u>
- 2. <u>https://onlinecourses.swayam2.ac.in/cec20 bt03/preview</u>
- 3. <u>https://ocw.mit.edu/courses/biology/7-03-genetics-fall-2004/lecture-notes/lecture26.pdf</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - I ELECTIVE COURSE - I: STEM CELL BIOLOGY (21PBT012) (From 2021-2022 Batch onwards)

HOURS/WEEK : 6 CREDITS : 4 DURATION : 90 hrs INT. MARKS : 40 EXT. MARKS : 60 MAX. MARKS: 100

Preamble

This course provides in depth knowledge of various forms of Stem cells and their applications in regenerative medicine.

Course Outcomes (CO)

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

CO1[K2]: explain the structure and functions of stem cells

CO2[K3]: determine therapeutic applications of stem cells

CO3[K4]: analyse different pattern of stem cell niches

CO4[K4]: discriminate the stem cell pathways in cell cycle control

CO5[K5]: justify ethical considerations in stem cell research

PC	P01	P02	P03	P04	P05	P06	P07
C0							
CO1[K2]	3	2	1	1	1	1	1
CO2[K3]	3	3	2	1	2	1	1
CO3[K4]	2	2	2	1	1	-	1
CO4[K4]	2	3	2	1	1	-	1
CO5[K5]	2	2	1	1	3	-	1
Weightage	12	12	08	05	08	02	5
of the							
course							
Weighted	4.62	5.33	4.04	3.73	9.3	1.94	4.63
percentage							
of Course							
contribution	1						
to POs							

CO-PO Mapping table (Course Articulation Matrix)

Based on the level of contribution ('3'-High, '2'-Medium, '1'-Low '-' no correlation)
Stem cells - Introduction, characterization, properties, proliferation and culture of stem cells, classification of stem cells, stem cell biology and therapy

UNIT II

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

Stem cell niches- Germ line Epithelial and Epidermal and neural niches, Neural stem cells, Stem cells cycle, Ras/Raf pathways, P13K cell signaling, p53 check points, Role of LIF pathway in cell cycle control.

UNIT IV

Single - Cell PCR methods for studying stem cells - Molecular regulation of embryogenesis and organogenesis processes during human development. mesoderm and endoderm development and Ectoderm, process of organogenesis during human development. Therapeutic cloning - Tissue Engineering

UNIT V

Therapeutic applications of Embryonic stem cells, Bone marrow stemcells, Adipose derived stem cells and Hematopoietic stem cell. Ethics in human stem cell research. Potential benefits of stem cell biology.

TEXTBOOKS

- 1. MunsieM. 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.
- 4. TurksenK. Embryonic Stem Cells-Methods and Protocols. Vol.185, Humana press, 2012.

REFERENCES

Books

- 1. Lanza R. *Essential of Stem cell Biology*. Elsevier press, 2005.
- 2. | Charles Davis. The Ethics of human embryonic stem cell research. Atlantic Publisher and Distributors (P) Ltd, 2014.
- 3. Alice park. *The stem cell Hope*. USA : Penguin Publishers, ^{1st} edition, 2012.
- 4. Kaiming ye and shajin. Human Embryonic and induced Pluripotent stem cells Cells. springer, 2011.

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

21PBT34

- 1. <u>https://nptel.ac.in/courses/102/106/102106036/</u>
- 2. https://nptel.ac.in/courses/102/104/102104052/
- 3. <u>https://nptel.ac.in/content/storage2/courses/102106036/Module%201/Lecture%201/Lecture%201.pdf</u>
- 4. <u>https://onlinecourses.nptel.ac.in/noc21 cy15/preview</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - I ELECTIVE COURSE - I: ENZYMES AND ENZYME TECHNOLOGY (21PBT013) (From 2021 – 2022 Batch onwards) HOURS/WEEK : 6 INT. MARKS: 40 CREDITS : 4 EXT. MARKS: 60 DURATION : 90hrs MAX. MARKS: 100

Preamble

This course provides a broad view on theories of enzymes, enzyme kinetics and the mechanisms of enzyme regulation in the cell.

Course Outcomes (CO)

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

CO1[K2]: illustrate the nomenclature of enzymes and its types

CO2[K3]: determine the mechanism of enzyme inhibition

CO3[K4]: analyse the significance of active sites and its orientation effects

CO4[K4]: differentiate competitive and non-competitive inhibition of enzymes

CO5[K5]: prove Michaelis - Menton equation

P0	P01	P02	P03	P04	P05	P06	P07
C0							
CO1[K2]	3	2	1	1	1	1	1
CO2[K3]	3	3	2	1	2	1	1
CO3[K4]	2	2	2	1	1	-	1
CO4[K4]	2	3	2	1	1	-	1
CO5[K5]	2	2	1	1	3	-	1
Weightage	12	12	08	05	08	2	5
of the							
course							
Weighted	4.62	5.33	4.04	3.73	9.3	1.94	4.63
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

Enzyme - IUB system of Classification, overview and specific examples, Characteristics of an enzyme, ES complex, effect of temperature, pH and substrate concentration on reaction rate, Activation energy, transition state theory.

UNIT II

Michaelis - Menton equation, steady state kinetics, Significance of Km and Vmax.Bisubstrate reactions. Enzyme inhibition-types of inhibitors-competitive, non competitive and un competitive, mode of action and experimental determination.

UNIT III

Enzyme specificity and the concept of active site - determination of active sites, Proximity and orientation effects, types of catalysis-general, acid base, nucleophilic and electrophilic attack,metal ion catalysis.

UNIT IV

Lysozyme – Chymotrypsin - DNA Polymerase – Rnase - Zymogens and enzyme activation. Allosteric interactions and product inhibition - membrane bound enzymes - isolation, lipid - protein interaction assay and effect of fluidity on enzyme activity.

UNIT V

Immobilization of various enzymes by various methods and their applications.Coenzymes, Cofactors, clinical and industrial uses of enzymes, Enzyme engineering.

TEXTBOOKS

- 1. Trevor Palmer and Philip L Bonner. *Enzymes Biochemistry, Biotechnology and Clinical chemistry*. Swaranjali Publication, 2021.
- 2. Sriram Sridhar. *Enzymes Biotechnology*. New Delhi: Dominant publishers and Distributors, First Edition, 2005.

REFERENCES

Books

- 1. Malcolm,Dixon and Edwin C Webb. *Enzymes* New York : Academic press, , Fifth Edition, 1971.
- 2. Nicholas C Price and Lewis Stevens. *Fundamentals of Enzymology*. Oxford University Press, Third Edition, 1999.
- 3. Dr.P. Palanivelu. *Analytical biochemistry and separation techniques*. Twenty first Century Publications, 2000.

(18 hrs)

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(18 hrs)

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- 1. <u>https://nptel.ac.in/content/storage2/courses/102101007/downloads/PPT/LEC-07-PPT.pdf</u>
- 2. https://nptel.ac.in/courses/102/102/102102033/
- 3. <u>https://nptel.ac.in/content/storage2/courses/103105054/assignments/Q & A Set 8.pdf</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - II CORE COURSE – V: IMMUNOLOGY AND IMMUNOTECHNOLOGY (21PBTC21) (From 2021-2022 Batch onwards)

HOURS/WEEK : 6 CREDITS :5 DURATION : 90hrs INT.MARKS : 40 EXT.MARKS : 60 MAX.MARKS : 100

Preamble

This course familiarises the learners with the Organization and functions of Immune system and also provides knowledge on various immunotechniques.

Course Outcomes (CO)

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

- **CO1[K2]:** illustrate the organization of the immune system and its functions.
- **CO2[K3]:** apply immunotechniques in Molecular diagnosis and Vaccine development
- **CO3[K4]:** analyse the immunological factors responsible for Immunodeficiency

CO4[K5]: appraise the action of immune system towards infecting agents.

CO5[K5]: evaluate the role of monoclonal antibodies in diagnosis and therapeutics

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P0	P01	P02	P03	P04	P05	P06	P07
C0							
CO1[K2]	3	1	1	2	1	-	1
CO2[K3]	3	2	1	1	1	2	-
CO3[K4]	3	2	2	1	1	-	1
CO4[K5]	3	2	2	1	1	1	1
CO5[K5]	3	2	2	1	1	2	1
Weightage	15	09	08	6	05	05	04
of the							
course							
Weighted	5.77	4	4.04	4.48	5.81	4.85	3.7
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

Overview of the immune system - Types of immunity, Cells of the immune system, Origin, development and differentiation of B and T lymphocytes, Lymphoid Organs. Antigen – Properties and Types, Immunogenicity and Antigenicity, Adjuvants, Haptens.Immunoglobulins - Types, structure, function and biological properties, Production, Purification and Characterization of antibodies.

UNITII

B cell and T cell Receptors and their functions- Humoral immune response-Clonal selection-Primary and Secondary immune response-Cell mediated immune response-Memory response – Phagocytosis-Subtypes of T cells – Cytokines-Interferons, Interleukins and Tumour necrosis factor. Complement systems- Structure and functions of Class I and Class II MHC molecules – MHC Polymorphism.

UNIT III

Antigen-Antibody interactions – Affinity, Avidity and Cross reactivity, Precipitation and Agglutination.Immuno-Electrophoresis, Immuno diffusion, Immnunofluorescence, Plaque Forming Cell Assay, Flow cytometer, Western Blotting, ELISA, Radioimmunoassay- Elispot assay.Immunosensors. Experimental animal model systems for toxicology and gene expression studies: Fish, mice. Immunohistopathology and Immunohaematology,CD Markers

UNIT IV

Immunodeficiency diseases-Autoimmune diseases-Immune response to Infections- Bacteria, Virus, Parasites, Helminths.Cancer immunology-Transplantation and rejection.Immunosuppression and immunological tolerance-HLA tissue typing-Hypersensitivity reactions.Abzymes – definition, mode of catalysis and applications.

