ACADEMIC CURRICULA

UNDERGRADUATE DEGREE PROGRAMME

BACHELOR OF SCIENCE IN BIOTECHNOLOGY
THREE YEARS /

BACHELOR OF SCIENCE (HONOURS) IN BIOTECHNOLOGY
FOUR YEARS

Learning Outcome Based Curriculum Framework (LOCF)

Choice based Flexible Credit System
Academic Year 2023 – 2024

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. Department Vision Statement	
Stmt - 1	Creating the most conducive environment for imparting quality education in Biotechnology
Stmt - 2	Contributing effectively to produce globally competent quality professionals in the field of life science
Stmt - 3	Contributing towards preparing young minds to serve community

2. Department Mission Statement	
Stmt - 1	Impart student's essential knowledge and skills required for a successful career in life science
Stmt - 2	Instill confidence in the students to take up new challenges by grooming them appropriately
Stmt - 3	Inculcate in the students a sense of commitment to professional ethics, moral values with emphasis on team work and leadership qualities
Stmt - 4	Instill the students with a clear awareness of environmental issues and their relevance to their profession
Stmt - 5	Impress upon the students the impact of their work on the nation's economic and social progress

3. Program Education Objectives (PEO)	
PEO - 1	Offer the students those skill sets and domain knowledge based on needs of current trends in biotechnology
PEO - 2	Provide the students with the capabilities in the areas of analysis, design, development and testing
PEO - 3	Kindle the minds of students to take up research and development in life science with missionary zeal
PEO - 4	Train the students to become effective communicators in professional as well as general aspects of life
PEO - 5	Prepare the students into balanced individuals who are keen to leave a mark by excelling in their profession

4. Consistency of PEO's with Mission of the Department

	Mission Stmt. – 1	Mission Stmt. - 2	Mission Stmt. - 3	Mission Stmt. - 4	Mission Stmt. – 5
PEO - 1	H	H	M	H	M
PEO - 2	H	M	H	H	H
PEO - 3	M	H	M	H	H
PEO - 4	H	H	H	L	M
PEO - 5	L	H	M	H	H

H – High Correlation, M – Medium Correlation, L – Low Correlation

1. Discipline Specific Core Courses (C) (20 Courses)

Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
UBT23101J	Cell Biology	3	0	3	2	4
UBT23102J	Microbiology	3	0	3	2	4
UBT23103J	Genetics	3	0	2	2	4
UBT23201J	Biochemistry	3	0	3	2	4
UBT23202J	Molecular Biology	3	0	3	2	4
UBT23203J	Computational Biology	3	0	2	2	4
UBT23301J	Biophysics & Bioinstrumentation	3	0	3	2	4
UBT23302J	Enzymology	3	0	3	2	4
UBT23303J	Bioprocess Technology	3	0	3	2	4
UBT23401J	Food Biotechnology	3	0	3	2	4
UBT23402J	Genetic Engineering	3	0	3	2	4
UBT23403J	Nanobiotechnology	3	0	3	2	4
UBT23501J	Cheminformatics	3	0	3	2	4
UBT23502J	Plant Biotechnology	3	0	3	2	4
UBT23503T	Signal Transduction	4	0	0	2	4
UBT23601J	Animal Biotechnology	3	0	3	2	4
UBT23602J	Immunology	3	0	3	2	4
UBT23603T	Research Methodology	4	0	0	2	4
UBT23701J	Environmental Biotechnology	3	0	3	2	4
UBT23801J	Biopython	2	0	4	2	4
Total Learning Credits						80

2. Discipline Specific Elective Courses (D) (10 Courses)

Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
UBT23D01T	Biofertilizer Technology	4	0	0	2	4
UBT23D02T	Pharmaceutical Biotechnology					
UBT23D03T	Forensic Science	4	0	0	2	4
UBT23D04T	Bioenergy					
UBT23D05J	Stem cell Biology	3	0	3	2	4
UBT23D06J	Algal Biotechnology					
UBT23D07T	Human Physiology	4	0	0	2	4
UBT23D08T	Medical Biotechnology					
UBT23D09T	Cancer Biology	4	0	0	2	4
UBT23D10T	Diagnostic Tools					
Total Learning Credits						20

3. Generic Elective Courses (G) (6 Course)

Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
ULT23G01J	Tamil-I	2	0	2	2	3
ULH23G01J	Hindi-I					
ULF23G01J	French-I					
ULT23G02J	Tamil-II	2	0	2	2	3
ULH23G02J	Hindi-II					
ULF23G02J	French-II					
UBT23G01J	Microbial physiology	2	0	4	2	4
UBT23G02T	Developmental Biology	4	0	0	2	4
UBT23G03J	Mushroom Cultivation	0	0	8	2	4
UBT23G04T	Tissue Engineering	4	0	0	2	4
UBT23G05T	Marine biotechnology	4	0	0	2	4
UBT23G06T	Biomaterials	4	0	0	2	4
UBT23G07T	Disease management	4	0	0	2	4
Total Learning Credits						34

4. Skill Enhancement Courses(S) (5 Courses)

Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
UCD23S01L	Quantitative Aptitude and Logical Reasoning	0	0	2	2	1
UCD23S02T	Verbal Ability and Skill Development	2	0	0	2	2
UBT23S01T	Mathematical Calculations in Biology	1	0	0	2	1
UBT23S02T	Entrepreneurship in Biotechnology	2	0	0	2	2
UBT23S03T	Bioethics & IPR	1	0	0	2	1
Total Learning Credits						20

5. Ability Enhancement Courses (AE) (10 Courses)

Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
ULE23AE1T	English	4	0	0	2	4
ULT23AE1J	Applied Tamil – I	1	0	2	2	2
ULH23AE1J	Applied Hindi – I					
ULF23AE1J	French for specific purpose-I					
ULT23AE2J	Applied Tamil – II	1	0	2	2	2
ULH23AE2J	Applied Hindi – II					
ULF23AE2J	French for specific purpose-II					
UES23AE1T	Environmental Studies	3	0	0	2	3
Total Learning Credits						20

6. Value Addition Course (V) (4 Courses)

Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
UCD23V01T	Universal Human Values	2	0	0	2	2
UEN23V01L	Communication Skills	0	0	4	2	2
UCD23V02T	Industry Oriented Employability Skills for Science	2	0	0	2	2
UCD23V05T	Career Readiness and Professional Skills	2	0	0	2	2
Total Learning Credits						8

7. Internship/Apprenticeship / Project/ Community Outreach (IAPC) (6 Courses)						
Course Code	Course Title	Hours/ Week				C
		L	T	P	O	
UBT23P01L	Internship - 1					1
UBT23P02L	Internship - 2					1
UBT23P03L	Internship - 3					2
UBT23P04L	Mini Project			4	2	2
UBT23P05L	Project Phase-I			8	2	4
UBT23P06L	Project Phase-II			12	2	6
Total Learning Credits						16

8. Mandatory Courses(M) (2 Courses)						
Course Code	Course Title	Hours/ Week				C
		L	T	P	O	
UNS23M01L	NSS					
UNC23M01L	NCC					
UNO23M01L	NSO					
UYG23M01L	YOGA					
UMI23M01L	My India Project					
Total Learning Credits						

STRUCTURE OF UG COURSES IN BIOTECHNOLOGY

DISTRIBUTION OF DIFFERENT COURSES IN EACH SEMESTER WITH THEIR CREDITS FORB.Sc. BIOTECHNOLOGY

Semester	Discipline Specific Core Courses (C)	Discipline Specific Elective (D)	Ability Enhancement Courses (AE)	Skill Enhancement Course (S) Value Addition Course (V)	Generic Elective (G)	Internship/ Project / Apprenticeship / Community Outreach (IAPC)	Total Credits
Semester I	C-1 C-2 C-3 (12)	-	AE-1 (4)	S-1 (1) V-1 (2)	(3)		22
Semester II	C-4 C-5 C-6 (12)	-	AE-2 (3)	S-2 (2) V-2 (2)	G-2 (3)		22
Semester III	C-7 C-8 C-9 (12)		AE-3 (2)	S-3 (1) V-3 (2)	G-3 (4)	IAPC-1 (1)	22
SemesterIV	C-10 C-11 C-12 (12)		AE-4 (2)	S-4 (2) V-4 (2)	G-4 (4)		22
Semester V	C-13 C-14 C-15 (12)	D - 1 (4)		S-5 (1)	G-5 (4)	IAPC-2 (1)	22
Semester VI	C-16 C-17 C-18 (12)	D -2 (4)			G-6 (4)	IAPC (2)	22
SemesterVII	C-19 (4)	D -3 (4)			G-7 G-8 (8)	IAPC-3 (6)	22
SemesterVIII	C-20 (4)	D -4 D 5 (8)			G-9 (4)	IAPC (6)	22
Total Credits	80	20	11	15	34	16	176

SEMESTER I						
Code	Course Title	Hours/ Week				
		L	T	P	O	C
ULT23G01J	Tamil-I	2	0	2	2	3
ULH23G01J	Hindi-I					
ULF23G01J	French-I					
ULE23AE1T	English	4	0	0	2	4
UBT23101J	Cell Biology	3	0	3	2	4
UBT23102J	Microbiology	3	0	3	2	4
UBT23103J	Genetics	3	0	2	2	4
UCD23S01L	Quantitative aptitude and Logical reasoning	0	0	2	2	1
UCD23V01T	Universal Human Values	2	0	0	2	2
Total Learning Credits		17	0	12	14	22
Total number of hours /week						29

SEMESTER II						
Code	Course Title	Hours/ Week				
		L	T	P	O	C
ULT23G02J	Tamil-II	2	0	2	2	3

ULH23G02J	Hindi-II					
ULF23G02J	French-II					
UES23AE1T	Environmental Studies	3	0	0	2	3
UBT23201J	Biochemistry	3	0	3	2	4
UBT23202J	Molecular Biology	3	0	3	2	4
UBT23203J	Computational Biology	3	0	2	2	4
UCD23S02T	Verbal Ability and Skill Development	2	0	0	2	2
UEN23V01L	Communication Skills	0	0	4	2	2
Total Learning Credits		16	0	14	14	22
Total number of hours /week						30

SEMESTER III						
Code	Course Title	Hours/ Week				
		L	T	P	O	C
UBT23301J	Biophysics and Bioinstrumentation	3	0	3	2	4
UBT23302J	Enzymology	3	0	3	2	4
UBT23303J	Bioprocess Technology	3	0	3	2	4
ULT23AE1J	Applied Tamil – I	1	0	2	2	2
ULH23AE1J	Applied Hindi – I					
ULF23AE1J	French for specific purpose-I					

UBT23G01J	Microbial physiology	2	0	4	2	4
UBT23S01T	Mathematical Calculations in Biology	1	0	0	2	1
UBT23P01L	Internship – I					1
UCD23V02T	Industry Oriented Employability Skills for Science	2	0	0	2	2
Total Learning Credits		15	0	15	14	22
Total number of hours /week						30

SEMESTER IV						
Code	Course Title	Hours/ Week				
		L	T	P	O	C
UBT23401J	Food Biotechnology	3	0	3	2	4
UBT23402J	Genetic Engineering	3	0	3	2	4
UBT23403J	Nanobiotechnology	3	0	3	2	4
ULT23AE2J	Applied Tamil – II	1	0	2	2	2
ULH23AE2J	Applied Hindi - II					
ULF23AE2J	French for specific purpose-II					
UBT23G02T	Developmental Biology	4	0	0	2	4
UBT23S02T	Entrprenurship in Biotechnology	2	0	0	2	2
UCD23V05T	Career Readiness and Professional Skills	2	0	0	2	2

Total Learning Credits	18	0	11	14	22
Total number of hours /week					29

SEMESTER V						
Code	Course Title	Hours/ Week				
		L	T	P	O	C
UBT23501J	Cheminformatics	3	0	3	2	4
UBT23502J	Plant Biotechnology	3	0	3	2	4
UBT23503T	Signal transduction	4	0	0	2	4
UBT23D01T	Biofertilizer Technology	4	0	0	2	4
UBT23D02T	Pharmaceutical Biotechnology					
UBT23G03J	Mushroom Cultivation	0	0	8	2	4
UBT23S03T	Bioethics & IPR	1	0	0	2	1
UBT23P02L	Internship – II					1
Total Learning Credits		15	0	14	12	22
Total number of hours /week						29

SEMESTER VI						
Code	Course Title	Hours/ Week				
		L	T	P	O	C
UBT23601J	Animal Biotechnology	3	0	3	2	4
UBT23602J	Immunology	3	0	3	2	4
UBT23603T	Research Methodology	4	0	0	2	4
UBT23D03T	Forensic Science	4	0	0	2	4
UBT23D04T	Bioenergy					
UBT23G04T	Tissue Engineering	4	0	0	2	4
UBT23P04L	Mini Project			4	2	2
Total Learning Credits		18	0	10	12	22
Total number of hours /week						28

SEMESTER VII						
Code	Course Title	Hours/ Week				
		L	T	P	O	C
UBT23701J	Environmental Biotechnology	3	0	3	2	4
UBT23D05J	Stem cell biology	3	0	3	2	4
UBT23D06J	Algal Biotechnology					

UBT23G05T	Marine Biotechnology	4	0	0	2	4
UBT23G06T	Biomaterials	4	0	0	2	4
UBT23P03L	Internship – III					2
UBT23P05L	Project Phase- I			8	2	4
Total Learning Credits		14	0	14	10	22
Total number of hours /week						28

SEMESTER VIII						
Code	Course Title	Hours/ Week				
		L	T	P	O	C
UBT23801J	Biopython	2	0	4	2	4
UBT23D07T	Human Physiology	4	0	0	2	4
UBT23D08T	Medical Biotechnology					
UBT23D09T	Cancer Biology	4	0	0	2	4
UBT23D10T	Diagnostic Tools					
UBT23G07T	Disease management	4	0	0	2	4
UBT23P06L	Project Phase – II			12	2	6
Total Learning Credits		14	0	16	10	22

Total number of hours /week						30

Courses for earning Additional Credits

Course Code	Course Title	Hours/ Week				
		L	T	P	O	C
Semester – II						
UCD23P01L	Internship Report– I	0	0	8	0	4
UCD23P02L	Project Work – I					
UCD23P03L	Apprenticeship – I					
Semester – IV						
UCD23P04L	Internship Report– II	0	0	8	0	4
UCD23P05L	Project Work – II					
UCD23P06L	Apprenticeship – II					
	Total Learning Credits	0	0	8	0	4

Note: Those students who decide to exit at the end of the First year shall register for any one of the courses mentioned under Semester – II; and decide to exit at the end of the Second year shall register for any one of the courses mentioned under Semester – IV in the above list.

