FACULTY OF SCIENCE AND HUMANITIES

ACADEMIC CURRICULA

UNDERGRADUATE DEGREE PROGRAMME

Bachelor of Science (Honors)
in

Biotechnology
Four Years

National **E**ducation **P**olicy

Learning **O**utcome-based **C**urricula **F**ramework

National **Cr**edit **F**ramework

Academic Year

2024 – 2025

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Deemed to be University u/s 3 of UGC Act, 1956)

Kattankulathur, Chengalpattu District 603203, Tamil Nadu, India

1. Vision Statement	
Stmt - 1	To be recognized nationally and internationally as an exemplary Department of Biotechnology
Stmt - 2	To emerge as a hub of world class research to disseminate our knowledge through interaction with industry, academia and society at large

2. Mission Statement	
Stmt - 1	To provide world class teaching and state of art research environment to highly talented young minds
Stmt - 2	To perform frontier research in life science, and to serve the society through technological advances
Stmt - 3	To provide an outstanding educational and research experience for the students, researchers and technologists
Stmt - 4	To enable the students to have wide range of career choices through outstanding learning experience

"Stmt" stands for Statement

3. Programme Education Objectives	
PEO - 1	Equip graduates with a comprehensive understanding of fundamental biological processes and their technological applications in biotechnology.
PEO - 2	Develop critical thinking and problem-solving skills to address contemporary challenges in the biotechnology industry.
PEO - 3	Foster a strong foundation for research through laboratory experience and scientific communication skills.
PEO - 4	Instill professional and ethical responsibility in biotechnological practices.
PEO - 5	Prepare graduates for successful careers in diverse fields of biotechnology, including research, development, and industry.

4. Consistency of Programme Education Objectives with Mission					
	Mission Stmt. - 1	Mission Stmt. - 2	Mission Stmt. - 3	Mission Stmt. - 4	Mission Stmt. - 5
PEO - 1	High	High	High	Low	Low
PEO - 2	High	High	High	Medium	Medium
PEO - 3	High	High	High	Medium	Medium
PEO - 4	Medium	Medium	Medium	High	High
PEO - 5	Medium	Medium	Medium	High	High

5. Programme Learning Outcomes (PLO)	
	Graduate Learning Attributes
PLO - 1	Fundamental Knowledge
PLO - 2	Analyze, Interpret Data
PLO - 3	Reasoning ability
PLO - 4	Ethical Practices
PLO - 5	Team Work
PLO - 6	Communication of complex biotechnological ideas
PLO - 7	Independent and lifelong learning
PLO -8	Graduates will acquire a comprehensive knowledge and sound understanding of fundamentals of Biotechnology
PSO - 1	Graduates will develop practical and analytical skills in Biotechnology
PSO - 2	Graduates will be prepared to acquire a range of general skills, to solve problems, to evaluate information, to use computers productively, to communicate with society effectively and learn independently throughout life

PSO-Programme Specific Outcomes

6. Mapping of PLO's with PEO's										
	PLO–1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PSO-1	PSO-2
PEO - 1	3	2	1	3	2	1	3	2	1	3
PEO - 2	3	2	1	3	2	1	3	2	1	3
PEO - 3	3	2	1	3	2	1	3	2	1	3
PEO - 4	3	2	1	3	2	1	3	2	1	3
PEO - 5	3	2	1	3	2	1	3	2	1	3

7. Programme Structure

Discipline Core Courses (C)

Course Code	Course Title	Sessions per Week			
		L	T	P	C
UBT24101J	Cell Biology	3	0	2	4
UBT24102J	Microbiology	3	0	2	4
UBT24103T	Genetics	4	0	0	4
UBT24201J	Biochemistry	3	0	2	4
UBT24202J	Molecular Biology	3	0	2	4
UBT24203T	Enzymology	4	0	0	4
UBT24301J	Genetic Engineering	3	0	2	4
UBT24302J	Computational Biology	3	0	2	4
UBT24303J	Biophysics and Bioinstrumentation	3	0	2	4
UBT24401J	Bioprocess Technology	3	0	2	4
Total Learning Credits					**40**

Elective Courses (Minor) (E)

Course Code	Course Title	Sessions per Week			
		L	T	P	C
UBT24E01T	General Biology	4	0	0	4
UBT24E02J	Mushroom Cultivation	3	0	2	4
UBT24E03T	Disease Management	4	0	0	4
UBT24E04J	Algal Technology	3	0	2	4
UBT24E05T	Food and Nutrition	4	0	0	4
UBT24E06J	Vermicomposting	3	0	2	4
UBT24E07T	Farming Technologies	4	0	0	4
UBT24E08J	Basic Bioinformatics	3	0	2	4
Total Learning Credits					**32**

Ability Enhancement Courses (A)

Course Code	Course Title	Sessions per Week			
		L	T	P	C
ULT24AE1J	Tamil – I	2	0	2	3
ULH24AE1J	Hindi – I				
ULF24AE1J	French – I				
ULE24AE1J	English	2	0	2	3
ULT24AE2J	Tamil – II	2	0	2	3
ULH24AE2J	Hindi – II				
ULF24AE2J	French – II				
Total Learning Credits					**9**

Discipline Core/ Elective Courses (D)

Course Code	Course Title	Sessions per Week			
		L	T	P	C
UBT24D01T	Biostatistics	4	0	0	4
UBT24D02J	Food Biotechnology	3	0	2	4
UBT24D03J	Immunology	3	0	2	4
UBT24D04J	Plant Biotechnology	3	0	2	4
UBT24D05J	Animal Biotechnology	3	0	2	4
UBT24D06J	Cheminformatics	3	0	2	4
UBT24D07J	Nanobiotechnology				
UBT24D08T	Marine Biotechnology	4	0	0	4
UBT24D09T	Biofertilizer Technology				
UBT24D10T	Biomaterials	4	0	0	4
UBT24D11T	Bioenergy				
UBT24D12T	Research Methodology	4	0	0	4
UBT24D13J	Biopython	3	0	2	4
UBT24D14J	Stem Cell Biology				
Total Learning Credits					**40**

Multidisciplinary Courses (M)

Course Code	Course Title	Sessions per Week			
		L	T	P	C
UBT24M01T	Environmental Biotechnology	3	0	0	3
UBT24M02T	Medical Biotechnology	3	0	0	3
UBT24M03T	Pharmaceutical Technology	3	0	0	3
Total Learning Credits					**9**

Value Added Courses (V)

Course Code	Course Title	Sessions Week			
		L	T	P	C
UCD24V01T	Essentials of Artificial Intelligence	1	0	0	1
UES24V01T	Environmental Studies	2	0	0	2
UCD24V02T	Universal Human Values	2	0	0	2
Total Learning Credits					**5**

Project Work / Internship (P)						
Course Code	Course Title	Sessions per Week				C
		L	T	P		
UBT24P01L	Internship – I	-	-	-		1
UBT24P02L	Internship – II	-	-	-		1
UBT24P03L	Project Work	0	0	4		2
UBT24P04L	Research Project and Dissertation	0	0	24		12
UBT24P05L	Professional Internship					
Total Learning Credits						**16**

Skill Enhancement Courses (S)					
Course Code	Course Title	Sessions per Week			C
		L	T	P	
UCD24S01J	Verbal Ability and Skill Development	1	0	2	2
UCD24S02L	Quantitative Aptitude and Logical Reasoning	0	0	2	1
UCD24S03J	Industry Oriented Employability and Leadership Skills	1	0	2	2
UEN24S01L	Communication Skills	0	0	4	2
UCD24S04J	Career Readiness and Professional Skills	1	0	2	2
Total Learning Credits					**9**

Mandatory Courses (Y)					
Course Code	Course Title	Sessions per Week			C
		L	T	P	
UNS24Y01L	NSS	0	0	0	0
UNC24Y01L	NCC				
UNO24Y01L	NSO				
UYG24Y01L	YOGA				
UMI24Y01L	My India Project	0	0	0	0
Total Learning Credits					**0**

Internship – I to be completed during Summer Vacation of the First year
Internship – II to be completed during Summer Vacation of the Second year

Students from other departments can enroll in Elective Courses (Minor) (E)
Students from all departments will be able to enroll in Multidisciplinary Courses (M).

8. Course Allocation Across Semesters

Semester – I					
Code	**Course Title**	**Sessions per Week**			**C**
		L	**T**	**P**	
ULT24AE1J	Tamil – I	2	0	2	3
ULH24AE1J	Hindi – I				
ULF24AE1J	French – I				
ULE24AE1J	English	2	0	2	3
UBT24101J	Cell Biology	3	0	2	4
UBT24102J	Microbiology	3	0	2	4
UBT24103T	Genetics	4	0	0	4
UCD24S01J	Verbal Ability and Skill Development	1	0	2	2
Total Learning Credits					**20**

Semester – II					
Code	**Course Title**	**Sessions per Week**			**C**
		L	**T**	**P**	
ULT24AE2J	Tamil – II	2	0	2	3
ULH24AE2J	Hindi – II				
ULF24AE2J	French – II				
UBT24201J	Biochemistry	3	0	2	4
UBT24202J	Molecular Biology	3	0	2	4
UBT24203T	Enzymology	4	0	0	4
UCD24V01T	Essentials of Artificial Intelligence	1	0	0	1
	Multidisciplinary Course – I				3
UCD24S02L	Quantitative Aptitude and Logical Reasoning	0	0	2	1
UNS24Y01L	NSS	0	0	0	0
UNC24Y01L	NCC				
UNO24Y01L	NSO				
UYG24Y01L	YOGA				
Total Learning Credits					**20**

Total Learning Credits of Courses for FIRST year = 40

Semester - III					
Code	**Course Title**	**Sessions per Week**			**C**
		L	**T**	**P**	
UBT24301J	Genetic Engineering	3	0	2	4
UBT24302J	Computational Biology	3	0	2	4
UBT24303J	Biophysics and Bioinstrumentation	3	0	2	4
	Minor Elective - I				4
UBT24P01L	Internship - I	0	0	0	1
	Multidisciplinary Course - II				3
Total Learning Credits					**20**

Semester - IV					
Code	**Course Title**	**Sessions per Week**			**C**
		L	**T**	P	
UBT24401J	Bioprocess Technology	3	0	2	4
UBT24D01T	Biostatistics	4	0	0	4
	Minor Elective - II				4
	Minor Elective - III				4
UEN24S01L	Communication Skills	0	0	4	2
UCD24S03J	Industry Oriented Employability and Leadership Skills	1	0	2	2
UMI24Y01L	My India Project	0	0	0	0
Total Learning Credits					**20**

Total Learning Credits of Courses for SECOND year = 40

Semester - V					
Code	**Course Title**	**Sessions per Week**			**C**
		L	**T**	P	
UBT24D02J	Food Biotechnology	3	0	2	4
UBT24D03J	Immunology	3	0	2	4
	Minor Elective - IV				4
	Multidisciplinary Course - III				3
UES24V01T	Environmental Studies	2	0	0	2
UCD24S04J	Career Readiness and Professional Skills	1	0	2	2
UBT24P02L	Internship – II	0	0	0	1
Total Learning Credits					**20**

Semester - VI					
Code	**Course Title**	**Sessions per Week**			**C**
		L	**T**	P	
UBT24D04J	Plant Biotechnology	3	0	2	4
UBT24D05J	Animal Biotechnology	3	0	2	4
	Minor Elective - V				4
	Minor Elective - VI				4
UBT24P03L	Project Work	0	0	4	2
UCD24V02T	Universal Human Values	2	0	0	2
Total Learning Credits					**20**

Total Learning Credits of Courses for THIRD year = 40

Semester - VII					
Code	**Course Title**	**Sessions per Week**			**C**
		L	**T**	P	
UBT24D06J	Cheminformatics	3	0	2	4
UBT24D07J	Nanobiotechnology				
UBT24D08T	Marine Biotechnology	4	0	0	4
UBT24D09T	Biofertilizer Technology				
UBT24D10T	Biomaterials	4	0	0	4
UBT24D11T	Bioenergy				
	Minor Elective - VII				4
	Minor Elective - VIII				4
Total Learning Credits					**20**

Semester - VIII					
Code	**Course Title**	**Sessions per Week**			**C**
		L	**T**	P	
UBT24D12T	Research Methodology	4	0	0	4
UBT24D13J	Biopython	3	0	2	4
UBT24D14J	Stem Cell Biology				
UBT24P04L	Research Project and Dissertation	0	0	24	12
UBT24P05L	Professional Internship				
Total Learning Credits					**20**

Total Learning Credits of Courses for FOURTH year = 40

8.1 Elective Courses (MINOR) offered by the Department of Biotechnology to other Departments (excluding Department of Biotechnology)

Elective Courses (Minor) (E)						
Semester	Course Code	Course Title	Sessions per Week			C
			L	T	P	
III	UBT24E01T	General Biology	4	0	0	4
IV	UBT24E02J	Mushroom Cultivation	3	0	2	4
IV	UBT24E03T	Disease Management	4	0	0	4
V	UBT24E04J	Algal Technology	3	0	2	4
VI	UBT24E05T	Food and Nutrition	4	0	0	4
VI	UBT24E06J	Vermicomposting	3	0	2	4
VII	UBT24E07T	Farming Technologies	4	0	0	4
VII	UBT24E08J	Basic Bioinformatics	3	0	2	4
	Total Learning Credits					32

8.2 Multidisciplinary Courses offered by the Department of Biotechnology to all departments (Including Department of Biotechnology)

Multidisciplinary Courses (M)						
Semester	Course Code	Course Title	Sessions per Week			C
			L	T	P	
II	UBT24M01T	Environmental Biotechnology	3	0	0	3
III	UBT24M02T	Medical Biotechnology	3	0	0	3
V	UBT24M03T	Pharmaceutical Technology	3	0	0	3
	Total Learning Credits					9

9. Programme Articulation Matrix

Course Code	Course Title	PLO									
		1	2	3	4	5	6	7	8	PSO1	PSO2
ULT24AE1J	Tamil – I	3	3	3	2	2	2	2	3	2	-
ULH24AE1J	Hindi – I	2	2	2	3	-	2	3	1	-	2
ULF24AE1J	French – I	3	-	2	-	3	2	3	3	2	-
ULE24AE1J	English	2	1	1	2	2	1	2	1	2	-
UBT24101J	Cell Biology	3	3	2	2	1	2	1	2	2	-
UBT24102J	Microbiology	3	3	3	2	2	1	1	3	2	2
UBT24103T	Genetics	2	3	3	1	1	3	3	2	1	2
UCD24S01J	Verbal Ability and Skill Development	3	-	2	-	3	2	3	3	2	2
ULT24AE2J	Tamil – II	1	2	2	3	2	2	3	3	1	2
ULH24AE2J	Hindi – II	3	3	3	2	2	1	1	3	2	2
ULF24AE2J	French – II	2	3	3	1	1	3	3	2	1	2
UBT24201J	Biochemistry	3	-	2	-	3	2	3	3	2	2
UBT24202J	Molecular Biology	1	2	2	3	2	2	3	3	3	-
UBT24203T	Enzymology	3	2	2	-	1	-	3	2	-	2
UCD24V01T	Essentials of Artificial Intelligence	3	2	2	1	2	2	3	3	2	2
	Multidisciplinary Course – I										
UCD24S02L	Quantitative Aptitude and Logical Reasoning	2	2	2	3	-	2	3	1	2	2
UNS24Y01L	NSS	3	2	2	-	1	-	3	2	2	-
UNC24Y01L	NCC	2	1	1	2	2	1	2	1	-	2
UNO24Y01L	NSO	2	2	2	3	-	2	3	1	2	2
UYG24Y01L	YOGA	3	3	3	2	2	1	1	3	1	2
UBT24301J	Genetic Engineering	3	2	-	2	-	2	2	1	2	-
UBT24302J	Computational Biology	3	3	3	2	2	1	1	3	2	2
UBT24303J	Biophysics and Bioinstrumentation	2	2	2	3	-	2	3	1	2	2
	Minor Elective – I										
UBT24P01L	Internship - I	1	2	2	2	3	3	3	2	2	2
	Multidisciplinary Course – II										
UBT24401J	Bioprocess Technology	3	3	1	-	3	1	-	1	3-	-
UBT24D01T	Biostatistics	3	2	2	-	2	-	3	2	3	3
	Minor Elective – II										
	Minor Elective – III										
UEN24S01L	Communication Skills	3	3	2	1	1	3	2		3-	-
UCD24S03J	Industry Oriented Employability and Leadership Skills	3	3	2	3	3	2	2	-	3	3
UMI24Y01L	My India Project	3	3	2	2	1	2	1	2	3	3

UBT24D02J	Food Biotechnology	3	2	2	-	1	-	3	2	2	2
UBT24D03J	Immunology	3	2	2	1	2	2	3	3	3	2
	Minor Elective – IV										
	Multidisciplinary Course - III										
UES24V01T	Environmental Studies	3	2	1	-	-	-	2	-	-	-
UCD24S04J	Career Readiness and Professional Skills	3	3	2	2	1	2	1	2	3	2
UBT24P02L	Internship – II	1	2	2	3	3	3	3	2	2	2
UBT24D04J	Plant Biotechnology	3	3	2	3	3	2	1	2	2	1
UBT24D05J	Animal Biotechnology	3	3	3	3	2	2	1	3	3	-
	Minor Elective – V										
	Minor Elective – VI										
UBT24P03L	Project Work	1	2	2	3	2	2	3	3	3	3
UCD24V02T	Universal Human Values	3	3	3	2	2	3	1	3	3	2
UBT24D06J	Cheminformatics	3	3	2	2	3	2	1	2	2	2
UBT24D07J	Nanobiotechnology	3	3	2	2	-	3	2	3	3	3
UBT24D08T	Marine Biotechnology	3	3	2	2	2	2	2		3-	-
UBT24D09T	Biofertilizer Technology	3	3	2	3	3	2	2	-	3	3
UBT24D10T	Biomaterials	3	3	2	2	3	2	3	2	2	2
UBT24D11T	Bioenergy	3	2	1	-	-	2	2	2	1	2
	Minor Elective – VII										
	Minor Elective – VIII										
UBT24D12T	Research Methodology	3	3	3	3	-	2	3	-	2	3
UBT24D13J	Biopython	3	3	3	3	-	2	3	-	2	3
UBT24D14J	Stem Cell Biology	3	2	2	3	2	2	2	2	3	2
UBT24P04L	Research Project and Dissertation	1	2	2	2	2	3	3	3	3	3
UBT24P05L	Professional Internship	3	2	2	3	3	2	2	2	-	2
Average		2.57	2.33	2.07	2.16	2.06	2.02	2.25	2.15	2.20	2.24

Abbreviations

CLR – Course Learning Rationale
CLO – Course Learning Outcomes
PLO – Programme Learning Outcomes
SLO – Session Learning Outcomes
BLoT – Bloom's Level of Thinking
CLA – Continuous Learning Assessment

SEMESTER - I

Course Code	ULT24AE1J	Course Title	Tamil - I	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

Course Offering Department	Tamil	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
CLR-1	மரபிலிருந்F மாற்றம் பெற்ற புF க்கவிதை மரபின் சிந்ைதனகதை அறியச்பசய்ைல்																		
CLR-2	நவீன கவிதையின் வழி மனிைவாழ்வியல் விழுமியங்கதைைபரியச்பசய்ைல்																		
CLR-3	சிற்றிலக்கியங்கை, காைபியங்கை கற்பிக்கும் ைமிழ்ச்சமூகைின் வாழ்வியதல அறியச்பசய்ைல்																		
CLR-4	நவீன ைமிழ்இலக்கிய வைர்ச்சி வரலாற்றறெ புரியச்பசய்ைல்																		
CLR-5	பமாழிைெயிற்சி வழிபமாழியின் ெல்வவறு நுட்ெங்கதைை பரியச்பசய்ைல்																		
CLO	**At the end of this course, learners will be able to:**	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected	Problem Solving,	Communication	Independent	Leadership	Digital	Value Inculcation,	Environmental	Entrepreneurial	PSO 1	PSO 2	
CLO-1	புF க்கவிதைஉருவாக்கிை்ைந்ைபுதியசிந்ைதனக்கைங்கதைஅறிந்Fபகாை்ளுைல்	✓	✓	-	-	2	75	60	3		3	-	-	-	-	3	-	-	
CLO-2	நவீனகவிதைைக்வழிமாற்றம்பெற்றுவரும்மாFடவிழுமியங்கதைை்பரிந்Fபகாை்ளுைல்	✓	✓	✓	-	2	80	70	-	-		2	-	3	3		-	-	
CLO-3	ைமிழ்ச்சமூகைின்இதடக்காலவாழ்வியல்முதறகதைஉணர்ந்Fபகாை்ளுைல்	✓	✓	✓	✓	2	70	65	3		3	-	-	2		-	-	-	
CLO-4	நவீனஇலக்கியவரலாறுவழிைமிழ்க்கல்விவரலாறு, சமூகவரலாறுபெற்றவைர்ச்சிநிதலகதைை்பரிந்Fபகாை்ளுைல்	✓	✓	✓	✓	2	70	70	-	3		-	1	2	-	-	-	-	
CLO-5	பமாழியின்நுட்ெங்கதைை்பரிந்Fபமாழிஆளுதமவயாெபசயல்ெடும்திறன்பெறுைல்	✓	✓	✓	✓	3	80	70	3	3		2	-	-	-	-	-	-	

Session	CLO – 1	CLO – 2	CLO – 3	CLO – 4	CLO - 5
	12	12	12	12	12
SLO-1	ைமிழ்க்கவிதை மரபு	நவீனகவிதை வாைற்றம், வரலாறு	ைமிழரின் வீரமரபு - வொர் விழுமியங்கை்	சிற்றிலக்கியை்வாைற்றம் – வதகதம	ைமிழ் உதரநதட மரபு – உ·வவ·சா· வின் ெங்கிை்ெ
SLO-2	புF க்கவிதை உருவாக்கம், புF க்கவிதை வைர்ச்சி பநறிகை்	நவீனகவிதைகில் பசல்பநறிகை்	ெரணி அறிமுகம் ெரணி இலக்கியங்கை்	பிை்தைை்ைமிழ் -உலா - தூF	உ·வவ·சா· வின் ராஜதவத்தியம்
SLO-3	ெ்ாரதியார் ென்முக ஆளுதமத்திறன்	கவிதைபமாழி - நவீனகவி ஆளுதமகை்	ைதலவனின் வீரம்- கலிங்கைF்ெரணி 477,490	புF க்கவிதையின் வாைற்றமும்பமாழியும்	நாட்டுை்புற மரபில் சிறுபையவ வழிை்ாடு
SLO-4	ெ்ாரைவசம் ெ்ாரைவசைின் வைம்	கவிதையில் நாட்டுை்புற வடிவம்	ைமிழ் இலக்கிய மரபில் தூF இலக்கியங்கை்	புF க்கவிதையில் சமூகம் – புF க்கவிதையும் இதழ்களும்	கழனியூரனின் பொன்காை்ை ஐயனார்

SLO-5	பவ்ை◌ிெ◌்ெனிமதலயின் மீFலவுவவாம்…	பெண்ணகின் கல்விநிதல - ணைம்பிதற – அம்மா	ை◌மிழின் பெருதம – ை◌மிழ்விடுதூF (184 – 186)	மணிக்பகாடி ணைழ், எழுை◌்F ணைழ், வானம்ெ◌◌ாடி ணைழ்	பிதழநீக்கி எழுFம் நுட்ெ◌ங்கைக்
SLO-6	20 ஆம்நூற்றாண்டுக்கவிதை மரபில் ெ◌◌ாரதிை◌◌ாசன்	ஆண்பெண் சமைFவமும் ெ◌.கல் ெனா – கீறல் விழுந்ை◌ மாதலக்காலங்கைக்	பசய்யுை◌◌் மரபில் கலம்ெ◌க இலக்கியங்கைக்	சிறுகதை வைாற்றம் - சிறுகதை வைர்ச்சி	எழுை◌◌்Fெ◌◌்பிதழ – ந - ண - ன ல,ை◌,ழ, ர, ற வவறுெ◌◌ாடு அறிை◌ல்
SLO-7	ெ◌◌ாரதிை◌◌ாசன் – அழகின் சிரிெ◌◌்பு ஆல்– ஆயிரம்கிதைகைக் பகாண்ட அடிமரம்	விை◌◌ிம்பு நிதலவாழ்வியல்: திருநர்களும் சாை◌தனகளும்	தகயறுநிதல – நந்திக்கலம்ெ◌கம் - வாFறுமதிதய (110)	சிறுகதை வரலாறு – சிறுகதை ஆசிரியர்கைக்	பாைடர்பிதழ ஒருதமென்தம வவறுெ◌◌ாடு
SLO-8	ஆல்–ஆயிரம்கிதைகைக் பகாண்ட அடிமரம்	திருநங்தகுணவதி – சமூகெ◌◌ார்தவ	ை◌மிழ் இலக்கிய மரபில் குறவஞ்சி இலக்கியங்கைக்	ணைழ்களும் சிறுகதையும்	பிறபமாழிச் பசாற்கதை நீக்கி எழுFை◌ல், ஷ,ஜ,ஸ,ஹமாற்பறாலிகைக்
SLO-9	வானம் ெ◌◌ாடிக்கவிஞர்களும் மு.வமைம்ை◌◌ாவும்	புலம் பெயர் வாழ்வியல் – வலியும் நம்பிக்தகயும்	குற்றாலக்குறவஞ்சி – ஆடுமரவீFமணி (3)	புதினம் வைாற்றம் - புதினம் வைர்ச்சி வரலாறு	ை◌மிழில் பசால்வதகைக் பசால்லும் ெ◌யன்ெ◌◌ாடும்
SLO-10	மனிை◌வநயம் - மு.வமைம்ை◌◌ாவின் மனிை◌தனவைடி	ஸர்மிை◌◌ாபஸய்யிை◌◌் – புராை◌னஊர்	காெ◌◌்பிய இலக்கணம் - காெ◌◌்பிய வதகதமகைக்	புதினின்தின் வதகதம புதினஆ சிரியர்கைக்	பெயர்ச்பசாற்கைக் பெயர்ச்பசாற்களும் வதகைகளும்
SLO -11	ை◌மிழ்க் கவிதையில் சுற்றுச் சூழலியல்	காலந்வைாறும் கவிதை வடிவில் மாற்றங்கைக். தஹக்கூ – மு.முருவகஷ்	சிலெ◌்ெ◌திகாரம் – அறிமுகம் கட்டுதரக்காதை	ை◌மிழ்இலக்கிையிதி ல் உதரநதடக்கூறுகைக் - உதரநதடயின் வைாற்றம்	விதனச்பசாற்கைக் அறிை◌ல்
SLO -12	இயற்தகயும் சமைFவமும் ெ◌ழனி ெ◌◌ாரதியின் காடு	லிமதரக்கூ – ஈவராடு ை◌மிழன்ெ◌ன் பசன்ரியூ – மாமையாதன	ஊழ்விதன - வகாவலனின் முற்பிறெ◌்புவரலாறு	ை◌மிழில்உ தரநதட வைர்ை◌◌்ை◌ அறிஞர்கைக்	ை◌மிழில்பெயரத ட, விதனயதட அறிை◌ல்

Resources			
1	முல்தலக்காடு, பொகுெ்ப்ம்ெதிெ்ப்ம் - ைமிழ்ை்Fதறஆசிரியர்கை், எஸ்.ஆர்.எம். அறிவியல்மற்றும்பொழில்நுட்ெக்கல்விநிறுவனம், காட்டாங்குைை்தூர், 603203, 2023	4	வல்லிக்கண்ணன், புFக்கவிதைவொற்றமும்வைர்ச்சியும், ஆழிெதிெ்ெகம், பசன்தன, 2018
2	கா. சிவை்ைம்பி, ைமிழில்சிறுகதைவொற்றமும்வைர்ச்சியும், என்.சி.பி.எச்., பசன்தன, 2013	5	மு.வரைராசன், ைமிழ்இலக்கியவரலாறு, சாகிை்தியஅக்காபைமி, 1972.
3	மFதரைமிழ்இலக்கியமின்பொகுெ்புை்திட்டம் -https://www.projectmadurai.org/	6	ைமிழ்இதணயக்கல்விக்கழகம் - http://www.tamilvu.org/

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)
		CLA - 1 (10 %)		CLA – 2 (10 %)		CLA – 3 (20 %)		CLA – 4 * (10%)		
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)
1	Remember	15	15	15	15	10	10	10	10	15
2	Understand	15	15	15	15	10	10	10	10	15
3	Apply	20	25	25	20	25	25	25	25	25
4	Analyze	20	25	25	20	25	25	25	25	25
5	Evaluate	15	10	10	15	15	15	15	15	10
6	Create	15	10	10	15	15	15	15	15	10
Total (%)		100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	**Dr. P.R. Subramanian, Director, Mozhi Trust, Thiruvanmiyur, Chennai – 600 041**	1	Dr. V. Dhanalakshmi, Associate Professor, Subramania Bharathi School of Tamil Language & Literature, Pondicherry University, Pondicherry	1	Dr. B. Jaiganesh, Associate Professor and Head, Department of Tamil, FSH, SRMIST, Kattankulathur
				2	Dr. R. Ravi, Assistant Professor and Head, Department of Tamil, FSH, SRMIST, Vadapalani
				3	Mr. G. Ganesh, Assistant Professor, Department of Tamil, FSH, SRMIST, Ramapuram
				4	Dr. T. R. Hebzibah Beulah Suganthi, Assistant Professor, Department of Tamil, FSH, SRMIST, Kattankulathur
				5	Dr. S. Saraswathy, Assistant Professor, Department of Tamil, FSH, SRMIST, Kattankulathur