UNIT V

Hybridoma techniques and Monoclonal antibody production-Immunization techniques and Vaccines-Whole organism vaccine – attenuated and killed vaccines – Purified macromolecule vaccine – recombinant vector vaccine – anti–idiotypic vaccine – synthetic peptide vaccine – DNA vaccine – subunit vaccine – immune screening of recombinant proteins. Ethical guidelines for Biomedical research.

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

TEXTBOOKS

- 1. Goldsby R.A, Kindt T.J, Osborne B.A. and Kuby J. *Immunology*. New York : W.H. Freeman and Company, Eighth Edition, 2019.
- 2. Tizard I.R. *Immunology An introduction*. Cengage learning Pvt Ltd, Tenth Edition, 2017.
- 3. AbulK.Abbas, Andrew H, Litchman, Shiv Pillai. *Basic Immunology*. Elsevier India, 6th edition, 2019

REFERENCES

Books

- 1. Delves P.J, Martin, S. J. Burton, D. R. and Roitt I. M. *Essential Immunology*. Blackwell publishing, Thirteenth Edition, 2017.
- 2. ParijaS. C. *Textbook of Microbiology and Immunology*. Elsevier India, SecondEdition, 2013.
- 3. Zabriskie J.B. *Essential Clinical Immunology*. Cambridge University Press, Sixth edition, 2017.

- 1. <u>https://aasldpubs.onlinelibrary.wiley.com/doi/pdf/10.1002/lt.20406</u>
- 2. <u>https://oncologypro.esmo.org/content/download/125607/2374999/file/2</u> <u>017-ESMO-Preceptorship-I-O-TAAs-Cellular-Humoral-Response-Michele-</u> <u>Teng.pdf</u>
- 3. <u>https://pubs.rsc.org/en/content/chapterhtml/2019/bk9781788014373-00001?isbn=978-1-78801-437-3</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLGOY PG PROGRAMME - M.Sc. Biotechnology SEMESTER - II CORE COURSE - VI: GENETIC ENGINEERING (21PBTC22) (From 2021-2022 Batch onwards)

HOURS/WEEK : 6 CREDITS : 5 DURATION : 90 hrs INT. MARKS : 40 EXT. MARKS : 60 MAX. MARKS: 100

Preamble

This course familiarizes the learners with the basic concepts in genetic engineering through versatile tools and techniques.

Course Outcomes (CO)

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

- **CO1[K2]:** explain the strategies of genetic engineering.
- **CO2[K3]:** apply suitable Bio analytical tools in gene expression studies.
- **CO3[K4]:** compare the central dogma of cell in prokaryotes and eukaryotes.
- **CO4[K5]:** choose the appropriate gene transfer method for prokaryotes and eukaryotes
- **CO5[K5]:** appraise the applications of genetic engineering in the generation of recombinant molecules.

<u> </u>	-	-					
P0	P01	P02	P03	P04	P05	P06	P07
C0							
CO1[K2]	3	1	2	1	-	-	1
CO2[K3]	3	2	2	1	2	1	-
CO3[K4]	2	3	2	1	1	-	1
CO4[K5]	2	2	3	1	2	1	1
CO5[K5]	2	3	3	1	2	1	1
Weightage	12	11	12	05	07	03	04
of the							
course							
Weighted	4.62	4.89	6.06	3.73	8.14	2.91	3.7
percentage							
of Course							
contributior	1						
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

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

UNIT I

History and recent developments in Genetic Engineering – Guidelines, strategies in plant and animal genetic engineering. Watson and Crick model of DNA- Experimental evidence that DNA as genetic Material. Restriction enzymes - Endo&Exonucleases, linkers & adaptor-DNA & RNA Modifying enzymes. Plasmid - pUC19 & pBR322, phage vectors, Cosmid vectors, Shuttle and expression vectors, YAC & BAC.

UNIT II

DNA replication in Prokaryotes and Eukaryotes-Structure and function of RNA - rRNA, tRNA, mRNA and noncoding RNA - Mechanism of transcription in Prokaryotic and Eukaryotic genes, Post transcriptional modifications, Alternative splicing, Genetic code, Wobble hypothesis. Mechanism of translation in Prokaryotes and Eukaryotes - Post translational modifications, Protein turnover and degradation.

UNIT III

Gene transfer methods in Prokaryotes and Eukaryotes- Screening and selection of recombinants. Vector engineering & codon optimization, Genetic recombination, Mutations, Spontaneous and Induced mutation, Mutagenesis by Physical and Chemical agents, DNA repair mechanisms, Gene Silencing, Expression and Gene knock out in prokaryotic and eukaryotic organisms.

UNIT IV

DNA sequencing methods - Human Genome Project - DNA polymorphism. Western blotting, Southern blotting, RFLP, RAPD, AFLP, ISSR, SNP, PCR and its types - DNA finger printing and its applications - DNA bar coding, Marker assisted selection and QTL mapping.

UNIT V

Cloning and Production of recombinant DNA Products-Antibiotics, Biopolymers, Insulin, Human growth hormone, Interferon, Interleukin and various industrially important proteins, Proteases, Amylases and its applications. Purification strategies of expressed recombinant proteins-Intellectual Property Rights-Patent of Recombinant products.

TEXTBOOKS

- 1. DubeyR.C. *A Text Book of Biotechnology*. New Delhi : S. Chand & Co Ltd, 2014.
- 2. SatyanarayanaU. Biotechnology, Books and Allied (P) Ltd, 2020
- 3. RastogiV.B. *Fundamentals of Molecular Biology*. New Delhi :Ane Books Pvt. Ltd., 2010.

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REFERENCES

Books

- 1. Primrose S.B. and TwymanR.M. *Principles of Gene Manipulation and Genomics*. Blackwell Scientific Publications, 2013.
- 2. Glick *etal. Molecular Biotechnology: Principles and Applications of Recombinant DNA*. Taylor and Francis publications, 2017.
- 3. Brown T.A. *Gene Cloning and DNA Analysis-An Introduction*. Blackwell Scientific Publications, 2016.

- 1. <u>https://nptel.ac.in/courses/102/103/102103013/</u>
- 2. <u>https://nptel.ac.in/content/storage2/courses/102103012/module1/lec1/3.</u> <u>html</u>
- 3. <u>https://nptel.ac.in/content/storage2/courses/104108056/module8/PNR%</u> 20lecture%2029.pdf
- 4. <u>https://nptel.ac.in/courses/102/103/102103017/</u>
- 5. <u>https://nptel.ac.in/content/storage2/courses/102103013/pdf/mod5.pdf</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - II CORE COURSE - VII: BIOINFORMATICS (21PBTC23) (From 2021-2022 Batch onwards)

HOURS/WE	EK: 6
CREDITS	: 5
DURATION	: 90 hrs

INT. MARKS : 40 EXT. MARKS : 60 MAX. MARKS : 100

Preamble

This course introduces the learners to the different methods of molecular analysis (genomics and proteomics) using software which further enhances use of tools in drug designing and phylogenetic analysis.

Course Outcomes (CO)

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

CO1[K2]: explain the concept of genomics and Proteomics

CO2[K3]: apply the knowledge to address frontline problems in bioinformatics

CO3[K3]: compute the steps in drug designing

CO4[K4]: analyse the structure of protein using bioinformatics tools.

CO5[K5]: assess sequence alignment tools

PO	P01	PO2	PO3	P04	P05	P06	P07
C0							
CO1[K2]	3	3	1	1	-	1	1
CO2[K3]	3	2	2	2	-	1	1
CO3[K3]	2	2	3	2	-	1	1
CO4[K4]	2	2	3	2	-	1	1
CO5[K5]	2	2	3	2	-	1	1
Weightage	12	11	12	09	-	05	05
of the							
course							
Weighted	4.62	4.89	6.06	6.72	0	4.85	4.63
/percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

Genome - Merits and limitations of Chemical sequencing method, Dideoxy method, mRNA sequencing, cDNA library, Shotgun method, Automated sequencing, next generation sequencing, pyrosequencing. Genome mappings - restriction mappings, fluorescence in situ hybridization(FISH).

UNIT II

Genetic markers - SNP, VNTR, RFLP, Minisatellite and Microsatellite - Applications of Genome mappings. Genome databases – ENSEMBL, VISTA, FlyBase, OMIM-Protein databases, NCBI-UniProt, Secondary databases, PROSITE-2D PAGE Database, Structural databases, PDB, SCOP, CATH.

UNIT III

Drug Designing - Computer Based Drug Designing, Structure Based Drug Designing, Molecular Docking, Chemoinformatics, Chemdraw, Marvin Sketch, Chemspider. QSAR Studies in Drugs-ADME/TOXBox study - Analyzes the effect of drugs-Micro array analysis software.

UNIT IV

Sequence Alignment - Sequence similarity searching tools, Protein BLAST, Nucleotide BLAST, tBLASTn, BLASTx, Pairwise alignments - Multiple sequence alignments - Clustal, Omege. Protein structure alignment - DALI, Genome edited with CRISPR-Cas 9, Phylogenetic tree construction and analysis.