Programme Articulation Matrix														
Course Code	**Course Name**	**Fundamental Knowledge**	**Analyze, Interpret Data**	**Reasoning ability**	**Ethical Practices**	**Team Work**	**Communication of complex biotechnological ideas**	**Independent and lifelong learning**	**PSO-1**	**PSO-2**	**PSO–3**	**PSO-4**	**PSO-5**
ULT23G01T	Tamil-I	H	H	H	M	H	H	M	H	M	H	H	H
ULH23G0T	Hindi-I	H	H	H	H	H	H	M	H	H	H	H	H
ULF23G01J	French-I	H	H	H	M	H	H	M	H	H	H	H	H
ULE23AE1T	English	H	H	M	H	H	H	H	H	M	H	H	H
UBT23101J	Cell Biology	H	H	M	H	H	H	H	H	M	H	H	H
UBT23102J	Microbiology	H	H	M	H	M	L	M	M	L	L	M	H
UBT23103J	Genetics	H	H	M	M	M	L	M	M	L	M	L	H
UCD23S01L	Quantitative Aptitude and Logical Reasoning	H	H	H	H	H	H	M	H	H	M	L	H
UCD23V01T	Universal Human Values	H	H	M	M	M	H	L	M	H	M	L	H
ULT23G02J	Tamil-II	H	H	M	M	M	H	M	M	L	M	L	H
ULH23G02T	Hindi-II	H	M	M	M	M	H	M	H	M	M	L	H
ULF23G02J	French-II	H	M	M	M	M	H	H	M	M	M	L	H
UES23AE1T	Environmental Studies	H	H	M	M	M	H	H	M	M	M	H	H
UBT23201J	Biochemistry	H	H	H	H	M	H	H	M	M	H	M	H
UBT23202J	Molecular Biology	H	H	M	H	M	H	M	M	H	H	L	H
UBT23203J	Computational Biology	H	H	H	H	M	H	M	H	M	M	M	H
UCD23S02T	Verbal Ability and Skill Development	H	H	H	H	M	H	H	H	H	H	H	H
UEN23V01L	Communication Skills	H	H	M	H	M	H	M	H	H	H	L	H
UBT23301J	Biophysics & Bioinstrumentation	H	H	M	M	M	H	M	H	H	H	M	H
UBT23302J	Enzymology	H	H	H	H	M	H	L	H	M	H	M	H

UBT23303J	Bioprocess Technology	H	H	M	H	M	H	L	L	M	M	M	H
ULT23AE1J	Applied Tamil – I	H	H	M	H	M	L	L	L	M	M	L	H
ULH23AE1J	Applied Hindi – I	H	H	M	M	H	H	H	M	M	M	M	H
ULF23AE1J	French for specific purpose-I	H	H	M	M	M	L	L	L	M	M	-H	H
UBT23G01J	Microbial physiology	H	H	M	M	M	L	L	L	M	M	L	H
UBT23S01T	Mathematical Calculations in Biology	H	H	M	H	M	L	L	L	M	M	L	H
UBT23P01L	Internship – 1	H	H	H	M	H	H	M	H	H	H	M	H
UCD23V02T	Industry Oriented Employability Skills for Science	H	H	M	H	M	L	L	L	M	M	M	H
UBT23401J	Food Biotechnology	H	H	M	M	H	H	H	M	M	M	L	H
UBT23402J	Genetic Engineering	H	H	H	H	H	H	M	H	H	H	H	H
UBT23403J	Nanobiotechnology	H	M	M	M	M	H	M	M	M	M	H	H
ULT23AE2J	Applied Tamil – II	H	M	M	M	M	L	M	L	M	M	M	H
ULH23AE2J	Applied Hindi – II	H	H	M	M	M	L	L	L	M	M	M	M
ULF23AE2J	French for specific purpose-II	H	M	M	M	M	H	M	M	M	M	H	H
UBT23G02J	Developmental Biology	H	M	M	M	M	H	M	M	M	M	H	H
UBT23S02T	Entrprenurship in Biotechnology	H	H	H	H	M	L	L	L	M	L	M	H
UCD23V05T	Career Readiness and Professional Skills	H	H	M	H	M	L	M	M	L	L	M	H
UBT23501J	Cheminformatics	H	H	M	H	M	L	L	L	M	M	M	H
UBT23502J	Plant Biotechnology	H	H	M	M	H	H	H	M	M	M	L	H
UBT23503T	Signal transduction	H	H	M	M	L	L	L	L	L	L	L	H
UBT23D01T	Biofertilizer Technology	H	H	M	M	M	L	L	L	L	L	L	H
UBT23D02T	Pharmaceutical Biotechnology	H	M	M	M	M	L	M	L	M	M	M	H
UBT23G03J	Mushroom Cultivation	H	H	M	M	M	L	L	L	M	M	M	M
UBT23S03T	Bioethics & IPR	H	H	H	H	H	H	H	H	H	H	H	H
UBT23P02L	Internship – 2	H	H	M	H	H	H	H	H	M	H	H	H
UBT23601J	Animal Biotechnology	H	H	M	H	H	H	H	H	M	H	H	H
UBT23602J	Immunology	H	H	H	H	M	L	L	L	M	M	M	M
UBT23603T	Research Methodology	H	H	H	H	M	L	L	L	H	L	M	H
UBT23D03T	Forensic Science	H	M	H	M	L	L	L	M	M	-	H	-
UBT23D04T	Bioenergy	H	M	M	H	H	H	M	M	M	-	H	-
UBT23G04J	Tissue Engineering	H	M	M	M	L	L	L	M	M	-	H	-
UBT23P04L	Mini Project	H	M	M	M	L	L	L	M	M	-	H	-
UBT23701J	Environmental Biotechnology	H	M	H	M	L	L	L	M	M	-	H	-
UBT23D05T	Stem cell biology	H	H	M	H	H	M	H	H	H	-	H	-
UBT23D06T	Algal Biotechnology	H	M	H	M	L	L	L	M	M	-	H	-
UBT23G05J	Marine Biotechnology	H	M	M	H	H	H	M	M	M	-	H	-
UBT23G06J	Biomaterials	H	M	M	M	L	L	L	M	M	H	H	H
UBT23P03L	Internship – 3	H	H	M	M	H	H	H	M	M	H	H	H
UBT23P05L	Project Phase-I	H	M	M	M	L	L	L	M	M	M	M	M
UBT23801J	Biopython	H	M	H	M	L	L	L	M	M	L	M	H
UBT23D07T	Human Physiology	H	H	M	H	H	M	H	H	H	-	H	-

UBT23D08T	Medical Biotechnology	H	M	H	M	L	L	L	M	M	-	H	-
UBT23D09T	Cancer Biology	H	M	M	H	H	H	M	M	M	-	H	-
UBT23D10T	Diagnostic Tools	H	M	M	M	L	L	L	M	M	H	H	H
UBT23G07J	Disease management	H	M	H	M	L	L	L	M	M	H	H	H
UBT23P06L	Project Phase-II	H	H	M	H	H	M	H	H	H	M	M	M
Program Average		H	H	M	H	M	L	L	L	M	M	M	H

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SEMESTER I

Course Code	ULT23G01J	Course Name	Tamil - I	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

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

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	PSO -1	PSO -2	PSO-3
CLR-1 :	மரபிலிருந்து மாற்றம் பெற்ற புதுக்கவிதை மரபின் சிந்தனைகளை அறியச் செய்தல்																		
CLR-2 :	புதுக்கவிதையின் வழி மனித வாழ்வியல் விழுமியங்களைத் தெரியச் செய்தல்																		
CLR-3 :	சிற்றிலக்கியங்கள், காப்பியங்கள் கற்பிக்கும் தமிழ்ச் சமூகத்தின் வாழ்வியலை அறியச் செய்தல்																		
CLR-4 :	நவீன தமிழ் இலக்கிய வளர்ச்சி வரலாற்றைப் புரியச் செய்தல்																		
CLR-5 :	மொழிப் பயிற்சி வழி மொழியின் பல்வேறு நுட்பங்களைத் தெரியச் செய்தல்																		
Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*																		
CLO-1 :	புதுக்கவிதை உருவாக்கித் தந்த புதிய சிந்தனைக் களங்களை அறிந்துகொள்ளுதல்	*2*	*75*	*60*	*H*	*L*	*H*	*M*	*H*	*H*	*L*	*M*	*H*	*M*	*L*	*H*	-	-	-
LCLO-2 :	நவீன கவிதைகள் வழி மாற்றம் பெற்று வரும் மானுட விழுமியங்களைத் தெரிந்துகொள்ளுதல்	*2*	*80*	*70*	*H*	*M*	*H*	*L*	*M*	*H*	*L*	*H*	*M*	*L*	*H*	*H*	-	-	-
CLO-3 :	தமிழ்ச்சமூகத்தின் இடைக்கால வாழ்வியல் முறைகளை உணர்ந்துகொள்ளுதல்	*2*	*70*	*65*	*H*	*L*	*H*	*M*	*H*	*H*	*M*	*H*	*L*	*H*	*M*	*H*	-	-	-
CLO-4 :	நவீன இலக்கிய வரலாறு வழி தமிழ்க் கல்வி வரலாறு, சமூக வரலாறு பெற்ற வளர்ச்சி நிலைகளைத் தெரிந்துகொள்ளுதல்	*2*	*70*	*70*	*H*	*M*	*H*	*L*	*H*	*M*	*M*	*H*	*H*	*L*	*H*	*H*	-	-	-
CLO-5 :	மொழியின் நுட்பங்களை அறிந்து மொழி ஆளுமையோடு செயல்பட அறிந்துகொள்ளுதல்	*2*	*80*	*70*	*H*	*M*	*H*	*H*	*M*	*H*	*L*	*M*	*H*	*L*	*H*	*H*	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	தமிழ் இலக்கியத்தின் வளர்ச்சிப் போக்குகள்	நவீன கவிதை தோற்றம்	தமிழரின் வீரமரபு	சிற்றிலக்கியத் தோற்றம்	தமிழ் உரைநடை மரபில் உ.வே.சா.
	SLO-2	இலக்கிய உத்திகள்	நவீன கவிதை வரலாறு	போர் விழுமியங்கள்	சிற்றிலக்கிய வகைமை	ராஜ வைத்தியம்
S-2	SLO-1	தமிழ்க் கவிதை மரபு	நவீன கவிதை செல்நெறிகள்	பரணி அறிமுகம்	சிற்றிலக்கியங்கள்	வைத்தியர்களின் சிறப்பு
	SLO-2	காலந்தோறும் கவிதையின் கரு	செல்நெறிகளில் கோட்பாடுகள்	பரணி இலக்கியங்கள்	முதன்மைச் சிற்றிலக்கியங்கள் –	கழனியூரன் – அறிமுகம்
S-3	SLO-1	காலந்தோறும் கவிதையின் கட்டமைப்பு	கவிதை மொழி	கலிங்கத்துப்பரணி 477,490	பிள்ளைத்தமிழ் -உலா - தூது	சிறுதெய்வ வழிபாடு
	SLO-2	தற்கால இலக்கியம்	நவீன கவி ஆளுமைகள்	தலைவனின் வீரம்	புதுக்கவிதையில் சமூகம்	பொன் காத்த ஐயனார்
S-4	SLO-1	புதுக்கவிதை உருவாக்கம்	பெண் கவிஞர்கள்	தமிழ் இலக்கிய மரபில் தூது	புதுக்கவிதையும் இதழ்களும்	விருந்து – கள்ளர் செயல்கள்
	SLO-2	புதுக்கவிதை வளர்ச்சிநெறிகள்	கவிதையில் நாட்டுப்புற வடிவம்	தூது இலக்கியங்கள்	மணிக்கொடி இதழ்	பிழை நீக்கி எழுதுதல்

S-5	SLO-1	பாரதியார் – புதுக்கவிதையின் அடையாளம்	இளம்பிறை – அம்மா	தமிழ் விடு தூது (184 – 186)	எழுத்து இதழ்	எழுத்துப் பிழை
	SLO-2	பாரதியார் பன்முக ஆளுமைத்திறன்	பெண்களின் கல்வி நிலை	தமிழின் பெருமை	வானம்பாடி இதழ்	தொடர்பிழை
S-6	SLO-1	பாரத தேசம்	பெண் அடக்குமுறை	செய்யுள் மரபில் கலம்பகம்	சிறுகதை தோற்றம்	உயர்திணை, அஃறிணை
	SLO-2	பாரததேசத்தின் வளம்	ப. கல்பனா – கீறல் விழுந்த மாலைக் காலங்கள்	கலம்பக இலக்கியங்கள்	சிறுகதை வளர்ச்சி	பிறமொழிச் சொற்கள் வரலாறு
S-7	SLO-1	வெள்ளிப் பனிமலையின் மீதுலவுவோம்...	ஆண் பெண் சமத்துவம்	நந்திக் கலம்பகம்-வானுறு மதியை (110)	சிறுகதை – வரலாறு	பிறமொழிச் சொற்களை நீக்கி எழுதுதல்
	SLO-2	20 ஆம் நூற்றாண்டுக் கவிதை மரபில் பாரதிதாசன்	விளிம்புநிலை வாழ்வியல்	கையறுநிலை	சிறுகதை ஆசிரியர்கள்	ஷ, ஜ, ஸ, ஹ மாற்றொலிகள்
S-8	SLO-1	பாரதிதாசன் - அழகின் சிரிப்பு	திருநங்கை குணவதி - சமூகப்பார்வை	குறவஞ்சி அறிமுகம்	இதழ்களும் சிறுகதையும்	தமிழ் இலக்கண நுட்பங்கள்
	SLO-2	ஆல் - ஆயிரம் கிளைகள் கொண்ட அடிமரம்	திருநர்களும் சாதனைகளும்	குறவஞ்சி இலக்கியங்கள்	புதினம் தோற்றம்	இலக்கணமும் பயன்பாடும்
S-9	SLO-1	இயற்கையின் அழகியல்	புலம்பெயர் வாழ்வியல்	குற்றாலக் குறவஞ்சி – ஆடுமர வீனுமணி (3)	தொடக்கக்காலப் புதினங்கள்	தமிழில் சொல் வகைகள்
	SLO-2	வானம்பாடியில் மு.மேத்தா	ஸர்மிளா ஸெய்யித் – புராதன ஊர்	மலையும் வாழ்வும்	புதினம் வளர்ச்சி	சொல்லும் பயன்பாடும்
S-10	SLO-1	மு.மேத்தா - கவிதையின் தனித்தன்மைகள்	புலம் பெயர் வாழ்வின் வலியும் நம்பிக்கையும்	காப்பிய இலக்கணம்	புதினத்தின் வகைமை	பெயர்ச்சொற்கள்
	SLO-2	மனிதனைத்தேடி – கவிதை	காலந்தோறும் கவிதை வடிவில் மாற்றங்கள்	காப்பிய வகைமைகள்	புதின ஆசிரியர்கள்	பெயர்ச்சொற்கள் அறிதல்
S-11	SLO-1	மனிதநேயம்	ஹைக்கூ, லிமரைக்கூ, சென்ரியூ – தேர்ந்தெடுத்த கவிதைகள்	சிலப்பதிகாரம் – அறிமுகம்	தமிழ் இலக்கியத்தில் உரைநடைக்கூறுகள்	வினைச்சொற்கள்
	SLO-2	தமிழ்க் கவிதையில் சுற்றுச்சூழலியல்	ஹைக்கூ – மு.முருகேஷ்	கட்டுரைக்காதை	உரைநடையின் தோற்றம்	வினைச்சொற்கள் அறிதல்
S-12	SLO-1	பழனிபாரதியின் காடு	லிமரைக்கூ – ஈரோடு தமிழன்பன்	ஊழ்வினை	தமிழில் உரைநடை	தமிழில் பெயரடை, வினையடை
	SLO-2	இயற்கையும் சமூக சமத்துவ வாழ்வியலும்	சென்ரியூ – மாமதயானை	கோவலனின் முற்பிறப்பு வரலாறு	உரைநடை வளர்த்த அறிஞர்கள்	பெயரடை, வினையடை அறிதல்

Learning Resources	1. முல்லைக்காடு, தொகுப்பும் பதிப்பும் - தமிழ்த்துறை ஆசிரியர்கள், எஸ்.ஆர்.எம். அறிவியல் மற்றும் தொழில்நுட்பக் கல்விநிறுவனம், காட்டாங்குளத்தூர், 603203, 2023 2. வல்லிக்கண்ணன், புதுக்கவிதை தோற்றமும் வளர்ச்சியும், ஆழி பதிப்பகம், சென்னை, 2018 3. கா. சிவத்தம்பி, தமிழில் சிறுகதை தோற்றமும் வளர்ச்சியும், எஸ்.சி.பி.எச்., சென்னை, 2013	4. தமிழ் இணையக் கல்விக்கழகம் - http://www.tamilvu.org/ 5. மதுரை தமிழ் இலக்கிய மின் தொகுப்புத் திட்டம் - https://www.projectmadurai.org/