Course Code	ULH24AE1J	Course Title	Hindi – I	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

Course Offering Department	Hindi	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	To Communicate in Hindi without any inhibition
CLR-2	To appreciate the Hindi language in its various forms
CLR-3	To analyze the different writing styles
CLR-4	To display moral and social values in the field of social Responsibility and Integrity
CLR-5	To be willing listeners and Translators-where need be

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk	PSO 1	PSO 2
CLO-1	To Understand the Philosophy of life and living through Stories	✓	✓	-	-	2	85	75	3	2	3	-	-	2	-	-	-	-
CLO-2	To Examine Travelogue writing and Sketch	✓	✓	✓	-	2	85	75	3	-	2	-	3		3	-	-	-
CLO-3	To Identify Irony and essay - based writing	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2		-	-	-
CLO-4	Evaluate the various social issues depicted in the prose	✓	✓	✓	✓	3	85	75	2	-	2	3	-	-	2	-	-	-
CLO-5	To Understand the fundamental principal of Translation	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2	-	-	-	-

Sessions	CLO–1	CLO - 2	CLO – 3	CLO - 4	CLO - 5
	12	12	12	12	12
SLO-1	KAHANI KI AVDHARNA	REKHACHITRA & YATRAVITRANT	NIBANDH	NATAK	ANUVAD& PARIBHASHIK SHABDAVALI
SLO-2	SWARUP AUR PARIBHASHA	AVDHARNA EVM SWAROOP	NIBANDH KI AVDHARNA EVM SAWROOP	AVDHARNA EVM SAWROOP	ARTH EVM PARIBHASHA
SLO-3	KAHANI KE TATVA EVM MAHATWA	MAHATVA AUR UDDESHYA	MAHATVA EVM UDDESHYA	TATWA EVM PRAKAR	SWARUP EVM PRAKAR
SLO-4	PARIKSHA- PREMCHAND	GESHA REKHACHITRA	KUTAJ- NIBANDH HAJARI PRASHAD DIVEDI	UDDESHYA	MAHATVA
SLO-5	VISLESHAN	PATH KA VISHLESHAN	LEKHIAK PARICHAY	NATAK KA MAHATVA	UDDESHYA
SLO-6	UDDESHYA	GURU SHISHYA KA SAMBANDH	SHANGHARSHIL JEEVAN	RANGMANCH KA PARICHAY	ANUVAD KA PRAYOJAN EVM PRAYOG
SLO-7	MALBE KA MALIK- MOHAN RAKESH	THELE PAR HIMALAY (YATRAVITRANT)	PATH KA MAHATVA	LEKHAK PARICHAY	SHROT EVM LAKSHYA BHASHA KA GYAN
SLO-8	LEKHAK PARICHAY	YATRAVITRANT KA MAHATVA	BHOLARAM KA JEEV- (VYANGYA) HARISHANKAR PARSHAI	NATAK KA VISLESHAN	ANUVAD KA DAYITVA
SLO-9	BATWARE KA YATHARTH VARNAN	YATRA KA YATHARTH CHITRAN	VYANGYA KI AVADHARNA	LALCH KA DUSHPARINAM	PARIBHASHIK SHABDAVALI

SLO-10	TATKALIN PARISHTHITI KA VARNAN	PATH KA VISLESHAN	PATH KA VIHLESHAN	GURU SHISHYA SAMBANDH	TAKANIKI SHABDAVALI KA MHATVA
SLO-11	KAHANI KA VISHLESHAN	HIMALAY KA LOK JEEVAN	SARKARI TANTRA KA KHOKHLA RUP	MAHATTAKANKSHI KA DUSHPARINAM	VIVIDH PRAYOG
SLO-12	KAHANI KA UDDESHYA	HIMALAY KA VARNANA	SANVEDANSHIL BHAVANA	TATKALIN SAMAJIK VYAVASTHA KI CHARCHA	SHABDAVALI KI AVSHYAKTA

Resources			
1	Samanya Hindi, Srijonlok Publication, 2023, New Delhi	4	Bhakti AndolanAurSurdasKaKavya – Manager Pandey
2	Kabir – Hazari Prasad Dwedi	5	Bihari – Vishvnath Prasad Mishr
3	Surdas – Ram Chandra Shukl	6	AadhunikVigyapanAurJansampark – Taresh Bhatia

Assessment											**Strategies**					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)		(10%)		(20%)		(10%)			Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	15	15	15	15	10	10	10	10	15			Debate	✓		
2	Understand	15	15	15	15	10	10	10	10	15			Interactive Lecture	✓		
3	Apply	20	25	25	20	25	25	25	25	25			Brainstorming	✓		
4	Analyze	20	25	25	20	25	25	25	25	25						
5	Evaluate	15	10	10	15	15	15	15	15	10						
6	Create	15	10	10	15	15	15	15	15	10						
	Total (%)	100	100	100	100	100	100	100	100	100 100						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Ms. Reetha Govindan, Senior Manager (Rajbhasha)	1	Dr. S. Padmapriya, Professor and Head, Pondicherry University, Kalapet, Puducherry - 605014	1	Dr. S Preeti. Associate Professor, SRMIST
2	Mr. Vipin Kumar Jha, Senior Translation Officer (ALUMNI)			2	Dr. Md. Shwahidul Islam, Assistant Professor, SRMIST
				3	Dr. S. Razia Begum, Assistant Professor, SRMIST
				4	Dr. Nisha Murlidharan Assistant Professor, SRMIST

Course Code	ULF24AE1J	Course Title	French – I	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

Course Offering Department	French	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Extend and expand their savoir-faire through the acquisition of current scenario
CLR-2	Enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French
CLR-3	Make them learn the basic rules of French Grammar.
CLR-4	Develop strategies of comprehension of texts of different origin
CLR-5	Strengthen the language of the students both in oral and written

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity Solving	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	4 Leadership Qualities, Professionalism, Autonomy, Accountability	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO 1	10 PSO 2
CLO-1	To acquire knowledge about French language	✓	✓	-	-	2	85	75	3	2	3	-	-	2	-	-	-	-
CLO-2	To strengthen the knowledge on concept, culture, civilization, and translation of French	✓	✓	✓	-	2	85	75	3	-	2	-	3		3	-	-	-
CLO-3	To develop content using the features in French language	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2		-	-	-
CLO-4	To interpret the French language into other language	✓	✓	✓	✓	3	85	75	2	-	2	3	-	-	2	-	-	-
CLO-5	To improve the communication, intercultural elements in French language	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2	-	-	-	-

Sessions	CLO – 1	CLO - 2	CLO – 3	CLO – 4	CLO - 5
	12	12	12	12	12
SLO-1	Contacts, Emma la championne	Les verbes du premier groupe	Qu'est-cequ'ils font?	Portraits	Les verbes du deuxième groupe –
SLO-2	Les nombres à partir de 31	La liaison	Oùestmon sac	Un casting	Les pronomspersonnelstoniques
SLO-3	Les pays, les nationalités	Entreren contact	Quelquesobjets	Le Petit Spirou	Les verbes faire et lire
SLO-4	Les jours de la semaine, Les jours	Présenter et se présenter	Les professions	L'aspect physique	Les Sons
SLO-5	Les mois de l'année, Les animaux domestiques	Demander et dire la date	La formation du féminin (2)	Le caractère	Décrirel'aspect physique
SLO-6	La famille (1)	Unerencontre.	Qu'est-cequec'est?	les étatsd'âme	Demander et dire l'heure
SLO-7	La formation du féminin (1)	Contacts	C'est / Il est (1)	Les prépositions de lieu (1)	Elle est comment?
SLO-8	Les adjectifspossessifs	Emma la Championne	La phrase négative (1)	La famille (2)	Portraits

SLO-9	La phrase interrogative	Mots et expressions	Les verbes aller et venir	La formation du féminin	Mots et Expressions
SLO-10	Les nombres	Grammaire	Les formules de politesse	La formation du pluriel (2)	Grammaire.
SLO-11	Intonation et est-ce que	Communication	C'est qui?	Il y a	Communication
SLO-12	Les exemples	Les verbes du ER –groupe	Mots et Expressions	Les articles contractés	Les concepts

Resources			
1	''La Nouvelle Génération-AI'' Méthode de français, Marie-Noëlle COCTON, P. DAUDA, L. GIACHINO, C. BARACCO, Les éditions Didier, Paris, 2018.	4	https://www.elearningfrench.com/learn-french-grammar-online-free.html
2	Cahier d'activités avec deux discs compacts.	5	https://www.lawlessfrench.com/grammar
3	https://www.fluentu.com/blog/french/french-grammar	6	https://blog.gymglish.com/2022/12/15/basic-french-grammar

Assessment											**Strategies**					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *			Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)		(10%)		(20%)		(10%)			Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	15	15	15	15	10	10	10	10	15			Debate	✓		
2	Understand	15	15	15	15	10	10	10	10	15			Interactive Lecture	✓		
3	Apply	20	25	25	20	25	25	25	25	25			Brainstorming	✓		
4	Analyze	20	25	25	20	25	25	25	25	25						
5	Evaluate	15	10	10	15	15	15	15	15	10						
6	Create	15	10	10	15	15	15	15	15	10						
	Total (%)	100	100	100	100	100	100	100	100	100 100						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. Kavaskar Danasegarane, Language Specialist, Process Expert Maersk Global Service Center Pvt. Ltd	1	Dr. C Thirumurugan, Professor, Department of French, Pondicherry University	1	Mr. Kumaravel K. Assistant Professor and Head, SRMIST
2	Mr. Shrivathsan S, Journalist, Senior Sports Reporter/Sub-Editor, Times of India, Chennai			2	Ms. Abigail A, Assistant Professor, SRMIST
				3	Mrs. M. Mahalakshmi, Assistant Professor, SRMIST

Course Code	ULE24AE1J	Course Title	English	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

Course Offering Department	English	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Develop an understanding and sensibility of human consciousness through gender inclusive curriculum
CLR-2	Enhance the abilities of deeper understanding to stay with integrity with the fellow human beings
CLR-3	Develop the overall language competency of the learner
CLR-4	Develop proficient language skills
CLR-5	Learn to express the thoughts clearly, develop logical arguments and enhance the overall communication skills.

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills Collaborating	Independent Thinking, Analytical Reasoning,	Leadership Qualities, Professionalism,	Digital Technology	Value Inculcation, Multicultural	Environmental Action, Community	Entrepreneurial	PSO 1	PSO 2
CLO-1	Analyze different literary texts to identify the representation of issues related to gender, and class	✓	✓	-	-	2	85	75	3	2	3	-	-	2	-	-	-	-
CLO-2	Apply critical thinking skills to analyze and respond to academic texts.	✓	✓	✓	-	2	85	75	3	-	2	-	3		3	-	-	-
CLO-3	Critically evaluate and discuss contemporary issues through online articles.	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2		-	-	-
CLO-4	Refine their general writing skills	✓	✓	✓	✓	3	85	75	2	-	2	3	-	-	2	-	-	-
CLO-5	Improve their language application skills	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2	-	-	-	-

Sessions	CLO-1	CLO-2	CLO-3	CLO-4	CLO-5
	POETRY	SHORT STORIES	LEARNING ABOUT WRITING	LEARNING ABOUT SPEAKING	REFLECTION OF THE LANGUAGE LEARNING
	12	12	12	12	12
SLO-1	Introduction to the poet- Sukirtharani- Reading and recitation of the poem –Debt Analysis and Critical interpretation of the poem.	Introduction to the short story writer Katherine Mansfield. Reading the story- The Doll's House Explaining the story through depiction of characters and representation of injustices.	Introduction to Creative Writing. Explaining the elements of creative writing. Grouping the Students belonging to States other than Tamilnadu	Building the discourse- The significance of conversation and the key elements of discourse- Art of conversation in digital and verbal discourse- Lee Mockobe'sA Powerful Poem of what it means to be a Transgender. TEDX TALK- POEM RECITATION	Reflecting the learning. -Review writing Explaining the process of reviewing and the method of reviewing. Choosing the subject for reviewing.
SLO-2	Introduction to the poet KalkiSubramaniyam. Reading and recitation of the poem Phallus I cut. Analysis and Critical interpretation of the poem. Part-1	Analysis and critical interpretation of the short story Doll's House.	Stand-up comedy show -translate the audio content in English. (any regional language) Practice the writing activity - creative ways of engaging in translation.	Reflecting on the style and the tone of the poem. Practicing conversation	Choosing and planning the topic for students- group 1 and group 2

SLO-3	Analysis and Critical interpretation of the poem. Phallus I cut- Part-2	Class room activity- reviewing characters Group Discussion- social consciousness	Correction of errors- attempting to translate. Identifying equivalent terms to certain regional words - learn the art of translation.	Classroom- Speaking activity- reflection about the issues regarding gender expression and gender identity. Reviewing activity- group discussion- communicating effectively- importance	Choosing and planning the topic for students- group 3 and group 4
SLO-4	Introduction to the poet - ImtiazDharker. Reading and reciting the poem Purdah 1. Analysis and Critical interpretation of the poem- Purdah 1- part 1	Speaking activity- society and its portrayal in the short story- Magnifying and analyzing the characters from contemporary perspective	Introducing famous art works and the contexts of creation. Salvador Dali- The Face of War Pablo Picasso- Guernica Edward Munch- The Scream Pieter Bruegel- The Tower of Babel. Understanding the art works- Part 1	Introducing Content writing in Social Media- the importance of content writing.	Introducing the students to the review of the various works. Understand the review process how effectively a review of any work can be done.
SLO-5	Analysis and Critical interpretation of the poem- Purdah 1- part 2	Introduction to the writer Haruki Murakami. Reading the Confessions of a Shinawaga monkey. Discussion and analysis of the Confessions of a Shinawaga monkey.	Understanding the art works- Part 2 creative and/ or thoughtful writing - contemporary themes of modern day	BLOG WRITING - Subtleties Of Workplace Inclusion: Mental Health And Queer Community- Salik Ansari. Reading the text- content in the blog by the students- Reading Activity	Reviewing -record -post in the social media pages of SRMIST
SLO-6	Reading and reciting the poem Purdah 2 Analysis and Critical interpretation of the poem- Purdah 2- part 1	Group discussion activity reflecting the understanding of the character Shinagwa monkey Speaking activity- review on life and existentialism and identity crisis	Course instructor guidance-Classroom activity for creative writing- discussion on generation of ideas discussion on working and reflection of ideas	Analysing the text- content in the blog by the students- Discussion Activity writer's conversation with the readers - the blog in other blog articles.. Practice blog writing	Thoughtful conversation with your team member post the same in the official social media page of SRMIST. Choosing the team based on the abilities that are comfortable to match the peer members
SLO-7	Analysis and Critical interpretation of the poem- Purdah 2- part 2	Introduction to Crystal Wilkinson Reading Endangered Species: Case 47401.	Elements of writing Incorporate the elements of story in story writing	Apprehending Life by reading the texts of influence- ChimamandaNgoziAdiche's Notes on Grief- A BRIEF NOTE, We should all be Feminists- An Essay.	Choosing the topics for a thoughtful conversation Planning and preparation for the script of conversation with a team member
SLO-8	Introduction to the poet Arundathi Subramanian. Reading and reciting the poem- Home Student activity- recitation Analysis and Critical interpretation of the poem- Home	Discussion and analysis of Endangered Species: Case 47401.	Students -writing abilities- building stories- a visual treat of variety of pictures.	Class discussion- essay by the author - subjective depiction of life. Understand -subjective opinions - perspectives- Practising the task multiple times with all the students in the classroom.	Drafting , editing and revising the script of conversation and enacting the conversation with the team members Enactment -proper rehearsal -final performance -conversation- whole performance should be recorded. The recording should be posted in the official media page and social handles of SRMIST.

SLO-9	Recollection of study of the writing styles and intentions of the poets prescribed in the syllabus.	Introduction to C.S Lakshmi also known as Ambai. Reading the short story- In a Forest, A Deer.	Practice -write stories -pictures given or shown .Classroom activity- evaluation of writings ansd reflections for suggesting, correction and improvement	Interposing opinions in famous interviews- FII Interviews: Tasveer Co-Founder And Filmmaker Rita Meher On The Seattle Legislation, Minority Rights And The Fight Against Oppression- INTERVIEW- Analayisng the text and discussing the aspects of an interview	work for this social post - reflect on their experience of learning communicative English course and the testimonial has to be recorded and posted in the social media pages ofSRMIST..
S-10	Group Discussion activity for students to reflect up on gender consciousness	Discussion and Analysis of In a Forest, A Deer.	A writing task to write a script is introduced in the classroom.	Students -enact as interviewer and interviewee and practice building the discourse.	Involving the students for the project work. Introducing what is project work and inculcating the interest -Giving instructions to do the project works -
SLO-11	Revision of the poems Debt and Phallus I cut, Purdah 1 and Purdah 2	Classroom activity- speaking about identity, power of women and contemporary issues and perspectives up on women like ThangamAtthai	creative scripts inspiring from the dialogues of their favourite films by changing the scenario to their own wish according to their own whims and fancies. Creative writing -writing news reports. recreated with new characters, places, scenes, incidents.	Certain role plays like celebrity personalities, political personalities - conduct the interview and be the interviewer and interviewee. The art of conversation and the ability to build a discourse Reflecting on the points- Student reviewing activity- art of conversation in the text	Discussion of ideas and generation of creative ideas- Preparation for next semester. Assignment on any piece of creative writing (OR) Presentation- Mastering the art of Public Speaking. (OR) Project on compiling the real life influential events on gender inclusive issues and a presentation of the same. Interview Scripting /Blog writing.- Guidance
SLO-12	Revision of the poem Home. Creative activity for the students to reflect up on gender consciousness, influence of religion on women freedom.	Retrospecting the writing styles of the authors- Katherine Mansfield, Haruki Murakami, Crystal Wilkinson and Ambai. Overall Revision- The Doll's House, Confessions of a Shinawaga Monkey, Endangered Species: Case 47401 Classroom activity- speaking about racism in contemporary society- an attempt to understand the issues prevailing in the society from the perspectives of students	Watch debate shows - summarising the arguments Enhance -descriptive writing skill. Repetitive practice and continuous assessment -writing skiills-master the writing skill.	Reflecting on the points- Student reviewing activity- art of conversation in the text The evaluation and assesment of the conversation -constructive feedbacks to the students.	Reflection, Evaluation and Assessment of ideas- Students can opt any of the project from the given choice. Ready for the next semester- reflection of the learning through assignments practiced

Resources			
1	Horizon- English Text Book – Compiled and Edited by the Faculty of English Departement, FSH, SRMIST, 2023	5	The Art of Public Speaking by Stephen E. Lucas- 2019
2	The Creative Writing Coursebook: Forty Authors Share Advice and Exercises for Fiction and Poetry by Julia Bell and Paul Magrs- 2001	6	Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds by Carmine Gallo – 2014
3	On Writing: A Memoir of the Craft by Stephen King 2000	7	The Anatomy of a Book Review: A Guide for College Students by Ronald J. Weber 1994
4	The Writing Life: Writers on How They Think and Work edited by Marie Arana -2003	8	How to Write a Simple Book Review: It's easier than you think! by Allyson R. Abbott 2013

Assessment											Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)	Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 * (10%)			Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
											Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	15	15	15	15	10	10	10	10	15			Debate	✓		
2	Understand	15	15	15	15	10	10	10	10	15			Interactive Lecture	✓		
3	Apply	20	25	25	20	25	25	25	25	25			Brainstorming	✓		
4	Analyze	20	25	25	20	25	25	25	25	25						
5	Evaluate	15	10	10	15	15	15	15	15	10						
6	Create	15	10	10	15	15	15	15	15	10						
	Total (%)	100	100	100	100	100	100	100	100	100 100						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Krishna Raj, Sutherland Technologies	1	Dr. J Mangayarkarasi Associate Professor and Head, Department of English, Ethiraj College for Women, Chennai	1	Dr. Pushpanjali Sampathkumar, Assistant Professor, Department of English, FSH, SRMIST
		2	Dr. K S Antony Samy Associate Professor and Head, Department of English, Loyola College, Chennai	2	Dr. Dr. Shanthi Chitra, Associate Professor, & Head, Department of English, FSH, SRMIST
				3	Dr Anchal Sharma, Professor and Head, Department of EFL SRMIST
				4	Dr T Sridevi, Assistant Professor, FSH, SRMIST
				5	Dr ShanmugaPriya, Assistant Professor SRMIST

Course Code	UBT24101J	Course Title	Cell Biology	Category	C	Discipline Core Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understand the organization of cells
CLR-2	Understand the functions of cell organelles
CLR-3	Gain knowledge on cell cycle and cell division
CLR-4	Gain knowledge on specialized cells and its types
CLR-5	Learn about cell signaling pathways and cell biology techniques

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 PLO 1	2 PLO 2	3 PLO 3	4 PLO 4	5 PLO 5	6 PLO 6	7 PLO 7	8 PLO 8	9 PSO 1	10 PSO 2
CLO-1	Learn about prokaryotic and eukaryotic cell organization	✓	✓	-	-	2	85	75	3	-	2	-	-	1	1	2	-	-
CLO-2	Gain knowledge on structure and functions of cellular organelles	✓	✓	✓	-	2	85	75	3	-	2	-	-	2	2	-	-	-
CLO-3	Apply knowledge on cell cycle and its regulation	✓	✓	✓	✓	3	85	75	-	3	-	-	1	-	1	-	2	-
CLO-4	Learn about specialized cells and its functions	✓	✓	✓	✓	3	85	75	-	3	2	-	-	2	-	2	-	-
CLO-5	Apply concepts on cell signaling processes and techniques	✓	✓	✓	✓	3	85	75	-	3	3	2	-	2	-	-	2	-

Sessions	CLO – 1	CLO – 2	CLO - 1	CLO - 1	CLO - 1
	15	15	15	15	15
SLO-1	Cell Biology – Introduction and overview	Introduction to cell organelles	Cytoskeleton	Mitosis	Cells of Vision
SLO-2	Classification of cell	Nucleus	Centrioles	Mitosis	Pancreatic cells - Types
SLO-3	Development of cell theory	Endoplasmic reticulum	Chloroplast	Meiosis	Pancreatic cells - Functions
SLO-4&5	Practice: Lab Safety and GLP	Practice: Estimation of hemoglobin by Sahli's method	Practice: Enumeration of RBC count	Practice: Protoplast isolation	Practice: Preparation and Observation of polytene chromosomes
SLO-6	Prokaryotic cell organization	Mitochondria	Extracellular matrix	Meiosis	PI3K/Aktsignaling pathway
SLO-7	Eukaryotic cell organization	Golgi Apparatus	Cell Cycle - Introduction	Specialized cells - Introduction	PI3K/Akt signaling pathway
SLO-8	Plant cell and animal cell	Lysosomes	Phases of cell cycle	Nerve cells - Structure	AMPK signaling pathway

SLO-9&10	Practice: Blood Smear Preparation	Practice: Cell Counting and viability	Practice: Enumeration of RBC count	Practice: Protoplast isolation	Practice: Preparation and Observation of polytene chromosomes
SLO-11	Plasma membrane	Ribosomes	Checkpoints of cell cycle	Nerve cells - Functions	AMPK signaling pathway
SLO-12	Passive Transport	Vacuoles	Regulation of cell cycle	Muscle cells – Types	JAK/STAT signaling pathway
SLO-13	Active Transport	Microbodies	Regulation of cell cycle	Muscle cells - Functions	JAK/STAT signaling pathway
SLO-14&15	Practice: Estimation of hemoglobin by Sahli's method	Practice: Cell Counting and viability	Practice: Enumeration of WBC count	Practice: Observation of Barr bodies	Practice: Model Examination

Resources		
Alberts, B., Heald, R., Johnson, A., Morgan, D., Raff, M., Roberts, K., & Walter, P. (2022). Molecular Biology of the Cell: Seventh International Student Edition with Registration Card. WW Norton & Company.	3	Karp, G., Iwasa, J., & Marshall, W. (2020). Karp's Cell and Molecular Biology. John Wiley & Sons.
De Robertis. (2017). Cell and Molecular Biology, 8th Edition, Lea &Febiger.	4	Cooper GM. (2013). The Cell: A Molecular Approach, 6th Edition, ASM Press.

Assessment												Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1		CLA – 2		CLA– 3		CLA– 4 *				Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)		(10%)		(20%)		(10%)				Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20	20	20	20	20	20			Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20	20	20	20	20	20			Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20			Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20						
5	Evaluate	20	20	20	20	20	20	20	20	20	20						
6	Create	-	-	-	-	-	-	-	-	-	-						
	Total (%)	100	100	100	100	100	100	100	100	100	100						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. G. Swamynathan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24102J	Course Title	Microbiology	Category	C	Discipline Core Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understanding the techniques used for visualizing and identifying microorganism
CLR-2	Knowledge on structure and organization of bacteria
CLR-3	Knowledge on structure and organization of viruses and fungi
CLR-4	Learning techniques on preparation and sterilization of media
CLR-5	Understanding the techniques used for visualizing and identifying microorganism

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	
CLO-1	To identify the microorganism based on taxonomical rules	✓	✓	-	-	2	85	75	3	-	-	-	-	-	-	-	-	-	
CLO-2	Application of techniques for identifying microorganism using technologies	✓	✓	✓	-	2	85	75	1	2	-	-	1	-	-	-	-	-	
CLO-3	Having knowledge on sterilization and microbial culture media for microorganisms	✓	✓	✓	✓	3	85	75	3	-	-	-	-	-	1	-	-	-	
CLO-4	Applying knowledge to identify bacteria based on structure and functional organelles	✓	✓	✓	✓	3	85	75		2	-	-	2	2			3	1	
CLO-5	Applying knowledge to identify viruses and fungi based on structure and functional organelles	✓	✓	✓	✓	3	85	75		2			2	1			3	1	

Sessions	CLO – 1	CLO – 2	CLO – 3	CLO - 4	CLO - 5
	15	15	15	15	15
SLO-1	Introduction and Scope of Microbiology	Principles of Microscopy	Handling of microorganisms	Morphology of bacteria	Structure and organization of fungi
SLO-2	Concepts of spontaneous generation	Applications of Microscopy	Control of microorganisms (Physical and Chemical)	Cell wall of Gram-negative bacteria	Cell wall structure and composition
SLO-3	Contributions of Anton VanLeewenhoek	Bright field & Dark Field	Microbial Nutrients (Micro, Macro and growth factors)	Cell wall of Gram-positive bacteria	Reproduction of fungi
SLO-4&5	Practice: Introduction and basic instrumentation related to microbiology Lab. Cleaning of Glass wares	Practice: Enumeration of Bacteria-Serial dilution, Pour plate, Spread plate technique	Practice: Gram's staining technique	Motility test - Hanging drop method	Practice: Staining of Fungi – LPCB
SLO-6	Louis Pasteur, Robert Koch, Joseph Lister	Fluorescence microscope	Microbiological media and its types	Cell wall synthesis	Structure and organization of viruses

SLO-7	Koch Postulation	Phase contrast microscope	Nutritional types of microorganisms	Archaebacterial Cell wall	General property of viruses
SLO-8	Classification – Five kingdoms and Three kingdoms.	Stains and Staining methods	Growth curve and diauxic growth curve	Capsule types, composition, function	Viral Replication
SLO-9&10	Practice: Sterilization– Heat, Filtration and Radiation	Practice: Pure culture technique: Streak plate method	Practice: Spore staining technique	Practice: Biochemical tests- IMViC	Practice: Antibiotics sensitivity test
SLO-11	Taxonomy: Artificial and natural classification	Smear preparation and simple staining	Different culture methods	Flagella structures and types	Ultra structure–Bacteriophages
SLO-12	Classical characters used in taxonomy	Gram's staining and Spore,	Determination of cell count by hemocytometry	Cell membranes and Inclusion bodies and Ribosomes	Life cycle of Bacteriophages
SLO-13	Molecular characters used in taxonomy	Capsular and Acid-fast staining.	Preservation of microorganisms	Endospore-Structure & Function	Sub viral particles- Prions
SLO-14&15	Practice: Preparation of culture medium (Solid, Liquid, semisolid, agar slants and agar deep)	Practice: Smear preparation and simple staining	Practice: Capsular staining technique	Practice: Biochemical tests- TSI	Practice: Antibiotics sensitivity test

Resources

1	Pelezar, M.J., Chan., E.C.S., and Krieg, N.R. (2007). Microbiology, Krieg Tata McGraw Hill Publications.	3	Prescott., Harley., and Klein. (2003). Microbiology, McGraw Hill publications, Fifth edition.
2	Black, J. G. (2002). Microbiology: principles and explorations, Wiley publications		

Assessment												Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1		CLA – 2		CLA– 3		CLA– 4 *					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)		(10%)		(20%)		(10%)					Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	40	40	30	30	40	40	-	-	40	40				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	30	30	20	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	10	10	10	10	20	20	10	10							
5	Evaluate	-	-	10	10	10	10	20	20	10	10							
6	Create	-	-	-	-	-	-	20	20	-	-							
	Total (%)	100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. D. Thirumurugan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24103T	Course Title	Genetics	Category	C	Discipline Core Course	L	T	P	C
							4	0	0	4

Course Offering Department	Biotechnology	Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	NIL

CLR	The purpose of learning this course is to:
CLR-1	Understand Mendel's extensive work for genetics and the deviations from Mendel's theory
CLR-2	Understand the linkage – extension of Law of independent assortment and mapping techniques
CLR-3	Introduce the students about the organization of Genome inside the cell and what are the possible variation that leads to abnormalities
CLR-4	Focus on the different mutagens and how the cell responds to them
CLR-5	Comprehend the numerical ability and analysis skill of students by explaining the limitations and assumptions of HW equilibrium

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO-1	Know about Mendel's work and their deviation	✓	✓	-	-	2	85	75	3	2	2	3	2	-	1	-	-	-
CLO-2	Conceptualize about Linkage and how characters determined using Sex and also about the influence of distance between two genes in determining the trait through gene mapping techniques	✓	✓	✓	-	2	85	75	3	-	2	3	3	1	1	1	-	-
CLO-3	Know about the different mechanisms through which the genes are exchanged and the abnormalities associated with the improper exchange	✓	✓	✓	✓	3	85	75	3	3	-	3	3	2	1	1	-	-
CLO-4	Explain about the Epigenetics concept and genome imprinting	✓	✓	✓	✓	3	85	75	3	2	-	-	-	2	-	1	-	-
CLO-5	Understand the concept of breeding and the genetic manifestations	✓	✓	✓	✓	3	85	75	2	2	2	-	-	2	-	-	-	-

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO - 4	CLO - 5
	12	12	12	12	12
SLO-1	The history and impact of genetics in medicine	Incomplete dominance, co-dominance, semi-dominance; Pleiotropy, Multiple allelesPseudo allele, essential and lethal genes	Chromosome morphology, concept of euchromatin and heterochromatin; Packaging of DNA molecule into chromosomes, chromosome banding pattern	Fragile-X-syndrome and chromosome;sex influenced dominance; sex limitedgene expression	G-, NOR, C- Banding Techniques
SLO-2	Organisms suitable for genetic experimentation and their genetic significance	Duplicate genes	Karyotype, giant chromosomes	Genetic linkage	Metaphase chromosome

SLO-3	Mendelian era and Mendelism	Molecular basis of inheritance	Gene function, Metaphases	crossing over and chromosome mapping	Genetic risk calculation
SLO-4	Mendelian genetics: Mendel's experimental design	Inhibitory genes	chromosomal abnormalities	chromosomal abnormalities	Genetic risk calculation
SLO-5	monohybrid, di hybrid, and tri-hybrid crosses	Chromosome and genomic organization	Chromosome and gene mutations: Definition and types of mutations, causes of mutations	Sex-linked inheritance	Allelic and genotype frequencies
SLO-6	Law of segregation &principle of independent assortment	Satellite DNA; VNTRs; Repetitive transposed sequences- SINEs & LINEs	Variations in chromosomes structure - deletion	Extra chromosomal inheritance: Rulesofextranuclear inheritance	Clinical genetics, Genetic counseling
SLO-7	Developmental Genetics	Chromosomal disorders	duplication, inversion and translocation	Screening the genetic diseases	Genetic research
SLO-8	Developmental Genetics	Chromosomal disorders	Single-gene disorders	Nuclear staining	Normal Karyotyping
SLO-9	Chromosomal theory of inheritance, Allelic interactions: Concept of dominance, recessiveness	Chromosomal structural disorders	Aneuploidy and Euploidy, Sex determination and sex linkage; Environmental factors and sex determination	Prenatal testing and reproductive genetics	Treatment of genetic disease
SLO-10	Non-allelic interactions, epistasis	Chromosomal numerical disorders	Sex differentiation Barr bodies, genetic balance theory	Genetic linkage, crossing over and chromosome mapping	Ethical and legal issues in medical genetics
SLO-11	Genetic code	Genome imprinting	Genetic counseling	Cytogenetics	Genetic risk calculation
SLO-12	Genetic code	Genome imprinting	Genetic counseling	Cytogenetics	Abnormal Karyotyping

Resources

1	Lewin, B., Krebs, J., Kilpatrick, S. T., & Goldstein, E. S. (2011). Lewin's genes X. Jones & Bartlett Learning.	4	Robert H. Tamarin. (2002). Principles of Genetics, 7th Edition, Tata- McGraw Hill publications
2	Stansfield, W. D. (1969). Theory and problems of genetics.	5	Weaver, R.F., and Hendrick, P.W. (1992). Genetics, 2nd Edition, W.C. Brown.
3	Winter, P. C., Hickey, G. I., & Fletcher, H. L. (1998). Instant notes in genetics (pp. ix+-342).		