UNIT V

Protein Primary Structure Analysis - Structure analysis using EXPASY tools-Amino acid composition analysis- Molecular weight- Protein Secondary Structure Analysis- Hydrophobicity and Genome databases – ENSEMBL – VISTA – FlyBase-OMIM-Protein databases-NCBI-UniProt-Secondary databases – PROSITE-2D PAGE Database-Structural databases – PDB-SCOP-CATH.

TEXTBOOKS

- 1. Paul G and Teresa K. *Bioinformatics and molecular Evolution*. Blackwell Publishing, 2012.
- 2. David M Mount. *Bioinformatics sequence and genome analysis*. England: Gold Spring Harbor Press Publishers, 2009.
- 3. *Christina Marshall. Recent Advance in Bioinformatics*.Syrawood Publishing House, 2019.

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REFERENCES

Books

- 1. Andrew Leach. *Molecular Modelling*. Pearson education, Second Edition, 2009.
- 2. T.KWesthead. *Instant notes on Bioinformatics.* New Delhi: VIVA Publishers, 2012.

- 1. <u>https://youtu.be/sREv4rfpbCY</u>
- 2. https://drive.google.com/file/d/1t2R0CcKNCqn6EvCkRNkAbQGK1lMeD8In /view
- 3. <u>https://drive.google.com/file/d/1KQjd lJm8y4pLkGwU2vUyXGYbTDnWFvc</u>/view

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - II CORE COURSE - VIII: PRACTICAL: IMMUNOLOGY AND GENTIC ENGINEEERING (21PBTC2P) (From 2021-2022 Batch onwards)

HOURS/WEEK: 6 CREDITS : 4 DURATION : 90 hrs INT. MARKS : 50 EXT. MARKS : 50 MAX. MARKS: 100

Preamble

This course introduces the learners to explore the molecular methods of recombinant DNA technology and provides experimental knowledge on immunotechniques.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to CO1[K2]: demonstrate the methods of immunization and bleeding CO2[K3]: apply the suitable immunetechniques to study antigen-antibody interactions

CO3[K4]: separate nucleic acids and proteins from biological sources

CO4[K5]: asses the gene expressions using screening techniques

CO5[K6]: design primers using computational approaches

	PO	P01	PO2	P03	P04	P05	P06	P07
C0								
CO1[K2]		3	2	1	1	1	1	1
CO2[K3]		3	2	2	1	-	1	-
CO3[K4		2	3	2	1	-	2	2
CO4[K5		3	2	3	1	2	-	2
CO5[K6		3	3	3	3	1	1	1
Weighta	age	14	12	11	07	04	05	06
of the								
course								
Weighte	ed	5.38	5.33	5.56	5.22	4.65	4.85	5.56
percent	age							
of Cours	se							
contrib	ution							
to POs								

CO-PO Mapping table (Course Articulation Matrix)

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

Experiments

- 1. Immunization and methods of bleeding.
- 2. Estimation of RBC and WBC count in blood sample.
- 3. Antigen-antibody interactions:
 - a. Haemagglutination.
 - b. Immunodiffusion- Single, Double and Radial Immunodiffusion.
 - c. Electrophoresis Classical, Countercurrent and Rocket Immunoelectrophoresis.
- 4. Isolation and separation of B and T lymphocytes and Rosette assay.
- 5. Isolation and purification of immunoglobulin G using affinity chromatography.
- 6. Enzyme linked immunosorbent assay (ELISA).
- 7. Biomarkers assay-SGOT, SGPT, BUN, CK from Blood serum
- 8. Isolation of genomic DNA and RNA from bacteria, Plant, Animal tissue and Blood
- 9. Isolation of Plasmid DNA from *E.coli* by Alkaline lysis method
- 10. PCR amplification
- 11. Restriction Digestion and analysis (web cutter) and ligation.
- 12. Primer designing- A computer approach.
- 13. Selection & screening of rDNA -antibiotic resistance, blue white colony.
- 14. Bacterial DNA transformation
- 15. Separation of proteins by SDS PAGE
- 16. Western blotting

REFERENCES

Books

- 1. Sambrook J and Green M.R. *Molecular Cloning: A Laboratory Manual*. Cold Spring Harbor Laboratory Press, 2012.
- 2. Sittampalam G.Set al. Assay Guidance Manual. Eli Lilly and Company, 2017.
- 3. Bhatia A. *Manual of Practical Immunology*. Palani Paramount Publication, 2000.

- 1. <u>https://nptel.ac.in/content/storage2/courses/102103038/download/modu</u> <u>le5.pdf</u>
- 2. https://nptel.ac.in/content/storage2/courses/102103013/pdf/mod2.pdf
- 3. <u>https://nptel.ac.in/content/storage2/courses/102103013/pdf/mod4.pdf</u>
- 4. <u>https://nptel.ac.in/content/storage2/courses/102103013/pdf/mod3.pdf</u>
- 5. <u>https://nptel.ac.in/content/storage2/courses/102101040/downloads/Han</u> <u>douts/Lec-34.pdf</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - II NON-MAJOR ELECTIVE COURSE – I: FOOD SCIENCE (21PBTN21) (From 2021-2022 Batch onwards)

HOURS/WE	EK : 6
CREDITS	:4
DURATION	: 90 hrs

INT. MARKS : 40 EXT. MARKS : 60 MAX. MARKS :100

Preamble

This course introduces the learners to the basics of nutrition, nutritional types and nutritive value of foods.

Course Outcomes (CO):

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

CO1[K2]: explain the concepts of nutrition and functions of food

CO2[K3]: calculate the basal metabolic, carbohemic and glycemic index

CO3[K3]: articulate the nutritive value of food

CO4[K4]: examine the quality and adulterations of food

CO5[K5]: perceive common nutritional problems in India

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P0	P01	P02	PO3	P04	P05	P06	P07
C0							
CO1[K2]	3	1	1	2	-	2	2
CO2[K3]	2	2	1	2	-	2	1
CO3[K3]	3	2	-	2	-	1	2
CO4[K4]	2	1	-	2	-	1	1
CO5[K5]	2	1	-	1	-	1	1
Weightage	12	07	02	09	0	07	07
of the							
course							
Weighted	4.62	3.11	1.01	6.72	0	6.8	6.48
percentage							
of Course							
contribution							
to Pos							

CO-PO Mapping table (Course Articulation Matrix)

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

Concept of Nutrition and Functions of Food- Scope of Human Nutrition-Classification of nutrients, Recommended Dietary Allowances- Energy in Human Nutrition- Energy requirements for humans- Basal Metabolic Index.

UNIT II

Sources and Functions of Carbohydrates, Proteins and Fats- Digestion & absorption of carbohemic index, glycemic load original-Dietary fibre – classification and composition, nutritional significance.

UNIT III

Protein quality-Digestion and absorption of lipids-Water – Functions and Requirements Minerals and Trace Elements-Fat soluble Vitamins - Physiological role, bioavailability, sources, deficiency and excess-Water Soluble Vitamins-Assessment of nutritional status.

UNIT IV

Structure, Composition and Nutritive Value of Cereals, Millets and Pulses, Fruits and Vegetables, Milk and Milk Products, Egg and Poultry.

UNIT V

Food Adulteration-Food Standards- Importance of sanitation and hygiene in food-Post harvest handling, Marketing and Distribution of Foods-Laws concerning hygiene and safety- Common nutritional problems in India.

TEXTBOOKS

- 1. Srilakshmi B. *Nutrition Science.* Chennai: New age International(P) Publishers Ltd, 2017.
- 2. Chopra H.K. and P.S. Panesar. *Food Chemistry*. New Delhi :Narosa Publishing House, 2010.
- 3. James L Groff and Sareen S Gropper. *Advanced Nutrition and Human Metabolism*. Wadsworth Publishing Company, 2010.
- 4. Srilakshmi B. *Food science*, Chennai : New age International (P) Publishers Ltd, 2018.
- 5. Visakh P. M, Laura B. Iturriaga and Pablo Daniel Ribotta. *Advances in Food Science and Nutrition*.Scrivener Publishing, 2014.

REFERENCES

Books

- 1. Denis M. Medeiros and Robert E.C. Wildman. *Advanced Human Nutrition*. Jones and Bartlett learning, 2015.
- 2. Frazier W.C and Westhoff D.C. *Food Microbiology*. New Delhi : TMH Publication, 2017.

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- 1. <u>https://guides.nyu.edu/c.php?g=775277&p=5561023</u>
- 2. <u>https://www.who.int/teams/nutrition-and-food-safety</u>
- 3. <u>https://www.perkinelmer.com/category/authenticity-in-food</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - III CORE COURSE -IX: PLANT AND ANIMAL BIOTECHNOLOGY (21PBTC31) (From 2021-2022 Batch onwards) HOURS/WEEK : 6 INT. MARKS : 40

CREDITS : 5 DURATION : 90hrs INT. MARKS : 40 EXT. MARKS: 60 MAX.MARKS:100

Preamble

This course provides basic knowledge in Plant and Animal Tissue culture techniques and it also emphasize the cloning strategies in Plants and Animals.