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	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 & Literaturel, 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	ULH23G01J	Course Name	HINDI-I	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering Department	HINDI	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
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*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	PSO -1	PSO -2	PSO-3
CLO-1 :	*To Understand the Philosophy of life and living through Stories*	*2*	*75*	*80*	*H*	*H*	*H*	*M*	*L*	*H*	*L*	*M*	*L*	*L*	*H*	*M*	-	-	-
CLO-2 :	*To Examine Travelogue writing and Sketch*	*2*	*80*	*90*	*H*	*H*	*H*	*M*	*L*	*H*	*H*	*M*	*L*	*L*	*H*	*M*	-	-	-
CLO-3 :	*To Identify Irony and essay based writing*	*2*	*75*	*95*	*H*	*H*	*M*	*L*	*H*	*H*	*M*	*H*	*M*	*M*	*H*	*H*	-	-	-
CLO-4 :	*Evaluate the various social issues depicted in the prose*	*2*	*80*	*90*	*H*	*H*	*L*	*H*	*M*	*H*	*L*	*H*	*H*	*M*	*H*	*H*	-	-	-
CLO-5 :	*To Understand the basic and fundamental principal of Translation*	*2*	*85*	*90*	*M*	*H*	*M*	*H*	*L*	*H*	*H*	*L*	*H*	*M*	*H*	*H*	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	*KAHANI*	*REKHACHITRA &YATRAVITRANT*	*NIBANDH*	*NATAK*	*ANUVAD& PARIBHASHIKSHABDAVALI*
	SLO-2	*AVDHARNA*	*VDHARNA*	*IBANDH KI AVDHARNA*	*AVDHARNA*	*RTH*
S-2	*SLO-1*	*SWARUP*	*WAROOP*	*WARUP*	*NATAK KA SWARUP*	*ARIBHASHA*
	SLO-2	*PARIBHASHA*	*HUMIKA*	*ARIBHASHA*	*PARIBHASHA*	*WARUP*
S-3	*SLO-1*	*KAHANI KE TATVA*	*AHATVA*	*AHATVA*	*ATWA*	*RAKAR*
	SLO-2	*KAHANI KA MAHATVA*	*DDESHYA*	*DDESHYA*	*PRAKAR*	*AHATVA*
S-4	*SLO-1*	*PARIKSHA- PREMCHAND*	*ISHA- EKHACHITRA*	*UTAJ- NIBANDH AJARI PRASHAD DIVEDI*	*UDDESHYA*	*DDESHYA*
	SLO-2	*KAHANI KA PARICHAY*	*EKHIKA PARICHAY*	*EKHIKA PARICHAY*	*RANGMANCH KA PARICHAY*	*NUVAD KA PRAYOJAN*
S-5	*SLO-1*	*VISLESHAN*	*ATH KA VISHLESHAN*	*ATH KA MAHATVA*	*NATAK KA MAHATVA*	*NUVAD KA PRAYOG*
	SLO-2	*EMANDARI KA MAHATVA*	*URU SHISHYA KAAMBANDH*	*IPRIT PARISHTHITIYON ME JEEVAN KISH*	*PRAYOJAN*	*HROT BHASHA KA GYAN*
S-6	*SLO-1*	*HONHARI KA PARICHAY*	*GURU KE PRATI SMARPAN BHAVANA*	*MANAV KI AKANKSHAYEN*	*ANDHER NAGRI-(NATAK) BHARTENDU HARISHCHAND*	*LAKSHYA BHASHA KA GYAN*
	SLO-2	*UDDESHYA*	*PATH KA MAHATVA*	*SHANGHARSHIL JEEVAN*	*LEKHAK PARICHAY*	*ANUVAD KA DAYITVA*
S-7	*SLO-1*	*MALBE KA MALIK- MOHANRAKESH*	*HELE PAR HIMALAY (YATRAVITRANT)*	*SANGHARSH KA PARINAM*	*NATAK KA VISLESHAN*	*ANUVAD KA ABHYASH*
	SLO-2	*LEKHAK PARICHAY*	*LEKHAK PARICHAY*	*BHOLARAM KA JEEV-(VYANGYA)HARISHANKAR PARSHAI*	*NATAK ABHINAY*	*ANGREJI SE HINDI*

	SLO-1	*BATWARE KA YATHARTHVARNAN*	*YATRAVITRANT KAMAHATVA*	*VYANGYA KI AVADHARNA*	*LALCH KA DUSHPARINAM*	*HINDI SE ANGREJI*
S-8	*SLO-2*	*TATKALIN PARISHTHITI KAVARNAN*	*YATRA KA YATHARTHCHITRAN*	*MAHATVA*	*SHISHYA KI AGYANTA*	*ANUVAD PRIYOJNA KARYA*
	SLO-1	*APNI MITTI SE LAGAV*	*PATH KA VISLESHAN*	*LEKHAK PARICHAY*	*GURU SHISHYA SAMBANDH*	*PUNRIKSHAN*
S-9	*SLO-2*	*RAJNITIK VIDWESH KA PARINAM*	*HIMALAY KA VARNANA*	*PATH KA VIHLESHAN*	*HASHYA VYANGY SE AVAGATKARANA*	*VIVIDH PRAYOG*
	SLO-1	*PROPKAR KI BHAVANA*	*HIMALAY KA LOK JEEVAN*	*MADHYAVARGI PARIVAR KI STHITI*	*DURDRISHTIHIN*	*PARIBHASHIK SHABDAVALI*
S-10	*SLO-2*	*KAHANI PATH*	*LOK SAMASYA*	*SARKARI TANTRA KA KHOKHLA RUP*	*MAHATTAKANKSHI KADUSHPARINAM*	*ATI MAHTVAPURN SHABD*
	SLO-1	*KAHANI KA VISHLESHAN*	*UDDESHYA*	*PAURANIK KATHA KA CHITRAN*	*GURU KI AVAGYA KADUSHPARINAM*	*TAKANIKI SHABDAVALI KA MHATVA*
S-11	*SLO-2*	*PRASHO KI CHARCHA*	*PRASHNA ABHYASH*	*SANVEDANSHIL BHAVANA*	*TATKALIN SAMAJIK VYAVASTHA KICHARCHA*	*HINDI SE ANGREZI SHABD*
	SLO-1	*PRASHN ABHYASH*	*PATH PRICHARCHA*	*PARICHARCHA*	*PARICHARCHA*	*ANGREZI SE HINDI SHABD*
S-12	*SLO-2*	*KAHANI KA UDDESHYA*	*MAHATVAPURN BIBDUONKI CHARCHA*	*PRASHANA ABHYASH*	*PRASHNABHYASH*	*SHABDAVALI KI AVSHYAKTA*

Learning Resources	*Edited Book: ""SAMANYA HINDI", SRIJONLOK PUBLICATION, 2023, New Delhi.* 1. KABIR – HAZARI PRASAD DWEDI 2. SURDAS – RAM CHANDRA SHUKL	3. BHAKTI ANDOLAN AUR SURDAS KA KAVYA – MANAGER PANDEY 4. BIHARI – VISHVNATH PRASAD MISHR 5. Aadhunik Vigyapan aur Jansampark – Taresh Bhatia

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Shri. Santosh Kumar Editor : Srijanlok Magazine Place: Vashishth Nagar, Ara – 802301	*1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu*	*1. Dr.S Preeti. Associate Professor & Head, SRMIST*
		2. Dr. Md.S. Islam Assistant Professor, SRMIST
		3.Dr. S. Razia Begum, Assistant Professor, SRM IST
		4, Dr.Nisha Murlidharan Assistant Professor, VDP,SRM IST

Course Code	ULF23G01J	Course Name	French-I	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

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

Course Learning Rationale (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 foreignerspeaking 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

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*To acquire knowledge about French language*	*2*	*75*	*80*
CLO-2 :	*To strengthen the knowledge on concept, culture, civilization and translation of French*	*2*	*80*	*90*
CLO-3 :	*To develop content using the features in French language*	*2*	*85*	*75*
CLO-4 :	*To interpret the French language into other language*	*2*	*75*	*80*
CLO-5 :	*To improve the communication, intercultural elements in French language*	*2*	*80*	*75*

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	PSO -1	PSO -2	PSO-3
H	*M*	*H*	*H*	*M*	*H*	*H*	*L*	*M*	*M*	*H*	*L*	-	-	-
M	*H*	*L*	*H*	*H*	*M*	*H*	*M*	*L*	*L*	*H*	*M*	-	-	-
H	*H*	*L*	*M*	*H*	*M*	*L*	*H*	*M*	*M*	*H*	*H*	-	-	-
H	*L*	*M*	*H*	*M*	*H*	*H*	*M*	*L*	*H*	*M*	*L*	-	-	-
M	*H*	*H*	*L*	*M*	*M*	*H*	*H*	*M*	*L*	*H*	*M*	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Contacts	Les verbes du premier groupe	Qu'est-ce qu'ils font ?	Portraits	Les verbes du deuxième groupe –
	SLO-2	Emma la championne	Les exemples	Les exemples	Un casting	Les exemples
S-2	SLO-1	Les nombres à partir de 31	La liaison	Où est mon sac	Les exemples	Les pronoms personnels toniques
	SLO-2	Les activités	Les activités	Les exemples	Les activités	Les exemples
S-3	SLO-1	Les pays	Entrer en contact	Quelques objets	Le Petit Spirou	Les verbes faire et lire
	SLO-2	les nationalités	Les activités	Les exemples	Les activités	Les exemples
S-4	SLO-1	Les jours de la semaine	Présenter et se présenter	Les professions	L'aspect physique	*Les Sons*
	SLO-2	Les jours	Les activités	La fiche d'identité	Les activités	Les exemples
S-5	SLO-1	Les mois de l'année	Demander et dire la date	La formation du féminin (2)	Le caractère	*Décrire l'aspect physique*
	SLO-2	Les activités	Les activités	La phrase interrogative partielle –	Les exemples	*Décrire le caractère*
S-6	SLO-1	Les animaux domestiques	une rencontre.	*Qu'est-ce que c'est ?*	les états d'âme	*Demander et dire l'heure*
	SLO-2	Les activités	Les activités	*Qui est-ce ?*	Les activités	Les exemples
S-7	SLO-1	La famille (1)	Contacts	*C'est / Il est (1)*	Les prépositions de lieu (1)	*Elle est comment ?*
	SLO-2	Les activités	Les activités	Les exemples	Les exemples	Les exemples
S-8	SLO-1	La formation du féminin (1)	Emma la Championne	La phrase négative (1)	La famille (2)	*Portraits*
	SLO-2	Les activités	Les activités	Les exemples	Les activités	Les exemples

S-9	SLO-1	Les adjectifs possessifs	Mots et expressions	Les verbes aller et venir	La formation du féminin	*Mots et Expressions*
	SLO-2	Les exemples	Les activités	L'élision	Les activités	Les activités
S-10	SLO-1	La phrase interrogative	Grammaire -	Les formules de politesse	La formation du pluriel (2)	*Grammaire.*
	SLO-2	Les exemples	Les exemples	Demander des informationspersonnelles	Les activités	Les exemples
S-11	SLO-1	Les activités	Communication	C'est qui ?	*Il y a*	Les activités
	SLO-2	Les nombres	Les activités	Qu'est-ce qu'ils font ?	Les activités	*Communication*
S-12	SLO-1	intonation et *est-ce que*	*Les verbes du ER –groupe*	Mots et Expressions	Les articles contractés	Les activités
	SLO-2	Les exemples	Les exemples	Grammaire – Communication	Les exemples	Les exemples

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

Learning Assessment											
	Bloom'sLevel of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (5%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	Internal Experts
1. Mr. Kavaskar DanasegaraneProcess Expert Maersk Global Service Center Pvt. Ltd	*1. Dr. C.Thirumurugan Professor, Department of French,Pondicherry University*	*1. Mr. Kumaravel K. Assistant Professor & Head, SRMIST, KTR*
2.Mr. Sharath Raam PrasadCharacter Designer, Animaker Company Pvt.		*2. Mrs. Abigail, Assistant Professor, SRMIST, VDP*

Course Code	ULE23AE1T	Course Name	English	Course Category	AE	Ability Enhancement course	L	T	P	0	C
							4	0	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	ProgressiveCourses	Nil
Course OfferingDepartment	Department of English, FSH, SRMIST		Data Book / Codes/Standards	Nil	

Course LearningRationale (CLR):	The purpose of learning this course is to:	Learning

		1	2	3
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.*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of	Expected	Expected
CLO-1 :	*Analyze different literary texts to identify the representation of issues related to gender, and class*	*2*	*75*	*60*
CLO-2 :	*Apply critical thinking skills to analyze and respond to academic texts.*	*2*	*80*	*70*
CLO-3 :	*Critically evaluate and discuss contemporary issues through online articles.*	*2*	*70*	*65*
CLO-4 :	*Refine their general writing skills*	*2*	*70*	*70*
CLO-5 :	*Improve their language application skills*	*2*	*80*	*70*

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental	Application of	Link with	Procedural	Skills in	Ability to Utilize	Skills in	Analyze,	Investigative	Problem Solving	Communication	Analytical Skills	PSO -1	PSO -2	PSO-3
H	*M*	*M*	*L*	-	*M*	-	*M*	*H*	*L*	*H*	*L*	-	-	-
M	*H*	*L*	-	-	-	-	*M*	*M*	*H*	*H*	*M*	-	-	-
M	*M*	*M*	-	*L*	*L*	-	*H*	*M*	*H*	*H*	*L*	-	-	-
H	*M*	*L*	-	*M*	*H*	-	-	-	-	*H*	*L*	-	-	-
H	*H*	-	*M*	-	*M*	-	*L*	*L*	*M*	*H*	*M*	-	-	-

Duration (hour)		*12*	*12*	*12*	*12*	12
S-1	*SLO-1*	*Introduction to the poetry andthe poet-Sukirtharani*	*Introduction to Short stories. Introducing the short story writer KatherineMansfield.*	*Introduction to Creative Writing. Explaining the elements of creative writing.*	*Building the discourse- The significance of conversation and the key elements of discourse are the points of discussion in thisclass hour.*	*Reflecting the learning. -Review writing*
	SLO- 2	*Reading and recitation of thepoem - Debt*	*Reading the story- TheDoll's House*	*Stand-up comedy show -translate the audio content in English. (any regional language)*	*Art of conversation in digital and verbal discourse- Lee Mockobe's A Powerful Poem of what it means to be a Transgender. TEDXTALK- POEM RECITATION*	*Choosing the subject for reviewing.*
S-2	*SLO-1*	*Analysis and Critical interpretation of the poem.*	*Explaining the story throughdepiction of characters and representation of injustices.*	*Students- groups -Students belonging to States other than Tamilnadu*	*Reflecting on the style and the tone of thepoem.*	*Planning to choose.*
	SLO- 2	*Introduction to the poet Kalki Subramaniyam.*	*Analysis and critical interpretation of the short story Doll's House.*	*Practice the writing activity -creative ways of engaging in translation.*	*Practicing conversation*	*Understand the review process how effectively areview of any work can be done.*
S-3 –S-4	*SLO-1*	*Reading and recitation of thepoem Phallus I cut.*	*Introduction to the writerHaruki Murakami.*	*Correction of errors- attempting totranslate.*	*Introducing Content writing in Social Media-the importance of content writing.*	*Introducing the students to the review of thevarious works.*
	SLO- 2	*Analysis and Critical interpretation of the poem.*	*Reading the Confessionsof a Shinawaga monkey.*	*Identifying equivalent terms to certainregional words - learn the art of translation.*	*.BLOG WRITING - Subtleties Of Workplace Inclusion: Mental Health And Queer Community- Salik Ansari..*	*Reviewing -recorded -posted in the social mediapages of SRMIST*
S-5	*SLO-1*	*Introduction to the poet Imtiaz Dharker*	*Discussion and analysis ofthe Confessions of a Shinawaga monkey.*	*Introducing famous art works and thecontexts of creation. Salvador Dali- The Face of*	*writer's conversation with the readers - theblog in other blog articles..*	*Thoughtful conversation with your team member post the same in the official social media page of SRMIST.*

				WarPablo Picasso- Guernica *Edward Munch- The Scream* *Pieter Bruegel- The Tower of Babel*		
	SLO- 2	*Reading and reciting thepoem Purdah 1*	*Introduction to CrystalWilkinson*	*creative and/ or thoughtful writing - contemporary themes of modern dayrelevance*	*Practice blog writing*	*Choosing the team based on the abilities that arecomfortable to match the peer members*
S-6	*SLO-1*	*Analysis and Critical interpretation of the poem-Purdah 1*	*Reading Endangered Species: Case 47401.*	*Students -writing abilities-buildingstories- a visual treat of variety of pictures.*	*Apprehending Life by reading the texts of influence- Chimamanda Ngozi Adiche's Notes on Grief- A BRIEF NOTE, We shouldall be Feminists-An Essay.*	*Choosing the topics for a thoughtful conversation*
	SLO- 2	*Reading and reciting thepoem Purdah 2*	*Discussion and analysis of Endangered Species: Case47401.*	*Elements of writing*	*Discussion- essay by the author -subjective depiction of life.* *Understand -subjective opinions - perspectives -*	*Planning and preparation for the script ofconversation with a team member*
S-7 –S-8	*SLO-1*	*Analysis and Critical interpretation of the poem-Purdah 2*	*Introduction to C.S Lakshmialso known as Ambai.*	*Incorporate the elements of story in story writing.*	*Class discussion*	*Drafting , editing and revising the script of conversation and enacting the conversation withthe team members*
	SLO- 2	*Introduction to the poet Arundathi Subramanian*	*Reading the short story- Ina Forest, A Deer.*	*Practice -write stories -pictures given or shown .*	*Practising the task multiple times with all the students in the classroom.*	*Enactment -proper rehearsal -final performance -conversation- whole performance should be recorded.*
S-9	*SLO-1*	*Reading and reciting the poem- Home*	*Discussion and Analysis ofIn a Forest, A Deer.*	*A writing task to write a script isintroduced in the classroom.*	*Interposing opinions in famous interviews-*	*The recording should be posted in the officialmedia page and social handles of SRMIST.*
	SLO- 2	*Analysis and Critical interpretation of the poem-Home*	*Retrospecting the writing styles of the authors-Katherine Mansfield, HarukiMurakami, Crystal Wilkinson and Ambai.*	*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.*	*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*	*work for this social post - reflect on their experience of learning communicative English course and the testimonial has to be recorded andposted in the social media pages of SRMIST..*
S-10	*SLO-1*	*Recollection of study of the writing styles and intentions ofthe poets prescribed in the syllabus.*	*Revision- The Doll's House*	*Creative writing -writing news reports. recreated with new characters, places, scenes, incidents.*	*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 theinterest -Giving instructions to do the project works-*
	SLO- 2	*Revision of the poems Debtand Phallus I cut*	*Revision- Confessions of aShinawaga Monkey*	*Watch debate shows - summarising the arguments Enhance -descriptive writing skill.*	*Certain role plays like celebrity personalities,political personalities -conduct the interview and be the interviewer and interviewee.*	*Discussion of ideas and generation of creativeideas*
S 11 - S 12	*SLO-1*	*Revision of the poems Purdah1 and 2*	*Revison- EndangeredSpecies: Case 47401*	*Practice the* improvement *of writing skill.*	*The art of conversation and the ability tobuild a discourse*	1. *Assignment on any piece of creativewriting (OR)* 2. *Presentation- Mastering the art ofPublic Speaking. (OR)* 3. *Project on compiling the real life influential events on gender inclusive issues and apresentation of the same. Interview Scripting /Blogwriting.*
	SLO- 2	*Revision of the poem Hiome.*	*Revision- In a Forest, ADeer.*	*Repetitive practice and continuous assessment -writing skiills-master the writing skill.*	*The evaluation and assesment of the conversation -constructive feedbacks to thestudents.*	*Students can opt any of the project from the givenchoice.*