Assessment								Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1	CLA – 2	CLA– 3	CLA– 4 *			Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)	(10%)	(20%)	(10%)			Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20							
5	Evaluate	20	20	20	20	20							
6	Create	-	-	-	-	-							
	Total (%)	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. Raja Ganesan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UCD24S01J	Course Title	Verbal Ability and Skill Development	Category	S	Skill Enhancement Courses	L	T	P	C
							1	0	2	2

Course Offering Department	Career Guidance	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Expose students to right attitude in a land behavioral aspects and to build the same through activities
CLR-2	Develop and nurtureinterpersonalskillsofthestudentsthroughindividualandgroupactivities.
CLR-3	Increase efficiency and leadership skills to improve team results.
CLR-4	Use the basic mechanics of Grammar.
CLR-5	Instill confidence in students and develop skills necessary to face the challenges of competitive exams and placements

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem solving, critical thinking, creativity solving	2 Communication skills, Collaborating skills	3 Independent thinking, analytical reasoning	4 Leadership Qualities, Professionalism, Autonomy	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO 1	10 PSO 2
CLO-1	Re-engineer their attitude and understand its influence on behaviour	✓	✓	-	-	2	85	75	2	3	2	2	-	1	2	3	-	-
CLO-2	Acquire inter-personal skills and be an effective goal-oriented team player	✓	✓	✓	-	2	85	75	3	3	2	3	-	1	2	1	-	-
CLO-3	Learn the importance of inner management and creativity	✓	✓	✓	✓	3	85	75	3	2	2	3	-	1	2	2	-	-
CLO-4	Understand the correct usage of grammar	✓	✓	✓	✓	3	85	75	3	-	3	-	3	1	1	-	-	-
CLO-5	Help the students succeed in competitive exams and placements	✓	✓	✓	✓	3	85	75	3	-	3	-	3	1	1	-	-	-

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO - 4	CLO - 5
	9	9	9	9	9
SLO-1	Introduction to IKIGAI, IKIGAI – Key concepts	Networkingskills – relationship building, value exchange, active listening, friendliness and positivity, clear communication	Time management skills – Value of Time, Pomodoro technique.	Basics of Grammar	Sentence Correction
SLO-2	Attitude, Attitude formation and Factors influencing Attitude	Negotiation skills – building rapport and problem-solving	Weekly Planner, To do list, Prioritizing work, Time management activity	Spotting Errors	Sentence completion (Grammar based)
SLO-3	SWOTAnalysis, individualSWOTAnalysis-SWOTAnalysis activity	EntrepreneurialSkills, Entrepreneurialknowledge, Focus,Investment,Risktolerance,Resilience,Ethics	Creative thinking skills – divergent thinking, Synthesis and collaboration, out-of -the -box thinking	Error spotting based on Parts of Speech	Sentence completion (Vocabulary based)
SLO-4	Presentation skills, Types of presentation, Structure of presentation, Delivery techniques	Creatingbrands–activity(posters,flyers,businesscards)	Creative thinking skillsActivity session	Errors how to avoid in Nouns & Pronouns	Cause and Effect - Introduction
SLO-5	ExtemporePracticeSession I	Stress Management – CausesofStressandItsImpact	Brainstorming,useofgroupsandindividualbrainstorming techniquestopromoteideageneration	Common Errors: Subject - verb Agreement	Cause and Effect – Practise Session

SLO-6	ExtemporePracticeSession II	HowtoManageStressand distress, Understanding the circle of control, stress busters	Interculturalcommunication – beliefs,customsandattitudesofpeopleindifferent countries(US,UK,Japan,WestAsia,China,Russia), Socialandculturaletiquettes	Vocabulary - Synonyms - Antonyms - Phrasal verbs-	Theme detection – Introduction - Practice session
SLO-7	InterpersonalSkills, EmotionalIntelligence	Conflict Management - Conflict in human relations – reasons, Approaches to conflict resolution	Communicationetiquettes, Telephoneetiquettes	One Word Substitution - Homophones - Homonyms	Critical Reasoning and Verbal deduction
SLO-8	ImportanceofTeamWork, TeamBuilding activity	Conflict resolutions – Case studies	Icebreaking, Designingicebreakergames	Words often confused	Types of Critical Reasoning- Tips and Tricks
SLO-9	Leadershipskills, Leadershipskills -based activity	Importance of decision making, Process of decision making, Practical ways of decision making, weighing positives and negatives	Resume writing skills	Idioms and Idiomatic Expressions – Introduction	Word Analogy - Types of Word analogy

Resources

1	Jeff Butterfield, Soft Skills for Everyone, CENGAGE, India,2015	5	Dr. K. Alex, Soft Skills, S. Chand Publishing & Company, India, 2014
2	Covey Sean, Seven habits of highly effective teens, Simon & Schuster, NewYork, 2014	6	Carnegie Dale, How to win friends and influence people, Simon and Schuster, New York, 2016
3	Thomas A Harris, I am ok, you are ok, Arrow, London, 2012	7	Daniel Coleman, Emotional Intelligence, Bloomsbury, India, 2016
4	Norman Lewis, Word Power Made Easy New Revised and Expanded Edition, Goyal publication, 2011	8	Bhatnagar R P, English for Competitive Examinations, Trinity Press, 2016.

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment(CLA) (100%weightage)							
		CLA – 1		CLA – 2		CLA – 3		CLA – 4 *	
		(20 %)		(20 %)		(30 %)		(30 %)	
		Theory (%)	Practice(%)	Theory(%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	20	20	-	-	20	20	20	20
2	Understand	20	20	20	20	20	20	20	20
3	Apply	20	20	20	20	20	20	20	20
4	Analyze	20	20	20	20	20	20	20	20
4	Evaluate	20	20	20	20	20	20	20	20
5	Create	-	-	20	20	-	-	-	-
	Total (%)	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. P. Chockalingam, Senior Lead Software Engineer, Virtusa Consulting Services Private Ltd, DLF IT Park SEZ, Chennai – 600089. p.chockalingam1986@gmail.com	1	Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeetham, Coimbatore - 641112 g_saravanaprabu@cb.amrita.edu	1	Dr. Sathish K, HOD, Department of Career Guidance Cell, FSH,SRMIST hod.dcgc.ktr@srmist.edu.in
				2	Dr. Sam Israel S, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST, samisras@srmist.edu.in
				3	Mrs. Deepalakshmi S, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST, deepalas@srmist.edu.in

SEMESTER - II

Course Code	ULT24AE2J	Course Title	Tamil – II	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

Course Offering Department	Tamil	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	சங்கஇலக்கியங்கைவழிபொன்தமஅக, புறவாழ்வியதலஅறியச்பசய்ை்ல்
CLR-2	ைமிழ்ச்சமூகைத்தின்அறவியல்குறிை்Fபைரியச்பசய்ை்ல்
CLR-3	ெக்திஇலக்கியங்கைவொதிை்ைமனிைமாண்புகததஉணரச்பசய்ை்ல்
CLR-4	ெண்ததட்ைமிழ்ச்சமூகைத்தின்பைால்இலக்கியங்கைவைர்ச்சிபெற்றவர ல ாாற்ததற்புரியச்பசய்ை்ல்
CLR-5	சிறுகததைைப்பசால்லும்வாழ்வியல்பநறி, பமாழியின்நுட்ெங்கைஆகியவற்ததற்பைரியச்பசய்ை்ல்

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity Solving	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	4 Leadership Qualities, Professionalism, Autonomy, Accountability	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO 1	10 PSO 2
CLO-1	ெண்ததட்ைமிழ்ச்சமூகைத்தின்அக, புறவாழ்வியல்இன்தறயசமூகவமம்ை்ாட்டிற்குவழிகாட்டிநிற்ெைதஅறி ந்F பகாை்ஞை்ல்	✓	✓	-	-	2	75	60	-	3	3	-	-	-	2	-	-	-
CLO-2	ைமிழ்ச்சமூகம்அறற்தைவலியுறை்தியசமூகம்என்ெைன்வழிமாF டஅறற் தைை்பைரிந்Fபகாை்ஞை்ல்	✓	✓	✓	-	2	80	70	2	-	3	-	-	3	-	-	-	-
CLO-3	ெக்திஇலக்கியம்மூலம்இதறற்ைந்Fவங்கதைஅறிந்FமாFடஒற்றுதமம வாம்ை்ாட்தடஅறிந்Fபகாை்ஞை்ல்	✓	✓	✓	✓	2	70	65	-	3		3		1	-	-	-	-
CLO-4	பைால்ைமிழ்ச்சமூகம்இலக்கியம், அரசியல், அறம், ெக்திஆகியவற்றில்ைதழ்வைாங்கியதை்பைரிந்Fபகாை்ஞை்ல்	✓	✓	✓	✓	2	70	70	3	-	3	-	-	3	-	-	-	-
CLO-5	வாழ்வியலின்பநறிகதைச்பசால்லும்கதைகதை்ெதடக்கும்திறவனா டு பமாழிஆளுதமதயயும்அறிந்Fபகாை்ஞை்ல்	✓	✓	✓	✓	3	80	70	3	-	-	2	-	-	-	3	-	-

Sessions	CLO – 1	CLO – 2	CLO – 3	CLO – 4	CLO – 5
	12	12	12	12	12
SLO-1	காலந்வொறும்மிழ்அக ைத்திதணமர பு- ைடக்கம்	சங்கமருவியகாலம் அறமும்வாழ்வியலும்	ல்லவர்காலஇலக்கியங்கை	ண்தடக்காைல்மிழகம் சங்ககாலமக்கின்வாழ்வியல்	மிழ்ச்சிறுகதையும்மிழ்ச்ச மூகவாழ்வியலும்
SLO-2	எட்டுை்பாதகநூல்கள ம்குகு்புமுதறயும்	உலகெ்பொFமதற - திருக்குறைகட்டதம்பு	க்தியும்மிழும் - க்திஇலக்கியைவாற்றநித ல	முச்சங்கஅறிமுகமும் வரலாறும்	புFதம்பிை்ன்- சங்குை்வைவனின்ர்மம்
SLO-3	ஐங்குறுநூறு – 375, 391	திருக்குறைவான்சிறெ்பு (2)	தசவசமயஇலக்கியங்கை - தசவக்குரவர்நால்வர்	சங்கஇலக்கியெ்ொடுபொரு ளும்வடிவமும்	ந.பிச்சமூர்ை்தி – வவெ்ெமரம் - மரபும்நம்பிக்தகளும்
SLO-4	குறுந்பொதக – 02, 03	திருக்குறை் – புலவிநுணுக்கம் (132) -	வைவாரம் – திருஞானசம்ெந்ைர்- 2834 திருநாவுக்கரசர் - 4262	எட்டுை்பாதகநூல்கின் வர லாறும்கட்டதம்பும்	மிழருவிமணியன் – ஒற்தறச்சிறகு - உறவின்வமன்தம
SLO-5	அகநானூறுநூல்கட்டம தாெ்பு	மிழ்இலக்கியமரபில்நீதி இலக்கியங்கை	திருவாசகம்- மாணிக்கவாசகர்ஆனந்ெரவ சம் – ொடல் 10	ெை்Fெ்ொட்டுநூல்கின்வரல ாாறும்வாழ்வியலும்	ஆர். சூடாமணி – மூடநம்பிக்தக.
SLO-6	அகநானூறு -238	நாலடியார் தவகலும்- ொடல்எண் 39	தவணவசமயவைர்ச்சிெ்வொக் கு	ெதிபனண்கீழ்க்கணக்கும் மை ாிழர்அறமரபும்	கிருஷ்ணாடாவின்ஸி – காலாஅருவகவாடா
SLO-7	கலிை்பாதக –11	நீதிஇலக்கியைதில்மருந்F நூல்கை்	நாலாயிரைதிவ்யெ்பிரெந்ம் குலவசகராழ்வார்ொடல்– 678	ெதிவனாருநீதிஇலக்கியங்கை்	பமாழிெ்ெயிற்சி பசாற்கதைஉருவாக்குல்
SLO-8	மிழர்புறமர பு- புறநானூறு- 107	சிறுெஞ்சமூலம் -64	ஆண்டாை்ொடல் – 574. திருமழிதசஆழ்வார்ொடல்	காெ்பியஇலக்கணம்– காெ்பியங்கைன்வதகதம	எழுை்Fகைில்இருந்Fபசாற்கதைக்கண்டுபிடிை்ல்
SLO-9	புறநானூறு -110, 112	ெழபமாழிநானூறுஅறிமுகம்– னிை்ன்தமகை்	மிழில்இஸ்லாமிய இலக்கியங்கை	ஐம்பெருங்காெ்பியங்கை்	ெடம்ெ்ார்ை்Fக்கதைஎழுFல்
SLO-10	ெை்Fெ்ொட்டும் ஆற்றுெ் ெதடநூல்களும்	ெழபமாழிநானூறு - 184	சீறாெ்புராணம் - விடமீட்டெ்டலம் - 10ொடல்கை்	மிழ்ச்சமூகமும்சமயை் ை்F வங்களும்	ெடம்ெ்ார்ை்Fக்கவித ைஎழுF ல்
SLO -11	சிறுொணாற்றுெ் ெத: 84-115	ெண்தடக்காெல்வொரும் வ ாாழ்வும்–புறம்	மிழில்கிறி்ை்வ இலக்கியங்கை	ென்னிருதிருமுதற – அறிமுகம், வரலாறு	கற்ெதனயும்ெதெ்பும் - மிழில்வாசகம்

SLO -12	ெட்டின்ெொதல: 40-50	கைவழிநாற்ெF - 40	கிறிை்Fவின்அருை்வவட்டல் – திரு.வி.க. அலகிபலாை்ி-5ெொடல்	நாலாயிரைத்திவ்வியெ்பிரெந்ை்ம் – அறிமுகம், வரலாறு	விை்ம்ெரைத்திற்குவாசகம்எழு Fை்ல்

Resources			
1	பகான்தற, பாைகுெ்ை்பும்ெதிெ்ை்பும் - ை்மிழ்ை்Fதறஆசிரியர்கைக், ை்மிழ்ை்Fதற, எஸ்.ஆர்.எம். அறிவியல்மற்றும்பாைழில்நுட்ெ்கல்விநிறுவனம், காட்டாங்குை்ை்தூர், 603203, 2023	4	தமிழண்ணல், புதியந ோக்கில்தமிழ்இலக்கியவரலோறு, மீனோட்சிபுத்தக ிலலயம், மFலர, **2017**
2	மு. அருணாசலம், ை்மிழ்இலக்கியவரலாறு, நூற்றாண்டுமுதற(9ஆம்நூ. முை்ல் 16 வதர), திெொர்க்கர், பசன்தன, 2005	5	ை்மிழ்இலக்கிையெ்பாைடரதடவு – http://tamilconcordance.in/
3	மFதரைமிழ்இலக்கியமின்பாைகுெ்ை்புை்திட்டம் -https://www.projectmadurai.org/	6	ை்மிழ்இதணயக்கல்விக்கழகம் - http://www.tamilvu.org/

Assessment												**Strategies**					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA - 4 (10%)				Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
												Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	15	15	15	15	10	10	10	10	15	-			Debate	✓		
2	Understand	15	15	15	15	10	10	10	10	15	-			Interactive Lecture	✓		
3	Apply	20	25	25	20	25	25	25	25	25	-			Brainstorming	✓		
4	Analyze	20	25	25	20	25	25	25	25	25	-						
5	Evaluate	15	10	10	15	15	15	15	15	10	-						
6	Create	15	10	10	15	15	15	15	15	10	-						
	Total (%)	100	100	100	100	100	100	100	100	100	-						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. P.R. Subramanian, Director, Mozhi Trust, Thiruvanmiyur, Chennai – 600 041.	1	Dr. V. Dhanalakshmi, Associate Professor, Subramania Bharathi School of Tamil Language & Literature, Pondicherry University, Pondicherry	1	Dr. B .Jaiganesh, Associate Professor & Head, Dept. of Tamil, FSH, SRMIST, KTR.
				2	Dr. R. Ravi, Assistant Professor and Head, Dept. of Tamil, FSH, SRMIST, VDP.
				3	Mr. G. Ganesh, Assistant Professor, Dept. of Tamil, FSH, SRMIST, RMP.
				4	Dr. T.R. Hebzibah Beulah Suganthi, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.
				5	Dr. S. Saraswathy, Assistant Professor, Dept. of Tamil, FSH, SRMIST, KTR.

Course Code	ULH24AE2J	Course Title	Hindi – II	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

Course Offering Department	Hindi	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	They get to learn Ancient ,Medieval,and Modern poetry
CLR-2	To understand the Significance of poems of great poets like Kabir,Tulsidas,Bihari and Dhananand
CLR-3	To Enhance and Enrich their knoeledge through poetry
CLR-4	Media based understanding for employability
CLR-5	Job Oriented writing skills

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO 1	PSO 2
CLO-1	To provide a brief Introduction of Hindi poetry (Bhaktikal,Reetikal and Aadhunikkal)	✓	✓	-	-	2	75	60	-	3	3	-	-	-	2	-	-	-
CLO-2	To Discuss the origin and development of various forms of poetry in Hindi	✓	✓	✓	-	2	80	70	2	-	3	-	-	3	-	-	-	-
CLO-3	Focus on Evaluating the social changes through poetry	✓	✓	✓	✓	2	70	65	-	3		3		1	-	-	-	-
CLO-4	To Examine Transcreation in advertisement	✓	✓	✓	✓	2	70	70	3	-	3	-	-	3	-	-	-	-
CLO-5	To guide the students in the learning of the technical aspect of the HindiLanguge,this would help them in the field administration	✓	✓	✓	✓	3	80	70	3	-	-	2	-	-	-	3	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	12	12	12	12	12
SLO-1	BHAKTI KALIN KAVITA	RITI KALIN KAVITA	ADHUNIK KAVITA	VIGYAPAN	PATRA LEKHAN&PARIBHASHIK SHABDAVALI
SLO-2	BHAKTIU KALIN KAITA KI AVADHARNA	AVADHARNA EVM SAWROOP	AVADHARNA EVM SAWROOP	AWADHARNA EVM SAROOP	AVADHARNA EVM SAROOP
SLO-3	SWARUP EVM MAHATWA	RITI KAL VIBHAJAN	MAHATVA EVM UDDESHYA	ARTH EVM PARIBHASHA	ARTH EVM PARIBHASHA
SLO-4	BHAKTIKAL KI PRASANGIKTA	MAHATVA EVM UDDESHYA	MATHLI SHARAN GUPT- NAR HO NA NIRASH KARO MAN KO	VIGYAPAN KE PRAKAR	PRAYOJAN EVM PRYOG
SLO-5	DOHE- KABIRDAS	DOHE- BIHARI	KAVI PARICHAYA EVM KAVITA KA VISHLESHAN	VIGYAPAN KI VISHESHTAYEN	PRAKAR EVM MAHATVA
SLO-6	SANT PARICHAY	KAVI PARICHAYA	SURYAKANT TRIPATHI NIRALA-VAR DE VEENAVADINI VAR DE	VIGYAPAN KA MAHATVA	VYAKTIGAT PATRA

SLO-7	DOHE KA VISLESHAN	DOHE KA VISLESHAN	KAVI PARICHAYA EVM VISHLESHAN	VIGYAPAN KI BHASHA	AUPCHARIK PATRA
SLO-8	GURU KA MAHATVA	DOHE- GHANANAND	NAGARJUN-- AKAL AUR USKE BAD	VIGYAPAN AUR ROZGAR	PARIBHASHIK SHABDAVALI
SLO-9	DOHE- TULSHIDAS	SNEH KI SARLTA KA VARNAN	AKAL KA VASHTAVIK CHITRAN	PRINT EVM ELECTRONIC VIGYAPAN	SHABDAVALI KI AVSHYAKTA
SLO-10	DOHE KA VISLESHAN	PREM KA MAHATVA	KATTIS- BADRINARAYAN	VIGYAPAN KI VYAPAKTA	KARYALYIN SHABDAVALI
SLO-11	DAYA KA MAHATVA	GHANANAND KI KAVYA SHAILI KA MAHATVA	SAMBAND VICCHED KI PARICHARCHA	VIGYAPANLEKHAN KI KALA	EK DIN EK SHABD
SLO-12	RAM KI MAHIMA	DHOHA PARICHARCHA	KAVYA PARICHARCHA	UDDESHYA	HINDI SE ANGREJI AUR ANGREJI SE HINDI SHABD

Resources			
1	Edited Book:“Samanya Hindi”, Srijonlok Publication, 2023, New Delhi.	4	Bhakti AndolanAurSurdasKaKavya – Manager Pandey
2	Kabir – Hazari Prasad Dwedi	5	Bihari – Vishvnath Prasad Mishr
3	Surdas – Ram Chandra Shukl	6	AadhunikVigyapanAurJansampark – Taresh Bhatia

Assessment													**Strategies**					
		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 % weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
	Bloom's Level of Thinking	CLA– 1 (10%)		CLA– 2 (10%)		CLA - 3 (20%)		CLA – 4 * (10%)					Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
													Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	15	15	15	15	10	10	10	10	15	-				Debate	✓		
2	Understand	15	15	15	15	10	10	10	10	15					Interactive Lecture	✓		
3	Apply	20	25	25	20	25	25	25	25	25	-				Brainstorming	✓		
4	Analyze	20	25	25	20	25	25	25	25	25								
5	Evaluate	15	10	10	15	15	15	15	15	10	-							
6	Create	15	10	10	15	15	15	15	15	10	-							
	Total (%)	100	100	100	100	100	100	100	100	100	-	-						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Ms..Reetha Govindan, Senior Manager (Rajbhasha) Ritushivani@Yahoo.Com	1	Dr. S. .Padmapriya, Prof& Head, Pondicherry University, Kalapet, Puducherry-605014. Padmapriya.Srirka@Gmail.Com	1	Dr. S Preeti. Associate Professor & Head, SRMIST- Hod.Hindi.Ktr@Srmist.Edu.In
				2	. Dr. Md. Shwahidul Islam Assistant Professor, SRMIST, shwahidj@Srmist.Edu.In
3	Alumini - Vipin Kumar Jha, Senior Translation Officer Anju.Bipin.Jha@Gmail.Com			3	Dr. S. Razia Begum, Assistant Professor, SRMIST Raziabes@Srmist.Edu.In
				4	Dr. Nisha Murlidharan Assistant Professor, VDP,SRM IST Murulidharan- nishamup@srmist.edu.in

Course Code	ULF24AE2J	Course Title	French – II	Category	A	Ability Enhancement Course	L	T	P	C
							2	0	2	3

Course Offering Department	French	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Strengthen the language of the students both in oral and written
CLR-2	Express their sentiments, emotions, and opinions, reacting to information, situations
CLR-3	Make them learn the basic rules of French Grammar.
CLR-4	Develop strategies of comprehension of texts of different origin
CLR-5	Enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO 1	PSO 2
CLO-1	To acquire knowledge about French language	✓	✓	-	-	2	85	75	3	2	3	-	-	2		-	-	-
CLO-2	To strengthen the knowledge on concept, culture, civilization, and translation of French	✓	✓	✓	-	2	85	75	3	-	2	-	3	-	3	-	-	-
CLO-3	To develop content using the features in French language	✓	✓	✓	✓	3	85	75	-	3		3	3	2		-	-	-
CLO-4	To interpret the French language into other language	✓	✓	✓	✓	3	85	75	2		2	3	-	-	2	-	-	-
CLO-5	To improve the communication, intercultural elements in French language	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2	-	-	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	12	12	12	12	12
SLO-1	Temps libre	Le pronomindéfini on	Vendre	Il faut	Les gallicismes
SLO-2	Les loisirs	Les adjectifsinterrogatifs	Acheter	Le verbe devoir	Les pronomspersonnels COI
SLO-3	Les moments de la journée	Les prépositions avec les noms géographiques	Les aliments	Le verbepouvoir	Le pronom Y
SLO-4	Les matièresscolaires	Les verbes prendre et sortir	Les emballages	Le verbevouloir	Des pronomscompléments
SLO-5	Les activités quotidiennes, Les quotidiennes	Les sons	Les quantités	Demander et dire le prix	Les nombresordinaux
SLO-6	Le temps, L'heure	Parler de ses gouts	Les commerces	Faire des achats	Les verbes écrire et voir
SLO-7	La fréquence	Parler de sespréférences	Les commerçants	Les activités	Le E caduc ou instable
SLO-8	Les sons [u], Les sons [y]	Parler de sa routine	L'impératif	Les activités	Présentersesvœux
SLO-9	L'heure, Quelle heure est-il ?	A la recherche d'un cadeau	Les articles partitifs	Mots et expressions	Présentersesfélicitations
SLO-10	Les pronomspersonnels COD	Temps libre	Trèsou beaucoup (de)	Communication	Répondre à une invitation
SLO-11	Les pronominaux, Se promener, se coucher etc…,	Mots et expressions	Le pronom en (la quantité)	Les sorties	Écrire un message amical

SLO-12	Les verbes du premier groupe, Parler, Demander, Poser	Grammaire– Communication	La phrase négative (2)	Les fêtes	Parler au téléphone

Resources			
1	‘‘La Nouvelle Génération-AI’’ Méthode de français, Marie-Noëlle COCTON, P. DAUDA, L. GIACHINO, C. BARACCO, Les éditions Didier, Paris, 2018.	4	https://www.elearningfrench.com/learn-french-grammar-online-free.html
2	Cahier d’activités avec deux discs compacts.	5	https://www.lawlessfrench.com/grammar
3	https://www.fluentu.com/blog/french/french-grammar	6	https://blog.gymglish.com/2022/12/15/basic-french-grammar