Course outcomes (CO)

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

- CO1[K2]:demonstrate Plant and Animal tissue Culture
- **CO2[K3]:**use gene transfer techniques for developing disease and Pest resistance plants
- **CO3[K4]:** analyze the role of Reporters and Marker genes in gen transfer

CO4[K5]: assess the Impacts of Genetically Modified Organism

CO5[K5]:choose the appropriate vector for efficient gene transfer

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P0	P01	P02	P03	P04	P05	P06	P07
CO 🔨							
CO1[K2]	3	3	2	1	1	1	1
CO2[K3]	3	3	2	1	1	1	1
CO3[K4]	3	3	2	1	1	1	1
CO4[K5]	2	2	2	1	3	1	1
CO5[K5]	2	3	2	1	1	1	1
Weightage	13	14	10	5	7	5	5
of the							
course							
Weighted	5	6.22	5.05	3.73	8.14	4.85	4.63
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

Concept of cellular totipotency. Plant tissue culture-Nutritional requirements, Hormones, Types of Media used in Plant tissue culture, single cell culture, micro-propagation, somaclonal variation, somatic embryogenesis and production of Embryoids, Protoplast isolation and culture, Somatic hybridization and Cybrid production and their applications in crop improvement.

UNIT II

Molecular Biology of *Agrobacterium* mediated gene transfer – Production of Transgenic plants (Bt Cotton, BtBrinjal).Basis of tumor formation, hairy roots, features of Ti and Ri plasmids, mechanisms of DNA transfer, role of virulence genes, binary vectors, use of 35S and other promoters. Gene Transfer methods in Plants -Physical and Chemicalmethods.

UNIT III

Plant genetic Engineering - Markers, Reporters and Promoters, Development of Pest and Disease resistant Plants, Delay of fruit ripening.Transgenesis – Methods of Gene transfer in Animal gene cloning-Recombinant vectors for gene transfer in animal – YAC, BAC, SV40, Adeno virus, Baculo Virus, Retro virus. Artificial insemination, Embryo transfer.

UNIT IV

Laboratory requirements for animal cell culture - Sterile handling area, Sterilization of different materials used in animal cell culture, Aseptic concepts, Instrumentation and equipment used in animal cell culture, History of cell culture, Primary and secondary cell culture.

UNIT V

Gene therapy – *ex vivo and in vivo*.Production of transgenic animals – Cattle, Pig, Mice, Sheep, Goat, Chicken, Insects, Fish.Molecular farming.Production of Recombinant Proteins – Vaccines, Blood Products, Hormones, Regulaory Proteins.Ethical Guidelines for Animal research.

TEXTBOOKS

- 1. Brown T.A. *Genomes*. Oxford Academic Publications, 2011.
- 2. Dubey R.C.Advanced Biotechnology. Chand and Compnay Pvt Ltd, 2014.
- *3.* Bob B. Buchanan, Wilhelm Gruissem, Russell L. Jones. *Biocehemistry and Molecular Biology.* Wiley Publishers, Second Edition, 2015.

(18 hrs)

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(18 hrs)

(18 hrs)

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Books

- 1. Purohit S.S. *Plant tissue culture.* Axis Book India Pvt Ltd, 2010.
- 2. Singh B.D. *Biotechnology.* Kalyani Publishers, 2014.
- 3. Brown T.A .*Gene cloning and DNA analysis –AN introduction*.Wiley Publishers, 2015.

- 1. <u>https://www.sciencedirect.com/topics/agricultural-and-biological-</u> sciences/molecular-farming
- 2. <u>https://www.onlinebiologynotes.com/equipment-and-materials-used-in-animal-cell-culture/</u>
- 3. https://www.tandfonline.com/doi/pdf/10.1080/089106000435527

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - III CORE COURSE - X: BIOPROCESS TECHNOLOGY (21PBTC32) (From 2021-2022 Batch onwards) HOURS/WEEK: 6 INT. MARKS : 4 CREDITS : 5 EXT. MARKS : 6

CREDITS : 5 DURATION : 90 hrs INT. MARKS : 40 EXT. MARKS : 60 MAX. MARKS: 100

Preamble

This course makes the students familiar with the concepts of fermentation and types of Bioreactors and it also provides the knowledge on applications of Bioprocessing in various industries.

Course outcomes (CO)

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

CO1[K2]:demonstrate the screening of industrially important microbes

CO2[K3]: choose the appropriate media for different fermentation process

CO3[K4]:analyse theimportance of enzymes in developing Biosensors

CO4[K5]:perceive the downstream processing

CO5[K5]:assess the structure and functions of different fermentors.

F	8			,			
<u></u> P0	P01	P02	P03	P04	P05	P06	P07
СО							
CO1[K2]	3	3	2	2	1	2	1
CO2[K3]	3	3	2	2	-	2	1
CO3[K4]	3	2	2	2	-	1	1
CO4[K5]	2	2	2	2	-	2	1
CO5[K5]	2	2	2	2	-	1	I
Weightage	13	12	10	10	1	8	4
of the course							
Weighted	5	5.33	5.05	7.46	1.16	7.77	3.7
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

Isolation and screening of industrially important microbes - Improvement of strains forincreased yield and other desirable characteristics -Preservation of industrial importantmicroorganisms.General concept of fermentation process – Concepts and bioreactor designs - aeration and agitation, stirrers and impellers in bioreactor.

UNIT II

Types of Fermentation -Batch, Fed Batch and Continuous Fermentation .Bioreactor types -Airlift Bioreactors, Stirred Tank Bioreactors, Fluidized Bed Bioreactor, Packed-Bed reactors, Trickle Bed Bioreactor, Bubble Column Fermentor, Multiphase Bioreactors, Disposable Bioreactors And Wave Bioreactor. Scale up Fermentation Process –Instrumentation and Computer Applications in Control of Bioprocess.

UNIT III

Immobilization of enzymes and cells.General principles of enzyme biosensors–Amperometric Biosensors, Potentiometric Biosensors, Conductimetric Biosensors, Thermometric Biosensors.Factors affecting bio Processing and regulation -The Recovery andPurification of the Fermentation Products.

UNIT IV

Production of Biomass –Primary and Secondary Metabolites, Microbial production of alcohol, Antibiotics, Penicilin, tetracycline. Amino acids -Glutamic acid. Extracellular Enzymes – amylase and cellulases. Biotechnologically important extracellular Products. Industrial application of enzymes. Industrial production of Bio Fuel.

UNIT V

Economics of large scale fermentation.Fermented Foods - Yoghurt, Butter Milk, Cheese.Fermented Beverages – Wine and Beer.Fermented Vegetables.Microbial Foods-Single CellProtein (SCP) -Single Cell Oils (SCO). Biodegradation and Bioremediation.

TEXTBOOKS

- 1. Kalichelvan P.T,Arul Pandi I. *Bioprocess Technology*. Chennai:MJP Publishers, 2019.
- 2. Sathyanarayana U.Biotechnology.Kolkata : Books and allied Pvt. Ltd, 2020.
- 3. Doran. Bioprocess Engineering Principles. Academic Press, 2012.

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

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Books

- 1. Mansi E.M.T, Bryce C.F.A,Dmain A.L, Alliman A.R. *Fermentation Microbiology and Biotechnology*. New York :Taylor and Francis, 2012.
- 2. Murray MorYoung. Comprehensive Biotechnology. Elsevier, 2019.
- 3. James E,Bailey and David F,Ollis.*Biochemical Engineering Fundamentals*. TATA-McGraw Hill,2017.

- 1. <u>https://www.classcentral.com/search?q=bioprocess+technology</u>
- <u>https://www.edx.org/course/industrial-biotechnology-</u> <u>2?index=product&queryID=9246eddee9649956fef9d8aa75aee8c0&position=</u> <u>1</u>.
- 3. <u>https://youtu.be/z11JTrmI41Q</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme – M.Sc. Biotechnology SEMESTER - III CORE COURSE- XI: AGRICULTURALAND ENVIRONMENTAL BIOTECHNOLOGY (21PBTC33) (From 2021-2022 Batch onwards)

HOURS/WEE	K: 6	INT. MARKS: 40
CREDITS	: 5	EXT. MARKS : 60
DURATION	: 90hrs	MAX.MARKS: 100

Preamble

This course introduces the learners to the role of Biotechnology in development of agriculture and it also emphasizes the applications of Biotechnology in Environmental protection.

Course Outcomes (CO):

On successful completion of the course, the learners will be able to **CO1[K2]:**explain the biotechnology intervention in Agriculture and

environment

CO2[K3]:apply the gene manipulation techniques in the production of GMO

CO3[K4]: analyse the role of Nitrogen fixing organism in crop production

CO4[K5]: assess the methods of Monitoring Pollution

CO5[K6]:elaborate the methods of Bioremediation to solve the pollution

PO	P01	PO2	PO3	P04	P05	P06	P07
C0							
CO1[K2]	3	3	1	1	1	1	1
CO2[K3]	3	3	3	1	1	1	1
CO3[K4]	2	3	2	1	1	1	1
CO4[K5]	2	2	2	1	1	1	1
CO5[K6]	2	3	2	1	1	1	1
Weightage	12	14	10	05	05	05	05
of the							
course							
Weighted	4.62	6.22	5.05	3.73	5.81	4.85	4.63
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

Soil – Soil as a medium of plant growth and its composition, chemical physical and microbiological properties of soil, essential plant nutrients, their functions occurrence and recycling, micro-secondary and micro nutrient sources and their management, integrated nutrient management, soil water relationship..

UNIT II

Methods of breeding -self pollinated, cross- pollinated and asexually propagated crops, self incompatibility and male sterility in crop breeding, mutation breeding and Ploidy breeding in crop improvement, Precise breeding – Intergenic (Potato), intragenic (tomato) breeding with genetically modified plants. Gene silencing in plants – cis and trans silencing. Application of gene silencing in plants.Transgenic crops – cotton, potato, rice, maize, soybean and sugarcane.