Learning Resources	1. Horizon- English Text Book – Compiled and Edited by the faculty of English Departement, FSH, SRMIST, 2020 English Grammar in Use by Raymond Murphy 2. Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007	3. R.P. Bhatnagar, English for Competitive Examinations, Trinity Press, 3rd Edition,2016http://www.aptitudetests.org/verbal-reasoning-test https://www.assessmentday.co.uk/aptitudetests_verbal.htm

Level	Blooms Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (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	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
3	Evaluate	30 %	-	30%	-	30%	-	30 %	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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Course Code	UBT23101J	Course Name	CELL BIOLOGY	Course Category	C	Discipline Specific Core Courses	L	T	P	O	C
							3	0	3	2	4

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering Department	Biotechnology	Data Book / Codes/Standards		Nil	

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-1 :	Understand the organization of cells	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication ofcomplex biotechnological ideas	Independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO – 4	PSO – 5
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															
Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*															
CLO-1 :	Learn about prokaryotic and eukaryotic cell organization	2	85	80	H	M		M	H	-	-	-	-	-		
CLO-2 :	Gain knowledge on structure and functions of cellular organelles	2	85	80	H	-		M	H	L	-	-	-	-		
CLO-3 :	Apply knowledge on cell cycle and its regulation	3	80	75	H	H		-	-	M	-	-	-	-		
CLO-4 :	Learn about specialized cells and its functions	3	80	75	H	H		-	H	M	-	-	-	-		
CLO-5 :	Apply concepts on cell signaling processes and techniques	3	85	80	H	H		M	H	M	-	-	-	-		

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Cell Biology – Introduction andoverview	Introduction to cell organelles	Lysosomes	Mitosis	Cells of Vision
S-2	SLO-1	Classification of cell	Plasma membrane	Vacuoles	Mitosis	Pancreatic cells – Types
S-3	SLO-1	Development of cell theory	Nucleus	Cytoskeleton	Meiosis	Pancreatic cells – Functions
S 4-6	SLO-1	Introduction to cell biology laboratory	Estimation of hemoglobin bySahli's method	Cell Counting and viability	Protoplast isolation	Preparation and Observation ofpolytene chromosomes
	SLO-2					
S-7	SLO-1	Prokaryotic cell organization	Endoplasmic reticulum	Centrioles	Meiosis	PI3K/Akt signaling pathway
S-8	SLO-1	Eukaryotic cell organization	Golgi Apparatus	Extracellular matrix	Specialized cells - Introduction	PI3K/Akt signaling pathway
S-9	SLO-1	Plant cell and animal cell	Mitochondria	Cell cycle - Introduction	Nerve cells	JAK/STAT signaling pathway
S 10-12	SLO-1	Lab Safety and GLP	Estimation of hemoglobin bySahli's method	Enumeration of RBC count	Protoplast isolation	Preparation and Observation ofpolytene chromosomes
	SLO-2					
S-13	SLO-1	Cell Transport	Chloroplast	Phases of cell cycle	Structure and function of neurons	JAK/STAT signaling pathway
S-14	SLO-1	Active Transport	Ribosomes	Cell cycle check points	Muscle cells – Types	AMPK signaling pathway
S-15	SLO-1	Passive Transport	Microbodies	Regulation of cell cycle	Muscle cells - Functions	AMPK signaling pathway
S 16-18	SLO-1	Blood Smear Preparation	Cell Counting and viability	Enumeration of WBC count	Observation of Barr bodies	Model Examination
	SLO-2					

Learning Resources	1. *"Molecular Biology of Cell", Bruce Alberts, 7th Edition, WW Norton & Co, 2022.* 2. *"Karp's Cell and Molecular Biology: Concepts and Experiments", Gerald Karp, 8th Edition, 2015.* 3. *"Cell and Molecular Biology", De Robertis, 8th Edition, Lea & Febiger,2017.* 4. *"The Cell: A Molecular Approach, Cooper GM, 6th Edition, ASM Press, 2013.*

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chenna	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. G. Swamynathan, Assistant Professor,Dept. of Biotechnology, FSH, SRMIST,KTR

Course Code	UBT23102J	Course Name	MICROBIOLOGY	Course Category	C	Professional Core Course	L	T	P	O	C
							3	0	3	2	4

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil

Course Offering Department	Biotechnology	Data Book / Codes/Standards	Nil

Course Learning Rationale(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*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)											
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	mmunication of complex biotechnological ideas	ependent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	To identify the microorganism based on taxonomical rules	*3*	*80*	*70*	*H*	-	-	*H*	-	-	-	-	-	*M*	*H*	*H*
CLO-2 :	Application of techniques for identifying microorganism using technologies	*3*	*85*	*75*	*H*	*H*	*H*	*H*	*H*	-	*M*	-	-	*M*	*H*	*H*
CLO-3 :	Applying knowledge to identify bacteria based on structure and functionalorganelles	*3*	*75*	*70*	*H*	-	-	*H*	-	-	*M*	-	-	*M*	*H*	*H*
CLO-4 :	Applying knowledge to identify viruses and fungi based on structure and functionalorganelles	*3*	*85*	*80*	*H*	-	-	*H*	-	-	-	-	-	*M*	*H*	*H*
CLO-5 :	Having knowledge on media preparation and sterilization in microbiology formaintaining GLP	*3*	*85*	*75*	*H*	*H*	*H*	*H*	*H*	*M*	*M*	-	*M*	*M*	*H*	*H*

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction and Definition and Scopeof Microbiology	*Principles of Microscopy*	*Handling pathogens*	*Introduction into morphology ofbacteria Bacterial structure*	*Structure and organization of viruses*
S-2	SLO-1	*Biogenesis vs Abiogenesis*	*Applications of Microscopy*	*Importance of Sterilization*	*Cell wall of Gram negative bacteria*	*General property of viruses*
S-3	SLO-1	*Contributions of Anton VanLeewenhoek,*	*Bright field & Dark Field*	*Sterilization techniques*	*Cell wall of Gram-positive bacteria*	*Viral Replication*
S 4-6	SLO-1	*Lab 1: Introduction and basic instrumentation related to microbiology Lab., Wet preparation*	*Lab 4- Preparation of media (Solid,Liquid).*	Lab 7- Gram's staining technique	*Lab 10: Enumeration of Bacteria-Serial dilution,*	*Lab 12: Biochemical tests- TSI*
	SLO-2					
S-7	SLO-1	*Louis Pasteur, Robert Koch, JosephLister*	*Fluorescence microscope*	*Nutrients and types - Micro, Macroand growth factor*	*Cell wall synthesis*	*Ultra structure–Bacteriophages*
S-8	SLO-1	*Koch Postulation*	*Phase contrast microscope*	*Growth curve*	*Archaebacterial Cell wall*	*Life cycle of Bacteriophages*
S-9	SLO-1	*Classification – Five kingdoms andThree kingdoms.*	*Staining methods and principles*	*Microbiological media and its types*	*Capsule types, composition, function*	*Sub viral particles- Prions*
S	SLO-1			Lab 8: Spore staining technique		Lab 13: Antibiotics sensitivity test
10-12	SLO-2	*Lab 2: Cleaning of Glassware andlaboratory rules*	*Lab 5: Inoculation techniques: Pourplate, Spread plate, Streak plate,*		*Lab 11: Biochemical tests- IMViC*	

S-13	SLO-1	*Taxonomy: Artificial and naturalclassification*	*Smear preparation and simplestaining*	*Different culture methods*	*Flagella structures and types*	*Structure and organization of fungi*
S-14	SLO-1	*Classical characters used in taxonomy*	*Spore and flagellar staining,*	*Techniques of pure culture*	*Cell membranes and Inclusion bodiesand Ribosomes*	*cell wall structure and composition*
S-15	SLO-1	*Molecular characters used intaxonomy*	*Acid-fast staining.*	*Preservation of culture*	*Endospore-Structure & Function*	*Microbiology for public health and Detection methods*
S 16-18	SLO-1 SLO-2	Lab 3: Principles and method of sterilization– Heat, Filtration andRadiation	*Lab 6: Smear preparation and simplestaining*	*Lab 9: Staining of Fungi – LPCB*	*Lab 11: Biochemical tests- IMViC*	Lab 13: Antibiotics sensitivity test

Learning Resources	*Text Books:* *1. M.J. Pelezar, E.C.S. Chan and N.R. Krieg "Microbiology"– Krieg Tata McGraw Hill Publications,2007.* *2. Prescott, Harley and Klein, "Microbiology", McGraw Hill publications, Fifth edition, 2003.*	*3. Jacquelyn G.Black, "Microbiology -Principles and Explorations" Wiley publications2008* *.*

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chenna	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	*Dr. S. Thanigaivel* Assistant Professor,Dept. of Biotechnology, FSH, SRMIST,KTR

Course Code	UBT23103J	Course Name	GENETICS	Course Category	C	Discipline Specific Core Courses	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Understand Mendel's extensive work for genetics and the deviations from Mendel 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			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	Program Learning Outcomes (PLO)											
					1	2	3	4	5	6	7	8	9	10	11	12
					Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	Independent and lifelong learning	PSO-1	PSO-2	PSO–3	PSO-4	PSO-5
CLO-1 :	Know about Mendel's work and their deviation	2	80	75	H	M	M	H	M	-	-	L	-	-	-	-
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	3	80	75	H	-	M	H	H	L	-	L	-	-	-	-
CLO-3 :	Know about the different mechanisms through which the genes are exchanged and the abnormalities associated with the improper exchange	3	85	80	H	H	-	-	H	M	-	M	-	-	-	L
CLO-4 :	Explain about the Epigenetics concept and genome imprinting	2	80	80	H	M	-	H	-	M	-	L	-	-	-	L
CLO-5 :	Explain about the genetic flow and different phenomenon that influences them to understand the concept of bottle neck effect and founders effect.	2	85	80	M	H	M	H	-	M	-	-	-	-	-	L

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction: Historical developments in the field of genetics	Non allelic interactions: Interaction producing new phenotype complementary genes, epistasis (dominant & recessive)	Chromosome morphology, concept of euchromatin and heterochromatin	Fragile-X-syndrome and chromosome	Cytoplasmic inheritance
S-2	SLO-1	Organisms suitable for genetic experimentation and their genetic significance	Duplicate genes and inhibitory genes	Packaging of DNA molecule into chromosomes, chromosome banding pattern	sex influenced dominance, sex limited gene expression	Organelle heredity
S-3	SLO-1	Cell Cycle: Mitosis and Meiosis: Control points in cell-cycle progression in yeast. Role of meiosis in life cycles of organisms.	Chromosome and genomic organization: Eukaryotic nuclear genome nucleotide sequence composition –unique & repetitive DNA	Karyotype, giant chromosomes, one gene one polypeptide hypothesis, concept of cistron, exons, introns, genetic code, gene function	Sex linked inheritance	Evolution and population genetics
S 4-6	SLO-1	Lab GLP	Permanent and temporary mount of meiosis	Blood grouping	Study of polyploidy in onion root tip by colchicine treatment.	Mechanisms of sex determination

S-7	SLO-1	Mendelian genetics: Mendel's experimental design, monohybrid, di-hybrid, and tri hybrid crosses	Satellite DNA	Chromosome and gene mutations: Definition and types of mutations, causes of mutations	Genetic linkage, crossing over and chromosome mapping	In breeding and out breeding
S-8	SLO-1	Law of segregation & Principle of independent assortment	Centromere and telomere DNA sequences, middle repetitive sequences- VNTRs & dinucleotide repeats,	Ames test for mutagenic agents, screening procedures for isolation of mutants and uses of mutants	Linkage and Recombination of genes in a chromosome crossing over	Hardy Weinberg law (prediction, derivation)
S-9	SLO-1	Verification of segregates by test and back crosses	Repetitive transposed sequences- SINEs & LINEs	Variations in chromosomes structure - deletion, duplication, inversion and translocation (reciprocal and Robertsonian)	Cytological basis of crossing over, Molecular mechanism of crossing over	Allelic and genotype frequencies
S 10-12	SLO-1	Permanent and temporary mount of mitosis	Permanent and temporary mount of meiosis	Sub cellular fractionation	Barr Body	Cytoplasm staining
S-13	SLO-1	Chromosomal theory of inheritance, Allelic interactions: Concept of dominance, recessiveness	Middle repetitive multiple copy genes, noncoding DNA	Position effects of gene expression, chromosomal aberrations in human beings, abnormalities– Aneuploidy and Euploidy	Crossing over at four strand stage	Changes in allelic frequencies
S-14	SLO-1	Incomplete dominance, co-dominance, semi-dominance	Middle repetitive multiple copy genes, noncoding DNA. Genetic organization of prokaryotic and viral genome	Sex determination and sex linkage:	Multiple crossing overs Genetic mapping	Systems of mating
S-15	SLO-1	Pleiotropy, Multiple alleles, pseudo-allele, essential and lethal genes, penetrance, and expressivity	Structure and characteristics of bacterial and eukaryotic chromosome	Environmental factors and sex determination, sex differentiation Barr bodies, dosage compensation, genetic balance theory	Extra chromosomal inheritance: Rules of extra nuclear inheritance, Maternal effects, maternal inheritance	Evolutionary genetics, Natural selection.
S 16-18	SLO-1	Permanent and temporary mount of meiosis	Karyotyping with the help of photographs	Isolation of chromosomes	Nuclear staining	Model Examination

Learning Resources	1. *Genes- IX, 9th Ed., Benjamin Lewin. Jones and Bartlett Publishers, 2008* 2. *Principles of Genetics, 7th Edition, Robert H. Tamarin. 2002. Tata- Mc Graw Hill publications* 3. *Theory and Problems of Genetics. W. D. Stansfield. 2002. Mc Graw Hill publications* 4. *Genetics, 2nd Edition, by Weaver, R.F. and Hendrick, P.W. (1992). W.C. Brown.* 5. *Instant notes in Genetics by P. C. Winter, G.I. Hickey and H. L. Fletcher (2003) Viva Books Pvt.. Ltd.*

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. G.Swamynathan, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UCD23S01L	Course Name	Quantitative Aptitude and Logical Reasoning	Course Category	S	Skill Enhancement Course	L	T	P	0	C
							2	0	0	2	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
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Demonstrate various principles involved in solving mathematical concepts*			
CLR-2 :	*Critically evaluate basic mathematical concepts related to profit, loss, interest calculations, average and interpret data*			
CLR-3 :	*Enable students to understand reasoning skills*			
CLR-4 :	*Use the basic mechanics of Grammar*			
CLR-5 :	*Acquire time management skills and expose students to the requirements of the job market*			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	Program Learning Outcomes (PLO)											
					1	2	3	4	5	6	7	8	9	10	11	12
					Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
CLO-1 :	*Understand the concepts of LCM, HCF, ratio and proportions, percentages and approach questions in asimpler and innovative method*	*3*	*80*	*70*	*H*	*M*	*-*	*M*	*-*	*M*	*-*	*H*	*M*	*H*	*-*	*M*
CLO-2 :	*Develop, solve, analyze, and use simple mathematical models that are relevant to daily life.*	*3*	*80*	*75*	*H*	*M*	*-*	*M*	*L*	*M*	*-*	*H*	*M*	*H*	*-*	*M*
CLO-3 :	*Solve problems on reasoning*	*3*	*85*	*70*	*-*	*M*	*-*	*-*	*-*	*M*	*M*	*H*	*-*	*H*	*-*	*H*
CLO-4 :	*Understand the different parts of speech and use them in sentences appropriately*	*3*	*85*	*80*	*H*	*-*	*-*	*-*	*-*	*-*	*M*	*M*	*-*	*-*	*-*	*H*
CLO-5 :	*Instill confidence in students and develop skills necessary to face the audience*	*3*	*85*	*75*	*-*	*-*	*M*	*-*	*-*	*M*	*-*	*-*	*M*	*-*	*H*	*M*