Assessment												**Strategies**					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 * (10%)				Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
												Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	15	15	15	15	10	10	10	10	15	-			Debate	✓		
2	Understand	15	15	15	15	10	10	10	10	15	-			Interactive Lecture	✓		
3	Apply	20	25	25	20	25	25	25	25	25	-			Brainstorming	✓		
4	Analyze	20	25	25	20	25	25	25	25	25	-						
5	Evaluate	15	10	10	15	15	15	15	10	10	-						
6	Create	15	10	10	15	15	15	15	10	10	-						
	Total (%)	100	100	100	100	100	100	100	100	100	-						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. Kavaskar Danasegarane, Language Specialist, Process Expert Maersk Global Service Center Pvt. Ltd Mailkavas18@gmail.com	1	Dr. C. Thirumurugan, Professor, Department of French, Pondicherry University drcthirumurugan@gmail.com	1	Mr. Kumaravel K. Assistant Professor & Head, SRMIST, KTR., hod.french.ktr@srmist.edu.in
2	Mr. Shrivathsan S, Journalist, Senior Sports Reporter/Sub-Editor, Times of India, Chennai shrivathsangilramhanga@gmail.com			2	Miss. Abigail A, Assistant Professor, SRMIST,VDP abigaila@srmist.edu.in
				3	Mrs. M. Mahalakshmi, Assistant Professor , SRMIST, RMP mahalakm2@srmist.edu.in

Course Code	UBT24201J	Course Title	Biochemistry	Category	C	Discipline Core Course	L	T	P	C
							3	0	2	4

Course Offering Department	BIOTECHNOLOGY	Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	NIL

CLR	The purpose of learning this course is to:
CLR-1	Know about carbohydrates and its classification; metabolism of carbohydrates to energy
CLR-2	Have introduction into lipid structure, properties, functions and its synthesis
CLR-3	Have knowledge on amino acid structures, classificationand conformations ofprotein, and urea synthesis
CLR-4	Have a basic knowledge on nucleic acids and its biosynthesis
CLR-5	Know about basic of vitamins and minerals

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLO-1	Understand the concept of classification of carbohydrates and its metabolism for energy production	✓	✓	-	-	2	85	75	3	3	-	-	-	-	-	2	2	-
CLO-2	Know how to classify amino acids, understand the formation of proteins and estimation of proteins	✓	✓	✓	-	2	85	75	3	-	3	-	-	-	-	-	2	-
CLO-3	Understand lipids and estimation of lipids for its structural properties	✓	✓	✓	✓	3	85	75	3	-	-	-	-	-	-	-	2	-
CLO-4	Know about nucleic acids and synthesis of it, followed by structural classification and rule for formation of nucleic acids	✓	✓	✓	✓	3	85	75	3	-	-	-	-	-	-	-	-	-
CLO-5	Know about classification of vitamins, minerals and its estimation	✓	✓	✓	✓	3	85	75	3	-	-	-	-	-	-	-	-	-

Sessions	CLO - 1	CLO – 2	CLO - 3	CLO – 4	CLO - 5
	15	15	15	15	15
SLO-1	Introduction – Carbohydrates & its general classification	Introduction & Classification amino acids- Based on charge & side chains- concept of isoelectric point	Introduction & General Classification of lipids	Introduction- nucleic acid, Structure of Purines &Pyrimidines	Vitamins- Classification- Fat soluble &water soluble Fat soluble vitamins- A, & D
SLO-2	Structure & functions of carbohydrates- Monosaccharides& Disaccharides- straight chain, Ring structures	Properties of amino acids- physical, chemical & biological	Simple lipids- Classification of fats,	Unusual nitrogenous bases	Fat soluble vitamins- E & K

SLO-3	Polysaccharides- Homopolysaccharides – Starch & Glycogen, heteropolysaccharides- hyaluronic acid	Peptide bond, bonds involved in protein structure, conformations of proteins	Structure of a lipid	Students draw the macromolecule structure on the board for better understanding	
SLO-4&5	Preparation of Buffers	Amino acid analysis- Glycine, cysteine	Determination of Saponification Value	Estimation of DNA by diphenylamine method	Estimation of Vitamin B12 using ELISA
SLO-6	heteropolysaccharides- Chondroitin sulphate, Dermatansulphate, keratin sulphate, Heparin	Ramachandran plot	Classification of Oils & Wax	Bonds involved in Nucleic acids	water soluble vitamins- B1, B2
SLO-7	Properties of carbohydrates- Physical, Chemical and biological functions	Introduction & Classification of protein – shape, composition and solubility, biological function	Compounds lipids- Phospholipids, lecithin, Cephalins	DNA double helical structure, Watson & Crick model- Chargaff's rule	Water soluble vitamins- B3, B5
SLO-8	Chemical reactions with carbohydrates	Prediction of secondary structure in protein	Reactions of lipids with various molecules	Forms of DNA- A DNA, B-DNA, Z-DNA	Water soluble vitamins- B6, B12
SLO-9&10	Carbohydrate analysis- Glucose & fructose	Amino acid analysis- Tryptophan, Tyrosine	Determination Of Iodine Number	Estimation of RNA by Orcinol method	Estimation of Vitamin D using ELISA
SLO-11	Introduction to metabolism - Glycolysis pathway, energetics & regulation	Properties of proteins- physical	Compounds lipids- Sphingolipids- Sphingomyelin, Gangliosides, Terpenes	Types of RNA- mRNA, tRNA & rRNA- structure & Function	Macro minerals- Calcium, potassium, magnesium
SLO-12	Citric acid cycle – pathway, energetics & regulation	Properties of proteins- chemical	Derived lipids- cholesterol- Structure and function- derivatives	Purine biosynthesis- IMP	Micro minerals-Manganese, Copper, Zinc
SLO-13	quiz using a technology	quiz using a technology	Biosynthesis of fatty acid-Palmitic acid, Elongation and desaturation	Pyrimidine biosynthesis- UTP	quiz using a technology
SLO-14&15	Carbohydrate analysis- lactose & maltose	Estimation of proteins by Lowry method	Lipid analysis- fats & oils	Repetition of experiments	Repetition of experiments

Resources

1. JAIN, J., JAIN, S., JAIN, N., NAGAR, R., DELHI, N., & JAIN, L. S. H. N. epdf. pub_fundamentals-of-biochemistry.
2. Lehninger, A. L., Nelson, D. L., Cox, M. M. (2005). Principles of biochemistry. United Kingdom: W. H. Freeman.

Assessment													**Strategies**					
		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
	Bloom's Level of	CLA-1		CLA-2		CLA-3		CLA – 4 *					Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
	Thinking	(10%)		(10%)		(20%)		(10%)					Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓		
1	Remember	20	20	20	20	20	20	20	20	20	20				Debate	✓		
2	Understand	20	20	20	20	20	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20							
5	Evaluate	20	20	20	20	20	20	20	20	20	20							
6	Create	-	-		-	-	-	-	-	-	-							
	Total (%)	100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences,(vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. N. Prasanth Bhatt, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24202J	Course Title	Molecular Biology	Category	C	Discipline Core Course	L	T	P	C
							3	0	2	4

Course Offering Department	BIOTECHNOLOGY	Pre-requisite Courses	NIL	Co-requisite Courses	NIL	Progressive Courses	NIL	Data Book / Codes/Standards	NIL

CLR	The purpose of learning this course is to:
CLR-1	Learn about the structure and functions of nucleic acids
CLR-2	Gain knowledge on chromosome types and functions
CLR-3	Understand the central dogma of molecular biology
CLR-4	Learn on the mechanism of transcription
CLR-5	Gain knowledge about the translation process

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	
CLO-1	Gain knowledge on DNA, RNA and Proteins	✓	✓	-	-	2	80	75	3	-	1	-	-	2	1	1	-	-	
CLO-2	Learn about the genome organization	✓	✓	-	-	2	85	80	3	2	-	1	-	-	2	3	2	-	
CLO-3	Apply knowledge on various replication mechanisms	-	✓	✓	-	3	85	80	-	3	2	-	-	-	-	-	-	-	
CLO-4	Apply the concepts of gene expression	✓	-	✓	-	3	80	75	-	2	3	-	-	3	2	-	3	-	
CLO-5	Learn about translation and molecular techniques	✓	-	✓	✓	3	80	75	-	-	3	-	1	2	1	3	3	-	

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	15	15	15	15	15
SLO-1	Molecular Biology - Overview	Prokaryotic genome	Central dogma	Transcription	Genetic code
SLO-2	Nucleic acid as genetic material	Eukaryotic genome	DNA Replication	Prokaryotic transcription	Translation
SLO-3	DNA – structure and functions	Genome organization in prokaryotes	Replication in prokaryotes	Prokaryotic transcription – mechanism	Ribosomes – prokaryotic and eukaryotic
SLO-4&5	Practice: Lab Safety and GLP	Practice: Isolation of genomic DNA	Practice: Isolation of plasmid DNA	Practice: Polymerase chain reaction	Practice: SDS-PAGE
SLO-6	Watson and Crick Model	Genome organization in eukaryotes	Mechanism of replication and enzymes involved	Eukaryotic transcription	Prokaryotic translation
SLO-7	Forms of DNA	Mitochondrial DNA	Rolling circle replication	Eukaryotic transcription – mechanism	Prokaryotic translation - mechanism
SLO-8	RNA – types and structure	Chloroplast DNA	D-Loop replication	Post-transcriptional modifications	Eukaryotic translation

SLO-9&10	Practice: Isolation of genomic DNA	Practice: Isolation of RNA	Practice: Quantification of DNA	Practice: Polymerase chain reaction	Practice: Southern Blotting
SLO-11	Functions of RNA	Chromosome – types and functions	Replication in eukaryotes	5'-capping	Eukaryotic translation - mechanism
SLO-12	Proteins – Types and functions	Fine structure of gene	Mechanism of replication	3'-polyadenylation	Proteins involved in translation
SLO-13	Structure of Proteins	Types of genes	Proteins involved in replication	Splicing	Post-translational modifications
SLO-14&15	Practice: Isolation of genomic DNA	Practice: Agarose gel electrophoresis	Practice: Quantification of RNA	Practice: SDS-PAGE	Practice: Model Examination

Resources

1	David Freifelder. (2015). Essentials of Molecular Biology, 4th Edition, Narosa Publishing House.	3	Gerald Karp. (2015). Karp's Cell and Molecular Biology: Concepts and Experiments, 8th Edition.
2	De Robertis. (2017). Cell and Molecular Biology, 8th Edition, Lea &Febiger.	4	Lewin. (2017). Genes XII, 12th Edition, Jones and Bartlett Publishers.

Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 * (10%)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	20	20	20	20	20	20	20	20	20	20
2	Understand	20	20	20	20	20	20	20	20	20	20
3	Apply	20	20	20	20	20	20	20	20	20	20
4	Analyze	20	20	20	20	20	20	20	20	20	20
5	Evaluate	20	20	20	20	20	20	20	20	20	20
6	Create	-	-	-	-	-	-	-	-	-	-
	Total (%)	100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓		
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

* CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. G. Swamynathan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24203T	Course Title	Enzymology	Category	C	Discipline Core Course	L	T	P	C
							4	0	0	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understanding the classification of enzymes & properties
CLR-2	Knowledge on enzyme involvement in lowering activation energy
CLR-3	Knowledge on different inhibitors and its role
CLR-4	Understanding the importance of coenzymes
CLR-5	Understanding the techniques used for purification of enzymes

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	
CLO-1	Gain knowledge on enzyme classification, nomenclature	✓	✓	-	-	2	80	75	3	-	2	-	-	1	2	-	-	-	
CLO-2	Knowledge on active site amino acids in reactions	✓	✓	-	-	2	85	80	3	-	2	-	-	1	2	-	-	-	
CLO-3	Applying knowledge to design drugs	-	-	✓	✓	3	80	75	3	3	3	-	2	3	3	-	-	-	
CLO-4	Knowledge on coenzymes	✓	-	✓	-	3	85	80	3	3	2	-	-	3	3	-	-	-	
CLO-5	Application of techniques for isolation and purification of enzymes	-	-	✓	✓	3	80	75	3	3	3	2	3	3	3	-	-	-	

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO -5
	12	12	12	12	12
SLO-1	Introduction to Enzymes.Properties and Nomenclature of Enzymes.	Introduction- Chymotrypsin Chymotrypsin mechanism Acylation phase	Inhibition introduction Reversible inhibition- competitive	TPP- Structure and functions Reactions involving TPP	Purification of soluble enzymes- electrophoresis
SLO-2	Classification - IUB system- group I, II, III, IV, V, VI	Chymotrypsin mechanism deacylation phase, Lysozyme Introduction	Deviation in MM equation- in the presence of Competitive inhibitor, Uncompetitive inhibition	Pyridoxal phosphate- Structure and functions, Reactions involving PLP	Purification of membrane bound enzymes-chromatography
SLO-3	Factors affecting enzyme action- Effect of temperature, PH, and substrate concentration on reaction rate.	Regulation of enzyme activity- Introduction, covalently modified enzymes.	Deviation in MM equation- in the presence of Uncompetitive inhibitor	Lipoic acids- Precursor, Structure and functions	Purification of membrane bound enzymes-electrophoresis

SLO-4	Factors affecting enzyme action-substrate and inhibitor concentration on reaction rate.	Allosteric enzymes	Comparison of all the 3 inhibitors Line-weaver Burk plot	Reactions involving THF	Enzyme Immobilization- Physical method
SLO-5	Enzyme specificity: Group specificity, absolute specificity, Stereospecificity, Bond Specificity	Multienzyme complex, Isoenzymes-CK, LDH	Irreversible inhibition, Suicidal inhibition	Vitamin B12- Structure and functions, Reactions involving Vitamin B-12	Chemical method, Entrapment and encapsulation.
SLO-6	Purity of enzymes- Enzyme activity, Specific activity.	Kinetics introduction Steady state kinetics and pre-steady state kinectics.	Introduction-coenzymes	Enzyme isolation introduction	Enzyme Immobilization – Applications
SLO-7	Enzyme units- Katal& IU, Metalloenzymes and metal activated enzymes	MichaelisMenten Equation assumptions, Derivation of MM equation	Classification of coenzymes, Functions of coenzymes	Steps of enzyme purification, Physical method of enzyme isolation	Industrial application of immobilized enzymes, Industrial applications of enzyme- amylase
SLO-8	Active site -3D structure, Ribozymes	Modified MM Equation Difference between MM and modified MM equation	Reactions involving NAD	chemical methods of enzyme isolation	Industrial applications of enzyme-protease
SLO-9	Introduction to ES complex, Activation energy, collision theory, transition state theory.	Significance of MM equation Kcat, Kcat/Km	NADP- Precursor, Structure and functions Reactions involving NADP	Biological methods of enzyme isolation	Introduction to enzyme application in clinical field
SLO-10	Lock and key Hypothesis., Induced fit Hypothesis	Drawback of MM equation, Line-weaver Burk plot	FAD- Precursor, Structure and functions	Preliminary purification Salting in, salting out	Clinical applications of enzymes-LDH3, 4, 5
SLO-11	Mechanismof enzyme catalysis-Acid-base catalysis, covalent catalysis.	Importance of Line-weaver Burk plot Drawback of LB plot	Reactions involving FAD, FMN-Precursor, Structure and functions	Dialysis, Soluble enzymes & membrane bound enymes	Clinical applications of enzymes - SGOT, SGPT
SLO-12	Metal ion catalysis, Proximity and orientation	Eadie-Hofstee plots, Importance of Eadie-Hofstee plot	Reactions involving FMN, Comparing NAD, NADP, FAD & FMN in oxidation reduction reaction.	purification of soluble enzymes-chromatography	Abzymes introduction

Resources			
1	Nicholas C. Price., Lewis Stevens, (2003). Fundamentals of Enzymology, Oxford University Press, 2003.	3	Lehninger, A. L., Nelson, D. L., Cox, M. M. (2005). Lehninger principles of biochemistry. United Kingdom: W. H. Freeman.
2	Trevor Palmer., Philip Bonner, (2004). Enzymes - Biochemistry, Biotechnology, Clinical chemistry, 2nd edition, East-West Press Pvt. Ltd.	4	Prakash, M., DigmartiBhaskaraRao,Jena T, Enzyme Biotechnology, 1st edition, Discovery Publication, 2010.

Assessment								Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1	CLA – 2	CLA– 3	CLA– 4 *			Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)	(10%)	(20%)	(10%)			Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	30	30	30	10	30				Debate	✓	Life on Land	✓
2	Understand	20	20	20	10	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20							
5	Evaluate	10	10	10	30	10							
6	Create	-	-	-	-	-							
	Total (%)	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. G. Swamynathan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UCD24V01T	Course Title	Essentials of Artificial Intelligence	Category	V	Value Added Course	L	T	P	C
							1	0	0	1

Course Offering Department	Computer Applications	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Study the basics of designing intelligent agents that can solve general purpose problems'
CLR-2	Discover appropriate AI methods to solve a given problem
CLR-3	Perform intellectual task as decision making, problem solving, perception, understanding
CLR-4	Formalize a given problem using different AI methods
CLR-5	Provides adaptive learning

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	Leadership Qualities, Professionalism, Autonomy,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO 1	PSO 2	
CLO-1	Demonstrate fundamental understanding of the history of artificial intelligence and its foundations	✓	✓	-	-	2	85	75	3	-	-	1	2	1	-	-	-	1	
CLO-2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	✓	✓	✓	-	2	85	75	2	-	1	-	2	2	-	1	-	1	
CLO-3	Identify systems with Artificial Intelligence. evaluation of different algorithms on a problem formalization	✓	✓	✓	✓	3	85	75	2	2	2	-	2	1	-	1	-	2	
CLO-4	Use classical Artificial Intelligence techniques, such as search algorithms	✓	✓	✓	✓	3	85	75	3	-	2	-	2	2	-	2	-	-	
CLO-5	Ability to apply Artificial Intelligence techniques for problem solving.	✓	✓	✓	✓	3	85	75	2	2	-	-	2	-	-	-	-	-	

Sessions	CLO – 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	Introduction to Artificial Intelligence	Logical Reasoning and First order logic	Unification and State Space Search	Planning Graphs	Probability Theory and Temporal Models
	3	3	3	3	3
SLO-1	Introduction to Artificial Intelligence, History of Artificial Intelligence- AI models,	Logical Reasoning-Introduction-Knowledge Representation	Unification and Conditions, Unification algorithm	Partial-order planning, planning graphs	Probability Theory, Uncertain Knowledge, Axioms of probability.
SLO-2	Problem Solving with Artificial Intelligence- ProblemSolving Process	Logical Agents, Knowledge basedAgents, Syntax of First order logic, Basic elements of First order logic	Planning: designing programs to search for data or solutions to problem.	Uses of planning graph, Planning and acting in the realworld	Bayes Theorem, Bayes' Rules & uses, Bayesian networks, Types of Bayesian Network

SLO-3	Problem Types, Characteristics and Representation-Agents- Examples of Agents, Types of agents	Forward chaining andBackward Chaining- Properties Examples	State-space search, Problems to solve: Water Jug Problem, State representation: Initial, operator, goal state	Forward march, Backward march and Limited resources	Temporal models, Hidden Markov models, HMM components

Resources			
1	Russel.SandNorvig.P, (2003), "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education	2	S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education

Assessment					
	Bloom's Level of Thinking	**Continuous Learning Assessment (CLA) (100% weightage)**			
		CLA – 1	**CLA – 2**	**CLA – 3**	**CLA – 4 ***
		(20%)	**(20%)**	**(40 %)**	**(20 %)**
		Theory (%)	**Theory (%)**	**Theory (%)**	**Theory (%)**
1	**Remember**	15	15	10	10
2	**Understand**	15	15	10	10
3	**Apply**	20	25	25	25
4	**Analyze**	20	25	25	25
5	**Evaluate**	15	10	15	15
6	**Create**	15	10	15	15
Total (%)		100 -	100	100	100 -

Strategies					
Technology		**Pedagogy / Andragogy**		**Sustainable Development**	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		**Higher Institution Experts**		**Internal Experts**	
1	Mr. Jothi Periaswamy, Founder/Chief Data Scientist, Deep Sphere AI, 2 Venture Drive, #13-26 Vision Exchange, Singapore, 608526	1	Dr. S. Gopinathan, Professor and Head, Department of Computer Science, University of Madras, Guindy Campus,,Chennai-600025	1	Dr. S. Belina V J Sara, SRMIST KTR Campus

Course Code	UCD24S02L	Course Title	Quantitative Aptitude and Logical Reasoning	Category	S	Skill Enhancement Courses	L	T	P	C
							0	0	2	1

Course Offering Department	Career Guidance	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Illustrate the application of different principles in solving mathematical problems
CLR-2	Foster students' curiosity and understanding of concepts related to profit/loss, interest computation, and averages
CLR-3	Analyze fundamental mathematical concepts concerning permutation and combination, as well as time and work, with a critical perspective
CLR-4	Equip students with the abilities essential for generating and comprehending data, focusing on topics such as cubes, dices and blood relations
CLR-5	Empower students to grasp the fundamentals of reasoning

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving, Critical Thinking, Creativity Solving	2 Communication Skills, Collaborating Skills	3 Independent Thinking, Analytical Reasoning, Learning to Learn ,Research Skills	4 Leadership Qualities, Professionalism, Autonomy, Accountability	5 Digital Technology Skills	6 Value Inculcation, Multicultural inclusivity	7 Environmental Action, Community Engagement	8 Entrepreneurial Risk Taking	9 PSO 1	10 PSO 2
CLO-1	Grasp, evaluate, and tackle problems involving numbers and percentages	✓	✓	-	-	2	85	75	3	1	3	-	2	2	-	-	-	-
CLO-2	Develop, solve, interpret, and apply fundamental mathematical models relevant to everyday situations	✓	✓	✓	-	2	85	75	3	1	3	-	2	2	-	-	-	-
CLO-3	Realize the principles of permutation and combination, probability, time and work, and adopt simplified and innovative approaches to problem- solving	✓	✓	✓	✓	3	85	75	3	1	3	-	2	2	-	-	-	-
CLO-4	Comprehend the concepts of data interpretation, data sufficiency, coding and decoding	✓	✓	✓	✓	3	85	75	3	1	3	-	2	2	-	-	-	-
CLO-5	Solve logical puzzles and reasoning challenges	✓	✓	✓	✓	3	85	75	3	1	3	-	2	2	-	-	-	-

Sessions per week	CLO – 1 6	CLO - 2 6	CLO - 3 6	CLO - 4 6	CLO - 5 6
SLO-1	Classification of numbers and Test of divisibility	Profit and Loss	Permutation and Combination	Cubes and Dice	Direction Sense
SLO-2	Unit digit and Trailed zeroes	Ratio and Proportions	Problems on Probability	Data Interpretation	Number Series and Word Series
SLO-3	Problems on HCFand LCM	Simple Interest and Compound Interest	Time and work - Men and Work	Data sufficiency	Odd man out Missing Number and Wrong Number
SLO-4	Problems on Partnership	Word problems on Linear and Simultaneous Equations	Time and Work - Pipes and Cisterns	Seating Arrangements – Linear and Circular	Puzzles - Concepts & Problems Syllogisms - Concepts & Problems
SLO-5	Problems on Percentage	Problems on Averages	Time, Speed and Distance - Problems on Trains	Problems on Blood Relations	Problems on Clocks
SLO-6	Percentage - Increasing & Decreasing functions	Mixtures and Alligations	Time, Speed and Distance - Boats & Streams	Coding – Decoding	Problems on Calendars

Resources			
1	Abhijit Guha,QuantitativeAptitudeforCompetitiveExaminations,TataMcGrawHill,5thEdition	4	Dr. Agarwal. R. S,QuantitativeAptitudeforCompetitiveExaminations,S.ChandandCompanyLimited,2018Edition
2	Archana Ram, Place Mentor:TestsofAptitudeforPlacementReadiness,OxfordUniversityPress,Oxford,2018	5	EdgarThrope,TestofReasoningforCompetitiveExaminations,TataMcGrawHill,6th Edition
3	Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for competitive examinations, Pearson,3rd Edition	6	PAAnand,QuantitativeAptitudeforcompetitiveexaminations,Wileypublications,ebook,2019

Assessment						Strategies					
		Continuous Learning Assessment (CLA) (100% weightage)				Technology		Pedagogy / Andragogy		Sustainable Development	
	Level of Thinking	CLA – 1 (20 %)	CLA – 2 (20 %)	CLA – 3 (30 %)	CLA – 4 (30 %)	Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	
						Presentation Tools	✓	Group Discussion		Quality Education	✓
		Practice	Practice	Practice	Practice	Learning Management System	✓	Hands-on Practice	✓	Gender Equality	
1	Remember	20	10	20	10			Debate			
2	Understand	20	10	20	10			Interactive Lecture	✓		
3	Apply	20	20	20	20			Brainstorming	✓		
4	Analyze	20	20	20	20						
5	Evaluate	10	20	10	20						
6	Create	10	20	10	20						
	Total	100 %	100 %	100 %	100 %						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. P. Chockalingam, Senior Lead Software Engineer, Virtusa Consulting Services Private Ltd, DLF IT Park SEZ, Chennai – 600089 p.chockalingam1986@gmail.com	1	Dr. G. SaravanaPrabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeetham, Coimbatore - 641112 g_saravanaprabu@cb.amrita.edu	1	Dr. Sathish K, HOD, Department of Career Guidance Cell, FSH,SRMIST hod.dcgc.ktr@srmist.edu.in
				2	Dr.AarthiS,AssistantProfessor,DepartmentofCareerGuidanceCell,FSH,SRMIST aarthis4@srmist.edu.in

Course Code	UNS24Y01L / UNC24Y01L / UNO24Y01L / UYG24Y01L	Course Title	NSS / NCC / NSO / YOGA	Category	Y	Mandatory Course	L	T	P	C
							0	0	0	0

Course Offering Department	NSS	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understand themselves in relation to their community
CLR-2	Develop among themselves a sense of social and civic responsibility
CLR-3	Utilize their knowledge in finding practical solution to individual and community problems
CLR-4	Develop competence required for group-living and sharing of responsibilities
CLR-5	Acquire leadership qualities and democratic attitude

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning, Learning to Learn, Research Skills	Leadership Qualities, Professionalism, Autonomy, Accountability	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	EntrepreneurialRiTaking	PSO 1	PSO 2	
CLO-1	realize themselves in relation to their community	✓	✓	-		2	85	75	3	-	-	1		3	3	2			
CLO-2	Develop among themselves a sense of social and civic responsibility	✓	✓	✓		2	85	75	3	2	1	2		3	3	1			
CLO-3	find practical solution to individual and community problems	✓	✓	✓	✓	3	85	75	3	1	3	1		3	3	1			
CLO-4	Develop competence required for group-living and sharing of responsibilities	✓	✓	✓	✓	3	85	75	3	3	2	3		3	3	2			
CLO-5	develop leadership qualities and democratic attitude	✓	✓	✓	✓	3	85	75	3	3	2	3		3	3	3			

Assessment is Fully Internal

Assessment							Strategies					
		Continuous Learning Assessment (CLA) (100% weightage)					Technology		Pedagogy / Andragogy		Sustainable Development	
	Bloom's Level of Thinking	CLA – 1 *	CLA – 2 *	CLA – 3 *	CLA – 4 *		Simulations		Clarification/Pauses		Good Health & Well Being	✔
		(20%)	(30%)	(30%)	(20 %)		Presentation Tools		Group Discussion	✔	Quality Education	
		Practice (%)	Practice (%)	Practice (%)	Practice (%)		Learning Management System		Hands-on Practice	✔	Gender Equality	✔
1	Remember	20	20	20	20				Debate	✔		
2	Understand	20	20	20	20				Interactive Lecture	✔		
3	Apply	40	40	40	40				Brainstorming			
4	Analyze	20	20	20	20							
5	Evaluate											
6	Create											
	Total (%)	100	100	100	100							

***CLA s are evaluated based on (i) participation in awareness programmes, (ii) participation in outreach programme, (iii) Community Services (iv) Camps (National, State, Regional)**

Resources	
1.	NSS Manual (Revised), Govermnment of India

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr Samuel Chellaiya C Regional Director, NSS Government of India	1	State Officer, NSS Tamil Nadu NSS	1	Dr Prakash V, NSS Coordinator, SRMIST, AP, department of Economics, FSH, SRMIST Prakashv2@srmist.edu.in
				2	Dr Yogalakshmi, NSS Programme Officer, FSH, SRMIST.