UNIT III

Green biotechnology - Definition, concept and implication, scope of biotechnology and its roles in agriculture. Bio-fertilizers – types, production of biofertilizers. vermicomposting. Biopesticides – Production and future prospects. Production of biofuels, biodiesel and bioethanol - Generation of alternate fuels in Plants.

UNIT IV

Methods of monitoring Pollution - Biological methods - Detection methods for DO, BOD, Pathogen monitoring by heterotrophic plate count, Multiple tube method, Membrane filtration methods, enzyme detection, hybridization, PCR, Gene probe technology. Strategies for controlling pathogen transfer, Chemical methods- Detection methods for COD, pH, alkalinity, TSS, TDS, Total organic carbon, oil, grease.

UNIT V

Biosensors for monitoring pollutants and toxic compounds, Bioremediation – application in distillery effluent, Genetically modified organisms for bioremediation. Phytoremediation – roles & Strategies for detection and control of soil, air and water pollutants. Mutagenesis, metabolic engineering, Recombinant microbes in bioremediation.

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

TEXTBOOKS

- 1. Ramesh ChanderKuhad, Ajay Singh. *Biotechnology for Environmental Management and Resource Recovery*.Springer,2013.
- 2. Frank Kempken, 1 Christian Jung. *Genetic Modification of Plants Agriculture, Horticulture and Forestry.* SpringerVerlag, 2010.
- 3. H K Das. *Biotechnology.* Wiley India Pvt.Limited, 2010.

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- 1. AhindraNAG. *Textbook of Agricultural Biotechnology.* PHI learning Pvt Ltd,2008.
- 2. H. Rawat. Agricultural Biotechnology. Oxford Book Company, 2008.
- 3. Parmjit S,PanesarSatwinder S,Marwaha. *Biotechnology in Agriculture and Food Processing Opportunities and Challenges.* CRC Press, 2014.

- 1. <u>https://www.isaaa.org/resources/publications/agricultural_biotechnology/</u><u>download/Agricultural_Biotechnology.pdf</u>
- 2. <u>https://www.healthknowledge.org.uk/public-health-textbook/disease-</u> causation-diagnostic/2f-environment/control-environmental-hazards
- 3. <u>https://www.intechopen.com/books/progress-in-molecular-and-</u> <u>environmental-bioengineering-from-analysis-and-modeling-to-technology-</u> <u>applications/engineering-bacteria-for-bioremediation</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme – M.Sc. Biotechnology SEMESTER- III CORE COURSE-XII: PRACTICAL: PLANT, ANIMAL AND BIOPROCESS TECHNOLOGY (21PBTC3P) (From 2021-2022 Batch onwards)

HOURS/WEE	K: 6	INT. MARKS: 50
CREDITS	:4	EXT. MARKS : 50
DURATION	: 90hrs	MAX.MARKS: 100

Preamble

This course provides the skill based knowledge on Plant and Animal Tissue culture and it also provides basic knowledge in production of fermented products.

Course Outcomes (CO):

On successful completion of the course, the learners will be able to CO1[K2]:explain the media composition for Plant and Animal tissue culture CO2[K3]:determine the cell viability and Toxicity CO3[K4]:analyse the importance of long term storage using Cryopreservation CO4[K5]:resolve the problems associated with contamination

CO5[K6]: perform Protoplast isolation

<u> </u>	P01	P02	P03	P04	P05	P06	P07
C0							
CO1[K2]	3	3	3	1	-	1	1
CO2[K3]	3	2	2	1	1	1	1
CO3[K4]	3	3	2	1	1	1	1
CO4[K5]	3	2	2	2	-	1	1
CO5[K6]	3	2	3	1	-	1	1
Weightage	15	12	12	06	02	05	05
of the							
course							
Weighted	5.77	5.33	6.06	4.48	2.33	4.85	4.63
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

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

Experiments

- 1. Preparation of hormone and surface sterilization of field-grown plant tissues
- 2. Callus induction
- 3. Regeneration of shoots and roots from callus cultures
- 4. Immobilization of seeds and callus
- 5. Acclimatization
- 6. Isolation and purification of protoplasts
- 7. Preparation of Animal tissue culture media
- 8. Different types of cell lines
- 9. Cell toxicity and viability assay
- 10. Cryopreservation
- 11. Isolation of industrially important strains from environment enzyme

producers and Antibiotic producers

- 12. Strain improvement UV treatment
- 13. Fermentation process Batch and Fed batch fermentation
- 14. Small scale production of alcohol and their product recovery.

REFERENCES

Books

- 1. L. Fletcher, E. Goss, P. Phelps, A. Wheeler, S.O. Grady. *Introduction to biotechnology a laboratory manual*, 2011.
- 2. R.I. Freshney. *Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications*. John Wiley & Sons, Sixth Edition, 2010.
- 3. S. Harisha. *Biotechnology procedures and experiments hand book*. Infinity Science Press, 2007.

- 1. <u>https://www.mdpi.com/journal/plants/special issues/plant tissue culture</u>
- 2. <u>https://www.liverpool.ac.uk/~sd21/tisscult/what.htm</u>
- 3. <u>https://www.intechopen.com/books/new-insights-into-cell-culture-technology/history-of-cell-culture</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY **PG Programme – M.Sc. Biotechnology SEMESTER - III** ELECTIVE COURSE -II: IPR, BIOETHICS AND BIOSAFETY (21PBT031) (From 2021-2022 Batch onwards) **HOURS/WEEK:6** INT. MARKS: 40 :4 **EXT. MARKS : 60**

CREDITS DURATION :90 hrs **MAX. MARKS: 100**

Preamble

This course aims to explore the principles and types of intellectual property right and also helps to adhere to the ethical and Biosafety practices relevant to bio industries and research.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to **CO1[K2]**: illustrate the basic principles and general requirements in patent filing **CO2[K3]**: determine the importance of Biosafety practices and guidelines **CO3[K4]**: analyse the importance of protecting the novel and innovative

Biotechnologyderived products

CO4[K5]: appraise the benefits of GMO's and its effect on human health **CO5[K5]:** assess the ethical aspects of biological and biomedical research

P0	P01	P02	P03	P04	P05	P06	P07
со							
CO1[K2]	2	2	1	1	2	1	2
CO2[K3]	2	2	1	1	2	1	2
CO3[K4]	2	2	2	1	2	1	2
CO4[K5]	2	2	2	1	2	1	2
CO5[K5]	2	2	2	1	3	1	2
Weightage	10	10	08	05	11	05	10
of the course							
Weighted	3.85	4.44	4.04	3.73	12.79	4.85	9.26
/;percentage							
of Course							
contribution							
to POs							

CO-PO Manning table (Course Articulation Matrix)

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

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

UNIT I

Intellectual properties, copyrights, trademarks, trade secrets, patents, geographical indications, Protection of plant variety and farmers right act, Indian patent act and amendments, patent filing, Convention on biological diversity.

UNIT II

Patents and Patent Laws - Objectives of the patent system, Basic principles and general requirements of patent law.Implications of intellectual property rights on the commercialization of biotechnology products.

UNIT III

Bioethics - Introduction to ethics and bioethics, framework for ethical decision making. Ethical, legal and socio economic aspects of gene therapy.Ethical implications of GM crops, biopiacy and biowarfare.Monitoring strategies and methods for detecting transgenics, Radiation safety and non radio isotopic procedure, Benefits of transgenics to human health, society and the environment.

UNIT IV

Bio safety: Introduction – bio safety issues in biotechnology - historical background. Biosafety Levels - Levels of Specific Microorganisms, Infectious Agents and Infected animals. Biosafety and risk assessment issues, Regulatory framework, National biosafety policies and law, The Cartagena protocol on biosafety, WTO and other international agreements related to biosafety. Roles of Institutional Biosafety Committee, RCGM, GEAC.

UNIT V

General principles for the laboratory and environmental bio safety, Health aspects, toxicology, allergenicity, antibiotic resistance, Impact on environment, gene flow in natural and artificial ecologies, Sources of gene escape, tolerance of target organisms, creation of superweeds/superviruses.

TEXTBOOKS

- 1. DubeyR.C.*A text Book of Advanced Biotechnology*. New Delhi : S. Chand and Co. Pvt. Ltd, 2014.
- 2. Deepa G, Shomini P. *IPR, Biosafety and Bioethics*. New Delhi : Dorling Kindersley Pvt. Ltd, 2013.
- 3. V.K.Ahuja. *Law related to Intellectual Property.* New Delhi :Nexis Publishers, 2017.

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(18 hrs)

REFERENCES

Books

- 1. Sibi G. Intellectual property rights, Bioethics, Biosafety and Entrepreneurship in Biotechnology, IK International Publishing House Pvt.Ltd, 2020.
- 2. Rajmohan Joshi (Ed.). *Biosafety and Bioethics*. Isha Books, 2006.
- 3. Senthil Kumar Sadasivam, Mohammed Jaabir M. S. *IPR, Biosafety and Biotechnology Management*. Jasen Publications, 2008.
- 4. V.K.Ahuja. *Intellectual Property Rights in India*.New Delhi :LexisNexis Publishers, 2014.

- 1. <u>https://drive.google.com/file/d/15iMVLcc b 2cR7190u T53pIzg0W wQa/v iew</u>
- 2. <u>https://nptel.ac.in/content/storage2/courses/102103047/module1/lec1/2.</u> <u>html</u>
- 3. <u>https://nptel.ac.in/courses/110/105/110105139/</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - III ELECTIVE COURSE -II: MOLECULAR ONCOLOGY (21PBT032) (From 2021-2022 Batch onwards)

HOURS/WEEK : 6 CREDITS : 4 DURATION : 90 hrs INT. MARKS :40 EXT. MARKS :60 MAX. MARKS:100

Preamble

This course familiarizes the learners with the types of cancer and their diagnosis methods and it also explains the treatment procedures of cancer.