Duration (hour)		6	6	6	6	6
S-1	*SLO-1*	*Speed Maths and Simplification*	*Profit and Loss-Introduction*	*Number Series*	*Most Logical Choice*	*Self-Introduction – Introduction*
	SLO-2	*Simplification Techniques and Tricks*	*Profit and Loss- Basic Problems*	*Number Series – Solving Problems*	*Most Logical Choice – solving problems*	*Self-Introduction - Session 1*
S-2	*SLO-1*	*Divisibility*	*Simple Interest-Introduction, Formulas&Problems*	*Word Series*	*Logical Order*	*Self-Introduction - Session 2*
	SLO-2	*Power cycle, Reminder cycle*	*Compound Interest-Introduction,Formulas &Problems*	*Word Series – Solving Problems*	*Logical Order – tips and tricks*	*Self-Introduction - Session 3*
S-3	*SLO-1*	*Problems On H.C.F and L.C.M*	*Averages-Introduction& Basics*	*Odd man out*	*Synonyms*	*Self-Introduction - Session 4*
	SLO-2	*Problems On H.C.F and L.C.M Solving problems*	*Averages-Tricky Problems*	*Missing number and wrong number*	*Antonyms*	*Self-Introduction - Session 5*
S-4	*SLO-1*	*Linear and Simultaneous Equation*	*Algebra –Introduction*	*Image Based Problems- Introduction*	*Essential Part*	*Self-Introduction - Session 6*
	SLO-2	*Linear and Simultaneous Equation – solving problems*	*Algebraic Expressions Concepts*	*Image Based Solving Problems*	*Parts of Speech - Worksheets*	*Self-Introduction - Session 7*
S-5	*SLO-1*	*Ratio and Proportions-Introduction*	*Data Interpretation – Bar chart, PieChart*	*Inequalities*	*Spotting Error*	*Basics of Written Communication*
	SLO-2	*Ratio and Proportions-Basics Problems*	*Data Interpretation – Table, Line Graph*	*Inequalities - methods*	*Spotting Error –Concord, Prepositional usage, Usage of Articles*	*Basics of Written Communication Methods*
S-6	*SLO-1*	*Percentage -Introduction*	*Quadratic Equations*	*Coding – Decoding-Introduction*	*Sentence Correction – Vocabularybased*	*Time Management Skills*

	SLO-2	*Percentage- Basic problems*	*Quadratic Equations – Formulas and Methods*	*Coding – Decoding-Different types*	*Sentence Correction – Grammar Based*	*Time Management Skills – Activity*

Learning Resources	*1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition* *2. Dr. Agarwal R.S, Quantitative Aptitude for Competitive Examinations, S. Chand and CompanyLimited, 2018 Edition* *3. Archana Ram, Place Mentor: Tests of Aptitude for Placement Readiness, Oxford University Press,Oxford, 2018*	*4. Edgar Thrope, Test of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition* *5. Singh O.P., Art of Effective Communication in Group Discussion and Interview, S Chand &Company, 2014* *6. Bhatnagar R P, English for Competitive Examinations, Trinity Press, 2016*

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%)#
		Practice	Practice	Practice	Practice
Level 1	Remember	30%	30%	30%	10%
	Understand				
Level 2	Apply	30%	30%	30%	50%
	Analyze				
Level 3	Evaluate	40%	40%	40%	40%
	Create				
	Total	100 %	100%	100%	100%

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Extempore, etc.
CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr. M. Ponmurugan, Executive PMOSS, CognizantTechnology Solutions India Pvt. Limited, Chennai	*Dr. G. Saravana Prabu, Asst. Professor, Department of English,Amrita Vishwa Vidhyapeedam, Coimbatore*	*Dr. Sathish K, HOD, Department of Career Guidance Cell, FSH, SRMIST* *Ms. Deepalakshmi S, Assistant Professor, Department of Career Guidance Cell,FSH, SRMIST*

Course Code	UCD23V01T	Course Name	Universal Human Values	Course Category	V	Value Addition Course	L	T	P	0	C
							2	0	0	2	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	Program Learning Outcomes (PLO)

		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 lifeand 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 ina natural way.			
CLR-4 :	Help students on right understanding of the Human reality and the rest of existence, harmony at all thelevels 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:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Fundamental Knowledge	2 Application of Concepts	3 Link with Related Disciplines	4 Procedural Knowledge	5 Skills in Specialization	6 Ability to Utilize Knowledge	7 Skills in Modeling	8 Analyze, Interpret Data	9 Investigative Skills	10 Problem Solving Skills	11 Communication Skills	12 Analytical Skills
CLO-1 :	Evaluate the significance of value inputs in formal education and start applying them in their life and profession	3	80	70	M	-	-	H	-	-	-	-	-	-	M	-
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	-	M	-	H	-	L	-	-	-	-	-	-
CLO-3 :	Analyze the value of harmonious relationship based on trust and respect in their life and profession	3	85	70	-	-	-	H	-	-	-	M	L	-	-	-
CLO-4 :	Examine the role of a human being in ensuring harmony in society and nature.	3	85	80	-	-	-	H	-	-	L	-	L	L	-	L
CLO-5 :	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.	3	85	75			L	H	L	-	-	-	-	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO	Right Understanding, Relationship andPhysical Facility	Understanding Human being as the Co-existence of the Self and the Body	Harmony in the Family – the Basic Unitof Human Interaction	Understanding Harmony in the Nature	Natural Acceptance of Human Values
S-2	SLO	Understanding Value Education	Distinguishing between the Needs ofthe Self and the Body	Trust – the Foundational Value in Relationship	Interconnectedness, self-regulation and Mutual Fulfilment among the FourOrders of Nature	Definitiveness of (Ethical) HumanConduct
S-3	SLO	Self-exploration as the Process forValue 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 atAll Levels	Competence in Professional Ethics

S-5	*SLO*	*Happiness and Prosperity – CurrentScenario*	*Harmony of the Self with the Body*	*Understanding Harmony in the Society*	*The Holistic Perception of Harmony inExistence*	*Holistic Technologies, Production Systems and Management Models-Typical Case Studies*
S-6	*SLO*	*Method to Fulfill the Basic Human Aspirations*	*Programme to ensure self-regulationand Health*	*Vision for the Universal Human Order*	*Exploring Co-existence in Existence*	*Strategies for Transition towardsValue-based Life and Profession*

Learning Resources	1. *Gaur R.R., Sangal R., Bagaria G.P., 2019 (2nd Revised Edition), A Foundation Course inHuman 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.*

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%)#
		Theory	Theory	Theory	Theory
Level 1	Remember	30%	30%	30%	30%
	Understand				
Level 2	Apply	40%	40%	40%	40%
	Analyze				
Level 3	Evaluate	30%	30%	30%	30%
	Create				
	Total	100 %	100%	100%	100%

CLA-1, CLA-2 and CLA-3 can be from any combination of these: MCQ Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Extempore, etc. # CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
-	-	*Dr. Supraja P, UHV University Coordinator, SRMIST*
		Dr. Sathish K, HOD, Department of Career Guidance Cell, FSH, SRMIST
		Dr. Sweety Bakyarani E, Department of Computer Science, FSH, SRMIST

SEMESTER II

Course Code	ULT23G02J	Course Name	Tamil – II	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

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

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	சங்க இலக்கியங்கள் வழி தொன்மை அக, புற வாழ்வியலை அறியச் செய்தல்
CLR-2 :	தமிழ்ச்சமூகத்தின் அறவியல் குறித்து தெரியச் செய்தல்
CLR-3 :	பக்தி இலக்கியங்கள் போதித்த மனித மாண்புகளை உணரச் செய்தல்
CLR-4 :	பண்டைத் தமிழ்ச்சமூகத்தின் தொல் இலக்கியங்கள் வளர்ச்சி பெற்ற வரலாற்றைப் புரியச் செய்தல்
CLR-5 :	சிறுகதைகள் சொல்லும் வாழ்வியல் நெறி, மொழியின் நுட்பங்கள் ஆகியவற்றைத் தெரியச் செய்தல்

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning: 1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)	PLO 1 Fundamental Knowledge	PLO 2 Application of Concepts	PLO 3 Link with Related Disciplines	PLO 4 Procedural Knowledge	PLO 5 Skills in Specialization	PLO 6 Ability to Utilize Knowledge	PLO 7 Skills in Modeling	PLO 8 Analyze, Interpret Data	PLO 9 Investigative Skills	PLO 10 Problem Solving Skills	PLO 11 Communication Skills	PLO 12 Analytical Skills	PLO 13 PSO -1	PLO 14 PSO -2	PLO 15 PSO-3
CLO-1 :	பண்டைத் தமிழ்ச் சமூகத்தின் அக, புற வாழ்வியல் இன்றைய சமூக மேம்பாட்டிற்கு வழிகாட்டி நிற்பதை அறிந்துகொள்ளுதல்	2	75	60	H	L	H	M	H	H	L	M	H	M	L	H	-	-	-
CLO-2 :	தமிழ்ச் சமூகம் அறத்தை வலியுறுத்திய சமூகம் என்பதன் வழி மானுட அறத்தைத் தெரிந்துகொள்ளுதல்	2	80	70	H	M	H	L	M	H	L	H	M	L	H	H	-	-	-
CLO-3 :	பக்தி இலக்கியம் மூலம் இறைத் தந்துவங்களை அறிந்து மானுட ஒற்றுமை மேம்பாட்டை அறிந்துகொள்ளுதல்	2	70	65	H	L	H	M	H	H	M	H	L	H	M	H	-	-	-
CLO-4 :	தொல் தமிழ்ச்சமூகம் இலக்கியம், அரசியல், அறம், பக்தி ஆகியவற்றில் தழைத்தோங்கியதைத் தெரிந்துகொள்ளுதல்	2	70	70	H	M	H	L	H	M	M	H	H	L	H	H	-	-	-
CLO-5 :	வாழ்வியலின் நெறிகளைச் சொல்லும் கதைகளைப் படைக்கும் திறனோடு மொழி ஆளுமையையும் அறிந்துகொள்ளுதல்	2	80	70	H	M	H	H	M	H	L	M	H	L	H	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	காலந்தோறும் தமிழ் அகத்திணை மரபு	சங்க மருவிய காலம்	பல்லவர் காலம்	பண்டைக்காலத் தமிழகம்	தமிழ்ச் சிறுகதைப் போக்குகள்
	SLO-2	அக இலக்கியத்தின் கட்டமைப்பு/ உள்ளடக்கம்	அறமும் வாழ்வியலும்	பல்லவர் கால இலக்கியங்கள்	சங்ககால மக்களின் வாழ்வியல்	தமிழ்ச் சிறுகதையும் தமிழ்ச் சமூக வாழ்வியலும்
S-2	SLO-1	எட்டுத்தொகை நூல்களும் பகுப்புமுறையும்	உலகப்பொதுமறை - திருக்குறள்	பக்தியும் தமிழும்	முச்சங்கம் – அறிமுகம்	புதுமைப்பித்தன் - சங்குத்தேவனின் தர்மம்
	SLO-2	ஐங்குறுநூறு (375)	திருக்குறளின் கட்டமைப்பு	பக்தி இலக்கியத் தோற்ற நிலை	முச்சங்க வரலாறு	கள்வனின் தர்மம்
S-3	SLO-1	உடன்போக்கும் நற்றாய் புலம்பலும்	திருக்குறள் வான்சிறப்பு (2)	சைவ சமய இலக்கியங்கள்	பத்துப்பாட்டும் எட்டுத் தொகையும்	ந.பிச்சமூர்த்தி – வேப்பமரம்
	SLO-2	ஐங்குறுநூறு (391)	மழையும் வாழ்வும்	சைவக்குரவர் நால்வர்	சங்க கால மக்களின் வாழ்வியல்	மரபும் நம்பிக்கைகளும்
S-4	SLO-1	உடன் போக்கும் தமிழர் பறவையியல் அறிவும்	திருக்குறள் – புலவி நுணுக்கம்	தேவாரம் – திருஞான சம்பந்தர் - பாடல் – 2834	எட்டுத்தொகை நூல்களின் வரலாறு	தமிழருவி மணியன் – ஒற்றைச் சிறகு

	SLO-2	குறுந்தொகை (02)	ஊடலின் அழகியல்	தேவாரம் – திருநாவுக்கரசர் –பாடல் - 4262	எட்டுத்தொகை நூல்களின் கட்டமைப்பு	உறவின் மேன்மை
S-5	SLO-1	இயற்கைப் புணர்ச்சியும் தலைவி நலம் பாராட்டலும்	நீதி இலக்கியங்கள்	திருவாசகம் அறிமுகம்	பத்துப்பாட்டு நூல்களின் வரலாறு	ஆர். சூடாமணி – மூடநம்பிக்கை
	SLO-2	குறுந்தொகை (03)	நாலடியார்	மாணிக்கவாசகர் பாடல் - ஆனந்த பரவசம் – பாடல் 10	பத்துப்பாட்டும் தமிழர் வாழ்வியலும்	சமூகத்தில் மூடநம்பிக்கைகள்
S-6	SLO-1	தலைவனின் மேன்மைத் தன்மையும் இயற்கையும்	வைகலும் - பாடல் (39)	வைணவ சமயம்	பதினெண் கீழ்க்கணக்கு நூல்கள்	மூடநம்பிக்கைகளின் சிக்கல்கள்
	SLO-2	அகநானூறு (238)	நிலையாமையும் அறமும்	வைணவ சமய வளர்ச்சிப்போக்கு	பதினெண் கீழ்க்கணக்கும் தமிழர் அற மரபும்	கிருஷ்ணா டாவின்ஸி – காலா அருகே வாடா
S-7	SLO-1	இயற்கையும் அகவாழ்வுச் சித்திரிப்பும்	தமிழர் மருத்துவம்	நாலாயிரத் திவ்யப் பிரபந்தம்	நீதி இலக்கியங்கள்	மனித வாழ்வில் மருத்துவம்
	SLO-2	நள்ளியின் கொடைத்திறம்	நீதி இலக்கியத்தில் மருந்து நூல்கள்	குலசேகராழ்வார் பாடல் - 678	நீதி இலக்கியங்களின் பன்முகத் தன்மைகள்	பாரம்பரிய மருத்துவம்
S-8	SLO-1	கலித்தொகைப் பாடல் –(11)	சிறுபஞ்சமூலம் (64)	ஆண்டாள் பாடல் – 574.	காப்பிய இலக்கணம்	மொழிப்பயிற்சி
	SLO-2	அறம் பொருள் இன்பம் சிறப்பு	ஈகையின் சிறப்பு	திருமழிசை ஆழ்வார் பாடல் – கணிகண்ணன்	காப்பியத்தின் போக்குகள்	சொற்களை உருவாக்குதல்
S-9	SLO-1	சூழலியலும் மனித வாழ்வும்	பழமொழி நானூறு அறிமுகம்	தமிழில் இஸ்லாமிய இலக்கியங்கள்	காப்பியங்களின் வகைமை	எழுத்துகளில் இருந்து சொற்களைக் கண்டுபிடித்தல்
	SLO-2	தமிழர் புறமரபு	பழமொழி நானூறு – தனித்தன்மைகள்	இஸ்லாமிய இலக்கியங்களின் கொடை	ஐம்பெருங்காப்பியங் களின் தனித்தன்மைகள்	படம் பார்த்துக் கதை எழுதுதல்
S-10	SLO-1	புறநானூறு (107) பாரியும் மாரியும்	பழமொழி நானூறு (184)	சீறாப்புராணத்தின் அமைப்பு	தமிழ்ச் சமூகமும் சமயத் தத்துவங்களும்	படம் பார்த்துக் கவிதை எழுதுதல்
	SLO-2	புறநானூறு (110) பாரியின் வள்ளல் தன்மை	பழமொழியும் அறிவுரையும்	விடமீட்டப் படலம் (10 பாடல்கள்)	சமயத் தத்துவங்களும் வாழ்வியல் விழுமியங்களும்	கற்பனைத்திறன் – வளர்த்தல்
S-11	SLO-1	புறநானூறு (112) கையறுநிலை	பண்டைக்காலப் போரும் வாழ்வும்	கிறித்தவ சமய இலக்கியங்கள்	சைவத் திருமுறை – அறிமுகம்	கற்பனையும் படைப்பும்
	SLO-2	சிறுபாணாற்றுப்படை (84-115)	புற இலக்கியங்கள்	கிறித்தவ இலக்கியங்களின் தமிழ்க் கொடை	பன்னிரு திருமுறை – வரலாறு	தமிழில் வாசகம்
S-12	SLO-1	கடையெழு வள்ளல்களின் சிறப்புகள்	களவழி நாற்பது (40)	கிறித்துவின் அருள்வேட்டல் – திரு.வி.க	நாலாயிரத் திவ்வியப் பிரபந்தம் – அறிமுகம்	விளம்பரத்திற்கு வாசகம் எழுதுதல்
	SLO-2	பட்டினப்பாலை (40-50) அட்டில் சாலைகளின் நிலை	போர்க்களமும் யானைப்படையும்	அலகிலொளி – 5 பாடல்கள்	வைணவ ஆழ்வார்கள் வரலாறு	வாசகம் எழுது முறைகள்

earning Resources	1. கொன்றை, தொகுப்பும் பதிப்பும் - தமிழ்த்துறை ஆசிரியர்கள், தமிழ்த்துறை, எஸ்.ஆர்.எம். அறிவியல் மற்றும் தொழில்நுட்பக் கல்விநிறுவனம், காட்டாங்குளத்தூர், 603203, 2023 2. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை, 2017 3. மு. அருணாசலம், தமிழ் இலக்கிய வரலாறு, நூற்றாண்டு முறை (9ஆம் நூ. முதல் 16 வரை), தி பார்க்கர், சென்னை, 2005 4. தமிழ் இணையக் கல்விக்கழகம் - http://www.tamilvu.org/ 5. மதுரை தமிழ் இலக்கிய மின் தொகுப்புத் திட்டம் - https://www.projectmadurai.org/