SEMESTER - III

Course Code	UBT24301J	Course Title	Genetic Engineering	Category	C	Discipline Core Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understand the fundamental of restriction enzymes and DNA modifying enzymes
CLR-2	Gain knowledge on vectors
CLR-3	Understand the various methods of gene transfer
CLR-4	Understand the methodology of gene cloning and selection.
CLR-5	Understand the methods amplification and interpretation

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO-1	Describe the biological role and mechanism of restriction enzymes and DNA modifying enzymes	✓	✓	-	-	2	85	75	3	2	-	-	-	2	1	1	2	-
CLO-2	Differentiate types of vectors and their application	✓	✓	✓	-	2	85	75	3	-	-	-	-		1	1	-	-
CLO-3	Select the suitable gene transfer method based on the need	✓	✓	✓	✓	3	85	75	-	1	-	3	-	2		-	2	-
CLO-4	Explain the concept of gene cloning	✓	✓	✓	✓	3	85	75	2	-	-	3	-	-	2	-	-	-
CLO-5	Analyse and interpret the data of PCR and variant PCR experiments.	✓	✓	✓	✓	3	85	75	-	1	-	3	-	2	-	-	2	-

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO - 4	CLO - 5
	15	15	15	15	15
SLO-1	Genetic Engineering- Introduction and scope of Genetic Engineering	Introduction to cloning vectors- Plasmids	Gene transfer methods- introduction	Gene cloning -Strategy	PCR and its application
SLO-2	Discovery of Restriction Enzymes, Nomenclature of Restriction enzymes	Phagemid, Cosmid and Ti plasmids	Physical method of gene transfer- Microinjection, Electroporation.	Steps of cloning	Reverse-transcriptase PCR
SLO-3	Types of RE -I	Bacteriophage vectors	Physical method of gene transfer- shot gun method, ultrasonication.	Choice of cloning vectors	Real-time –PCR
SLO-4&5	Practice: Buffer preparation.	Practice: Agarose gel Electrophoresis	Practice: Preparation of competent cell	Practice: Isolation of RNA	Practice: PCR

SLO-6	Types of RE -II	Yeast plasmid vectors	Chemical method of gene transfer- liposomes mediated transfer, DEAE mediated transfer.	Selection of host organism	Assymetric PCR
SLO-7	Types of RE -III	Bacterial Artificial Chromosomes Yeast Artificial Chromosomes.	Chemical method of gene transfer- calcium mediated transfer.	Preparation of vector	Nested PCR
SLO-8	Factors affecting RE, Star activity	Plant virus vectors	Agrobacterium mediated transfer	Preparation of DNA to be cloned	Multiplex PCR
SLO-9&10	Practice: Isolation of Genomic DNA	Practice: Restriction digestion of DNA by ECoRI and HindIII	Practice: Transform the competent cells in into EcoKI bacteria	Practice: Quantification of RNA by spectrophotometer	Practice: Real-Time PCR
SLO-11	Linkers and adaptors	Animal virus vectors	Agrobacterium mediated transfer	Preparation of recombinant DNA	RFLP
SLO-12			Virus mediated transfer- DNA		
SLO-13	DNA modifying enzymes- DNA ligase, polynucleotide kinase	Expression Vectors	Virus mediated transfer- RNA	Selection methods of recombinants	AFLP
SLO-14&15	Practice: Quantification of Genomic DNA by spectrophotometer	Practice: Ligation of restricted fragment of ECORI and Hind III	Practice: Identification of recombinants –Blue-white colony selection	Practice: PCR	Practice: Real-Time PCR

Resources

1	Brown, T.A. (2006). *Gene Cloning and DNA Analysis*. 5th edition. Blackwell Publishing, Oxford, U.K.	3	Glick, B.R., & Pasternak, J.J. (2003). *Molecular Biotechnology- Principles and Applications of recombinant DNA*. ASM Press, Washington
2	Primrose, S., & Twyman, R.M. (2006). *Principles of Gene Manipulation and Genomics*, 7th edition. Blackwell Publishing, Oxford, UK	4	Glick, B. R., & Pasternack, J. J. (2003). *Molecular biotechnology*. American Society for Microbiology.

Assessment													Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1		CLA – 2		CLA– 3		CLA– 4 *					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)		(10%)		(20%)		(10%)					Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20	20	20	20	20	20				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20							
5	Evaluate	20	20	20	20	20	20	20	20	20	20							
6	Create	-	-	-	-	-	-	-	-	-	-							
	Total (%)	100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. S. Vijaya Bharathi, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24302J	Course Title	Computational Biology	Category	C	Discipline Core Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understand the decoding of DNA and its importance
CLR-2	Analyze the genome sequences and compare them for better understanding
CLR-3	Generate the 3D structure of proteins offering clues to their function
CLR-4	Provide access to chemical information in database and their representation in structure searching
CLR-5	Learn the inventive process of finding new drugs based on knowledge of target molecules

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO-1	Understand the simulation of biological systems using computational platforms	✓	✓	-	-	2	85	75	3	2	-	-	-	2	1	1	2	-
CLO-2	Collectively characterize and quantify organism, genes and proteins by sequence analysis	✓	✓	✓	-	2	85	75	3	-	-	-	-		1	1	-	-
CLO-3	Gain knowledge on CADD	✓	✓	✓	✓	3	85	75	-	1	-	3	-	2		-	2	-
CLO-4	Understand the strength of intermolecular interaction between the small molecules	✓	✓	✓	✓	3	85	75	2	-	-	3	-	-	2	-	-	-
CLO-5	Understand the study of computational analysis of whole genome and its applications	✓	✓	✓	✓	3	85	75	-	1	-	3	-	2	-	-	2	-

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO – 4	CLO - 5
	15	15	15	15	15
SLO-1	Biological databases and their classification	Block Based Alignment	Eukaryotes – Genome Structure	Transmembrane protein prediction – helix	Introduction to Molecular Docking
SLO-2	Genome database	Phylogeny Construction – UPGMA	Gene prediction methods - Ab initio method	Transmembrane protein prediction – beta sheet	Types & methods of docking
SLO-3	Motif Databases – SCOP, CATH	Phylogeny Construction – NJ	NN Method	Coiled Coil prediction	Applications of Docking
SLO-4&5	Retrieval of database sequences & Format	BLAST	ORF Prediction	Rasmol	Molecular docking
SLO-6	Dot Matrix	Prokaryotes – Genome Structure	DA method	Protein Tertiary structure	Drug Discovery
SLO-7	Dynamic Programming	Conventional method of Gene prediction	Homology Based Method	Protein 3D structure prediction methods	Characteristics of Drug compounds

SLO-8	BLAST	Computational method – Ab initio method	Consensus method	Homology Modelling	Drug Discovery Pipeline Process
SLO-9&10	Retrieval of database sequences & Format	Global Alignment & Local Alignment	Secondary Structure Prediction	Chemsketch	ADMET
SLO-11	FASTA.	HMM	Protein secondary structure – usual and rare conformations	Fold Recognition	Drug Discovery Pipeline Process
SLO-12	Progressive Alignment	Homology method	Globular protein prediction – Chou Fasman	Ab initio method	Drug Development Process
SLO-13	Iterative Alignment	Performance Evaluation	GOR method	Computational tools for gene and structure prediction	ADMET Analysis
SLO-14&15	Retrieval of database sequences & Format	Multiple sequence alignment	Tertiary Structure Prediction - Swiss Model	Molecular docking	Model Practical exam

Resources			
1	Mount, D. W. (2004). *Bioinformatics*-sequence and genome analysis	3	Baxevanis, A.D., Francis Ouellette, B.F. (2009), *Bioinformatics*, Wiley.
2	Arthur, M. (2005). *Introduction to bioinformatics*. oxford university press.	4	Zhumur Ghosh., Bibekanand Mallick. (2009). *Bioinformatics: Principles and Applications*, OUP India.

Assessment													Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1		CLA – 2		CLA– 3		CLA– 4 *					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)		(10%)		(20%)		(10%)					Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20	20	20	20	20	20				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20							
5	Evaluate	20	20	20	20	20	20	20	20	20	20							
6	Create	-	-	-	-	-	-	-	-	-	-							
	Total (%)	100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. Vidhya V.G, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24303J	Course Title	Biophysics and Bioinstrumentation	Category	C	Discipline Core Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understand the Principle, Instrumentation and working method of spectroscopy techniques
CLR-2	Gain knowledge on principle and applications of chromatography technique.
CLR-3	Gain knowledge on applications of centrifugation in biomolecule separation.
CLR-4	Understand the importance of Electrophoresis in separation and purification of biomolecules
CLR-5	Understand the safety and proper handling of radioisotopes

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	
CLO-1	Analyse and interpret the result of Spectroscopy	✓	✓	-	-	2	85	75	3	2	-	-	-	2	-	3	2	-	
CLO-2	Apply the technique for separation of biomolecules.	✓	✓	✓	-	2	85	75	3	-	2	-	-	2	3	1	1	-	
CLO-3	Select the centrifugation technique based on the need.	✓	✓	✓	✓	3	85	75	2	-	-	-	-	2	-	1	-	2	
CLO-4	Apply the technique for separation and purification of biomolecules.	✓	✓	✓	✓	3	85	75	2	2	2	-	-	-	2	2	2	-	
CLO-5	Gain knowledge on safe handling of radioisotopes.	✓	✓	✓	✓	3	85	75	2	-	-	3	-	2	-	1	1	-	

Sessions	CLO – 1	CLO – 2	CLO – 3	CLO - 4	CLO - 5
	15	15	15	15	15
SLO-1	Spectroscopy- Introduction	Chromatography -introduction	Cell disruption -Introduction	Electrophoresis- Introduction	Radioisotopes Introduction
SLO-2	Electromagnetic spectrum	Principle of Paper chromatography	Cell disruption methods	Factors affecting migration rate	Radioactivity
SLO-3	UV-Vis spectroscopy - Instrumentation	Procedure – paper chromatography	Centrifugation- Introduction	Types of electrophoresis	Radioactive decay
SLO-4&5	Practice: GLP-1	Practice: Thin layer chromatography	Practice: Agarose gel electrophoresis	Practice: SDS PAGE	Practice: Blotting-Result and Discussion
SLO-6	Application of UV-Vis	Principle of TLC	Principle of centrifugation	Agarose gel electrophoresis	Measurement of radioactivity
SLO-7	Instrumentation, procedure and application of Fluorescence Spectroscopy	Gel filtration chromatography	Types of centrifugation	SDS- PAGE	GM counter and applications

SLO-8	Mass spectroscopy- principle, Instrumentation and application	Ion exchange chromatography	Types of rotor- components and handling of rotors	Native PAGE	Scintillation counting
SLO-9&10	Practice: UV – Visible Spectroscopy for sample purification	Practice: Column chromatography.	Practice: Protein dialysis	Practice: Western blotting	Practice: Southern blotting
SLO-11	Atomic Spectroscopy- Instrumentation and applications	Affinity Chromatography	Differential centrifugation	2D- Electrophoresis	Autoradiography
SLO-12	Principle, Instrumentation of Nuclear magnetic resonance	Gas Liquid chromatography	Density gradient centrifugation	Blotting introduction	Applications of radioisotopes
SLO-13	Applications of NMR	HPLC	Isopycnic centrifugation	Western blotting	Safety handling of radioisotopes
SLO-14&15			Practice: SDS PAGE		

Resources			
1	Wilson, K., Hofmann, A., Walker, J. M., & Clokie, S. (Eds.). (2018). *Wilson and Walker's principles and techniques of biochemistry and molecular biology*. Cambridge university press.	3	Srivastava, M. L. (2011). *Bioanalytical Techniques*. Narosa Publishing House.
2	Upadhyay, A. (2019). *Biophysical Chemistry* (3rd ed.). Himalaya Publication.	4	Plummer, D. T. (2017). *An introduction to practical biochemistry* (3rd ed.). Tata McGraw Hill.

Assessment													Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1		CLA – 2		CLA– 3		CLA– 4 *					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)		(10%)		(20%)		(10%)					Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20	20	20	20	20	20				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20							
5	Evaluate	20	20	20	20	20	20	20	20	20	20							
6	Create	-	-	-	-	-	-	-	-	-	-							
	Total (%)	100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. S. Vijaya Bharathi, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24P01L	Course Title	Internship – I	Category	P	Project Work / Internship	L	T	P	C
							0	0	0	1

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
CLR - 1	Demonstrate skills learnt in the real time environment	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	
CLR - 2	Explore the different industries that are using IT																		
CLR - 3	Enhance the skills in the system aspects																		
CLR - 4	Understanding the professional connections with the knowledge learnt																		
CLR - 5	Applying the skills in problem solving																		
CLO	At the end of this course, learners will be able to:																		
CLO - 1	To get an inside view of an industry and organization/company	✓	✓	-	-	2	85	75	1	1	3	-	3	2	3	2	2	2	
CLO - 2	To gain valuable skills and knowledge	✓	✓	✓	-	2	85	75	1	2	1	-	3	2	3	2	2	2	
CLO - 3	To make professional connections and enhance networking	✓	✓	✓	✓	3	85	75	1	2	1	-	3	3	3	2	1	2	
CLO - 4	To get experience in a field to allow the student to make a career transition	✓	✓	✓	✓	3	85	75	1	2	2	3	3	3	3	2	2	2	
CLO - 5	To get an inside view of an industry and organization/company	✓	✓	✓	✓	3	85	75	1	1	1	2	3	3	3	2	2	2	

Students can choose problems of their own interest to develop solutions using available facilities. There will be two reviews conducted during the project period for all the students. At the end of the project, every student shall submit a structured project report and will take a Viva Voce examination

Assessment				
Internship	Continuous Learning Assessment (CLA) (50% weightage)		Final Assessment (50 %weightage)	
	Review -1	Review - 2		
	20 %	30 %	Project Report 30 %	Viva-Voce 20 %

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. D. Senbagam, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

SEMESTER IV

Course Code	UBT24401J	Course Title	Bioprocess Technology	Category	C	Discipline Core Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth			
		1	2	3	4
		Conceive	Design	Implement	Operate
CLR - 1	Understanding the basic concepts of bioprocess technology				
CLR - 2	Understanding the techniques used for fermentation				
CLR - 3	Knowledge on bioreactor				
CLR - 4	Knowledge on the downstream process				
CLR - 5	Knowledge on industrial production				

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO - 1	To understand the methods of isolation and strain improvement	✓	✓	-	-	2	80	75	3	-	2	-	1	-	-	1	1	-
CLO - 2	Having knowledge on design of bioreactor	✓	✓	✓	-	2	85	80	-	3	-	-	-	1	-	-	2	-
CLO - 3	Applying knowledge to understand the different types of fermenters	✓	✓	✓	✓	3	85	80	-	3	-	-	1	-	-	-	-	-
CLO - 4	Having knowledge on downstream processing methods	✓	✓	✓	✓	3	80	75	3	2	1	-	1	1	-	1	-	-
CLO - 5	Applying techniques to the production of valuable products	✓	✓	✓	✓	3	80	75	2	3	1	-	-	1	-	1	-	-

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO - 4	CLO - 5
	15	15	15	15	15
SLO - 1	Introduction to bioprocess Technology	Microbial growth kinetics: Introduction	Continuous fermentation	Membrane bioreactor	Purification of products
SLO - 2	Media for industrial fermentations	Fermenter- introduction	Functions of fermenter	Bubble column bioreactor	Product finishing
SLO - 3	Sterilization techniques	Design of fermenter	Troubleshooting of bioreactors	Downstream processing Introduction	Ethanol production
SLO - 4 & 5	Practice: Isolation of starch /cellulose degrading microorganism	Practice: Growth kinetics	Practice: Cell/Enzyme immobilization in alginate/polyacrylamide	Practice: Production of wine	Practice: Mushroom Cultivation
SLO - 6	Isolation of microorganisms	Parts of fermenter	Types of fermenters	Intracellular products and extracellular products	Citric acid production
SLO - 7	Screening of microorganisms	Computer's role in fermenter	Stirred tank (continuous) bioreactor	Separation techniques	Penicillin production

SLO - 8	Preservation techniques	Modes of operation of fermenter	Airlift bioreactor	Cell disruption mechanical and physical methods	Beer production
SLO - 9 & 10	Practice: Isolation of starch /cellulose degrading microorganism	Practice: Optimization of culture conditions for amylase production	Practice: beer production	Practice: Mushroom Cultivation	Practice: Beer production
SLO - 11	Inoculum preparation	Types of fermentation	Packed tower (Bed) bioreactor	Chemical methods	Bioplastic production
SLO - 12	Strain improvement	Batch fermentation	Fluidized bed bioreactor	Enzymatic methods	PHA production
SLO - 13	Mutation and recombination	Fed batch fermentation	Photobioreactor	Removal of insoluble and soluble products	Vermicompost
SLO - 14 & 15	Practice: Growth kinetics.		Practice: Production of wine		

Resources			
1	Douglas, S. C., & Harwey, W. B. (1996). *Biochemical Engineering* (2nd ed.). CRC Press	3	Shuler, M. L., & Kargi, F. (2002). *Bioprocess engineering: basic concepts* (2nd ed.). Prentice Hall PTR
2	Yoshida, T. (2017). *Applied bioengineering - innovations and future directions*. Wiley-VCH.	4	Najafpour, G. D (2007). *Biochemical engineering and biotechnology* (2nd ed.). Elsevier Science.

Assessment													Strategies					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA - 1 (10 %)		CLA - 2 (10 %)		CLA - 3 (20 %)		CLA - 4 * (10 %)					Simulations	✓	Clarification/Pauses	✓	Industry, Innovation & Infrastructure	✓
													Presentation Tools	✓	Group Discussion	✓	Responsible Consumption and Production	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓		
1	Remember	30	30	30	20	30	20	-	-	30	20				Debate	✓		
2	Understand	20	30	20	20	20	20	30	30	20	20				Interactive Lecture	✓		
3	Apply	30	20	40	30	20	30	30	30	20	30				Brainstorming	✓		
4	Analyze	-	-	10	20	10	20	20	20	10	20							
5	Evaluate	20	-	-	-	10	-	20	20	10	-							
6	Create	-	20	-	-	10	-	-	-	10	-							
Total (%)			100	100	100	100	100	100	100	100	100	100						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. P. Parthipan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D01T	Course Title	Biostatistics	Category	D	Disciple Core / Elective Course	L	T	P	C
							4	0	0	4

Course Offering Department	Mathematics & Statistics	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of taking this course is to:
CLR-1	To provide foundations in Data Collection, Classification and Presentation of Data
CLR-2	To understand the Concepts of Measures of Tendency
CLR-3	To understand the Concepts of Measures of Dispersion
CLR-4	To acquire the knowledge of Correlation and Regression Analysis
CLR-5	To understand and interpret data using Testing of Hypothesis based on large and small sample.

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1 Conceive	2 Design	3 Implement	4 Operate	1 Bloom's Level of	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Problem Solving	2 Critical Thinking	3 Creativity	4 Communication Skills	5 Analytical Reasoning	6 Research Skills	7 Collaborating Skills	8 Leadership Qualities	9 PSO -1	10 PSO -2
CLO-1	To acquire the knowledge of data, classification and presentation commonly used in Health and Medical Sciences	✓	✓	-	-	2	85	75	2	2		1	2	2				
CLO-2	To calculate descriptive statistics - averages from these data.	✓	✓	✓	-	2	85	75	3	3		1	2	2				
CLO-3	To calculate descriptive statistics - dispersion from these data.	✓	✓	✓	✓	3	85	75	3	3		1	2	2				
CLO-4	To acquire the skill of analysing the relationship between the independent and dependent variables	✓	✓	✓	✓	3	85	75	3	3		1	2	2				
CLO-5	To apply hypothesis testing via some of the statistical distributions and interpret the results	✓	✓	✓	✓	3	85	75	3	3		1	2	2				

Sessions	CLO-1	CLO-2	CLO-3	CLO-4	CLO-5
	12	12	12	12	12
SLO-1	Introduction - Biostatistics	Measures of central tendency	Measures of Dispersion-Definition-Methods of Dispersion	Definition of Bi-variate distribution, Definition of correlation, types and application	Small sample test :student t-test with single sample mean
SLO-2	Importance and limitations of Statistics- Uses of Statistical Methos	Characteristics and types of averages	Range- definitions-merits and demerits-problems	Methods of Measures of correlation coefficient- Karl Pearson's formula	t-test with comparison of two sample means
SLO-3	Sampling methods	Arithmetic mean - definitions-merits and demerits	Quartile deviations-definitions-merits and demerits	Correlation coefficient using Karl Pearson's method	Paired t-test for dependent samples
SLO-4	Basics of Biostatistics	Problems on Arithmetic mean	Problems on Range and Quartile deviation	Applications of Correlation	Applications of t-test

Sessions	CLO-1	CLO-2	CLO-3	CLO-4	CLO-5
	12	12	12	12	12
SLO-5	Classification of Statistical data	Median-definitions-merits and demerits,	Mean deviations-definitions-merits and demerits	Rank correlation – Definition and uses	F-test: equality of two sample variances
SLO-6	Tabulation of Statistical data	Mode definitions-merits and demerits,	Problems on Mean deviation	Correlation coefficient using Spearman's rank method	Analysis of variance: concepts, One-way ANOVA table
SLO-7	Frequency distribution	Problems on median and mode	Standard deviations-definitions-merits and demerits	Problems on Rank correlation	One-way ANOVA table- formula and problem
SLO -8	Problems on tabulating statistical data	Calculation of median and node through graphs	Problems on testing consistency of data. Applications of Coefficient of Variation	Applications of Rank Correlation	Applications of F-test
SLO-9	Presentation of data through diagrams and graphs	Empirical relationship between Mean, median, and mode	Graphical representation of dispersion-Lorenz curve	Concepts of regression-Properties of regression coefficients	Chi-square test: Goodness of fit
SLO-10	Diagrammatic representation of Statistical data	Geometric mean - definitions-merits and demerits	Measures of Skewness: Karl Pearson's	Regression lines using least square method	Chi-square test: independence of attributes
SLO-11	Graphical representation of Statistical data	Harmonic mean - definitions-merits and demerits	Measures of Skewness: Bowleys	Distinguish between Correlation and Regression	Problems on Chi-square test
SLO - 12	Difference between diagram and graph	Problems on Geometric mean and Harmonic mean	Skewness and its applications	Problems on Regression analysis	Applications of Chi-square test

Resources

1. Gupta, S.P. (2011). *Applied Statistical Methods* ,4th Edition, Sultan Chand & Sons, New Delhi.
2. Black, K. (2023). *Business statistics: for contemporary decision making*. John Wiley & Sons
3. Khan & Khanum, (2008), *Fundamentals of Bio Statistics*, 3rd Edition, Ukaaz Publications, Hyderabad.

Assessment								Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1	CLA – 2	CLA– 3	CLA– 4 *			Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)	(10%)	(20%)	(10%)			Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	15				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	15				Interactive Lecture	✓		
3	Apply	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20							
5	Evaluate	10	10	10	10	15							
6	Create	10	10	10	10	15							
	Total (%)	100	100	100	100	100							

The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. N. Visvanathan, Associate Professor and Head, Department of Statistics, Presidency College, Chennai	1	Dr. D. Arivudainambi, Professor, Department of Mathematics, Anna University, Chennai	1.	Dr. J. Madhumitha, Assistant Professor, Department of Mathematics and Statistics, FSH, SRMIST
				2.	Dr. S. Lakshmi Priya, Assistant Professor, Department of Mathematics and Statistics, FSH, SRMIST

Course Code	UEN24S01L	Course Title	Communication Skills	Category	S	Skill Enhancement Course	L	T	P	C
							0	0	4	2

Course Offering Department	English, FSH, KTR	Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO									
CLR-1	Bridge the theoretical language knowledge with practical communication skills, essential for academic and professional contexts.	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-2	focus on enhancing listening, speaking, reading, and writing skills, crucial for effective interaction and teamwork.																	
CLR-3	prepare students for employability by building competence in interviews, group discussions, and professional communication.																	
CLR-4	promote understanding and sensitivity towards linguistic and cultural diversity, key to thriving in a globalized world.																	
CLR-5	articulate ideas and emotions clearly, overcoming language barriers.																	
CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking, Creativity Solving	Communication Skills, Collaborating Skills	Independent Thinking, Analytical Reasoning,	Leadership Qualities, Professionalism, Autonomy,	Digital Technology Skills	Value Inculcation, Multicultural inclusivity	Environmental Action, Community Engagement	Entrepreneurial Risk Taking	PSO - 1	PSO - 2
CLO-1	acquire basic proficiency in listening, speaking, reading, and writing, enabling effective interaction in everyday and academic scenarios.	✓	✓	-	-	2	85	75	3	-	-	1	3	3	-	2	2	1
CLO-2	express ideas clearly using appropriate verbal cues and non-verbal signals in social, academic, and professional contexts.	✓	✓	✓	-	2	85	75	3	-	1	2	3	3	-	1	2	1
CLO-3	enhance their ability to comprehend, evaluate, and respond to diverse forms of written and spoken communication critically.	✓	✓	✓	✓	3	85	75	3	-	3	1	3	3	-	1	1	2
CLO-4	produce well-organized written documents and oral presentations, showcasing logical thinking and clarity of expression.	✓	✓	✓	✓	3	85	75	3	-	2	3	2	3	-	2	3	3
CLO-5	demonstrate awareness and sensitivity towards linguistic and cultural diversity, effectively navigating multicultural interactions.	✓	✓	✓	✓	3	85	75	3	3	2	3	2	3	-	3	3	3

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	12	12	12	12	12
SLO-1	Introduction to Communication. Types of Communication- verbal and non-verbal communication Barriers of Communication dynamics of interpersonal communication, Interpret Cross-Cultural Differences in Non-Verbal Communication Develop and Demonstrate Effective Non-Verbal Communication Skills	Introduction to Reading Skills. Discussion of techniques of Reading Skill Reading Skills.(Barriers of reading skills and strategies of effective communication through reading) Identifying common reading problems in students after making them read a few passages.	Introduction to Speaking Skills. Explaining the importance of phonetics and vocabulary Speaking Skills.(Barriers of speaking skills and strategies of effective communication through speaking) Explaining the usage of the Oxford Learner's Dictionary to learn phonetics of the words at the fundamental level.	Introduction to Writing Skills Importance of writing skills Writing Skills.(Barriers of writing skills and strategies of effective communication through writing) Explaining various forms of writing with examples:.	Introduction to appreciation of texts. Encouraging the students to share a few of their favourite lines from any sources they have read or sharing a few lines from paditthadhil piditthadhu.
SLO-2	Introduction to Digital language lab/ usage of mobile applications		The right enunciation of certain words to be taught through phonetic		Explaining why appreciating texts creates a good reader.

		Learners are enabled to record their speech and listen to it in order to correct their problematic areas	representation and decoding the phonetic symbols by learning to use the dictionary..	Introduction to letter writing. Types of letters- Formal and Informal letters with examples. Learning E-mail etiquette.	
	Equipping the listening skill of the learners Listening Skills.(Barriers of listening skills and strategies of effective communication through listening) Exploring Effective Ways of Listening.	repetitive practices of reading select paragraphs from web resources, their standard will be measured.	Observe and repeat and learn the phonetic pronunciation of words by practicing continuously.	Class Assignment - write a formal letter and informal letter and check for e-mail etiquettes in writing.	Enabling the students to reflect in the classroom about any of their favourite books/ articles or magazines.
SLO-3	Introducing google podcasts.	The speed, fluency, pronunciation, comprehension of the words in the paragraph	Teaching the usage of Thesaurus to understand and develop various words and improve vocabulary.	Enabling the students to unleash their potentials in creative writing through writing transcripts for advertisements of any product.	Introducing the text of Letters by Mathrubootham published in the Hindu.
SLO- 4	Task to write down the words from the audio they have listened to. This activity should be done in two steps. 1. Jotting down the words simultaneously as they listen to the speaker. 2. Writing the transcript of the audio through repetitive play and pause.	hints and tricks to follow where the pauses are to be followed.	Identifying common errors in concord, preposition, direct speech and indirect speech.	write a review of any book or a movie or an interview or a debate.	Reading and recitation of the text of the first letter-Enjoy within limits, says Mr. Mathrubootham Understanding characters by analyzing the usage of their style of language
SLO-5	Imitating the speakers by listening to them and attempting to learn the pronunciation of the words uttered in the audio.	Students group 1- reads – group 2 identifies the flaws in reading.	Identifying common errors in tenses, punctuation, and syntactical errors..	Mechanics of writing like capitalization, punctuation, spelling, correct pronoun, preposition, concord usage can be taught.	Reading of the second letter- Nobel? What Nobel, asks Mr. Mathrubootham.
	Repetitive listening to enhance pronunciation skills	The roles have to be exchanged between the two groups and the activity should be practiced.	Rectifying the common errors and instructing the learners about the right usage in order to avoid common errors.	meachnaics of writing - assessed and evaluated.	Mathrubootham's humour and the language of code switching from Tamil to English and vice –versa.
SLO-6	Introducing to the audios of TED TALK American Speakers. Listening to the native speakers of English Language through TED TALKS.	Identify the key arguments in a passage -introductory point, lead point, supportive argument statement, concluding point and the common connecting word between all the key words in the passage.	Practicing how to avoid common errors.	Teaching effective writing by learning to avoid common errors in concord, preposition, conjunction, relative pronouns, question tags.	Reading of the third letter -Mr. Mathrubootham is fully supporting all new technologies
	Introducing to the audios of TED TALK British Speakers. Listening to the native speakers of English Language through TED TALKS.	encouraged to identify the key arguments in other passages on their own.	The learners are introduced to collocations for quick choice of learning how to speak in short time and how to speak effectively.	Practicing effective writing by learning to avoid common errors in concord, preposition, conjunction, relative pronouns, question tags.	Mathrubootham's frustration over the failure of technologies and the language that he positively uses to denote hopelessness over technologies.
SLO-7	American and British styles can be differentiated.		Practice collocations	common errors in tenses, direct and indirect speech and syntax structure.	Reading of the fourth letter in the classroom and discussion

		Guiding the act of reading through scanning and skimming by model reading of the passages by the instructor.			Pizza maavu: Welcome to Mr. Mathrubootham food recipe website,
SLO-8	The recognition of different accents should be practiced by speaking after listening.	scanning and skimming activities	Idioms and phrases	Practicing effective writing by learning to avoid common errors in tenses, direct and indirect speech and syntax structure.	Mathruboothamʼs love for food and the miscommunication about food.
SLO-9	Learning advanced pronunciation and vocabulary through various computer applications like Woodpecker.	Loud reading and slow mind reading	A speaking task to learn- collocations, idioms and phrases, vocabulary and phonetic pronunciation	Teaching how to write statement of purpose for admission to higher educations, and practicing the same.	Analyisng the text for regional relevance and National significance.
	imitate the different sounds and accents - repeat it after listening to any of the videos from the library based on individual interest.	Pauses, pronunciation, comprehension and fluency can be checked for improvement at this stage through repetitive practices.	Their speaking activity is to be recorded and played again to rectify the errors and highlight the problematic areas in speaking.	Teaching how to write a story by looking at a picture. Developing the writing skill through word ladders.	Appreciating the aesthetics of the comic element and the embodiment of humour in the narrative in the letter
SLO-10	Repeat listening to the same time frames and move from 02.01 to 03.00	Students -groups -checking the comprehension skills. Analyse the text of a passage.	Automating vocabulary through engaging the students in various activity games like solving crossword puzzle and playing scattergories.	Introduction to blog writing and steps to become an effective blog writer.	importance of bringing in the Indianized way of speaking the English Language in order to depict the character called Mathruboothamֹ.
	Choosing any particular time frame and practicing it.	Brainstorming the comprehension skills-questioning the key points in the passage.	Engaging the students to play the games in order to learn the vocabulary.	Encourage the readers to create their own blogs and post articles on a regular basis.	relatable characters of both formal and informal everyday life experiences.
SLO-11	Interested students can complete listening and reflecting the complete audio listening practice and speaking.	Cross check with misunderstanding if any and rectify- match the question and answers.	Spur of the moment speech.:	Selecting any news article and learning the writing style in it.	Talk about their favourite letter from the letters of Mathruboothamֹ by recollecting the appreciation of the text according to their perception and understanding.
SLO-12	Group activities and games can be conducted to test the listening skills by responding to the speech given by other students	Passages for reading comprehension are to be given for practice that tests their reading skills.	Prepared speech : Giving a speaking task to the students to speak on their own choice	Students are given chances to write reports on various topics.	Enabling the students to share their appreciation of any of their favourite lines form the books they have read.