Course outcomes (CO)

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

CO1[K2]: explain the classification of cancer

CO2[K3]: choose the appropriate diagnostic method for detecting cancer

CO3[K4]:differentiate Oncogene, Proto oncogene and antioncogene

CO4[K5]: appraise the role of mutagens in causing cancer

CO5[K5]: perceive the different treatment procedures of cancer

	PO	P01	P02	P03	P04	P05	P06	P07
C0	/							
CO1[K2]		2	2	1	1	2	1	2
CO2[K3]		2	2	1	1	2	1	2
CO3[K4]		2	2	2	1	2	1	2
CO4[K5]		2	2	2	1	2	1	2
CO5[K5]		2	2	2	1	3	1	2
Weighta	ge	10	10	08	05	11	05	10
of the co	urse							
Weighte	d	3.85	4.44	4.04	3.73	12.79	4.85	9.26
percenta	age							
of Cours	e							
contribu	ition							
to POs								

CO-PO Mapping table (Course Articulation Matrix)

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

History, scope and current scenario of cancer research -Mutangens – Physical, chemical, Biological agents. Cancer – Types and their prevalence – Classification based on origin - Classification based on organ: breast, colon, lung, prostrate, cervical and oral cancers. Molecular biology of tumour invasion and metastasis.

UNIT II

Molecular mechanism of oncogenesis – Proto oncogenes, oncogene, oncoproteins, other tumour suppressor proteins and receptors proteins involved in cancer. Molecular significance of RAS, COX, cPLA RTK, SMADs, Ras cascade, NF-κ, and extracellular matrix signaling, hypoxia.

UNIT III

Apoptosis and cancer - Mechanism of apoptosis - proteins involved in apoptosis- Signaling pathways - types and their impact on apoptosis and oncogenesis - Angiogenesis related pathways – Relationship between cancer and antiapoptotic proteins.

UNIT IV

Principle and methods of cancer diagnosis: – Biochemical, Genetic, Cytotoxic and cell growth and viability tests. Current status of cancer proteomics.e-comte assay.Cancer therapy – at cellular level- at gene level- at protein level. Principles of cancer biomarker and their applications

UNIT V

Chemotherapeutics for cancer, Phytotherapy for cancer, Immunotherapy for cancer, Radio therapy for cancer, Applications of Nanoparticle in cancer treatment- Development of anti-cancer drugs.

TEXTBOOKS

- 1. Prohit.P.R. *The Gene*.Narosa publishing house, 2010.
- 2. Frederick O.Stephens, Karl R. Ainger. Basic of Oncology. Springer, 2011.
- 3. M. A. Hayat. *Methods of Cancer Diagnosis, Therapy, and Prognosis*. Springer. 2010.

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Books

- 1. Ian F. Tannock, Richard P. Hill.*The Basic Science of Oncology*. New York : McGraw- Hill, Third edition, 2013.
- 2. Gil Mor and Ayesha B.Alvero. Apoptosis and Cancer. Human Press, Second edition, 2016.

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- 3. Miguel H. Bronchud, Maryann Foote, Giuseppe Giaccone, Olufunmilayoolopade, Paul Workman.*Principles of Molecular Oncology*. New Jersey : Humana Press, Third edition, 2008.
- 4. Klaus-Michael Depatin, Simone Fulda. *Apoptosis and Cancer Therapy*. New York : WILEY-VCH Verlag GmbH and Co, 2008.

- 1. <u>https://nptel.ac.in/content/storage2/courses/102103041/pdf/mod4.pdf</u>
- 2. <u>https://nptel.ac.in/content/storage2/courses/104103068/pdf/M4.pdf</u>
- 3. https://nptel.ac.in/courses/102/108/102108077/
SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - III ELECTIVE COURSE - III: INDUSTRIAL SAFETY AND REGULATIONS (21PBT033)

(From 2021-2022 Batch onwards)

HOURS/WEEK : 6 CREDITS : 4 DURATION : 90hrs INT. MARKS :40 EXT. MARKS :60 MAX. MARKS :100

Preamble

This course familiarizes the learners with the various Safety acts and also emphasis the impacts of Industrial hazards in Environment.

Course outcomes (CO)

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

CO1 [K2]: illustrate Ergonomics and its Impacts.

CO2 [K3]: apply safety measures in various industries.

CO3 [K4]: analyze the impacts of industrial hazards in Environment.

CO4 [K5]: appraise the principles in Safety management.

CO5 [K5]: evaluate legislative measures in industrial safety.

PO	P01	P02	P03	P04	P05	P06	P07
C0							
CO1[K2]	2	2	1	1	2	1	2
CO2[K3]	2	2	1	1	2	1	2
CO3[K4]	2	2	2	1	2	1	2
CO4[K5]	2	2	2	1	2	1	2
CO5[K5]	2	2	2	1	3	1	2
Weightage	10	10	08	05	11	05	10
of the course							
Weighted	3.85	4.44	4.04	3.73	12.79	4.85	9.26
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

Bureau of Indian standards on safety and health 14489 - 1998 and 15001 -2000, OSHA, Process Safety Management (PSM) as per OSHA, PSM principles, OHSAS - 18001, EPA Standards, Performance measurements to determine effectiveness of PSM. ii. Importance of Industrial safety, role of safety department, Safety committee and Function.

UNIT II

Safety Management and Management Principles - Occupational Health Hazards, Promoting Safety, Safety and Health training, Stress and Safety. Safety Psychology.ErgonomicsIntroduction,Definition,Objectives,advantages.Ergonomic Musculoskeletal S Hazards Disorders and Cumulative Trauma Disorders.Importance of Industrial safety. Safety of Environment, Safety at various Industries: Agro-Industry, Sugar Industry, Food Industry.

UNIT III

Industrial Hygiene: Definition of Industrial Hygiene, Industrial Hygiene: Control Methods, Personal hygiene, housekeeping and maintenance, waste disposal, special control measures.

UNIT IV

Introduction to chemical hazards, different air pollutants in industries, Effect of different gases and particulate matter, acid fumes, smoke, fog on human health, bio-chemical action of toxic substances. Radiation - Types and effects of radiation on human body, Measurement disposal of radioactive waste, Control of radiation. Noise and Vibration - Sources, and its control.

UNIT V

Legislative measures in industrial safety - Factories Act, 1948, Workman's Compensation Act, 1923, Employees State Insurance Act, 1948. Mines Act, Air (Prevention and control) Pollution Act, 1981, Water (Prevention and Control) Pollution Act, 1974, Boiler Vessels Act. The factories rules, History, Provisions under the factories Act and rules made there under with amendments, Environment Protection Act. Employees liability Act 1938.

TEXTBOOKS

- 1. C. Ray Asfahly, David W, Rieske. Industrial Safety and Health Management. Pearson Publication, Seventh Edition, 2019.
- 2. MaitiJ, Ray, Pradip Kumar. Industrial Safety and Management. Elseiver Publication, 2018.

21PBT71

(18 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

REFERENCES

Books

- 1. Ray Gilbert. *A Quick guide to healthy and Safety.* Wood head Publishing Limited, 2010.
- 2. Barbara A. Plog, Patricia Quinlan.*Fundamentals of Industrial Hygeine.* Itasca National Safety Council, Sixth Edition, 2012.
- 3. Anwar Ahmad, ZularisamAb Wahid.*Industrial Safety and Environment Management*. Universiti Malaysia Pahang,2010.

Web Sources

- 1. <u>https://consumeraffairs.nic.in/organisation-and-units/division/bureau-indian-standard</u>
- 2. https://labour.gov.in/sites/default/files/Factories Act 1948.pdf.
- 3. <u>https://www.esic.nic.in/esi-acts</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme – M.Sc. Biotechnology SEMESTER - III SELF-PACED LEARNING (SWAYAM COURSE): FORESTS AND THEIR MANAGEMENT (21PBTM31) (From 2021-2022 Batch onwards)

CREDITS : 3 DURATION : 12 Weeks EXT. 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 Forests and their Management
- **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 or theories in the video lectures

PO	P01	P02	P03	P04	PO5	P06	PO7
CO							
CO1[K1]	3	2	2	2	-	-	2
CO2[K2]	3	2	2	2	-	-	2
CO3[K3]	3	2	2	2	1	1	2
CO4[K3]	2	2	2	1	1	1	1
CO5[K4]	2	2	2	2	1	-	1
Weightage							
of the	13	10	10	09	03	02	08
course							
Weighted	5	4.44	5.05	6.72	3.49	1.94	7.41
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

COURSE LAYOUT

Week 1: Introduction

Week 2: Basics of silviculture

Week 3: Forest soils

Week 4: Forest mensuration

Week 5: Forest surveying

Week 6: Forest protection

Week 7: Silvicultural management - I

Week 8: Silvicultural management - II

Week 9: Logging and yield

Week 10: Silvicultural practices

Week 11: Newer trends in forestry

Week 12: Revision

REFERENCES

Books

- 1. Dan Binkley and Richard F.Fisher. *Ecology and Management of forest soils.* Wiley-Blackwell, 2012.
- 2. G.R. Mahajan, A.M.Latare, K.A. Chobhe. *Soil Science*. New vishal Publishers, 2010.
- 3. S. S. Bist, M/s Bishensingh, Mahendra Pal singh. *Principles and practices of Silviculture*. First edition, 2016.
- 4. M/s Bishensingh, Mahendra Pal singh S.A, Wilde. *Forest soils and Forest growth*, 2009.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme – M.Sc. Biotechnology SEMESTER - III SELF-PACED LEARNING (SWAYAM COURSE): APPLIED ENVIRONMENTAL MICROBIOLOGY (21PBTM32) (From 2021-2022 Batch onwards)