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-

Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	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 & Literaturel, Pondicherry University, Pondicherry*	*1. Dr. B.Jaiganesh, Associate Professor & Head, Dept. of Tamil, FSH, SRMIST*
		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	ULH23G02J	Course Name	HINDI-II	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering Department	HINDI	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning			Program Learning Outcomes (PLO)											
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking	Expected Proficiency	Expected Attainment	Fundamental	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
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*															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	*To provide a brief Introduction of Hindi poetry(Bhaktikal,Reetikal and Aadhunikkal)*	*2*	*75*	*80*	*H*	*H*	*H*	*M*	*L*	*H*	*L*	*M*	*L*	*L*	*H*	*M*
CLO-2 :	*To Discuss the origin and development of various forms of poetry in Hindi*	*2*	*80*	*90*	*H*	*H*	*H*	*M*	*L*	*H*	*H*	*M*	*L*	*L*	*H*	*M*
CLO-3 :	*Focus on Evaluating the social changes through poetry*	*2*	*75*	*95*	*H*	*H*	*M*	*L*	*H*	*H*	*M*	*H*	*M*	*M*	*H*	*H*
CLO-4 :	*To Examine Transcreation in advertisement*	*2*	*80*	*90*	*H*	*H*	*L*	*H*	*M*	*H*	*L*	*H*	*H*	*M*	*H*	*H*
CLO-5 :	*To guide the students in the learning of the technical aspect of the Hindi Languge,this would help them in thefield administration*	*2*	*85*	*90*	*M*	*H*	*M*	*H*	*L*	*H*	*H*	*L*	*H*	*M*	*H*	*H*

Duration (hour)		12	12	12	12	12
S-1	SLO-1	*BHAKTI* KALIN KAVITA	RITI *KALIN* KAVITA	*ADHUNIK KAVITA*	*VIGYAPAN*	PATRA *LEKHAN & PARIBHASHIK* SHABDAVALI
	SLO-2	*BHAKTIU KALIN KAITA KI AVADHARNA*	*AVADHARNA*	*AVADHARNA*	*AWADHARNA*	*VADHARNA*
S-2	SLO-1	*SWARUP*	*SWARUP*	*SWARUP*	*RTH*	*RTH*
	SLO-2	*MAHATVA*	*RITI KAL VIBHAJAN*	*AHATVA*	*ARIBHASHA*	*WARUP*
S-3	SLO-1	*UDDESHYA*	*MAHATVA*	*DDESHYA*	*SWARUP*	*ARIBHASHA*
	SLO-2	*BHAKTIKAL KI PRASANGIKTA*	*UDDESHYA*	*MATHLI SHARAN GUPT- NAR HO NA NIRASH KARO MAN KO*	*VIGYAPAN KE PRAKAR*	*RAYOJAN*
S-4	SLO-1	*DOHE- KABIRDAS*	*DOHE- BIHARI*	*KAVI PARICHAYA*	*VIGYAPAN KI VISHESHTAYEN*	*RAYOG*
	SLO-2	*SANT PARICHAY*	*KAVI PARICHAYA*	*KAVITA KA VISLESHAN*	*VIGYAPAN MANG*	*AHATVA*
S-5	SLO-1	*DOHE KA VISLESHAN*	*DOHE KA VISLESHAN*	*ASHAVADI DRISHTIKON*	*VIGYAPAN KA PRABHAV*	*ATRALEKHAN KALA*
	SLO-2	*GURU KA MAHATVA*	*KANAK KA MAHATVA*	*SANGHARSH KI AOR PRERNA*	*VIGYAPAN MAHATVA*	*RAKAR*
S-6	SLO-1	*GURUTVA SE ISHVARATVA KI AOR*	*VIPRIT SWABHAV KI CHARCHA*	*SURYAKANT TRIPATHI NIRALA- VAR DE*	*VIGYAPAN KI BHASHA*	*VYAKTIGAT PATRA*
	SLO-2	*GURUTVA SE ISHVARATVA KI AOR*	*PRAKRITI KA ATAL RUP*	*KAVI PARICHAYA*	*VIGYAPAN AUR BAZAR*	*AUPCHARIK PATRA*
S-7	SLO-1	*BAHYA ADAMBAR KA VIRODH*	*YAMAK ALANKAR KA PRAYOG*	*KAVITA KA VISLESHAN*	*VIGYAPAN AUR ROZGAR*	*SARKARI PATRA*
	SLO-2	*MURTI POOJA KA VIRODH*	*SNEH KE MAHATVA KI CHARCHA*	*SARSHWATI KE PATRI SAMARPAN*	*PRINT VIGYAPAN*	*ARDHA SARKARI PATRA*
	SLO-1	*GHARELU VASHTUON KI UPYOGITA*	*BIHARI KI KAVYA SHAILI KA*	*BHAKTI KI BHAVANA*	*ELECTRONIC VIGYAPAN*	*PARIBHASHIK SHABDAVALI*

S-8			*MAHATVA*			
	SLO-2	*AHNKAR KA PARITYAG*	*DOHE- GHANANAND*	*NAGARJUN-- AKAL AUR USKE BAD*	*VIGYAPAN PARIYOJANA*	*AVADHARNA*
S-9	SLO-1	*DOHE- TULSHIDAS*	*KAVI PARICHAYA*	*AKAL KA VASHTAVIK CHITRAN*	*VIGYAPAN AUR SAMAJ*	*SHABDAVALI KI AVSHYAKTA*
	SLO-2	*PAROPKAR KI BHAVANA*	*DOHE KA VISLESHAN*	*AKAL KE PURVA KA CHITRAN*	*VIGYAPAN KI VYAPAKTA*	*KARYALYIN SHABDAVALI*
S-10	SLO-1	*DAYA KA MAHATVA*	*SNEH KI SARLTA KA VARNAN*	*AKAL KE BAD KA CHITRAN*	*VIGYAPANLEKHAN KALA*	*EK DIN EK SHABD*
	SLO-2	*ISHVAR KI MHATTA*	*PREM KA MAHATVA*	*KATTIS- BADRINARAYAN*	*VIGYAPAN AUR JAGRUPTA*	*HINDI SE ANGREJI SHABD*
S-11	SLO-1	*MADHUR VAHAN KI UPYOGITA*	*NAYIKA KE PRATI SMARPAN*	*SAMBAND VICCHED KI PARICHARCHA*	*UDDESHYA*	*ANGREJ SE HINDI SHABD*
	SLO-2	*RAM KI MAHIMA*	*GHANANAND KI KAVYA SHAILI KA MAHATVA*	*SWARTH NIHIT BHAVANA*	*VIGYAPAN KI SPASTTA*	*ABHYASH KARYA*
S-12	SLO-1	*DHOHA PARICHARCHA*	*DHOHA PARICHARCHA*	*KAVYA PARICHARCHA*	*VIGYAPANPARICHARCHA*	*PARICHARCHA*
	SLO-2	*PRASHNAABHYASH*	*PRASHNAABHYASH*	*PRASHNAABHYASH*	*PRASHNAABHYASH*	*PRASHNAABHYASH*

Learning Resources	*Edited Book: ""SAMANYA HINDI", SRIJONLOK PUBLICATION, 2023, New Delhi.* 1. KABIR – HAZARI PRASAD DWEDI 2. SURDAS – RAM CHANDRA SHUKL	3. BHAKTI ANDOLAN AUR SURDAS KA KAVYA – MANAGER PANDEY 4. BIHARI – VISHVNATH PRASAD MISHR 5. Aadhunik Vigyapan aur Jansampark – Taresh Bhatia

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Shri. Santosh Kumar Editor : Srijanlok Magazine Place: Vashishth Nagar, Ara – 802301	*1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu*	*1. Dr.S Preeti. Associate Professor & Head, SRMIST*
		2. Dr. Md.S. Islam Assistant Professor, SRMIST
		3.Dr. S. Razia Begum, Assistant Professor, SRM IST
		4, Dr.Nisha Murlidharan Assistant Professor, VDP,SRM IST

Course Code	ULF23G02J	Course Name	French-II	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	2	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil

Course Offering Department	French	Data Book / Codes/Standards	Nil

Course Learning Rationale (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 foreignerspeaking French

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)												
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
CLO-1 :	*To acquire knowledge about French language*	*2*	*75*	*80*	*H*	*M*	*H*	*H*	*M*	*H*	*H*	*L*	*M*	*M*	*H*	*L*
CLO-2 :	*To strengthen the knowledge on concept, culture, civilization and translation of French*	*2*	*80*	*90*	*M*	*H*	*L*	*H*	*H*	*M*	*H*	*M*	*L*	*L*	*H*	*M*
CLO-3 :	*To develop content using the features in French language*	*2*	*75*	*80*	*H*	*H*	*L*	*M*	*H*	*M*	*L*	*H*	*M*	*M*	*H*	*H*
CLO-4 :	*To interpret the French language into other language*	*2*	*75*	*90*	*H*	*L*	*M*	*H*	*M*	*H*	*H*	*M*	*L*	*H*	*M*	*L*
CLO-5 :	*To improve the communication, intercultural elements in French language*	*2*	*80*	*75*	*M*	*H*	*H*	*L*	*M*	*M*	*H*	*H*	*M*	*L*	*H*	*M*

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Temps libre	Le pronom indéfini *on*	Vendre	Il faut	Les gallicismes
	SLO-2	Les activités quotidiennes	Les activités	Les exemples	C'est / Il est	Les activités
S-2	SLO-1	Les exemples	Les adjectifs interrogatifs	Acheter	Le verbe devoir	Les pronoms personnels COI
	SLO-2	Les activités	Les activités	Les exemples	Les activités	Les exemples
S-3	SLO-1	Les moments de la journée	Les prépositions avec les noms géographiques	Les aliments	Le verbe pouvoir	Le pronom *y*
	SLO-2	Les exemples	Les activités	Les exemples	Le verbe savoir	Les exemples
S-4	SLO-1	Les matières scolaires	Les verbes prendre et sortir	Les emballages	Le verbe vouloir	Des pronoms complements
	SLO-2	Les exemples	Les activités	Les exemples	Les sons	Les activités
S-5	SLO-1	Les activités	Les sons	Les quantités	Demander et dire le prix	Les nombres ordinaux
	SLO-2	Les loisirs	Les activités	Les exemples	Les activités	Les exemples
S-6	SLO-1	Les exemples	Parler de ses gouts	Les commerces	Faire des achats	Les verbes écrire et voir
	SLO-2	Les activités	Les activités	Les activités	Expliquer une recette de cuisine	Les activités
	SLO-1	La fréquence	Parler de ses préférences	les commerçants	Les activités	Le E caduc ou instable

S-7	SLO-2	Les exemples	Les activités	Les exemples	Les courses	Les exemples
S-8	SLO-1	Les activités	Parler de sa routine	L'impératif	Les activités	Présenter ses vœux
	SLO-2	Les verbes pronominaux	Les activités	Les activités	Vendre et acheter	Présenter ses souhaits
S-9	SLO-1	Les exemples	A la recherche d'un cadeau –.	Les articles partitifs	Mots et expressions	Présenter ses felicitations
	SLO-2	Les activités	Les activités	Les exemples	Grammaire	inviter à une invitation
S-10	SLO-1	Les pronoms personnels COD	Temps libre	*Très* ou *beaucoup* (de)	Communication	répondre à une invitation
	SLO-2	Les exemples	Les activités	Les exemples	Tout le monde s'amuse	Les exemples
S-11	SLO-1	Les activités	Mots et expressions	Le pronom en (la quantité)	Les sorties	Écrire un message amical
	SLO-2	Les adjectifs démonstratifs	Les activités	Les exemples	Les saisons	Les exemples
S-12	SLO-1	Les exemples	Grammaire –Communication	La phrase négative (2	Les fêtes	Parler au telephone
	SLO-2	Les activités	Les activités	Les exemples	Les messages	Un coup de fil

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

		Learning Assessment									
	Bloom'sLevel of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (5%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	Internal Experts
1. Mr. Kavaskar DanasegaraneProcess Expert Maersk Global Service Center Pvt. Ltd	*1. Dr. C.Thirumurugan Professor, Departmentof French, Pondicherry University*	*1. Mr. Kumaravel K. Assistant Professor & Head, SRMIST,KTR*
2.Mr. Sharath Raam Prasad Character Designer, Animaker Company Pvt.		*2. Mrs. Abigail, Assistant Professor, SRMIST, VDP*

Course Code	UES23AE1T	Course Name	ENVIRONMENTAL STUDIES	Course Category	AE	Ability Enhancement Courses	L	T	P	O	C
							3	0	0	2	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-1 :	*To create awareness on Environment and Renewable and Non-renewable resources*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
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 onenvironment*															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	*Applying knowledge on Renewable and Non-renewable resources*	*2*	*80*	*65*	*L*	*H*	*L*	*M*	*L*	*H*	*L*	*L*	*L*	*H*	*L*	*M*
CLO-2 :	*Understanding about ecosystem and Biodiversity*	*2*	*80*	*70*	*M*	*H*	*L*	*M*	*L*	*H*	*L*	*L*	*L*	*H*	*L*	*M*
CLO-3 :	*Gathering knowledge on impact of environmental pollution*	*2*	*80*	*70*	*L*	*H*	*L*	*M*	*L*	*H*	*M*	*M*	*M*	*H*	*L*	*M*
CLO-4 :	*Understanding of different environmental problems*	*2*	*80*	*70*	*M*	*H*	*L*	*M*	*L*	*H*	*M*	*M*	*M*	*H*	*L*	*M*
CLO-5 :	*Having knowledge on various Environment Protection acts and the impact of human population onenvironment problems*	*2*	*80*	*65*	*M*	*H*	*L*	*M*	*L*	*H*	*L*	*M*	*L*	*H*	*L*	*M*

Duration (hour)		9	9	9	9	9
S-1	SLO-1	*Multidisciplinary nature ofenvironmental studies*	*Energy flow in the ecosystem*	*Conservation of biodiversity : In-situand Ex-situ conservation of biodiversity*	*Disaster management- NatureFloods, Earthquakes*	*Environment Protection Act*
	SLO-2	*Definition, Scope and Importance of Environmental Studies*	*Energy flow in the ecosystem*	*Environmental Pollution- Definition*		*Air (Prevention and Control ofPollution) Act*
S-2	SLO-1	*Need for public awareness.*	*Ecological succession*	*Causes, Effects and ControlMeasures of Air Pollution*	*Cyclones Landslides*	*Water (Prevention and control ofPollution) Act*
	SLO-2	*Institutions in Environment*	*Food chains, Food webs andEcological pyramids*			*Wildlife Protection Act*
S-3	SLO-1	*People in Environment*	*Ecosystem, Introduction, Types, Characteristic features, Structure andfunctions*	*Causes, Effects and ControlMeasures of Water Pollution*	*Social Issues and the Environment: From Unsustainable to Sustainable Development*	*Forest Conservation Act*
	SLO-2	*Introduction to natural resources-Associated Problems*	*Forest ecosystem*			*Issues involved in enforcement ofenvironmental legislation*
S-4	SLO-1	*Renewable and Nonrenewableresources*	*Grassland ecosystem*	*Causes, Effects and ControlMeasures of Soil Pollution*	*Urban problems related to energy*	*Public awareness*
	SLO-2	*Forest resources*	*Desert ecosystem*		*Water Conservation*	
S-5	SLO-1	*Water Resources*	*Aquatic ecosystems (ponds, lakes,streams)*	*Causes, Effects and Control Measures of Marine pollution*	*Rain Water Harvesting, Watershed*	