Resources			
1	Horizon- English Text Book – Compiled and Edited by the Faculty of English Departement, FSH, SRMIST, 2023	5	The Art of Public Speaking by Stephen E. Lucas- 2019
2	The Creative Writing Coursebook: Forty Authors Share Advice and Exercises for Fiction and Poetry by Julia Bell and Paul Magrs- 2001	6	Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds by Carmine Gallo – 2014
3	On Writing: A Memoir of the Craft by Stephen King 2000	7	The Anatomy of a Book Review: A Guide for College Students by Ronald J. Weber 1994
4	The Writing Life: Writers on How They Think and Work edited by Marie Arana -2003	8	How to Write a Simple Book Review: It's easier than you think! by Allyson R. Abbott 2013

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA)(50%weightage)								Final Assessment (50 %weightage)	
		CLA–1 (10%)		CLA–2 (10%)		CLA– 3 (20%)		CLA– 4* (10%)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember		20		20		15		20		20
2	Understand		20		20		15		20		20
3	Apply		20		20		20		20		20
4	Analyze		20		20		20		20		20
5	Evaluate		10		10		15		10		10
6	Create		10		10		15		10		10
Total (%)		100		100		100		100		100	

Strategies

Technology		Pedagogy/ Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	–	Good Health & Well Being	–
Presentation Tools	–	Group Discussion	–	Quality Education	–
Learning Management System	–	Hands-on Practice	–	Gender Equality	–
		Debate	–		
		Interactive Lecture	–		
		Brainstorming	–		

***The evaluation can be done on the one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences**

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Krishna Raj Sutherland , Krishna.Raj1@sutherlandglobal.com	1	Dr. J Mangayarkarasi Associate Professor and Head, Department of English, Ethiraj College for Women, Chennai	1	Dr. Pushpanjali Sampathkumar, Assistant Professor, Department of English, FSH, SRMIST
		2	Dr. K S Antony Samy Loyola College Chennai antonysamyks@loyolacollege.edu		

Course Code	UCD24S03J	Course Title	Industry Oriented Employability and Leadership Skills	Category	S	Skill Enhancement Courses	L	T	P	C
							1	0	2	2

Course Offering Department	Career Guidance	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale (CLR)	The purpose of learning this course is to:	Depth				Attainment			Program Learning Outcomes										
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking,	Communication Skills, Collaborating	Independent Thinking, Analytical	Leadership Qualities, Professionalism,	Digital Technology Skills	Value Inculcation, Multicultural	Environmental Action, Community	Entreprenuerial Risk Taking	PLO-9	PLO-10
CLR-1	Help students to develop essential skills to influence and motivate others																	
CLR-2	Inculcate emotional and social intelligence and integrative thinking for effective leadership																	
CLR-3	Create and maintain an effective and motivated team to work for the society																	
CLR-4	Nurture a creative and entrepreneurial mindset																	
CLR-5	Make students understand the personal values and apply ethical principles in professional and social contexts																	
Course Learning Outcomes (CLO)	**At the end of this course, learners will be able to:**																	
CLO-1	Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision	✓	✓	-	-	2	85	80	3	2	3	2	-	-	2	3	-	-
CLO-2	Learn and master a set of practical skills such as time management, self-management, handling conflicts, team leadership	✓	✓	✓	-	3	85	80	2	2	1	2	2	1	2	3	-	-
CLO-3	Understand the basics of entrepreneurship and develop business plan	✓	✓	✓	✓	3	85	80	2	3	3	3	-	3	2	3	-	-
CLO-4	Apply the design thinking approach for leadership	✓	✓	✓	✓	3	85	80	-	3	2	-	2	2	1	1	-	-
CLO-5	Appreciate the importance of ethics and moral values for making of a balanced personality & be an integral human being	✓	✓	✓	✓	3	85	80	3	3	2	2	2	2	2	3	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	9	9	9	9	9
SLO-1	Leadership - definition & Qualities	Team building & dynamics	Management – definition & Manager traits	Innovative leadership – Concept of emotional and social intelligence	Entrepreneurship
SLO-2	Leadership – styles	Work delegation with activity	Work schedule with activity	Synthesis of human and Artificial intelligence	Successful Indian entrepreneurs – case study
SLO-3	Difference between leader and boss	Decision making with activity	Strategic planning	Design thinking	Ethics – definition & Corporate ethics
SLO-4	Case study (based on leadership styles)	Motivation & Motivation for results	Conflict management	Measuring and Sustaining innovation	Importance of ethics
SLO-5	Leadership in diverse organizational hierarchy, cultures and communications	Argumentation, Persuasion, Negotiation, Networking	Energy Management & Novel Ways to manage energy in work place – activity	Case study: Organizations with sustained innovation.	Essential elements of business ethics
SLO-6	Leading the organisation through stability and turbulence	Interpersonal communication	Workforce management	Key elements of design thinking	Creating a harmonious life with work-life balance
SLO-7	Understanding Leadership and its importance.	Budget planning	Time Management	How to transform challenges into opportunities	Ethics and Conduct : Ethical decision-making
SLO-8	Models of Leadership	Workflow optimization	Recruiting and Retaining Talent	How to develop human-centric solutions for creating socially good humans	Importance of ethical principles in professional and social contexts.
SLO-9	Basic Leadership Skills	Critical thinking and Multitasking	Conflict & Stress Management	Emerging trends in design thinking	Building ethical culture: promoting ethical behavior in organization.

Resources

1	Johnson, C. E. (2020). *Meeting the ethical challenges of leadership: Casting light or shadow*. Sage Publications.	4	Alexander Osterwalder, Yves Pigneu. (2013). *Business Model Generation*, Wiley.
2	Rao, T. V. (2016). *IIMA-Managers Who Make A Difference: Sharpening Your Management Skills* (Vol. 1). Random House India.	5	Deborah Tannen. (2010). *Talking from nine to five: Women and men in the workplace*, Harper Collins Publishers.
3	Cohen, A. R., & Bradford, D. L. (2017). *Influence without authority*. John Wiley & Sons.	6	Picardi, C. A. (2021). *Leadership Essentials You Always Wanted To Know*. Vibrant Publishers.

Assessment									
Level of Thinking		Continuous Learning Assessment (CLA) (100% weightage)							
		CLA – 1		CLA – 2		CLA – 3		CLA – 4	
		(20 %)		(20 %)		(30 %)		(30%)	
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
7	Remember	5	5	5	5	15	15	10	10
8	Understand	5	5	5	5	15	15	10	10
9	Apply	25	25	25	25	20	20	20	20
10	Analyze	25	25	25	25	20	20	20	20
11	Evaluate	20	20	20	20	15	15	20	20
12	Create	20	20	20	20	15	15	20	20
	Total (%)	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

Designers

Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. P. Chockalingam, Senior Lead Software Engineer, Virtusa Consulting Services Private Ltd, DLF IT Park SEZ, Chennai – 600089 p.chockalingam1986@gmail.com -	1	Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeetham, Coimbatore - 641112 g_saravanaprabu@cb.amrita.edu -	1	Mrs. Deepalakshmi S, Head, Department of Career Guidance, FSH, SRMIST
				2	Dr. Elamathiyan E, Assistant Professor, Department of Career Guidance, FSH, SRMIST.

Course Code	UMI24Y01L	Course Title	My India Project	Category	Y	Mandatory Course	L	T	P	C
							0	0	0	0

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Assessment Tools	Marks
Review – I (Activities)	50
Review – II (Project report and Presentation)	50
Total	100

(Assessment Method – Fully Internal)

SEMESTER – V

Course Code	UBT24D02J	Course Title	Food Biotechnology	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth			
		1	2	3	4
CLR - 1	To practice sterilization technique for personal and societal safety	Conceive	Design	Implement	Operate
CLR - 2	Application of techniques for determines the quality of food				
CLR - 3	Knowledge acquired to analysis a Quality of milk				
CLR - 4	To understand the techniques required for Preparation of dairy products				
CLR - 5	Techniques to determine the Quality checking of packaging material				

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO - 1	To learn basic sterilization technique for personal and societal safety	✓	✓	-	-	1	80	70	3	3	2	3	2	2	2	3	1	1
CLO - 2	Knowledge acquired for isolation and identification of food pathogens	✓	✓	✓	-	2	80	70	3	3	2	3	2	2	2	3	1	1
CLO - 3	Understanding the techniques required for quality of water and milk	✓	✓	✓	✓	2	85	70	3	3	2	3	2	2	2	2	1	1
CLO - 4	Application of techniques required for Preparation of dairy products	✓	✓	✓	✓	1	85	70	3	2	2	3	3	2	2	2	1	1
CLO - 5	Knowledge acquired to determine the Quality checking of packaging material	✓	✓	✓	✓	1	85	70	3	2	2	3	3	2	2	2	1	1

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO – 4	CLO - 5
	15	15	15	15	15
SLO - 1	Current scenario of food industry	Classification of food	thermal processing	Food Toxicants	Food Preservation
SLO - 2	Significance of food biotechnology	Shelf life of stable foods	Blanching	Food allergens	Preservation traditional Methods
SLO - 3	Basics of food biotechnology	Food spoilage	Thermal resistance of microorganisms	HACCP and FSSAI	Preservation mechanical Methods
SLO - 4 & 5	Principles and method of sterilization - Heat, Filtration, Radiation & pasteurization	Identification staining of Molds by lactophenol cotton blue	Bacteriological Analysis of Water by MPN method	Isolation and characterization of lactobacillus from fermented milk products	Probiotics and evaluation

SLO - 6	Inter disciplines involved in Food Biotechnology	Food borne diseases	Thermal Death Time	Vinegar production	Preservation commercial Methods
SLO - 7	Current national and international scenario of food industry	Sterilization	Lethality concept	Lactic acid production	Canning
SLO - 8	Food as a substrate for microorganism	Sterilization-different methods	Factor affecting heat resistance	Beer and wine production	Preservatives-food
SLO – 9 & 10	Isolation and identification of microbes from dairy products	Standard Plate Count Method	Bacteriological Analysis of Water by MPN method	Isolation and characterization of lactobacillus from fermented milk products	Quality checking of packaging materials
SLO - 11	Physical characteristics of food	Sterilization- Equipment	Nutraceuticals and functional foods	Cheese production	Packing materials
SLO - 12	Chemical characteristics of food	Introduction to food processing	Antioxidative agents	Microbiological examination of water	Packing materials types
SLO - 13	Isolation and identification of microbes from dairy products	Thermal resistance of microorganisms	Antimicrobial agents	Microbiological examination of food	Packing materials Quality
SLO – 14 & 15	Isolation and identification of microbes from fermented products	Qualitative analysis of milk by MBRT test	Isolation of yeast from foods	Study of food contaminants	Testing methods of packaging materials

Resources

1	Frazier, W. C., & Westhoff, D. C. (1981). *Food microbiology*, Tata McGraw Hill. New Delhi.	4	Ramaswamy, H., & Marcott, M, (2006). *Food Processing Principles and Applications*. CRC Press.
2	Robertson, G. L. (2012). Food packaging and shelf life. *Food packaging and shelf life, a practical guide*, 1-16.		
3	Lee, B. H. (2014). *Fundamentals of Food Biotechnology*. John Wiley & Sons.	5	Adams M. R., & Moss, O.M. (2008). *Food Microbiology*. 2nd Edition, RSC Publishing

Assessment													**Strategies**					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA - 1 (10 %)		CLA - 2 (10 %)		CLA - 3 (20 %)		CLA - 4 * (10 %)					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
													Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	emember	25	20	25	20	25	20	10	10	25	20				Debate	✓	Life on Land	✓
2	Understand	25	30	25	30	25	30	20	20	25	30				Interactive Lecture	✓		
3	Apply	25	20	25	20	25	20	20	20	25	20				Brainstorming	✓		
4	Analyze	25	30	25	30	25	30	20	20	25	30							
5	Evaluate	-	-	-	-	-	-	10	10	-	-							
6	Create	-	-	-	-	-	-	20	20	-	-							
Total (%)		100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. Pavan Kumar Dara, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D03J	Course Title	Immunology	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth			
		1	2	3	4
CLR - 1	Understanding the basic concepts of Immunology and various components of immunity	Conceive	Design	Implement	Operate
CLR - 2	Understanding the basic features of antigens, antibodies, cytokines and their responses				
CLR - 3	Equipping the foundational knowledge for diagnosing infections				
CLR - 4	Providing knowledge on allergic reaction, autoimmunity and vaccines				
CLR - 5	Understanding the transplantation immunology and immunodeficiency disorders				

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO - 1	Acquire knowledge on immunity and their components	✓	✓	-	-	2	85	75	3	1	2	-	2	1	3	3	3	1
CLO - 2	Strengthen the knowledge on antigens and antibodies	✓	✓	✓	-	2	85	75	3	2	2	1	2	1	3	3	3	2
CLO - 3	Understand the antigen processing and presentation and complements	✓	✓	✓	✓	3	85	75	3	3	2	-	2	2	3	3	3	2
CLO - 4	Understand allergy, autoimmunity and immunodeficiency	✓	✓	✓	✓	3	85	75	3	2	3	2	2	2	3	3	3	2
CLO - 5	Know various immunoprophylaxis and immunotherapy	✓	✓	✓	✓	3	85	75	3	2	2	1	2	2	3	3	3	2

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	15	15	15	15	15
SLO - 1	Introduction to Immunology and scope of Immunology	Antigens: Types, Antigenic determinants, Affinity, Avidity, Haptens, Adjuvants	Complement System- classical, alternative, lectin	Hypersensitivity - Type I and II	Tumor Immunology
SLO - 2	History of Immunology	Superantigens, Factors determining the antigenicity	Complement System- classical, alternative, lectin	Hypersensitivity - Type III and IV	Tumor Immunology
SLO - 3	Immunity - Innate	Immunoglobulins: Structure, classes of Immunoglobulin	Monoclonal antibody: Production and application	Autoimmunity: Mechanism	Immunoprophylaxis : Vaccines
SLO - 4 & 5	Lab Safety Rules	Agglutination: ABO Blood Grouping and ASO test	Precipitation: Single radial immunodiffusion	Rocket immunoelectrophoresis	ELISA-Sandwich ELISA
SLO - 6	Immunodiagnosis	Biological functions of Immunoglobulins, Clonal selection	Monoclonal antibody: Production and application	Autoimmune diseases	Types of Vaccines

		theory			
SLO - 7	Immunity - Acquired	Major Histocompatibility Complex	Cytokines: Properties and secretion	Autoimmune diseases	Vaccine production
SLO - 8	Cells of Immune system - Lymphocytes	Major Histocompatibility Complex	Cytokines:Biological functions	Transplantation Immunology	Immunodiagnosis: ELISA
SLO - 9 & 10	Antigen-Antibody Interactions	Agglutination: Widal test (slide and tube test)	Precipitation : Ouchterlony double immunodiffusion	Counter current immunoelectrophoresis	ELISA: Sandwich ELISA
SLO - 11	Antigen presenting cells	Cell mediated and Humoral immune response	Antibody engineering	Types of Grafts, Graft rejection mechanism	Complement fixation test, RIA
SLO - 12	Lymphoid organs - Primary	Cell mediated and Humoral immune response	Antibody engineering	Immunodeficiency diseases	Fluorescence immunoassay
SLO - 13	Lymphoid organs - Secondary	Current Contours	Current Contours	AIDS	Current Contours
SLO - 14 & 15	Differential Blood count	Separation of mononuclear cells from peripheral blood	Rocket immunoelectrophoresis	ELISA-Sandwich ELISA	ELISA: DOT ELISA

Resources			
1	Richard A. Goldsby., Barbara A. Osborne., Janis Kuby., Thomas J. Kindt., David A. Marcus., & Jenni Punt. (2002). *Immunology*, Fifth Edition. W. H. Freeman & Company.	3	Rajasekarapandian, M., & Senthilkumar B. (2007). *Immunology and Immunotechnology*, Panima Publications
2	Delves, P. J., Martin, S. J., Burton, D. R., & Roitt, I. M. (2017). *Roitt's essential immunology*. John Wiley & Sons.		

Assessment													Strategies					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA - 1 (10 %)		CLA - 2 (10 %)		CLA - 3 (20 %)		CLA - 4 * (10 %)					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
													Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20	20	20	20	20	20				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20							
5	Evaluate	20	20	20	20	20	20	20	20	20	20							
6	Create	-	-	-	-	-	-	-	-	-	-							
Total (%)		100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. D. Senbagam, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UES24V01T	Course Title	Environmental Studies	Category	V	Value Added Course	L	T	P	C
							2	0	0	2

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth			
		1	2	3	4
CLR-1	To create awareness on environment and renewable and non-renewable resources	Conceive	Design	Implement	Operate
CLR-2	To understand about ecosystem and biodiversity				
CLR-3	To understand the natural and anthropogenic impact of the environmental pollution				
CLR-4	To create awareness on different environmental problems				
CLR-5	To create awareness on various environment protection acts and the impact of human population on environment				

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
CLO-1	Applying knowledge on renewable and non-renewable resources	✓	✓	-	-	1	75	70	3	2	1	-	-	-	2	-	-	-	
CLO-2	Understanding about ecosystem and biodiversity	✓	✓	-	-	1	80	75	2	2	-	-	-	-	3	-	-	-	
CLO-3	Gathering knowledge on impact of environmental pollution	-	✓	✓	-	2	80	75	3	1	1	-	-	-	2	-	-	-	
CLO-4	Understanding of different environmental problems	✓	-	✓	-	3	80	75	3	2	2	-	-	-	1	-	-	-	
CLO-5	Having knowledge on various environment protection acts and the impact of human population on environment problems	✓	-	✓	✓	3	80	75	2	2	1	-	-	-	1	-	-	-	
						Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	6	6	6	6	6
SLO - 1	Multidisciplinary nature of environmental studies, definition, scope and importance of environmental studies	Energy flow in the ecosystem, energy flow in the ecosystem, ecological succession	Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity	Disaster management- floods, earthquakes, cyclones, landslides	Air, water, wildlife - environment protection act
SLO - 2	Need for public awareness. institutions in environment, people in environment	Food chains, food webs and ecological pyramids	Environmental pollution- definition, causes, effects and control measures of air, water, and soil pollution	Social issues and the environment: From unsustainable to sustainable development	Forest conservation act; issues involved in enforcement of environmental legislation, public awareness

SLO - 3	Introduction to natural resources- renewable and nonrenewable resources - associated problems	Ecosystem, introduction, types, characteristic features, structure and functions: forest, grassland and desert ecosystems	Causes, effects and control measures of marine, and noise	Urban problems related to energy, water conservation, rain water harvesting, watershed	Human population and the environment: population growth, variation among nations
SLO - 4	Forest, water, mineral, food resources	Aquatic ecosystems; biodiversity and its conservation- genetic, species and ecosystem diversity	Causes, effects and control measures of thermal pollution and nuclear hazards	Environmental ethics: issues and possible solutions, climate change & global warming	Population explosion – family welfare programme, human rights, value education
SLO - 5	Energy and land resources; role of an individual in conservation of natural resources; equitable use of resources for sustainable lifestyles	Biogeographical classification of India, value of biodiversity, biodiversity at global, national and local levels	Role of individuals in pollution prevention	Acid rain & ozone layer depletion	HIV/AIDS, women and child welfare
SLO - 6	Concept of an ecosystem, structure and functions of an ecosystem, producers, consumers and decomposers	India as a mega diversity nation, hot-spots of biodiversity, threats to biodiversity: habitat loss, poaching of wildlife man-wildlife conflicts, endangered and endemic species of India	Solid waste management Causes, effects and control measures of urban and industrial waste	Nuclear accidents and nuclear holocaust; wasteland reclamation	Role of information technology in environment and human health

Resources

1	Bharucha, E (2013). *Textbook of environmental studies for undergraduate courses* (2nd ed.). Orient BlackSwan.	3	Jeyalakshmi, R. (2014). *Text book of Environmental Studies*, Devi publications
2	Basu, M., & Savarimuthu, X., (2017), *SJ Fundamentals of environmental studies*. Cambridge University Press, Cambridge, United Kingdom	4	Bharucha, E. (2002). *The Biodiversity of India*, Mapin Publishing Pvt. Ltd.

Assessment								Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1	CLA – 2	CLA– 3	CLA– 4 *			Presentation Tools	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)	(10%)	(20%)	(10%)			Learning Management System	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)			✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	30	30	30	30	30				Debate	✓	Life on Land	✓
2	Understand	30	30	30	30	30				Interactive Lecture	✓	Clean Water and Sanitation	✓
3	Apply	20	20	20	20	20				Brainstorming	✓	Affordable and clean energy	✓
4	Analyze	20	20	20	-	20							
5	Evaluate	-	-	-	-	-							
6	Create	-	-	-	20	-							
	Total (%)	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. P. Parthipan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UCD24S04J	Course Title	Career Readiness and Professional Skills	Category	S	Skill Enhancement Courses	L	T	P	C
							1	0	2	2

Course Offering Department	Career Guidance	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

Course Rationale	The purpose of learning this course is to:	Depth				Attainment			Program Learning Outcomes										
CLR-1	Develop resume building practice	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Problem Solving, Critical Thinking,	Communication Skills, Collaborating	Independent Thinking, Analytical	Leadership Qualities,	Digital Technology Skills	Value Inculcation, Multicultural	Environmental Action, Community	Entrepreneurial Risk Taking	PLO-9	PLO-10
CLR-2	Prepare for interviews and group discussion																	
CLR-3	Understand the significance of team skills																	
CLR-4	Help students improve their speaking and presenting abilities																	
CLR-5	Acquire career planning skills and fully pursue a successful career path																	
Course Learning Outcomes	**At the end of this course, learners will be able to:**																	
CLO-1	Understand the importance of resume preparation and face interview confidently	✓	✓	-	-	2	85	80	2	3	2	3	-	-	-	-	-	-
CLO-2	Perform appropriately and effectively in group discussions	✓	✓	✓	-	3	85	80	2	3	2	3	-	1	2	3	-	-
CLO-3	Empathize with and trust colleagues for improving interpersonal skills	✓	✓	✓	✓	3	85	80	3	3	3	3	1	-	3	2	-	-
CLO-4	Prepare effective presentations considering the important strategies	✓	✓	✓	✓	3	85	80	1	3	2	3	-	2	2	-	-	-
CLO-5	Explore sources of (online/offline) opportunities	✓	✓	✓	✓	3	85	80	-	3	2	3	-	1	2	2	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO - 5
	9	9	9	9	9
SLO-1	Introduction of resume and its Importance - Difference between a CV, Resume and Bio Data	Mock interview – face to face	Listening as a Team Skill	Types of Presentation - Informative, Instructional, Arousing, Persuasive, Decision-making - Structure of a presentation – Introduction of the	Process of Career Exploration - Knowing Yourself - Personal Characteristics

				event, Introducing the speaker, vote of thanks	
SLO-2	Essential components of a good resume, common errors people make while preparing a resume	Mock interview- Feedback	Trust and Collaboration - Importance of Collaboration in Organization	Improvisation and unprepared presentations, man-woman view, feedback – appreciation and critique - Dos and Don'ts	Knowledge about the World of Work - Requirements of Jobs including Self-employment
SLO-3	Resume building format -Video resume – Tips and tricks – Do's and Don'ts	Meaning and Importance of Group Discussion - types of Group Discussion	The Secret to be a high performing Team	PowerPoint presentation–body language and stage etiquette – practice session	Sources of Career Information - Career Opportunities
SLO-4	Meaning and types of interview (face to face, telephonic, video) - Dress code, background research	Procedure of Group Discussion - Ground rules - Evaluation of Group Discussion	Creativity - Meaning - Strategies to increase Creativity - creativity skills at the Workplace	PowerPoint presentation–practice session	Critical Thinking Skills - Problem Solving Skills - Ability to Learn
SLO-5	STAR Technique (situation, task, approach and response) for facing an interview	Group Discussion - Common Errors Group Discussion Rubric	Methods and Process of Creativity Skills	PowerPoint presentation–practice session	Non- Cognitive Skills - Types of non-cognitive Skills and Strategies
SLO-6	Interview procedure (opening, listening skills, closure, asking questions)	Group discussion – Types and Tips to follow	Social Skills - Peer Pressure	Presentation for Internal and External Communication - online & offline Meetings	Non-Cognitive Skills and Gaps I Socio Economic Status
SLO-7	Keys to attain success in an interview	Group Discussion Practice	Stress and Stress Management - Meaning Stress Management Techniques	Visual elements in Presentation	Brainstorming
SLO-8	Rules and Elements of an Interview	Email Drafting – formal and informal	Social and Cultural Etiquette	Oral Skills and Public Speaking Skills	Logic and Rationality of Critical Thinking
SLO-9	Preparation and Practice	Writing Email – Practice	Characteristics and Enhancing Social Skills	Speaking Skills – Practice	Habits and Traits of the Mind

Resources

4	Bennett, S. (2014). *The elements of résumé style: Essential rules for writing résumés and cover letters that work*. Amacom.	4	Paul Newton, *How to deliver a presentation*, e-book
5	David John, (2012*). Tricks and Techniques of Group Discussions*, Arihant.	5	Eric Garner. (2012). *A-Z of Presentation*, Eric Garner and Ventus Publishing ApS.
6	Singh O.P. (2014). *Art of Effective Communication in Group Discussion and Interview*, S Chand & Company.		