CREDITS : 3 DURATION : 12 Weeks **EXT. 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 Applied Environmental Microbiology
- **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 or theories in the video lectures

P0		DU3	DO3		DOF	D O6	DO7
C0	FUI	FU2	FU3	FU4	F05	FUO	FU/
CO1[K1]	3	2	2	2	-	-	2
CO2[K2]	3	2	2	2	-	-	2
CO3[K3]	3	2	2	2	1	1	2
CO4[K3]	2	2	2	1	1	1	1
CO5[K4]	2	2	2	2	1	-	1
Weightage							
of the	13	10	10	09	03	02	08
course							
Weighted	5	4.44	5.05	6.72	3.49	1.94	7.41
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

COURSE LAYOUT

Week 1: Introduction; cell elements and composition Cell and its composition, cytoplasmic membrane Prokaryotic cell division Microbes and their environmental niches Historical roots of microbiology Nucleic acids and amino acids DNA structure, replication, and manipulation Protein and its structure Regulation Microbial nutrition Microscopy: Light microscopy, 3D Imaging, AFM, Confocal scanning laser microscopy

Week 2 : Microbial energetics and diversity Stoichiometry and bioenergetics Oxidation-reduction NAD, energy-rich compounds and energy storage Mathematics of microbial growth Glycolysis Respiration Citric-acid cycle Catabolic Alternatives Phototrophy, Chemolithotrophy, anaerobic respiration (Nitrate and Sulfate reduction; Acetogenesis; Methanogenesis; Metal, Chlorate, and organic electron acceptors)

Week 3 : Microbial metabolism and functional diversity of bacteria Prokaryotic diversity Classical taxonomy Origin of life Tree of life Major catabolic pathways Catalysis and enzymes Energy conservation Sugars and polysaccharides, amino acids, nucleotides, lipids

Week 4 : Microbial ecosystems Population, guilds, and communities Environments and microenvironments Microbial growth on surfaces Environmental effects on microbial growth

Week 5 : Environmental genomics and microbial ecology; genetic exchange Environmental genomics Microbial ecology Horizontal and vertical gene transfer: Replication, Transformation Transduction

Week 6 : Microbial symbiosis and virus, Mutation and its rate ,Genetic recombination, Population dynamics, Virus,Viroid, Prion ,Application of environmental microbes

Week 7 : Investigations in environmental microbiology: sampling, detection, isolation, taxonomic and functional annotation and quantification; Introductory bioinformatics and data analysis Microbial sampling Culture based and culture independent tools Molecular biology tools: Cloning, amplification, sequencing, Case study

Week 8 : Bioremediation and wastewater microbiology, Bioremediation and examples, Acid mine drainage, Enhanced metal recovery, Wastewater microbiology

Week 9 : Drinking water microbiology, Drinking water microbiome and treatment, Microbial instability ,Water borne microbial diseases

Week 10 : Solid waste microbiology and antimicrobial resistance, Landfills, Leachate, Anaerobic degradation phases, Antimicrobial resistance

Week 11: Epidemiology and biosensors ,Public health, Epidemics, Biosensors ,Wearable biosensors

Week 12 : Built microbiology, exposomes and bioinformatics, Exposure routes ,Microbes living around us ,Exposomes Basic bioinformatics, Bioinformatics tools available online

REFERENCES

- 1. Bruce E. Rittmannand Perry L. McCarty. *Environmental Biotechnology: Principles and Applications*. McGraw-Hill, 2020.
- 2. Madigan, M. Bender K. S, Buckley D.H, Sattley W. M and Stahl D.A. Brock.*Biology of Microorganisms*. New York : Pearson, 2017.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER- IV CORE COURSE-XIII: BIOINSTRUMENTATION AND BIOSTATISTICS (21PBTC41) (From 2021-2022 Batch onwards)

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

Preamble

This course introduces the learners to the principles and working mechanism of Instruments related to biotechnology and also emphasis the statistical tools and methods to analyse and interpret the biological data.

Course Outcomes (CO)

On Successful completion of the course, the learners will be able to CO1[K2]:demonstrate the working mechanism of bioinstruments CO2[K3]:apply the suitable statistical tools to interpret the biological data CO3[K3]:determine the level of significance for different variables CO4[K4]:analyse the applications of bioinstruments CO5[K5]: appraise the principles and applications of spectrophotometry

	<u> </u>			-			
P0	P01	PO2	P03	P04	P05	P06	P07
CO							
CO1[K2]	3	2	2	1	1	1	1
CO2[K3]	3	2	2	2	1	1	1
CO3[K3]	2	2	2	1	1	2	2
CO4[K4]	2	2	2	2	1	1	1
CO5[K5]	2	2	2	1	1	1	1
Weightage	12	10	10	07	05	06	06
of the							
course							
Weighted	4.62	4.44	5.05	5.22	5.81	5.83	5.56
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

Spectroscopy Techniques - Beer-Lamberts law, UV- Visible, Raman and IR Spectroscopy. Theory and application of Circular Dichroism.Flourimetry and its types.Fluorescence, NMR, PMR, ESR and Plasma Emission spectroscopy.Mass spectrometry-Matrix Assisted Laser Desorption Ionization and Surface Enhanced Laser Desorption Ionization. Centrifugation - Basic principles- RCF, Sedimentation coefficient, Types of centrifuges, Preparative & Analytical centrifugation.

UNIT II

Chromatography Techniques - Principle and applications of Paper, Thin layer, LPCC, HPLC, Affinity, Gel permeation and Ion exchange chromatography. Electrophoretic techniques - Principle and applications of Poly acrylamide gel electrophoresis, Capillary electrophoresis, Isoelectric focusing, 2D Electrophoresis, Disc gel electrophoresis, Gradient electrophoresis, Pulsed field gel electrophoresis and Agarose gel electrophoresis.

UNIT III

Radiation Biophysics - Basic concept and measurement of radioactivity. Radioisotope techniques – GM Counter, Liquid scintillation and Solid scintillation counter. Physical Biomedical method of Imaging techniques, Intact biological structures -Xray, CAT, SCAN, ECG, EEG. Autoradiography, X ray crystallography, Photography, ultrasound, MRI, Angiography.

UNIT IV

Measures of central tendency - mean, median, mode, Measures of dispersion- range, quartile deviation, standard deviation, variance and standard error; Probability distribution (binominal, poisson and normal distribution); Confidence interval; Level of significance; Chisquare test and its application, goodness of fit.

UNIT V

Correlation - types, methods of correlation- graphic method, mathematical method, testing the significance of the coefficient of correlation; Regression analysis – equation, Estimation of unknown value from known value; Analysis of variance and its application, Statistical softwares – SPSS and MS-Excel

TEXTBOOKS

- 1. Boyer R. *Modern experimental Biochemistry*. Pearson education publication, 2014.
- 2. Jayaraman J. *Laboratory Manual in Biochemistry*, New Delhi :New Age International (P) Limited Publishers, 2011.
- 3. Gurumani N.An Introduction to Biostatistics. Chennai : MJP publishers, 2011.

(15 hrs)

(15 hrs)

(15 hrs)

(15 hrs)

REFERENCES

Books

- 1. Knoll G.F.*Radiation detection and measurement*. John Willey & Sons publishers, 2012.
- 2. Britton N.F. Essential Mathematical Biology. Springer-verlag, 2007
- 3. Daniel, W.W. *Biostatistics A foundation for analysis in health sciences,* John Wiley (Asia) & Sons, 2014.

Web Sources

- 1. <u>https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod2.pdf</u>
- 2. <u>https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod3.pdf</u>
- 3. <u>https://nptel.ac.in/courses/113/101/113101096/</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - IV CORE COURSE XIV: GENOMICS AND PROTEOMICS (21PBTC42) (From 2021-2022 Batch onwards)

HOURS/WEEK	:	5
CREDITS	:	5
DURATION	:	75 hrs

INT.MARKS : 40 EXT.MARKS : 60 MAX.MARKS : 100

Preamble

This course familiarizes the learners with the vital concepts of technologies pertinent to Genomics and Proteomics and its applications.

Course Outcomes (CO)

On Successful completion of the course, the learners will be able to CO1[K2]: illustrate the genome organization of prokaryotes and eukaryotes CO2[K3]: use various mapping methods to identify the chromosomal landmarks CO3[K4]: analyse the expression and interaction of proteins using different methods

- **CO4[K5]:** evaluate drug targets using highthroughput screening
- CO5[K6]:elaborate the methods in DNA sequencing

11	0	•		,			
P0	P01	PO2	PO3	P04	P05	P06	P07
C0							
CO1[K2]	3	3	2	1	1	1	1
CO2[K3]	3	3	2	1	1	1	1
CO3[K4]	2	3	3	1	1	1	1
CO4[K5]	2	3	3	1	1	2	1
CO5[K6]	2	3	2	1	-	2	1
Weightage	12	15	12	05	04	07	05
of the							
course							
Weighted	4.62	6.67	6.06	3.73	4.65	6.8	4.63
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

Structure and Organization of Prokaryotic and Eukaryotic genomes – Nuclear- Mitochondrial and Chloroplast Genomes- Tools for Genome Analysis– RFLP- RAPD- SAGE- FISH to identify chromosome landmarks.