	SLO-2	*Mineral Resources*	*Aquatic ecosystems (rivers, estuaries,oceans)*			*Human Population and the Environment: Population growth, variation among nations*
S-6	SLO-1	*Food Resources*	*Biodiversity and its conservation-genetic, species and ecosystem diversity*	*Causes, Effects and ControlMeasures of Noise Pollution*	*Environmental Ethics: Issues andPossible Solutions*	*Population explosion – FamilyWelfare Programme*
	SLO-2	*Energy Resources*	*Biogeographical classification of India*			*Environment and human health*
S-7	SLO-1	*Land Resources*	*Value of Biodiversity*	*Causes, Effects and Control Measures of Thermal Pollution*	*Climate change & Global warming*	*Human Rights*
	SLO-2	*Role of an individual in conservationof natural resources*	*Biodiversity at Global, National andLocal Levels*			*Value Education*
S-8	SLO-1	*Equitable use of resoureces for sustainable lifestyles*	*India as a Mega Diversity Nation*	*Causes, Effects and Control Measures of Nuclear hazards*	*Acid rain & Ozone layer depletion*	*HIV/AIDS*
	SLO-2	*Concept of an ecosystem*	*Hot-spots of biodiversity*			
S-9	SLO-1	*Structure and Functions of anecosystem*	*Threats to biodiversity: habitat loss,poaching of wildlife man-wildlife conflicts*	*Solid Waste Management Causes, Effects and Control Measures of Urban and Industrial Waste*	*Nuclear Accidents and NuclearHolocaust*	*Women and Child Welfare*
	SLO-2	*Producers, consumers and decomposers*	*Endangered and endemic species ofIndia*	*Role of Individuals In Pollution Prevention*	*Wasteland Reclamation*	*Role of Information Technology inEnvironment and human health*

1. Learning Resources Bharucha Erach, (2013), Textbook of Environmental Studies for Undergraduate Courses (Second edition). Telangana, India: Orient BlackSwan.
2. Basu Mahua, Savarimuthu Xavier, (2017), SJ Fundamentals of Environmental Studies. Cambridge, United Kingdom: Cambridge University Press
3. R.Jeyalakshmi (2014),Text book of Environmental Studies, Devi publications, Chennai.
4. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India, Email:mapin@icenet.net (R)

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	30%	-	30%	-	30%	-	30%	-	30%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers

Experts from Industry	Experts from Academic	Internal Experts
1. Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	2. Dr.N.Banu, Assistant Professor Bharathi Womens College (Autonomous), Chennai	*1. Dr. P. Parthipan,* Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR *2.Dr. D. Sankari, Professor and Head, Department of Biotechnology, FSH, SRMIST, KTR*

Course Code	UBT23201J	Course Name	BIOCHEMISTRY	Course Category	D	Discipline Specific Core Course	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-1:	*Understanding the classification of carbohydrates*															
CLR-2:	*Understanding the importance of lipids*															
CLR-3:	*Understanding the importance of bonds in structure integrity*															
CLR-4:	*Knowledge on structure of nucleic acid*															
CLR-5:	*Knowledge on importance of vitamins and minerals*															
Course Learning Outcomes(CLO):	At theendof thiscourse,learnerswillbeableto:	Level of Thinking(Bloom)	Expected Proficiency(%)	Expected Attainment(%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex	Independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1:	*To analyze the importance of carbohydrates, requirement for living organism*	3	80	70	*H*	*L*	*L*	*L*	*M*	M	M	-	L	L	M	H
CLO-2:	*To analyze the importance of lipids for living organism*	3	85	75	*H*	*L*	*L*	*L*	*L*	M	H	-	M	M	M	M
CLO-3:	*Strong basis for understanding protein structure*	3	75	70	*H*	*L*	*M*	*L*	*L*	M	H	L	M	M	M	M
CLO-4:	*Better knowledge gained in the structure of DNA and RNA*	3	85	80	*H*	*M*	*M*	*M*	*L*	H	M	L	L	-	M	M
CLO-5:	*Analyzing ability against the vitamins importance and deficiency disease*	3	85	75	*H*	*L*	*M*	*M*	-	H	M	L	M	M	M	M

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction - Carbohydrates	Introduction - lipids	Introduction of amino acids	Introduction- nucleic acid	Purine biosynthesis. ATP
	SLO-2	classification of carbohydrates	Classification of lipids	Classification of amino acids- basedof charge	Structure of Purines	GTP Synthesis
S-2	SLO-1	Structure of carbohydrates-monosaccharides (straight chain),Disaccharide, Function	Simple lipids- Fat, waxes	Based on requirement, based on involvement in protein synthesis	Structure of Pyrmidines	Pyrimidine biosynthesis. -CTP
	SLO-2	Epimers, enantiomers, anomers	Classification of fats	Zwitter ion and isoelectric point	Unusual bases	TTP, UTP
S-3	SLO-1	Structure of carbohydrates-monosaccharides (Ring structure),Functions	Mixed fats	Properties of amino acids	Nucleosides	Vitamins- Classification
	SLO-2		Compounds lipids- Phospholipids-lecithin	Properties of amino acids	Nucleotides	Fat soluble vitamins- A
S4-6	SLO-1	Introduction to Biochemistry lab-Lab safety guidelines	Sugar analysis-Fructose, Galactose	Sugar analysis- starch & dextrin	Amino acid analysis- cysteine,arginine	Estimation of Protein Lowry's method
	SLO-2					
S-7	SLO-1	Homoploysaccharides- Starch,Glycogen	Phospholipid- Cephalin	Properties of amino acids	Phosphodiester bond	Fat soluble vitamins-D
	SLO-2	Structure & functions of heteroploysaccharides- hyaluronicacid	Phosphotidyl inositol	Protein- Introduction	N-glycosidic bond	Fat soluble vitamins-E&K

S-8	SLO-1	Structure & functions of heteroploysaccharides- Chondroitinsulphate, Dermatan sulphate	Plasmologens	Classification of protein on different basis	Hydrogen bond in DNA structure	Water soluble vitamins- B1, B2
	SLO-2	Structure & functions of heteroploysaccharides- keratinsulphate, Heparin.	Compounds lipids- Sphingolipids-Sphingomyelin	Classification of protein on different basis	DNA double helical structure	Water soluble vitamins- B3, B5
S-9	SLO-1	Properties of carbohydrates	Gangliosides	Forces stabilizing protein structure	Forms of DNA- A DNA	Water soluble vitamins- B6, B12,
	SLO-2	Metabolism introduction	Terpenes	Structure of proteins- primary	B-DNA	Minerals- Introduction
S-10-12	SLO-1	Reagent preparation forcarbohydrate analysis	Sugar analysis- Sucrose	Amino acid analysis-General procedure, Histidine, tyrosine	Estimation of Glucose- OT method	Estimation of DNA- Diphenylamine method.
	SLO-2					
S-13	SLO-1	Glycolysis pathway	Derived lipids- cholesterol	Secondary structure of protein	Z-DNA	Macro minerals- Calcium
	SLO-2	Energetics of glycolytic pathway	Physical properties of fats.	Structure of proteins-tertiary	Difference between DNA & RNA	Macro minerals-potassium
S-14	SLO-1	Glycolysis regulation	Chemical properties of fats.	Structure of proteins-quarternary	Types of RNA-m-RNA	Macro minerals-magnesium
	SLO-2	TCA cycle	Chemical properties of fats.	Urea cycle	t-RNA	Micro minerals-Manganese
S-15	SLO-2	Energetics of TCA cycle.	Biosynthesis of fatty acid-Palmiticacid	Importance of Urea cycle	r-RNA	Micro minerals- Copper
	SLO-2	Regulation of TCA cycle	Elongation and desaturation	Regulation of Urea cycle	Heterogenous RNA	Micro minerals-Zinc
S-16-18	SLO-1	Sugar analysis-Glucose	Sugar analysis- lactose, Maltose	Amino acid analysis- tryptophan, methionine	Standard solution preparation and colorimetery basics	Estimation of RNA- Orcinol method.
	SLO-2					

Learning Resources	1. Robert K. Murray, David Bender, Kathleen M. Botham and Peter J.Kennelly,Harpers"Illustrated Biochemistry" 29th Edition, Mc Graw HilL 2012. 2. Lehninger, Nelson and Cox, "Principles of Biochemistry", 6th edition, W.H.Freeman & Company, 2013. 3. Voet&Voet, "Fundamentals of Biochemistry", John Willey & Sons, 2010. Jeremy M. Berg, John L.Tymoczko and LubertStryer, Biochemistry, 4th Edition , Freeman and Company, 2011 3. Devlin, Thomas M. Textbook of biochemistry: with clinical correlations. John Wiley & Sons, 2011.

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. S.Vijaya bharathi, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST,KTR

Course Code	UBT23202J	Course Name	MOLECULAR BIOLOGY	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							3	0	3	2	4

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil

Course Offering Department	Biotechnology	Data Book / Codes/Standards	Nil

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Learn about the structure and functions of nucleic acids			
CLR-2 :	Gain knowledge on the structure and types of chromosomes			
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 and molecular biology techniques			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO)											
					1	2	3	4	5	6	7	8	9	10	11	12
					Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	*Gain knowledge on the genome organization*	2	80	75	H	-	M	-	-	L	M	-	-	-	-	M
CLO-2 :	*Learn about the fine structure of gene and molecular techniques*	2	80	75	H	-	L	M	H	L	M	-	-	-	-	-
CLO-3 :	*Apply knowledge on various replication mechanisms*	3	75	70	-	H	H	-	H	H	H	-	-	-	-	M
CLO-4 :	*Apply concepts on transcription and its significance*	3	75	70	-	H	H	-	-	H	H	-	-	-	-	M
CLO-5 :	*Learn about the mechanism of translation*	2	80	75	H	-	M	-	M	H	H	-	-	-	-	-

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Molecular Biology - Overview	Prokaryotic genome	Central dogma	Transcription	Genetic code
S-2	SLO-1	Nucleic acid as genetic material	Eukaryotic genome	DNA Replication	Prokaryotic transcription	Translation
S-3	SLO-1	DNA – structure and functions	Genome organization inprokaryotes	Replication in prokaryotes	Prokaryotic transcription - mechanism	Ribosomes – prokaryotic andeukaryotic
S 4-6	SLO-1 SLO-2	Introduction to molecular biologylaboratory	Isolation of genomic DNA	Isolation of plasmid DNA	Polymerase chain reaction	SDS-PAGE
S-7	SLO-1	Watson and Crick Model	Mitochondrial DNA	Mechanism of replication and enzymesinvolved	Eukaryotic transcription	Prokaryotic translation
S-8	SLO-1	Forms of DNA	Chloroplast DNA	Rolling circle replication	Eukaryotic transcription - mechanism	Prokaryotic translation – mechanism
S-9	SLO-1	RNA – types and structure	Genome organization ineukaryotes	D-Loop replication	Post-transcriptional modifications	Eukaryotic translation
S 10-12	SLO-1 SLO-2	Lab Safety and GLP	Isolation of RNA	Quantification of DNA	Polymerase chain reaction -interpretation	Southern Blotting
S-13	SLO-1	Functions of RNA	Chromosome – types andfunctions	Replication in eukaryotes	5'-capping	Eukaryotic translation – mechanism
S-14	SLO-1	Proteins – Types and functions	Fine structure of gene	Mechanism of replication	3'-polyadenylation	Proteins involved in translation
S-15	SLO-1	Structure of Proteins	Types of genes	Proteins involved in replication	Splicing	Post-translational modifications
S 16-18	SLO-1 SLO-2	Isolation of genomic DNA	Agarose gel electrophoresis	Quantification of RNA	SDS-PAGE	Model Examination

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

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. G. Swamynathan, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23203J	Course Name	COMPUTATIONAL BIOLOGY	Course Category	C	Discipline Specific Core	L	T	P	O	C
							3	0	2	2	4

Pre-requisite Courses	NII	Co-requisite Courses	NII	Progressive Courses	Nil

Course Offering Department	Biotechnology	Data Book / Codes/Standards	Nil

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning	Program Learning Outcomes (PLO)

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
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															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	*Understand the simulation of biological systems using computational platforms*	1	75	70	H	H	M	-	M	L	-	-	-	-	-	
CLO-2 :	*Collectively characterize and quantify organism;s genes and proteins by sequence analysis*	1	75	70	H	-	H	H	M	L	-	-	-	-	-	
CLO-3 :	*Gain knowledge on CADD*	1	75	70	M	-	L	H	H	H	-	-	-	-	-	
CLO-4 :	*Understand the strength of intermolecular interaction between the small molecules*	1	75	70	-	H	-	M	H	H	-	M	-	-	-	
CLO-5 :	*Understand the study of computational analysis of whole genome and its applications*	1	75	70	M	H	-	M	-	H	-	M	-	-	-	

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Biological databases	Block based alignment	Ab into method	Prediction methods	Applications of molecular Docking
	SLO-2	Classification	Gene Prediction methods in Prokaryotes	Phylogenetic Foot Printing method	Homology modelling principle	Applications of molecular Docking
S-2	SLO-1	Genbank database	Conventional method	Expression Profiling method	Homology modelling steps	Methods of Molecular Docking
	SLO-2	EMBL, DDBJ	Computational method	Protein secondary structure prediction	Homology modelling applications	Methods of Molecular Docking
S-3	SLO-1	UNIPROT, PDB	Ab intio method	Globular proteins	Homology modelling tools	Methods of Molecular Docking
	SLO-2	Specialized Databases	Hidden Markov model	Chou fasman method	Homology modelling	Rigid docking
S 4-5	SLO-1	Retreival of Sequences from genbank	Retreival of Sequences from EMBL, DDBJ	Retreival of Sequences from Uniprot, PDB	Homology modelling	ORF Finder
S-6	SLO-1	Genome database	Performance Evaluation	GOR method	Fold Recognition principle	Flexible docking
	SLO-2	Drug bank, Pubmed	Gene Prediction in Eukaryotes	Transmembrane Proteins	Fold Recognition steps	Virtual Screening
S-7	SLO-1	Sequence analysis	Ab initio method	Prediction of Helical membrane proteins	Fold Recognition applicatrions	HTS
	SLO-2	Pairwise sequence alignment methods	Neural Network method	Prediction of Helical membrane proteins	Fold Recognition methods	Target Preparation
S-8	SLO-1	Dot matrix	Discriminant Analysis	Prediction of Helical membrane proteins	Ab initio method principle	Target Preparation

	SLO-2	Needleman Wunsch algorithm	Homology based method	Prediction of Helical membrane proteins	Ab initio method method	Ligand Preparation
S-9-10	SLO-1	BLAST	BLAST	Global Alignment	Local Alignment	MSA
S-11	SLO-1	Smith waterman algorithm	Consensus-based method	Prediction of Beta membrane proteins	Molecular Docking introduction	Lipinski Rule
	SLO-2	BLAST	Performance evaluation	Prediction of Beta membrane proteins	Molecular Docking definidtion	ADMET analysis
S-12	SLO-1	FASTA	Promoters in prokaryotes & Eukaryotes	Prediction of Beta membrane proteins	Molecular Docking applications	Scoring Functions
	SLO-2	Multiple sequence alignment methods	Regulatory Elements	Coiled-Coil Prediction	Principle of Molecular Docking	Scoring Functions
S-13	SLO-1	Progressive alignment	Consensus Sequences	Protein Tertiary structure	Principle of Molecular Docking	Docking Tools – Protein Ligand
	SLO-2	Iterative alignment	Prediction methods	Protein Tertiary structure	Principle of Molecular Docking	Docking Tools – Protein Protein
S-14-15	SLO-1	MSA - Clustal	MSA - T-COFFEE	Homology Modelling	Rasmol	Rasmol

Learning Resources

1. Essential bioinformatics, Jin Xiong, Cambridge University Press, 2006
2. Bioinformatics: A Practical Guide to the analysis of genes and proteins, 2nd edition, Andreas D. Baxevanis, B. F. Francis Ouellette
3. Introduction to Bioinformatics, Arthur M Lesk, Oxford University Press, 2019
4. Bioinformatics Concepts, Skills & Applications 2nd Edition, S.C.Rastogi, CBS Publishers and Distributors, 2018.