Assessment									
Level of Thinking		Continuous Learning Assessment (CLA) (100% weightage)							
		CLA – 1		CLA – 2		CLA – 3		CLA – 4	
		(20 %)		(20 %)		(30 %)		(30%)	
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
13	Remember	5	5	5	5	15	15	10	10
14	Understand	5	5	5	5	15	15	10	10
15	Apply	25	25	25	25	20	20	20	20
16	Analyze	25	25	25	25	20	20	20	20
17	Evaluate	20	20	20	20	15	15	20	20
18	Create	20	20	20	20	15	15	20	20
	Total (%)	100	100	100	100	100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓		
		Interactive Lecture	✓		
		Brainstorming	✓		

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Mr. P. Chockalingam, Senior Lead Software Engineer, Virtusa Consulting Services Private Ltd, DLF IT Park SEZ, Chennai – 600089	1	Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeetham, Coimbatore - 641112	1	Mrs. Deepalakshmi S, Head, Department of Career Guidance, FSH, SRMIST
				2	Dr. Muthu Deepa, Assistant Professor, Department of Career Guidance, FSH, SRMIST

Course Code	UBT24P02L	Course Title	Internship - II	Category	P	Project Work / Internship	L	T	P	C
							0	0	0	1

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR - 1	Demonstrate skills learnt in the real time environment	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLR - 2	Explore the different industries that are using IT																	
CLR - 3	Enhance the skills in the system aspects																	
CLR - 4	Understanding the professional connections with the knowledge learnt																	
CLR - 5	Applying the skills in problem solving																	
CLO	At the end of this course, learners will be able to:																	
CLO - 1	To get an inside view of an industry and organization/company	✓	✓	-	-	2	85	75	1	1	3	-	3	2	3	2	2	2
CLO - 2	To gain valuable skills and knowledge	✓	✓	✓	-	2	85	75	1	2	1	-	3	2	3	2	2	2
CLO - 3	To make professional connections and enhance networking	✓	✓	✓	✓	3	85	75	1	2	1	-	3	3	3	2	1	2
CLO - 4	To get experience in a field to allow the student to make a career transition	✓	✓	✓	✓	3	85	75	1	2	2	3	3	3	3	2	2	2
CLO - 5	To get an inside view of an industry and organization/company	✓	✓	✓	✓	3	85	75	1	1	1	2	3	3	3	2	2	2

Students can choose problems of their own interest to develop solution using available facilities. There will be two reviews conducted during the project period for all the students. At the end of the project, every student shall submit a structured project report and will take a Viva Voce examination

Assessment				
Internship	Continuous Learning Assessment (CLA) (50% weightage)		Final Assessment (50 %weightage)	
	Review -1	Review - 2		
	20 %	30 %	Project Report 30 %	Viva-Voce 20 %

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. D. Senbagam , Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

SEMESTER VI

Course Code	UBT24D04J	Course Title	Plant Biotechnology	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR - 1	Understand about Plant Genome
CLR - 2	Study about the plant tissue culture
CLR - 3	Gain knowledge on the gene transfer methods
CLR - 4	Learn about the vectors
CLR - 5	Learn about Single-cell proteins

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO - 1	Understand the basic concepts of plant and organelle genome	✓	✓	-	-	2	80	75	3	-	1	-	-	2	1	-	-	-
CLO - 2	Understand the concepts of tissue culture techniques	✓	✓	-	-	2	85	80	3	2	-	1	-	-	2	-	-	-
CLO - 3	Gain knowledge on genetic engineering of plants	-	✓	✓	-	3	85	80	-	3	2	-	3	-	3	-	-	-
CLO - 4	Apply knowledge vectors and protoplast isolation methods	✓	-	✓	-	3	80	75	-	2	3	-	-	3	2	-	-	-
CLO - 5	Apply knowledge on plant tissue culture and genetic engineering of plants	✓	-	✓	✓	3	80	75	-	-	3	-	3	2	1	-	-	-

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO - 4	CLO - 5
	15	15	15	15	15
SLO - 1	Plant biotechnology –Introduction	Gibberellins Abscisic Acid	Arabidopsis thaliana – genome Analysis	PEG	Golden rice
SLO - 2	Sterilization methods	Ethylene	Production of secondary metabolites	DEAE	Transposable Elements in plants
SLO - 3	Different types of media	Totipotency of plant cells	embryogenesis	Agrobacterium Technology	Molecular farming
SLO - 4 & 5	Preparation of Macro nutrients stock solution	Preparation of Plant tissue culture media	Root Induction - organogenesis	Somatic Embryogenesis	Isolation of Agrobacterium from root nodules of legumes
SLO - 6	Media components	Micropropagation	Somatic embryogenesis	Protoplast technology	SCP
SLO - 7	Composition of MS media	Micropropagation	Soma clonal variation	Isolation of plant protoplasts	Plant cell Bioreactors
SLO - 8	Gamborg media	Callus induction	Diagnosis using enzyme markers	Fusion of Protoplast	Plant cell as Bioreactors

SLO - 9 & 10	Preparation of Micro nutrients stock solution	Explant collection and Sterilization	Shoot induction - organogenesis	Protoplast Isolation Mechanical method	Isolation of Agrobacterium from root nodules of legumes
SLO - 11	Plant growth regulators	Caulogenesis	Gene transfer methods used in plants	Regeneration of Protoplast	Hydroponics
SLO - 12	Auxins	Rhizogenesis	Electroporation	Transgenic Plants	Aquaponics
SLO - 13	Cytokinin	Applications of Organogenesis	Gene Gun	Bt cotton	ELSI
SLO - 14 & 15	Preparation of Hormones stock solution	In vitro Seed Germination	Callus Induction	Protoplast Isolation Enzymatic method	Model Exam

Resources			
1	Dubey, R.C. (2001) *Textbook of Biotechnology*. S. Chand publishers	3	Ignacimuthu, S. (2006) *Plant Biotechnology*, Tata Mcgraw-Hill Pub., New Delhi.
2	Slater, A., Scott, N.W., Fowler, M.R. (2008). *Plant Biotechnology - The genetic manipulation of plants*, Oxford University Press.		

Assessment												Strategies					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA - 1 (10 %)		CLA - 2 (10 %)		CLA - 3 (20 %)		CLA - 4 * (10 %)				Simulations		Clarification/Pauses	✓	Good Health & Well Being	✓
												Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Learning Management System	✓	Hands-on Practice	✓	Gender Equality	
1	Remember	20	20	20	20	20	20	20	20	20	20			Debate	✓	Life on Land	
2	Understand	20	20	20	20	20	20	20	20	20	20			Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20			Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20						
5	Evaluate	20	20	20	20	20	20	20	20	20	20						
6	Create	-	-	-	-	-	-	-	-	-	-						
Total (%)		100	100	100	100	100	100	100	100	100	100						

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. Infant Santhose B, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D05J	Course Title	Animal Biotechnology	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth			
		1	2	3	4
		Conceive	Design	Implement	Operate
CLR - 1	Know about the basics of animal cell culture				
CLR - 2	Gain knowledge on the development of transgenic animals				
CLR - 3	Learn about gene knockins and knockouts				
CLR - 4	Gain knowledge on the use of animal models for research				
CLR - 5	Learn about gene therapy				

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	
CLO - 1	Learn about the fundamental concepts of animal biotechnology	✓	✓	-	-	2	85	80	3	3	-	-	-	1	2	3	3	-	
CLO - 2	Understand about the uses of transgenic animals	✓	✓	-	-	2	80	75	3	3	-	-	-	2	1	2	-	-	
CLO - 3	Apply knowledge on the advances in gene editing techniques	-	-	✓	✓	2	80	75	-	1	2	-	-	3	1	-	-	-	
CLO - 4	Learn about the various applications of animal biotechnology	-	✓	✓	-	3	85	80	-	2	3	-	-	1	-	1	-	-	
CLO - 5	Apply concepts on advancements in animal biotechnology techniques	-	✓	✓	-	3	80	75	-	-	3	2	2	-	2	3	3	-	

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO - 4	CLO - 5
	15	15	15	15	15
SLO - 1	Animal Biotechnology – Overview	Recombinant cells - Introduction	Gene Editing Techniques - Introduction	Industrial Applications of Animal Biotechnology	Hybridoma Technique
SLO - 2	Animal cell culture - Introduction	Recombinant cells - Uses	Gene knockout technology	Medical Applications of Animal Biotechnology	Hybridoma Technique - Applications
SLO - 3	Animal cell culture laboratory – set up	Gene transfer methods	Gene knockin technology	Medical Applications of Animal Biotechnology	DNA Vaccines
SLO - 4 & 5	Practice: Lab Safety and GLP	Practice: Development of cell culture	Practice: Sub-culturing of cells	Practice: Quantification of animal cells using hemocytometer	Practice: Human Leukocyte culture
SLO - 6	Animal cell culture media - composition	Gene transfer methods - Types	Gene knockdown technology	Animal models as Bioreactors	Molecular markers and types

SLO - 7	Animal cell culture media - types	Transgenic animals – Development	Assisted Reproductive Techniques	Animal cells for Transplantation	Molecular markers and types
SLO - 8	Serum containing and serum-free media	Transgenic animals - Applications	Assisted Reproductive Techniques	Animal Models for Research	Molecular markers for tissue typing
SLO - 9 & 10	Practice: Preparation of animal cell culture media	Practice: Development of cell culture	Practice: Cell Viability assay	Practice: Differential counting of WBC	Practice: Chick Embryo Fibroblast
SLO - 11	Characterization of animal cells	Transgenic mice	Cryopreservation	Animal Models for Research	Gene Therapy
SLO - 12	Cell viability assays	Transgenic fish	Pregnancy diagnosis	Diagnosis of animal diseases	Gene Therapy – Types and Applications
SLO - 13	Preparation of cell banks	Preservation of Germplasm	Pregnancy diagnosis	Use of probes for disease diagnosis	Human Genome Project
SLO - 14 & 15	Practice: Filter sterilization of animal cell culture media	Practice: Sub-culturing of cells	Practice: Quantification of animal cells using hemocytometer	Practice: Human Leukocyte culture	Practice: Model Examination

Resources			
1	Ian Freshney. (2015). *Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications* (6th Edition). John Wiley & Sons	3	Ramadass, P. (2015). *Animal Biotechnology: Recent Concepts and Developments*. MJP Publications.
2	Nigel Jenkins. (2010). *Animal Cell Biotechnology: Methods and Protocols (Methods in Biotechnology)*. Humana Press		

Assessment													Strategies					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA - 1 (10 %)		CLA - 2 (10 %)		CLA - 3 (20 %)		CLA - 4 * (10 %)					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
													Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20	20	20	20	20	20				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20							
5	Evaluate	20	20	20	20	20	20	20	20	20	20							
6	Create	-	-	-	-	-	-	-	-	-	-							
Total (%)		100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. G. Swamynathan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24P03L	Course Title	Project Work	Category	P	Project Work / Internship	L	T	P	C
							0	0	4	2

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	
CLR - 1	To test the ability to identify research gap																		
CLR - 2	To test the ability to identify the problem																		
CLR - 3	To teach how to determine the methodology																		
CLR - 4	To teach how to determine the methodology																		
CLR - 5	To test the practical knowledge																		
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	

CLO	At the end of this course, learners will be able to:																		
CLO - 1	Knowledge on reading the review of literature	✓	✓	-	-	2	85	75	1	1	3	-	3	2	3	2	2	2	
CLO - 2	Knowledge on problem solving methods	✓	✓	✓	-	2	85	75	1	2	1	-	3	2	3	2	2	2	
CLO - 3	Knowledge on devising methodologies	✓	✓	✓	✓	3	85	75	1	2	1	-	3	3	3	2	1	2	
CLO - 4	Hands- on knowledge on various techniques	✓	✓	✓	✓	3	85	75	1	2	2	3	3	3	3	2	2	2	
CLO - 5	Knowledge to interpret the results	✓	✓	✓	✓	3	85	75	1	1	1	2	3	3	3	2	2	2	

Students can choose problems of their own interest to find solution using available literatures. There will be two reviews conducted during the project period for all the students. At the end of the project, every student shall submit a structured project report and will take a Viva Voce examination

Assessment								
Project Work	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)			
	Review -1	Review - 2						
	Choosing the research topic	Literature review	Understanding the Research findings	Oral Presentation				
	10 %	10 %	20 %	10 %	Identification of Research Gap 10%	Presentation 10 %	Dissertation 20 %	Viva-Voce 10%

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. D. Senbagam, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UCD24V02T	Course Name	Universal Human Values	Course Category	V	Value Added Course	L	T	P	C
							2	0	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Guidance Cell	Data Book / Codes/Standards	-		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	Help the students to understand need of value education, appreciate the essential complimentarily between 'values' and 'skills' and to ensure sustained happiness and prosperity which are the core aspirations of all human beings,	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Help students initiate a process of dialog within themselves to know what they really want to be' in their life and profession.			
CLR-3 :	Help students to understand the meaning of happiness and prosperity for a human being. understanding holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.			
CLR-4 :	Help students on right understanding of the Human reality and the rest of existence, harmony at all the levels of human living, and live accordingly.			
CLR-5 :	Highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:				1	2	3	4	5	6	7	8	9	10
					Problem Solving, Critical Thinking,	Communication Skills, Collaborating	Independent Thinking, Analytical	Leadership Qualities, Professionalism,	Digital Technology Skills	Value Inculcation, Multicultural	Environmental Action, Community	Entreprenuerial Risk Taking	PLO-9	PLO-10
CLO-1 :	Evaluate the significance of value inputs in formal education and start applying them in their life and profession	3	80	70	-	1	1	2	-	3	2	-	-	-
CLO-2 :	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	3	80	75	-	-	1	2	-	3	2	-	-	-
CLO-3 :	Analyze the value of harmonious relationship based on trust and respect in their life and profession	3	85	70	-	1	1	2	-	3	2	-	-	-
CLO-4 :	Examine the role of a human being in ensuring harmony in society and nature.	3	85	80	-	-	1	2	-	3	2	-	-	-
CLO-5 :	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.	3	85	75	-	-	1	2	-	3	2	-	-	-

Duration (hour)		**6**	**6**	**6**	**6**	**6**
S-1	**SLO**	Right Understanding, Relationship and Physical Facility	Understanding Human being as the Co-existence of the Self and the Body	Harmony in the Family – the Basic Unit of Human Interaction	Understanding Harmony in the Nature	Natural Acceptance of Human Values
S-2	**SLO**	Understanding Value Education	Distinguishing between the Needs of the Self and the Body	Trust – the Foundational Value in Relationship	Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature	Definitiveness of (Ethical) Human Conduct
S-3	**SLO**	Self-exploration as the Process for Value Education	The Body as an Instrument of the Self	Respect – as the Right Evaluation	Exploring the Four Orders of Nature	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
S-4	**SLO**	Continuous Happiness and Prosperity – the Basic Human Aspirations	Understanding Harmony in the Self	Other Feelings, Justice in Human-to-Human Relationship	Realizing Existence as Co-existence at All Levels	Competence in Professional Ethics
S-5	**SLO**	Happiness and Prosperity – Current Scenario	Harmony of the Self with the Body	Understanding Harmony in the Society	The Holistic Perception of Harmony in Existence	Holistic Technologies, Production Systems and Management Models-Typical Case Studies
S-6	**SLO**	Method to Fulfill the Basic Human Aspirations	Programme to ensure self-regulation and Health	Vision for the Universal Human Order	Exploring Co-existence in Existence	Strategies for Transition towards Value-based Life and Profession

Learning Resources	*1. Gaur R.R., Sangal R., Bagaria G.P., 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi.* *2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.*	*3. A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.* *4. A N Tripathy, 2003, Human Values, New Age International Publishers.*

Assessment					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (100% weightage)			
		CLA – 1	CLA – 2	CLA – 3	CLA – 4
		(20 %)	(20 %)	(30 %)	(30%)
		Theory (%)	Theory (%)	Theory (%)	Theory (%)
1	Remember	20	10	20	10
2	Understand	20	10	20	10
3	Apply	20	20	20	20
4	Analyze	20	20	20	20
5	Evaluate	10	20	10	20
6	Create	10	20	10	20
Total (%)		100	100	100	100

Strategies					
Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	
Presentation Tools	✓	Group Discussion		Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	
		Debate			
		Interactive Lecture	✓		
		Brainstorming	✓		

* The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Prof. Rajiv Kumar, Member Secretary, NCC-IP as member at AICTE	Mrs. V Sumathi, Associate Professor, Sri Sairam Engineering College, Chennai, Tamil Nadu	Dr. Supraja P, UHV University Coordinator, SRMIST
		Dr. Deepalakshmi S, HoD, Department of Career Guidance Cell, FSH, SRMIST
		Dr. Sweety Bakyarani E, Department of Computer Science, FSH, SRMIST

SEMESTER VII

Course Code	UBT24D06J	Course Title	Cheminformatics	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understand Chemical Data Representation
CLR-2	Access and Use Chemical Databases
CLR-3	Perform Molecular Modeling and Simulations
CLR-4	Predict Chemical Properties and Activities
CLR-5	Develop and Use Virtual Screening Tools

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 PLO 1	2 PLO 2	3 PLO 3	4 PLO 4	5 PLO 5	6 PLO 6	7 PLO 7	8 PLO 8	9 PSO 1	10 PSO 2
CLO-1	Represent Chemical Structures Digitally	✓	✓	-	-	2	85	75	3	2	-	-	-	2	1	1	2	-
CLO-2	Automate Cheminformatics Workflows	✓	✓	✓	-	2	85	75	3	-	-	-	-		1	1	-	-
CLO-3	Develop and Use Virtual Screening Pipelines	✓	✓	✓	✓	3	85	75	-	1	-	3	-	2		-	2	-
CLO-4	Conduct Structure-Activity Relationship (SAR) Analysis	✓	✓	✓	✓	3	85	75	2	-	-	3	-	-	2	-	-	-
CLO-5	Apply Predictive Models in Drug Discovery	✓	✓	✓	✓	3	85	75	-	1	-	3	-	2	-	-	2	-

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO - 4	CLO - 5
	15	15	15	15	15
SLO-1	Introduction to cheminformatics	Relational database systems	Kappa Shape Indices	Indicator Variables	Drug Discovery Pipeline Process
SLO-2	Computer representation of chemical structures	Experimental 3D databases	Electrotopological state Indices	Free-Wilson Analysis	Drug Development – Preclinical and Clinical stages
SLO-3	Graph theoretic representations of chemical structures	3D Pharmacophores	2D fingerprints	Non-Linear terms in QSAR equations	Virtual screening
SLO-4&5	Accessing Chemical databases-PubChem	Virtual Screening	Ligand preparation	Toxicity prediction	Molecular Convertor
SLO-6	Connection tables and linear notations	Pharmacophore mapping	Atom pairs and Topological Torsions	Interpretation and Application of a QSAR equation	“Drug Likeness” and Compound filter

SLO-7	Canonical representations of chemical structures	Molecular Descriptors	Extended connectivity fingerprints	Small molecule Databases -Pubchem , ZINC	Structure based Virtual screening
SLO-8	Structure searching	Simple counts	BCUT Descriptors	Selecting Diverse set of Compounds	Protein – Ligand Docking
SLO-9&10	Accessing Chemical databases- Drug bank	Target Preparation	Chemsketch	Binding DB	Molecular Docking
SLO-11	Substructure searching	Physicochemical properties	Designing a QSAR Experiment	Cluster Analysis	Target & Ligand Preparation
SLO-12	Screening methods	Molar refractivity	Selecting the Descriptor to include	Drug Discovery	Scoring functions
SLO-13	Algorithms for subgraph isomorphism	Topological Indices	Experimental design	Characteristics of Drug Compound	Prediction of ADMET properties
SLO-14&15	Accessing Chemical databases- Zinc	Active Site Prediction	ADMET prediction	SMILES Coding	Model practical exam

Resources			
1	Leach, A. R., & Gillet, V. J. (2007). *An introduction to chemoinformatics*. Springer.	3	Bajorath, J. (Ed.). (2008). *Chemoinformatics: concepts, methods, and tools for drug discovery* (Vol. 275). Springer Science & Business Media.
2	Bunin., Barry, A., & Dordrecht. (2010). *Chemoinformatics*: Theory, Practice, and Products.UK:Springer.	4.	Gasteiger, J., & Engel, T. (Eds.). (2006). *Chemoinformatics: a textbook*. John Wiley & Sons.

Assessment													Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1		CLA – 2		CLA– 3		CLA– 4 *					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)		(10%)		(20%)		(10%)					Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20	20	20	20	20	20				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20							
5	Evaluate	20	20	20	20	20	20	20	20	20	20							
6	Create	-	-	-	-	-	-	-	-	-	-							
	Total (%)	100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. Vidhya V.G, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D07J	Course Title	Nanobiotechnology	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR - 1	*Understanding the concepts of nanomaterials*																	
CLR - 2	*Knowledge on characterization of nanomaterials*																	
CLR - 3	*Knowledge on nanobiotechnology applications in environment*																	
CLR - 4	*Understanding the applications of nanotechnology*																	
CLR - 5	*Candidates understanding on nanobiotechnology, nanomaterials and nanomedicine*																	

CLO	At the end of this course, learners will be able to:	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO - 1	Suggest a suitable technique for the specific characterization different materials	✓	✓	-	-	1	80	70	-	3	3	-	-	-	-	3	-	-
CLO - 2	Familiarity with working principles, tools and techniques in the field of nanomaterials	✓	✓	✓	-	1	85	70	-	3	2	-	-	-	-	3	-	-
CLO - 3	Understanding of the strengths, limitations and potential uses of nanomaterials	✓	✓	✓	✓	1	85	70	3	-	-	-	-	-	-	2	-	-
CLO - 4	Design a nanobioparticle for specific applications	✓	✓	✓	✓	1	85	70	2	3	-	-	-	-	-		3	3
CLO - 5	Overall understanding and application of nanoscience, nanomaterial and nanobiotechnology	✓	✓	✓	✓	1	85	70	3	-	-	-	-	3	2	3	-	-

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO - 4	CLO – 5
	15	15	15	15	15
SLO - 1	Introduction to nanoscience	Introduction to nanomaterial	Synthesis of nanomaterials	XRD	Nanomaterials for solar cells
SLO - 2	Fundamentals of nanoscience	Classes of nanomaterials	Top-down method	Mass Spectroscopy	Nanomaterials for fuel
SLO - 3	History of nanoscience	Metal nanomaterials, Non-Metal nanomaterials	Bottum-up methods	LC MS; GC MS	Biosensors
SLO – 4 & 5	Lab 1: General safety instruction for nanomaterials synthesis	Lab 4: Encapsulation of nanoparticles	Lab 7: Characterization of nanoparticles by UV spectroscopy	Lab 10: Characterization of nanoparticles by microscopic methods	Lab 13: Characterization of nanoparticles by XRD
SLO – 6	Definitions in nanoscale	Semiconductor Nanomaterials	Bottum-up methods types	SEM and TEM	Protein Nanomaterials
SLO - 7	Theory of nanoscale	Carbon Nanotubes	Characterization of Nanomaterials	NMR	Nanotechnology-Food applications
SLO - 8	Concept and Properties of nanoscale	Quantum Dots	Particle size	Physico chemical techniques	Polymer nanocomposites

SLO - 9 & 10	Lab 2: Green synthesis (nanoparticles)	Lab 5: Characterization of nanoparticles by Particle size	Lab 8: Characterization of nanoparticles by FTIR spectroscopy	Lab 11: Characterization of nanoparticles by SEM	Lab 14: Characterization of nanoparticles by NMR
SLO - 11	Applications of Nanoscience	Nanowires	UV, FTIR	Nanotechnology and Environment	Nanobiotechnology in dental, bone applications
SLO - 12	Nanotechnology -Today	Nanoparticles- types	Particle size distribution	Nanotechnology and Pollution	Nanobiotechnology in drug delivery
SLO – 13	Nanobiotechnology in research and development	Synthetic nanomaterials	Biomolecular sensing	Nanotechnology and Water purification	Nanobiotechnology in tissue engineering
SLO – 14 & 15	Lab 3: Ionic gelation (synthesis of nanoparticles)	Lab 6: Characterization of nanoparticles by Zeta potential	Lab 9: Characterization of nanoparticles by FTNIR	Lab 12: Characterization of nanoparticles by TEM	Lab 15: Characterization of nanoparticles by Mass spectroscopy

Resources

1	Goodsell, D. S. (2004). *Bionanotechnology: lessons from nature*. John Wiley & Sons.	3	Niemeyer, C.M., & Mirking C.A. (2004).*Nanobiotechnology Concepts, Applications* and *Perpectives.*
2	Shanmugam, S. (2019). *Nanotechnology*. MJP Publisher.	4	Karkare, M. (2013). *Nanotechnology: fundamentals and applications*. IK International Pvt Ltd.

Assessment

Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)	
		CLA - 1		CLA - 2		CLA - 3		CLA - 4 *			
		(10 %)		(10 %)		(20 %)		(10 %)			
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)
1	Remember	25	20	25	20	25	20	10	10	25	20
2	Understand	25	30	25	30	25	30	20	20	25	30
3	Apply	25	20	25	20	25	20	20	20	25	20
4	Analyze	25	30	25	30	25	30	20	20	25	30
5	Evaluate	-	-	-	-	-	-	10	10	-	-
6	Create	-	-	-	-	-	-	20	20	-	-
Total (%)		100	100	100	100	100	100	100	100	100	100

Strategies

Technology		Pedagogy / Andragogy		Sustainable Development	
Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
		Debate	✓	Life on Land	✓
		Interactive Lecture	✓		
		Brainstorming	✓		

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. Pavan Kumar Dara, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D08T		Marine Biotechnology	Category	D	Discipline Core / Elective Course	L	T	P	C
							4	0	0	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understanding the marine ecosystem
CLR-2	Understanding the aquatic environment and their issues
CLR-3	Knowledge on waste and pollution management methods
CLR-4	Knowledge on Bioremediation process and methods
CLR-5	Learning of recent advancement in the aquatic organism and health management

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 PLO 1	2 PLO 2	3 PLO 3	4 PLO 4	5 PLO 5	6 PLO 6	7 PLO 7	8 PLO 8	9 PSO 1	10 PSO 2
CLO-1	To identify the ecosystem structure and functions	✓	✓	-	-	2	85	75	3	2	2	-	-	1	2	2	2	1
CLO-2	Gathering knowledge on environmental pollutions and pollutants	✓	✓	✓	-	2	85	75	2	3	2	1	1	2	2	2	2	1
CLO-3	Applying knowledge on aquatic treatments and its pollution mitigations	✓	✓	✓	✓	3	85	80	2	3	3	1	1	2	1	2	2	2
CLO-4	Applying knowledge on bioremediation process for aquatic management	✓	✓	✓	✓	3	85	75	3	2	3	1	-	2	2	2	1	1
CLO-5	Having knowledge on recent techniques and applications for waste managements	✓	✓	✓	✓	3	85	80	3	3	1	1	2	2	1	2	1	2

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	12	12	12	12	12
SLO-1	Marine Ecosystem concept	Marine plants	Marine viruses	Species abundance, richness and diversity indices	Seafood, microbiology, factors, influencing, microbial, growth and activity
SLO-2	Basics of Aquatic Environmental	Invertebrates: sponges, cnidarians, polychaetes	Giant bacteria and their significance	Biogeography, Recruitment, Growth, Mortality	Seafood, Borne pathogens, bacteria fungi, viruses
SLO-3	Classification of the marine environment	crustaceans, marine worms, molluscs, echinoderms,	Unculturable bacteria: occurrence, characteristics and exploitation	Culture of microalgae and invertebrates	Toxins influencing food spoilage
SLO-4	Marine microbial habitats-Estuarine Ecosystems: Rocky shores, Sand dunes	arthropods, chordates non-craniate (non-vertebrate)	Barophilic organisms & their application	Marine production, biomass Photosynthetic and productivity efficiency	Microbes microbial nutraceuticals as food single cell protein (SCP)

SLO-5	Salt marshes, Deep-sea, hydrothermal vents.	Adaptations habitats of organisms to different	Seaweeds for removal of metal pollutants	Secondary distribution production, in ocean environment productivity	Quality system, management quality control – concepts, planning
SLO-6	Diversity of Marine Microorganisms-Archaea, Bacteria, Cyanobacteria	Marine Vertebrates	GFP, applications RFP characteristics and their	Mechanism primary production, factors affecting	Novel and sea product food export development, marketing
SLO-7	Algae, Fungi	Marine fishes (bony, cartilaginous, jawless fishes)	Green mussel adhesive protein	Preservation and processing – chilling methods,	Marine Products Export Development Authority
SLO-8	Viruses, viroids and prions.	Marine tetrapods (amphibians, reptiles, birds, mammals)	Chitosan: products and application	Salt curing, pickling and smoking; Freezing and cold storage	Novel products – nutrition promotion
SLO-9	Characteristics of marine microorganisms.	Plankton (phytoplankton and zooplankton)	Biomimetics	Canning procedures; Role of preservatives in processing	Drugs from Sea
SLO-10	Microbial temperature habitat	Bio interaction -communication in oceans, Microbe-microbe	Barnacles industry and their effect on animals and shipping	Packing individually layered and handling quick shatter frozen fresh packs (IQF), fish, frozen packs,	Pearl Production as an alternative to natural collection
SLO-11	Halophiles, polyextremophiles	Quorum sensing, Microbe-metazoan interaction	Biofouling and measures to control it	Fishery cannery by waste, -products, feeds, silage,	Linkage between marine Biotechnology and Shipping Industry
SLO-12	Actinomycetes and oxygen relations ships of organisms	Population connectivity	Antifouling and anti-corrosion effects	Pearl essence, fertilizer	Discussion on economic importance of marine resources.

Resources

1	Kim, S. K. (2019). *Essentials of Marine Biotechnology* (pp. 145-196). Nature Switzerland AG: Springer.	3	Kim, S. K., & Venkatesan, J. (2015). *Introduction to Marine Biotechnology*. Springer handbook of marine biotechnology, 1-10.
2	Kim, S. K. (Ed.). (2015). *Handbook of Marine Biotechnology* (pp. 1-1512). Berlin/Heidelberg, Germany: Springer.	4	Fedder, B. (2013). *Marine Genetic Resources, Access and Benefit Sharing: Legal and Biological Perspectives.* Routledge.