UNIT II

Human genome project-Landmarks on Chromosomes Generated by Various Mapping Methods-Physical Map-Cytogenetic Map- Contig Map, Restriction Map-DNA Sequencing- Chemical- Enzymatic and Automated DNA Sequencing and Sequence Assembly.

UNIT III

DNA Micro Array Technology- Basic Principles and Design - cDNA and Oligonucleotide Arrays – Applications-Global gene expression analysis-Comparative transcriptomics- Differential gene expression- Genotyping/SNP detection- Detection Technology- Computational Analysis of Micro Array Data.

UNIT IV

Overview of Protein structure-Relationship between Protein Structure and Function- Outline of a Typical Proteomics Experiment -Identification and analysis of proteins by 2D Analysis- Protein-Protein Interactions-Yeast Two Hybrid System- Phage Display- Protein Interaction Maps- Protein Arrays – Definition- Applications – Diagnostics-Expression Profiling.

UNIT V

High Throughput Screening For Drug Discovery- Identification of Drug Targets Pharmacogenomics and pharamacogenetics and Drug Development – Toxicogenomics – Metagenomics- Phylogenetics and Phenomics – Metabolomics-Mass spectrometry-MALDI TOF and HPLC Principle-Instrumentation and Application.

TEXTBOOKS

- 1. SB Primrose S, TwymanR.*Principles of Genome Analysis and Genomics*, Washington : Blackwell, 2008.
- 2. T.A. Brown. *Genomes*. Oxford Academic Publication, 2011.
- 3. Lehninger. *Principles of Biochemistry*. Palgrave Publication, 2021.

REFERENCES

Books

- 1. Glick BR, and Patten L Cheryl.*Molecular Biotechnology*. Fifth edition, Taylor and Francis, 2017.
- 2. JosipLovric.*Introducing Proteomics: From Concepts to Sample Separation, Mass SpectrometryandDataAnalysis.* Wiley- Blackwell Publication, 2010.

(15 hrs)

(15 hrs)

21PBT82

(15 hrs)

(15 hrs)

(15 hrs)

3. David Bowell and JosephSambrook.*DNA Microarays*.New York :Cold Spring Harbor Laboratory Press Publication, 2014.

Web Sources

- 1. <u>https://nptel.ac.in/courses/102/103/102103017/</u>
- 2. <u>https://www.lehigh.edu/~inbios21/PDF/Fall2014/Marzillier 09052014.pd</u> <u>f</u>
- 3. <u>https://www.youtube.com/watch?v=mGoTV81ic-k</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme – M.Sc. Biotechnology SEMESTER - IV CORE COURSE-XV: RESEARCH METHODOLOGY (21PBTC43) (From 2021 – 2022 Batch onwards) HOURS/WEEK: 5 INT. MARKS : 40 CREDITS : 4 EXT. MARKS : 60 DURATION : 75hrs MAX. MARKS: 100

Preamble

This course provides an introduction to the basis and principles of research methodology and makes the students to plan and carry out research.

Course Outcomes (CO)

On successful completion of the course, the learners will be able to CO1[K2]:Illustrate the significance and types of research and its methodologies CO2[K3]:determine issues and concepts salient to research process

CO3[K3]: apply theoretical aspects of research methodology for a proposed project

CO4[K4]:analyse the peer reviewed and indexed journals for publications **CO5[K5]:** appraise the application of electronic tools for checking plagiarisms

P0	P01	P02	P03	P04	P05	P06	P07
C0							
CO1[K2]	3	2	3	2	1	2	1
CO2[K3]	3	2	3	2	1	-	1
CO3[K3]	3	2	3	2	1	-	-
CO4[K4]	3	2	3	2	-	-	-
CO5[K5]	3	2	3	2	1	2	-
Weightage	15	10	15	10	04	4	02
of the							
course							
Weighted	5.77	4.44	7.58	7.46	4.65	3.88	1.85
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

Research Definition- Motivation and Objectives-Types of Research -Descriptive, Analytical, Applied, Fundamental, Quantitative, Qualitative, Conceptual and Empirical - Significance of Research - Methods vs Methodology.Essential Steps in Research-Literature collection- Literature citation – Different systems of citing References – Citation Index and Impact Factor-Journal Abbreviations.

UNIT II

Defining and Formulating the Research Problem - Selecting the Problem -Basic Principles of Research Design - Essential Steps in the Research Processes -Criteria for Good Research Data Collection – Classification of Data- Primary Data, Secondary Data.

UNIT III

Sampling - Sampling Methods- Essentials of the Scientific Report-Abstract, Introduction, Review of Literature, Materials and Methods, Results, Discussion, Reference, Cross-Referencing, Proof Reading.

UNIT IV

Preparing Manuscripts, Oral and Poster Presentation - Writing a Thesis-Project Proposal Writing, Grant Applicationand Funding Agencies for Project, Use of electronic tools for bibliographic formatting and checking Plagiarism. Research Guides, Handbook, Academic Databases for Biological Science Discipline. Methods to search required information effectively.

UNIT V

Applications of Computer in research -Input and output devices, classification of computers, CPU, Software and application, machine and assembly languages, compiler assembler and interpreter, flow charts, general knowledge of R programming.

TEXTBOOKS

- 1. Holmes, Debbie, Peter Moody, Diana Dine, and Laurence Trueman. *Research methods for the biosciences*. Oxford university press, 2017.
- 2. Kothari C.K. *Research Methodology: Methods and Techniques*. New Age International, 2013.
- 3. Krishnaswamy K.N, Mathiranjan M and Sivakumar A.I. *Management Research Methodology - Integration of Principles, Methods and Techniques.* Pearson Education, 2011.

(15 hrs)

(15 hrs)

(15 hrs)

(15 hrs)

(15 hrs)

REFERENCES

Books

- 1. Kumar R. *Research Methodology: A Step-by-Step Guide for Beginners*. 2nd edition, Pearson Education, 2005.
- 2. Montgomery, Douglas C.*Design and Analysis of Experiments.* 8th edition. Wiley, 2013.
- 3. Rao S and Richard J. *Introduction to Biostatistics and Research Methods*. Prentice Hall India Learning Private Limited, 2012.
- 4. Gastel, Barbara, and Robert A. *How to write and publish a scientific paper*. ABCCLIO, 2016.

Web sources

- 1. <u>https://explorable.com/</u>
- 2. <u>http://openwetware.org/wiki/Guide to Excel for statistics</u>
- 3. <u>http://www.biostathandbook.com/</u>

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI DEPARTMENT OF BIOTECHNOLOGY PG Programme - M.Sc. Biotechnology SEMESTER - IV CORE COURSE - XVI: PROJECT (21PBTJ41) (From 2021-2022 Batch onwards)

HOURS/WEEK :15 CREDITS : 4 DURATION : 225 hrs INT. MARKS : 50 EXT. MARKS : 50 MAX. MARKS: 100

Preamble

The Research Project aims at developing scientific research knowledge and to train the students in analyzing, interpreting the data and drawing valid conclusions. The students are allowed to choose the problems in subject areas of their own interest.

Course outcomes (CO)

On Successful completion of the Project, the learners will be able to **CO1[K2]**:outline the concept of research with ethics

CO2[K3]:apply academic skills to present the research study findings in a

formal academicoral presentations and a written research paper CO3[K5]:recommend valuable solutions to the betterment of society CO4[K5]:assess ways to collect, compile and conduct a data analysis CO5[K6]: develop laboratory skills and advanced biotechniques

<u> </u>	P01	P02	P03	P04	P05	P06	P07
C0							
CO1[K2]	3	3	2	1	1	1	1
CO2[K3]	3	3	3	1	1	1	1
CO3[K5]	3	3	2	1	1	1	1
CO4[K5]	3	2	3	1	1	1	1
CO5[K6]	3	2	2	1	1	1	1
Weightage	15	13	12	05	05	05	05
of the							
course							
Weighted	5.77	5.78	6.06	3.73	5.81	4.85	4.63
percentage							
of Course							
contribution							
to POs							

CO-PO Mapping table (Course Articulation Matrix)

Guidelines

- 1. Students are required to submit a project at the end of the IV semester. The student will work under a faculty member as the research guide.
- 2. Depending on the interest of the students, project research areas will be chosen.
- 3. Students must meet the guide periodically.
- 4. The project carries 100 marks of which 50 marks for Internal Assessment and 50 Marks for External Examination.
- 5. There will be two project review sessions.
- 6. Each student must either present paper or participate in Conferences/Seminars related to his Project work.
- 7. A draft of the final project report should be submitted to the Project Guide for review atleast two weeks prior to the end of the semester.
- 8. The project report should be of minimum 50 pages (excluding bibliography & appendices)
- 9. Three copies of the final project report should be submitted.
- 10. The Head of the department and the Project Guide will evaluate the final Project Report.
- 11. The viva voce board shall consist of the External Examiner, the Head of the Department and the Internal Examiner (Research Project Guide)

The following rubrics will be taken into account for the evaluation of Project work and viva-voce:

Internal Assessment (50 Marks)

Project Report & Review : 40 Marks Powerpoint Presentation : 5 Marks Participation/Publications in Conferences or Seminars : 5 Marks

External Examination (50 Marks)

Project Report : 20 Marks Viva Voce : 30 Marks