Assessment								Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1 (10%)	CLA – 2 (10%)	CLA– 3 (20%)	CLA– 4 * (10%)			Simulations	✓	Clarification/Pauses	✓	Life under water	✓
								Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)		Learning Management System	✓	Hands-on Practice	✓	Clean Water and Sanitation	✓
1	Remember	20	20	20	-	20				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20							
5	Evaluate	20	20	20	20	20							
6	Create	-		-	20	-							
	Total (%)	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. S. Thanigaivel, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D09T	Course Title	Biofertilizer Technology	Category	D	Discipline Core / Elective Course	L	T	P	C
							4	0	0	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understanding the scope and concept of biofertilizer technology
CLR-2	Understanding the biofertilizers in agriculture
CLR-3	Knowledge on algal biofertilizer
CLR-4	Knowledge on bacterial biofertilizer
CLR-5	Knowledge on fungal biofertilizer

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 PLO 1	2 PLO 2	3 PLO 3	4 PLO 4	5 PLO 5	6 PLO 6	7 PLO 7	8 PLO 8	9 PSO 1	10 PSO 2
CLO-1	To understand about the importance of biofertilizer	✓	✓	-	-	2	85	75	3	2	3	-	-	2	-	-	-	-
CLO-2	To develop new biofertilizers	✓	✓	✓	-	2	85	75	3	-	2	-	3		3	-	-	-
CLO-3	Applying knowledge to apply it in the field	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2		-	-	-
CLO-4	Having knowledge on agricultural biofertilizers	✓	✓	✓	✓	3	85	75	2	-	2	3	-	-	2	-	-	-
CLO-5	Applying knowledge to create new biofertilizers	✓	✓	✓	✓	3	85	75	-	3	-	3	3	2	-	-	-	-

Sessions	CLO – 1	CLO – 2	CLO - 1	CLO - 1	CLO - 1
	12	12	12	12	12
SLO-1	Biofertilizers – Definition, History	Introduction to Bacterial Biofertilizers	Actinorrhizal symbiosis	Fungal Community Dynamics	Organic farming and climate change
SLO-2	Biofertilizers - types	Azospirillum - isolation	Nitrogen Fixation	Strain selection in Biofertilizers	Organic crop management
SLO-3	Biofertilizers - Components	Mass multiplication	Root Nodule Formation	Formulation of Biofertilizers	Biopesticides
SLO-4	Soil Ecosystem	Carrier based inoculant	Blue green algae and Azolla in rice cultivation.	Mobilization of Biofertilizers	Natural predators
SLO-5	Microbial Consortium	Azotobacter classification	Mycorrhizal Fungi as Biofertilizers	Quantity and Quality Assurance	Cultural practice
SLO-6	Plant – Microbe interaction	Characteristics	Types of Fungal biofertilizers	Application Methods	Rotation design for organic system
SLO-7	Introduction to Algal Biofertilizers	Crop response to Azotobacter inoculum	Importance of Ectomycorrhiza	Commercialization and Scaling Up	Transition to organic agriculture
SLO-8	Cyanobacterial Biofertilizers	Maintenance and mass multiplication	Importance of Endomycorrhiza	National and Regional Biofertilizers	Organic food and human health

				Development centers	
SLO-9	Anabaena	Rhizobium isolation	Vesicular Arbuscular Mycorrhiza (VAM Fungi)	Organic farming	Bio compost making methods
SLO-10	Nostoc, Spirulina	Identification	Isolation	Green manuring	Types of Biocompost
SLO-11	Algalization	Mass multiplication	Inoculum production of VAM	Concepts and principles of organic farming	Method of vermicomposting
SLO-12	Field applications of cyanobacterial Biofertilizers	Carrier based inoculants	Influence on growth and yield of crop plants.	Key indicators of sustainable agriculture	Field Application

Resources	
1	Giri, B., Prasad, R., Wu, Q.-S., & Varma, A. (Eds.). (2019). *Biofertilizers for sustainable agriculture and environment* (1st ed.).

Assessment								Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1	CLA – 2	CLA– 3	CLA– 4 *			Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)	(10%)	(20%)	(10%)			Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	30	30	30	10	30				Debate	✓	Life on Land	✓
2	Understand	20	20	20	10	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20							
5	Evaluate	10	10	10	30	10							
6	Create	-	-	-	-	-							
	Total (%)	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. N. Prasanth Bhatt, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D10T		Biomaterials	Category	D	Discipline Core / Elective Courses	L	T	P	C
							4	0	0	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understanding the Basic concepts of material science
CLR-2	Understanding the properties of Biomaterials
CLR-3	Knowledge on characteristics and classifications of biomaterials
CLR-4	Knowledge on materials and composites used for implantations
CLR-5	Learning of recent advancement of bodily functions and applications of biomaterials health management

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO-1	Identify and classify the type of biomaterials according to the ASTM standards	✓	✓	-	-	2	85	75	3	2	1	-	-	2	1	2	1	1
CLO-2	Understand the structural properties of various biomaterials	✓	✓	✓	-	2	85	75	3	2	1	1	1	2	3	2	1	2
CLO-3	Determine the characteristics of biomaterials suitable for the implantation	✓	✓	✓	✓	3	85	80	3	3	2	2	2	2	1	1	1	2
CLO-4	Study the functional properties of the materials implanted into the body	✓	✓	✓	✓	3	85	75	3	3	2	2	-	2	1	2	1	2
CLO-5	Can design the materials specific to the body targets with biocompatible parameters	✓	✓	✓	✓	3	85	80	2	3	3	3	1	2	3	2	2	2

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	12	12	12	12	12
SLO-1	Basics and definition of material science	Polymers, silicone biomaterials,	Types of metallic implant materials	Natural polymers	Orthopedic implants
SLO-2	Requirements of a materials	Medical fibers and synthetic polymers	Stainless steels	Synthetic polymers	Biocompatible factors
SLO-3	Grading of materials	Ceramics	Co-based alloys	Classes and types of polymers	Dental implants
SLO-4	Need for biomaterials	Metals and semiconductors	Ti and Ti-based alloys	Thermosets, thermoplastics	Fixation and capping process
SLO-5	Usefulness of biomaterials	Smart polymers	Ceramic implant materials	Elastomer and merits and demerits	Soft tissue replacement implants
SLO-6	Generations of implants	Bioresorbable and bio erodible materials	Bio ceramics, Aluminum oxide	Viscoelastic behavior	Percutaneous planning
SLO-7	Classification of materials	Bulk properties of the materials	Glass ceramics and medical use	Polymers as Biomaterials	Skin implants
SLO-8	Nature and Types of biomaterials	Surface properties	Importance of stress-corrosion cracking	Hydrogels	Skin compatibility
SLO-9	PLA and PHAs,	Micro and nano properties of materials	Host tissue reaction with bio metal	PTFE, PMMA	Heart valve materials

SLO-10	HA and chitosan's	Characterizations of biomaterials	Corrosion behavior	Hydroxyapatite	Cardiac valve implants
SLO-11	Polymers, silicone biomaterials,	Metallic biomaterial	Importance of passive films for tissue adhesion	Composite implant materials	Polymeric and ceramic implant materials
SLO-12	Alginate and fibroin	Metals as implant material	Hard tissue replacement implant	Composite theory of fiber reinforcement	Application medical

Resources

1	Ratner, B. D., Hoffman, A. S., Schoen, F. J., & Lemons, J. E. (2004). *Biomaterials science: an introduction to materials in medicine*. Elsevier.	3	Park, J. B. (2012). *Biomaterials science and engineering*. Springer Science & Business Media.
2	Bhat, S. V., & Bhat, S. V. (2002). Overview of biomaterials. *Biomaterials*, 1-11.	4	Enderle, J., & Bronzino, J. (Eds.). (2012). *Introduction to biomedical engineering*. Academic press.

Assessment								Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1	CLA – 2	CLA– 3	CLA– 4 *			Simulations	✓	Clarification/Pauses	✓	Industry, innovation and infrastructure	✓
		(10%)	(10%)	(20%)	(10%)			Presentation Tools	✓	Group Discussion	✓	Sustained and inclusive economic growth	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)		Learning Management System	✓	Hands-on Practice	✓		
1	Remember	20	20	20	-	20				Debate	✓		
2	Understand	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20							
5	Evaluate	20	20	20	20	20							
6	Create	-		-	20	-							
	Total (%)	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. S. Thanigaivel, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D11T	Course Title	Bioenergy	Category	D	Discipline Core / Elective Course	L	T	P	C
							4	0	0	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Understanding of basics of bioenergy
CLR-2	Understanding of wood and grass bioenergy
CLR-3	Knowledge on algal bioenergy
CLR-4	Knowledge on biogas production and anaerobic digestion
CLR-5	Knowledge on biodiesel production and advanced techniques in bioenergy production

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 PLO 1	2 PLO 2	3 PLO 3	4 PLO 4	5 PLO 5	6 PLO 6	7 PLO 7	8 PLO 8	9 PSO 1	10 PSO 2	
CLO-1	Knowledge about bioenergy and sources and their need for sustainable developments	✓	✓	-	-	1	75	70	3	1	2	-	-	-	-	-	-	-	
CLO-2	Understanding of wood based bioenergy production methods and their importance	✓	✓	-	-	1	80	75	3	2	-	-	-	2	-	1	-	-	
CLO-3	Understanding of algae based bioenergy production methods and their importance	-	✓	✓	-	2	80	75	3	1	1	-	-	1	-	1	-	-	
CLO-4	Knowledge about biogas production process	✓	-	✓	-	3	80	75	2	3	-	-	-	-	2	1	-	-	
CLO-5	Knowledge about biodiesel production methods and recent advanced techniques in bioenergy production	✓	-	✓	✓	3	80	75	3	2	1	-	-	1	1	1	-	1	

Sessions	CLO - 1	CLO - 2	CLO - 3	CLO – 4	CLO - 5
	12	12	12	12	12
SLO - 1	Introduction to bioenergy and concepts of bioenergy	Wood bioenergy-introduction	Algae based bioenergy	Anaerobic digestion	Biodiesel production
SLO - 2	Bioenergy development: policy, government research programs	Wood energy sources	Algae as a sustainable feedstock for multiple uses	The anaerobic digestion process for biogas production	Batch process and Continuous process
SLO - 3	Feedstocks: biomass materials and sources	Values and benefits of wood bioenergy	Importance of light in photosynthesis-algal growth	Benefits of anaerobic digestion	Noncatalyzed systems- bio-process supercritical process
SLO - 4	Forest and agriculture based feedstocks	Managing wood biomass for bioenergy	Biofuel production from algae biomass	The fermenting bacteria and methanogen relationship	Post reaction processing: Ester/glycerol separation

SLO - 5	Waste-based feedstocks	Direct combustion options	Algae selection: types, strains, and use in biofuel production	The process of starting a digester	Ester washing, other ester treatments
SLO - 6	Agroforestry feedstocks	Biochemical technological processes	Algae cultivation: photobioreactors	Operation and control of a digester	Treatment and recovery of side streams
SLO - 7	Biomass from conservation lands	Thermochemical processes	Open system fermenters	Role of mixing in biogas production	Pretreatment of high free fatty acid feedstocks
SLO - 8	Advanced fuels from algae	Economics of woody bioenergy	Algae harvesting	Effect of speed on mixing	Microbial fuel cell and Bio-sensitized solar cells (BSSC)
SLO - 9	Biomass supply and availability	Economics of woody bioenergy production	Oil extraction from harvested algae biomass	Types of anaerobic digesters	Photobioreactors and bacteriorhodopsin
SLO - 10	Overview of conversion technologies	Sustainability of woody bioenergy	Challenges in upscaling of algal biofuel operations from bench to commercial scales	Suspended growth systems	Restriction on the use of bio-fuel due to human health and concern of environment
SLO - 11	Co-products and byproducts	Bioenergy from perennial grass biomass and biomass conversion	Integrated algal biofuel production	Attached growth system	Socio economic impacts of bio-energy
SLO - 12	Social, economic, and environmental impacts	Environmental impact and economic considerations of grass biomass	Life cycle analysis, economics, and environmental impacts	Merits and demerits of biogas consumption	Government initiatives and role to improve the use of bioenergy

Resources

1	Anju, D. (2015). *Bioenergy biomass to biofuels*, Academic Press	3	Sorensen, B. (2010). *Renewable energy* (4th ed.). Academic press
2	Wei-Hsin, C., Keat, T. Lee., & Hwai, C. O. (2019). *Biofuel and bioenergy technology*, MDPI	4	Vaughn C. N., & Kenneth, L. S. (2016). *Introduction to bioenergy (Energy and the Environment)*. CRC Press

Assessment								Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1	CLA – 2	CLA– 3	CLA– 4 *			Presentation Tools	✓	Clarification/Pauses	✓	Affordable and clean energy	✓
		(10%)	(10%)	(20%)	(10%)			Learning Management System	✓	Group Discussion	✓	Responsible Consumption and Production	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)				Hands-on Practice	✓	Climate Action	✓
1	Remember	30	30	30	30	30				Debate	✓		
2	Understand	30	30	30	30	30				Interactive Lecture	✓		
3	Apply	10	20	20	20	20				Brainstorming	✓		
4	Analyze	10	10	10	20	10							
5	Evaluate	20	10	10	-	10							
6	Create	-	-	-	-	-							
	Total (%)	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. P. Parthipan, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

SEMESTER VIII

Course Code	UBT24D12T	Course Title	Research Methodology	Category	D	Discipline Core / Elective Course	L	T	P	C
							4	0	0	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Know the basics of research, sources of research problems and questions
CLR-2	Search scientific resources, review them and carry out basic descriptive statistics
CLR-3	Understand the sampling methods, data collection methods, graphical presentation of data
CLR-4	Learn the general principles of ethics in research
CLR-5	Gain knowledge on the types of scientific articles, funding agencies and writing articles

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
		Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLO-1	Understand the basics of research, identify a research problem, develop a research question	✓	✓	-	-	2	85	75	3	-	-	-	-	2	-	-	-	3
CLO-2	Carry out literature survey, postulate research hypothesis, perform descriptive statistics	✓	✓	✓	-	2	85	75	-	3	-	-	-	-	-	-	2	-
CLO-3	Demonstrate ability to identify data collection methods, represent research data graphically	✓	✓	✓	✓	3	85	75	3	-	3	-	-	-	-	-	-	-
CLO-4	Apply principles of ethics in performing and reporting research	✓	✓	✓	✓	3	85	75	-	-	-	3	-	-	-	-	-	-
CLO-5	Identify various types of scientific articles, write research papers and thesis	✓	✓	✓	✓	3	85	75	2	-	-	-	-	-	3	-	-	-

Sessions	CLO – 1	CLO – 2	CLO - 1	CLO - 1	CLO - 1
	12	12	12	12	12
SLO-1	Introduction to Research Meaning and objective of research	Literature survey Introduction	Sampling types	Research ethics	Types of scientific articles
SLO-2	Significance and purpose of research	Sources of literature survey Library, Books	Sampling methods	General principles of ethics in research	Review articles
SLO-3	Types of research	Sources of literature survey Online databases	Sampling methods	General principles of ethics in research	Short communications
SLO-4	Types of research	Methods for online literature survey Boolean queries	Types of data Primary and Secondary	Conflict of interest	Research articles
SLO-5	Research Process Flow	Hypothesis	Methods of primary data collection Experiments	Plagiarism detection softwares	Components of a research article

SLO-6	Steps involved in a research process	Characteristics	Types of Fungal biofertilizers	Application Methods	Rotation design for organic system
SLO-7	Steps involved in a research process	Types of hypotheses	Survey	Role of Institutional Ethics Committee (IEC)	Choosing the appropriate journal
SLO-8	Defining a research problem	Measures of central Tendency Mean	Interview	3Rs in animal testing	Thesis
SLO-9	Sources of research problem	Measures of central Tendency Median	Methods of secondary data collection	Critical evaluation	Layout of a thesis
SLO-10	Research Question	Measures of central Tendency Mode	Graphical representation of data Line graphs and bar graphs	Critically evaluating a research report	Use of reference managing softwares
SLO-11	Sources of research questions	Measures of dispersion Range	Graphical representation of data Histograms	Patents	National Funding Agencies
SLO-12	Steps in conceiving a research question	Measures of dispersion Standard Deviation	Graphical representation of data Pie charts	Preparing for conference presentations	International Funding Agencies

Resources

1	Mishra, S. B., & Alok, S. (2011). Handbook of research methodology.	3	Kothari, C. R. (2004). Research methodology: Methods and techniques. *New Age International*.
2	Daniel, W. W. (1978). *Biostatistics: a foundation for analysis in the health sciences* (Vol. 129). Wiley.	4	Forthofer, R. N., & Lee, E. S. (1995). *Introduction to Biostatistics*.

Assessment								Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)		Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1	CLA – 2	CLA– 3	CLA– 4 *			Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)	(10%)	(20%)	(10%)			Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Theory (%)	Theory (%)	Theory (%)	Theory (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	30	30	30	10	30				Debate	✓	Life on Land	✓
2	Understand	20	20	20	10	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20							
5	Evaluate	10	10	10	30	10							
6	Create	-	-	-	-	-							
	Total (%)	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. N. Prasanth Bhatt, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D13J	Course Title	Biopython	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:
CLR-1	Automate biological data analysis
CLR-2	Access and manipulate biological databases
CLR-3	Handle complex biological data formats
CLR-4	Develop custom bioinformatics tools
CLR-5	Integrate computational and biological approaches

CLO	At the end of this course, learners will be able to:	Depth				Attainment			PLO										
		1 Conceive	2 Design	3 Implement	4 Operate	1 Level of Thinking	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 PLO 1	2 PLO 2	3 PLO 3	4 PLO 4	5 PLO 5	6 PLO 6	7 PLO 7	8 PLO 8	9 PSO 1	10 PSO 2
CLO-1	Manipulate biological sequences programmatically	✓	✓	-	-	2	85	75	3	2	-	-	-	2	1	1	2	-
CLO-2	Retrieve and parse data from biological databases	✓	✓	✓	-	2	85	75	3	-	-	-	-		1	1	-	-
CLO-3	Create and analyze phylogenetic trees	✓	✓	✓	✓	3	85	75	-	1	-	3	-	2		-	2	-
CLO-4	Process high throughput Sequencing Data	✓	✓	✓	✓	3	85	75	2	-	-	3	-	-	2	-	-	-
CLO-5	Visualize and Interpret biological Data	✓	✓	✓	✓	3	85	75	-	1	-	3	-	2	-	-	2	-

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO – 4	CLO - 5
	15	15	15	15	15
SLO-1	Introduction to Python Programming	Creating a sequence	Writing sequences to a file	Phylogenetics	Translation of RNA sequence
SLO-2	Basics of Python syntax - variables, data types	Parsing a sequence file	Converting a FASTQ file to FASTA file	Phylogenetic tree basics	PDB: 3D structure protein analysis
SLO-3	Basics of Python syntax - lists, dictionaries	Counting sequence length & number of occurrences of a nucleotide	Running a web BLAST	Constructing a phylogenetic tree	Count atoms in a PDB structure
SLO-4&5	Installation of Biopython	Creating a sequence	Parsing a sequence file	Counting sequence length	Calculating GC-content
SLO-6	Basics of Python syntax - loops, functions	Calculating GC Content	Parsing a BLAST output	Building trees with Phylo module	Handling Biological Annotations

SLO-7	File I/O operations	Calculating molecular weight	Pairwise sequence alignment	Visualization of trees using Bio.Phylo	Understanding gene features and annotations
SLO-8	What is Biopython	reverse complement of a sequence	Multiple Sequence Alignment	Modifying an existing tree	Extracting features like CDS, exons
SLO-9&10	reverse complement of a sequence	Slicing a sequence	Changing case	Sequence motif analysis	Transcription of DNA sequence
SLO-11	Installing and upgrading	Slicing a sequence	Creating alignment using different algorithms: ClustalW	Sequence motif analysis	Extracting features like introns using Bio.Seq Feature
SLO-12	Reading Biological File Formats - FASTA, GenBank, Pubmed and other biological formats	Concatenating sequences	Creating alignment using different algorithms: MUSCLE	Finding the starting index of a subsequence	Parsing biological file formats using SeqIO and AlignIO
SLO-13	Working with Sequences	Changing case	Reading a MSA	Transcription of DNA sequence	Biopython: Applications in bioinformatics
SLO-14&15	Translation of RNA sequence	Concatenating sequences	Running a web BLAST	Reading a MSA	Building trees with Phylo module

Resources			
1	Antao, T. (2018). *Bioinformatics with Python Cookbook: Learn how to use modern Python bioinformatics libraries and applications to do cutting-edge research in computational biology*. Packt Publishing Ltd.	3	Youens-Clark, K. (2021). *Mastering python for bioinformatics*. " O'Reilly Media, Inc.".
2	Biopython documentation: https://biopython.org/wiki/Documentation	4	Python for Biologists: https://pythonforbiologists.com/

Assessment													Strategies					
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA – 1		CLA – 2		CLA– 3		CLA– 4 *					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
		(10%)		(10%)		(20%)		(10%)					Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	20	20	20	20	20	20	20	20	20				Debate	✓	Life on Land	✓
2	Understand	20	20	20	20	20	20	20	20	20	20				Interactive Lecture	✓		
3	Apply	20	20	20	20	20	20	20	20	20	20				Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20							
5	Evaluate	20	20	20	20	20	20	20	20	20	20							
6	Create	-	-	-	-	-	-	-	-	-	-							
	Total (%)	100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. Vidhya V.G. Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24D14J	Course Title	Stem Cell Biology	Category	D	Discipline Core / Elective Course	L	T	P	C
							3	0	2	4

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR-1	Provide foundational knowledge of stem cells, essential for understanding advanced concepts and applications in stem cell biology.	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	
CLR-2	Gain understanding into ESCs' role in development and differentiation																		
CLR-3	Emphasize the practical applications and limitations of adult stem cells, crucial for understanding their role in regenerative medicine and clinical therapies																		
CLR-4	Provide a deeper understanding of iPSCs, their potential and limitations in regenerative medicine and personalized therapy.																		
CLR-5	Help students connect theoretical knowledge with real-world clinical challenges and opportunities in the field of stem cell biology																		

CLO	At the end of this course, learners will be able to:																		
CLO-1	Categorize different types of stem cells and their fundamental characteristic	✓	✓	-	-	2	85	75	3	2	1	-	3	2	2	3	3	-	
CLO-2	Understand the mechanisms and applications of embryonic stem cells in development and differentiation	✓	✓	✓	-	2	85	75	3	2	1	-	2	1	2	3	2	-	
CLO-3	Evaluate the role and applications of adult stem cells in tissue regeneration and clinical therapy	✓	✓	✓	✓	3	85	75	1	3	3	2	2	3	2	2	2	-	
CLO-4	Understand the generation and applications of induced pluripotent stem cells (iPSCs) and their implications	✓	✓	✓	✓	3	85	75	3	2	2	3	2	2	2	2	3	-	
CLO-5	Assess the use of stem cells in disease management and therapy, focusing on specific applications and challenges	✓	✓	✓	✓	3	85	75	1	3	2	-	2	2	3	2	3	-	

Sessions	CLO – 1	CLO – 2	CLO - 3	CLO - 4	CLO - 5
	15	15	15	15	15
SLO-1	Stem Cells - Definition and Basic Concepts	Embryonic Stem Cells (ESCs) - Introduction	Introduction to Adult Stem Cells	Introduction to iPSCs	Stem Cells in Cancer
SLO-2	Historical Background	Derivation of embryonic stem cells	Sources and Isolation Techniques	Reprogramming Techniques	Stem Cell Therapy for Neurodegenerative Diseases
SLO-3	Types of Stem Cells	Pluripotency and differentiation	Sources and Isolation Techniques	Characteristics of iPSCs	Cardiovascular Regeneration
SLO-4&5	GLP: Stem cells	Culturing of bone marrow MSCs (BM-MSCs)	Cryopreservation of HSCs	Viability Measurement of BM-MSCs	Differentiation of BM-MSCs

SLO-6	Types of Stem Cells	Embryonic Stem Cells in Early Development	Stem Cell Plasticity and Transdifferentiation	Applications of iPSCs	Stem Cells in Diabetes Treatment
SLO-7	Stem Cell Potency	Invitro Differentiation of ESCs into various cell types	Tissue Regeneration and Repair	iPSCs in Regenerative Medicine	Stem Cells in Musculoskeletal Disorders
SLO-8	Stem Cell Markers	Invitro Differentiation of ESCs into various cell types	Stem Cells in Hematopoiesis	Challenges in iPSC Technology	Hematopoietic Stem Cell Transplantation
SLO-9&10	Proper Equipment: Stem cells isolation and Maintenance	Culturing of BM-MSCs	Thawing of Cryopreserved BM-MSCs	Cytotoxicity analysis using BM-MSCs	Differentiation of BM-MSCs
SLO-11	Stem Cell Niche	Teratoma formation	Clinical Applications of Adult Stem Cells	iPSCs and Gene Editing	Stem Cells in Autoimmune Diseases
SLO-12	Methods for culturing stem cells	Genetic and Epigenetic Regulation	Clinical Applications of Adult Stem Cells	Epigenetic Memory in iPSCs	Regenerative Medicine and Tissue Engineering
SLO-13	Methods for culturing stem cells	Applications of ESCs in research	Limitations and Ethical Issues	Ethical, Legal, and Social Implications of iPSCs	Future Directions in Stem Cell Research
SLO-14&15	Reagents: Stem cells isolation and Maintenance	Passaging and Sub culturing of BM-MSCs	Cell Counting by Trypan blue	Differentiation of BM-MSCs	Differentiation of BM-MSCs

Resources

1	Lanza, R., Gearhart, J., Hogan, B., Melton, D., Pedersen, R., Thomas, E. D., & Thomson, J. A. (Eds.). (2005). *Essentials of stem cell biology*. Elsevier.	3	Slack, J. M. (2018). *The science of stem cells*. John Wiley & Sons..
2	Burgess, R. (2015). *Stem cells: a short course*. John Wiley & Sons.	4	Steinhoff, G. (Ed.). (2011). *Regenerative Medicine*. Springer Sciece+ Business Media BV.

Assessment													Strategies					
Bloom's Level of Thinking		Continuous Learning Assessment (CLA) (50% weightage)								Final Assessment (50 %weightage)			Technology		Pedagogy / Andragogy		Sustainable Development	
		CLA - 1 (10%)		CLA - 2 (10%)		CLA - 3 (20%)		CLA - 4 * (10%)					Simulations	✓	Clarification/Pauses	✓	Good Health & Well Being	✓
													Presentation Tools	✓	Group Discussion	✓	Quality Education	✓
		Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)	Theory (%)	Practice (%)		Learning Management System	✓	Hands-on Practice	✓	Gender Equality	✓
1	Remember	20	10	20	10	20	10	10	10	20	10				Debate	✓	Life on Land	✓
2	Understand	30	20	30	20	30	20	20	20	30	20				Interactive Lecture	✓		
3	Apply	30	30	30	30	30	30	30	30	30	30				Brainstorming	✓		
4	Analyze	20	20	20	20	20	20	20	20	20	20							
5	Evaluate	-	10	-	10	-	10	10	10	-	10							
6	Create	-	10	-	10	-	10	10	10	-	10							
Total (%)		100	100	100	100	100	100	100	100	100	100							

*The evaluation can be done on one or more parameters that include, (i) Seminars, (ii) Mini-Project, (iii) Case-Studies, (iv) MOOC Certification, (v) Publication of Article, (vi) Presentation of Research Work in Conferences, (vii) Assignments

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. S. Samuel Joshua Pragasam, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24P04L	Course Title	Research Project and Dissertation	Category	P	Project Work / Internship	L	T	P	C
							0	0	24	12

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO										
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR - 1	To test the ability to identify research gap	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2	
CLR - 2	To test the ability to identify the problem																		
CLR - 3	To test the ability to devise a plan of stud																		
CLR - 4	To learn how to determine the methodology																		
CLR - 5	To test the practical knowledge																		
CLO	At the end of this course, learners will be able to:																		
CLO - 1	Knowledge on reading the review of literature	✓	✓	-	-	2	85	75	1	1	3	-	-	3	3	3	3	3	
CLO - 2	Knowledge on problem solving methods	✓	✓	✓	-	2	85	75	1	2	1	3	-	3	3	3	3	3	
CLO - 3	Knowledge on devising methodologies	✓	✓	✓	✓	3	85	75	1	2	1	-	-	2	3	2	3	3	
CLO - 4	Hands- on knowledge on various techniques	✓	✓	✓	✓	3	85	75	1	2	2	2	3	2	3	3	3	3	
CLO - 5	Knowledge to interpret the results	✓	✓	✓	✓	3	85	75	1	1	1	3	2	1	3	1	3	3	

Assessment								
Research Project and Dissertation	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)			
	Review -1	Review - 2						
	Choosing the research topic	Literature review	Understanding the Research findings	Oral Presentation	Identification of Research Gap 10%	Presentation 10 %	Dissertation 20 %	Viva-Voce 10%
	10 %	10 %	20 %	10 %				

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. D. Senbagam, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT24P05L	Course Title	Professional Internship	Category	P	Project Work / Internship	L	T	P	C
							0	0	24	12

Course Offering Department	Biotechnology	Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil	Data Book / Codes/Standards	Nil

CLR	The purpose of learning this course is to:	Depth				Attainment			PLO									
		1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10
CLR - 1	To test the ability to identify research gap	Conceive	Design	Implement	Operate	Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PSO 1	PSO 2
CLR - 2	To test the ability to identify the problem																	
CLR - 3	To test the ability to devise a plan of stud																	
CLR - 4	To learn how to determine the methodology																	
CLR - 5	To test the practical knowledge																	
CLO	At the end of this course, learners will be able to:																	
CLO - 1	Knowledge on reading the review of literature	✓	✓	-	-	2	85	75	1	1	3	-	-	3	3	3	3	3
CLO - 2	Knowledge on problem solving methods	✓	✓	✓	-	2	85	75	1	2	1	3	-	3	3	3	3	3
CLO - 3	Knowledge on devising methodologies	✓	✓	✓	✓	3	85	75	1	2	1	-	-	2	3	2	3	3
CLO - 4	Hands- on knowledge on various techniques	✓	✓	✓	✓	3	85	75	1	2	2	2	3	2	3	3	3	3
CLO - 5	Knowledge to interpret the results	✓	✓	✓	✓	3	85	75	1	1	1	3	2	1	3	1	3	3

Assessment								
Professional Internships	Continuous Learning Assessment (CLA) (50% weightage)				Final Assessment (50 %weightage)			
	Review -1		Review - 2					
	Choosing the research topic	Literature review	Understanding the Research findings	Oral Presentation	Identification of Research Gap 10%	Presentation 10 %	Dissertation 20 %	Viva-Voce 10%
	10 %	10 %	20 %	10 %				

Designers					
Professional Experts		Higher Institution Experts		Internal Experts	
1	Dr. Arumugam Perumal, ARMATS BIOTEK, Training and Research Institute, Chennai	1	Dr. N. Banu, Bharathi Women's College (Autonomous), Chennai	1	Dr. D. Senbagam, Assistant Professor, Department of Biotechnology, FSH, SRMIST, KTR