Learning Assessment

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

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. Vidhya V.G, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UCD23S02T	Course Name	Verbal Ability and Skill Development	Course Category	S	Skill Enhancement Course	L	T	P	O	C
							2	0	0	2	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
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Critically evaluate basic mathematical concepts related to mixtures and alligations, Numbers, time and work*			
CLR-2 :	*Use their logical thinking and analytical abilities to solve reasoning problems*			
CLR-3 :	*Develop soft skills relating to the need for job recruitment*			
CLR-4 :	*Provide students with the necessary skills to generate and interpret data sufficiency, problems on ChainRule, Pipes and Cisterns, Boats and streams,*			
CLR-5 :	*Enable students to understand problems on graphs and also increase their ability in language skills*			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	Program Learning Outcomes (PLO)											
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12
					Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
CLO-1 :	*Understand the concepts of mixtures and alligations, Numbers, time and work and to approach questions in asimpler and innovative method*	3	80	70	M	H	-	L	-	M	-	M	M	H	-	H
CLO-2 :	*Establish a student's interest and awareness in seating arrangements, mathematical operations, logical reasoning*	3	80	75	M	H	-	L	-	M	-	M	M	H	-	H
CLO-3 :	*Acquire soft skills that will help for applying jobs*	3	85	70	-	-	M	H	M	-	L	-	-	-	H	-
CLO-4 :	*Demonstrate various principles involved in aptitude problems*	3	85	80	-	-	-	-	M	-	L	H	-	H	-	H
CLO-5 :	*Ability to solve problems on reasoning and to interpret English language*	3	85	75	-	H	-	L	-	H	-	M	M	-	H	--

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Time and Distance – Introduction	Seating Arrangements (Circular andtable) Introduction	Resume Building - Introduction	Chain Rule, Pipes and Cistern – Introduction	Functions and Graphs Introduction
	SLO-2	Time and Distance – Problems	Seating Arrangements (Circular andtable) – Problems	Resume Building	Chain Rule, Pipes and Cistern –Problems	Functions and Graphs – Problems
S-2	SLO-1	Time & Work- Introduction	Mathematical Operations – BasicProblems	Group Discussions - Introduction	Data Sufficiency – Introduction	Comprehension
	SLO-2	Time & Work – Problems	Mathematical Operations – TrickyProblems	Group Discussions – Mock GD	Data Sufficiency – Problems	Comprehension – Practise session
S-3	SLO-1	Alligation or Mixture – Introduction	Data Arrangements - Introduction	Group Discussions - Activity 1	Logarithms – Introduction	Idioms and Idiomatic Expressions – Introduction
	SLO-2	Alligation or Mixture - Problems	Data Arrangements – Problems	Group Discussions - Activity 1	Logarithms – Problems	Idioms and Idiomatic Expressions – Practise Session
S-4	SLO-1	Numbers – Basic Problems	Logical Deductions – Introduction	Group Discussions - Activity 2	Boats and Streams – Basic Problems	Cause and Effect – Introduction
	SLO-2	Numbers – Tricky Problems	Logical Deductions – Problems	Group Discussions - Activity 2	Boats and Streams – Tricky Problems	Cause and Effect – Practise Session
S-5	SLO-1	Problems on Trains – Introduction	Letter and Symbol Series – BasicProblems	Leadership Skills Introduction	True Discount – Introduction	Theme detection – Introduction
	SLO-2	Problems on Trains – Problems	Letter and Symbol Series – TrickyProblems	Leadership Skills	True Discount – Problems	Theme detection – Activity
	SLO-1	Races and Games – Basic Problems	Input Output Tracing Introduction	How to Handle Criticism and Feedback	Geometry and MensurationIntroduction	Ordering of words _ Introduction

S-6	SLO-2	Races and Games – Tricky Problems	Input Output Tracing – Problems	How to Handle Criticism and Feedback	Geometry and Mensuration – Problems	Ordering of words – Practise Session

Learning Resources	1. James Barrett & Tom Barrett - Ultimate aptitude tests: over 1000 practice questions for abstract visual, numerical, verbal, physical, spatial and systems tests, Kogan Page, London, 2018. Fourthedition 2. Kathy A. Zahler & Over Drive, Inc (Distributor) Conquering GRE verbal reasoning and analytical writing, McGraw-Hill Education, New York, 2020 Second Edition 3. Archana Ram, Place Mentor: Tests of Aptitude for Placement Readiness, Oxford University Press, Oxford, 2018	4. David Bartlett, The art of general practice: soft skills to survive and thrive, Scion, Banbury, 2018,eBook, 2018 5. Zsolt Nagy, Soft skills to advance your developer career: actionable steps to help maximizeyour potential, A press, Berkeley, CA, 2019, eBook, 2022

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%)#
		Theory	Theory	Theory	Theory
Level 1	Remember	30%	20%	30%	30%
	Understand				
Level 2	Apply	30%	50%	30%	30%
	Analyze				
Level 3	Evaluate	40%	30%	40%	40%
	Create				
	Total	100%	100%	100%	100%

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.
CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr. M. Ponmurugan, Executive PMOSS, CognizantTechnology Solutions India Pvt. Limited, Chennai	*Dr. G. Saravana Prabu, Asst. Professor, Department of English,Amrita Vishwa Vidhyapeedam, Coimbatore*	*Dr. Sathish K, HOD, Department of Career Guidance Cell, FSH, SRMIST* *Dr. Muthu Deepa M, Assistant Professor, Department of Career Guidance Cell,FSH, SRMIST*

Course Code	UEN23V01L	Course Name	COMMUNICATION SKILLS	Course Category	AE	Value Addition Course	L	T	P	O	C
							0	0	4	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	ProgressiveCourses	Nil
Course OfferingDepartment	Department of English, FSH, SRMIST	Data Book / Codes/Standards		Nil	

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-1 :	*Develop fluency in spoken English by practicing and engaging in various speaking activities.*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
CLR-2 :	*Improve pronunciation and intonation to enhance clarity and effectiveness in oral communication.*															
CLR-3 :	*Expand vocabulary and idiomatic expressions to communicate more accurately and expressively.*															
CLR-4 :	*Enhance listening skills to understand and respond appropriately to spoken English in different situations.*															
CLR-5 :	*Employ effective communication strategies, such as active listening, summarizing, paraphrasing, and asking clarifying questions, to enhance interpersonal and intercultural communication.*															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	*Demonstrate improved fluency in spoken English by expressing ideas and thoughts confidently andcoherently.*	*2*	*75*	*60*	*H*	*M*	*M*	*L*	*-*	*M*	*-*	*M*	*H*	*L*	*H*	*L*
CLO-2 :	*Pronounce English words and phrases accurately, using appropriate intonation and stress patterns.*	*2*	*80*	*70*	*M*	*H*	*L*	*-*	*-*	*-*	*-*	*M*	*M*	*H*	*H*	*M*
CLO-3 :	*Expand and effectively use a range of vocabulary and idiomatic expressions to enhance communication.*	*2*	*70*	*65*	*M*	*M*	*M*	*-*	*L*	*L*	*-*	*H*	*M*	*H*	*H*	*L*
CLO-4 :	*Understand and comprehend spoken English in various contexts, including informal conversations,lectures, and presentations.*	*2*	*70*	*70*	*H*	*M*	*L*	*-*	*M*	*H*	*-*	*-*	*-*	*-*	*H*	*L*
CLO-5 :	*Deliver well-structured and engaging oral presentations, incorporating effective body language and visualaids.*	*2*	*80*	*70*	*H*	*H*	*-*	*M*	*-*	*M*	*-*	*L*	*L*	*M*	*H*	*M*

Duration (hour)		12	12	12	12	12
S-1	SLO-1	*Introduction to Listening Skills.*	*Introduction to Reading Skills. Discussion of techniques of ReadingSkill*	*Introduction to Speaking Skills. Explaining theimportance of phonetics and vocabulary*	*Introduction to Writing Skills Importance ofwriting skills*	*Introduction to appreciation oftexts.*
	LO- 2	*Exploring Effective Ways of Listening. Barriers of Listening.Active and Passive Listening.*	*Identifying common reading problemsin students after making them read a few passages.*	*Explaining the usage of the Oxford Learner's Dictionary to learn phonetics of the words at the fundamental level.*	*Explaining various forms of writing withexamples:.*	*Encouraging the students toshare a few of their favouritelines from any sources they have read or sharing a few lines from paditthadhil piditthadhu.*
S-2	SLO-1	*Introduction to Digital language lab/ usage of mobile applications*	*Learners are enabled to record their speech and listen to it in order to correct their problematic areas*	*The right enunciation of certain words to be taught through phonetic representation and decoding the phonetic symbols by learning touse the dictionary..*	*Introduction to letter writing. Types of letters- Formal and Informal letters withexamples. Learning E-mail etiquette.*	*Explaining why appreciatingtexts creates a good reader.*
	SLO- 2	*Equipping the listening skill ofthe learners*	*repetitive practices of reading select paragraphs from web resources, their standard will be measured.*	*Observe and repeat and learn the phoneticpronunciation 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-1	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 andimprove vocabulary.	Enabling the students to unleash their potentials in creative writing through writing transcripts for advertisements ofany product.	Introducing the text of Letters by Mathrubootham published in the Hindu.
S-3 – S-4	SLO- 2	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 andpause.	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 aninterview or a debate.	Reading and recitation of thetext of the first letter-Enjoy within limits, says Mr. Mathrubootham Understanding characters byanalyzing the usage of their style of language
S-5	SLO-1	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.
	SLO- 2	Repetitive listening to enhancepronunciation 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 andevaluated.	Mathrubootham's humour andthe language of code switching from Tamil to English and vice –versa.
S-6	SLO-1	Introducing to the audios of TEDTALK American Speakers. Listening to the native speakersof 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
	SLO- 2	Introducing to the audios of TEDTALK British Speakers.Listening to the native speakersof English Language through TED TALKS.	encouraged to identify the key arguments in other passages on theirown.	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.
S-7 – S-8	SLO-1	American and British styles canbe differentiated.	Guiding the act of reading through scanning and skimming by model	Practice collocations	common errors in tenses, direct and indirect speech and syntax structure.	Reading of the fourth letter in the classroom and discussion
			reading of the passages by theinstructor.			Pizza maavu: Welcome to Mr.Mathrubootham food recipe website,
	SLO- 2	The recognition of different accents should be practiced byspeaking after listening.	scanning and skimming activities	Idioms and phrases	Practicing effective writing by learning to avoid common errors in tenses, direct andindirect speech and syntax structure.	Mathrubootham's love for foodand the miscommunication about food.
S-9	SLO-1	Learning advanced pronunciation and vocabulary through various computer applications like Woodpecker.	Loud reading and slow mind reading	A speaking task to learn- collocations, idiomsand 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 regionalrelevance and National significance.
	SLO- 2	imitate the different sounds and accents - repeat it after listeningto any of the videos from the library based on individual interest.	Pauses, pronunciation, comprehensionand 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 highlightthe problematic areas in speaking.	Teaching how to write a story by looking ata picture. Developing the writing skill through wordladders.	Appreciating the aesthetics ofthe comic element and the embodiment of humour in thenarrative in the letter
	SLO-1	Repeat listening to the sametime frames and move from 02.01 to 03.00	Students -groups -checking the comprehension skills. Analyse the textof a passage.	Automating vocabulary through engaging the students in various activity games like solving crossword puzzle and playing	Introduction to blog writing and steps tobecome an effective blog writer.	importance of bringing in the Indianized way of speaking the English Language in orderto depict the character called Mathrubootham.

S-10				scattergories.		
	SLO- 2	*Choosing any particular timeframe and practicing it.*	*Brainstorming the comprehension skills- questioning the key points in thepassage.*	*Engaging the students to play the games inorder to learn the vocabulary.*	*Encourage the readers to create their ownblogs and post articles on a regular basis.*	*relatable characters of both formal and informal everyday life experiences.*
	SLO-1	Interested students can complete listening and reflectingthe complete audio listening practice and speaking.	*Cross check with misunderstanding ifany and rectify- match the question and answers.*	*Spur of the moment speech.:*	*Selecting any news article and learning thewriting style in it.*	*Talk about their favourite letterfrom the letters of Mathrubootham by recollecting the appreciation of the text according to their perception and understanding.*
S 11 - S 12	SLO- 2	*Group activities and games canbe conducted to test the listening skills by responding to the speech given by other students*	*Passages for reading comprehensionare to be given for practice that tests their reading skills.*	*Prepared speech : Giving a speaking task to the students to speakon their own choice*	*Students are given chances to writereports on various topics.*	*Enabling the students to share their appreciation of anyof their favourite lines form thebooks they have read.*

Learning Resources	1. Horizon- English Text Book – Compiled and Edited by the faculty of English Departement, FSH, SRMIST, 2020 2. *English Grammar in Use by Raymond Murphy* 3. *Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007*	4. *R.P. Bhatnagar, English for Competitive Examinations, Trinity Press, 3rd Edition,2016* 5. *http://www.aptitudetests.org/verbal-reasoning-test* 6. *https://www.assessmentday.co.uk/aptitudetests_verbal.htm*

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA – 1 (20%)	CLA – 2 (20%)	CLA – 3 (30%)	CLA – 4 (30%) #
		Practice	Practice	Practice	Practice
Level 1	Remember	10%	10%	30%	15%
	Understand				
Level 2	Apply	50%	50%	40%	50%
	Analyze				
Level 3	Evaluate	40%	40%	30%	35%
	Create				
	Total	100 %	100 %	100 %	100 %

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

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Course Code	UCD23P01L	Course Name	Internship Report– I	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Demonstrate skills learnt in the real time environment.			
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			
Course Learning Outcomes (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	*3*	*80*	*70*
CLO-2 :	To gain valuable skills and knowledge	*3*	*85*	*75*
CLO-3 :	To make professional connections and enhance networking	*3*	*75*	*70*
CLO-4 :	To get experience in a field to allow the student to make a career transition	*3*	*85*	*80*
CLO-5 :	To get an inside view of an industry and organization/company	*3*	*85*	*75*

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Students can choose a company of their own interest for internship for a period of minimum TEN weeks (Part-time) to learn about the application of their related field in real time environment. All students have to give a presentation about their observations made by them in internship as per the schedule given. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
internship	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	UCD23P02L	Course Name	Project Work – I	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Demonstrate skills learnt in the real time environment.			
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			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	To get an inside view of an industry and organization/company	3	80	70	L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Students can choose problems of their own interest to develop software package using the programming languages/tools available. 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.

Learning Assessment				
	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
internship	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	UCD23P03L	Course Name	Apprenticeship – I	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Demonstrate skills learnt in the real time environment.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
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																		
Course Learning Outcomes (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	3	80	70	L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Students can choose a company of their own interest for *Apprenticeship* for a period of minimum TEN weeks (Part-time) to learn about the application of their related field in real time environment. All students have to give a presentation about their observations made by them in internship as per the schedule given. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
internship	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

SEMESTER III

Course Code	UBT23301J	Course Name	BIOPHYSICS & BIOINSTRUMENTATION	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							3	0	3	2	4

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering Department	Biotechnology	Data Book / Codes/Standards		Nil	

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning
CLR-1 :	Understand the Principle, Instrumentation and working method of the analyticaltechniques	
CLR-2 :	Able to anlayse and interpret the results.	
CLR-3 :	Knowledge on applying suitable techniques for analysis.	
CLR-4 :	Understand the isolation of pure form biomolecules	
CLR-5 :	Understand the safety and proper handling of instruments.	

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)
CLO-1 :	*Acquire knowledge and skills on spectroscopic and colorimetric instruments*	3	80	70
CLO-2 :	*Understand the principle, function and application of chromatographic techniques*	3	85	75
CLO-3 :	*Understand the concepts of separation and purification of Biomolecules*	3	75	70
CLO-4 :	*Understand the Principle, application of electrophoresis technique in analyzingbiomolecules.*	3	85	80
CLO-5 :	*Apply the instrumentation and technical skills to collect, analyze and interpretbiological problems with appropriate solutions.*	3	85	75

	1 Fundamental Knowledge	2 Analyze, Interpret Data	3 Reasoning ability	4 Ethical Practices	5 Team Work	6 Communication of complex biotechnological ideas	7 independent and lifelong learning	8 PSO -1	9 PSO - 2	10 PSO – 3	11 PSO-4	12 PSO-5
CLO-1 :	*H*	*H*	-	-	*L*	*M*	*H*		*L*	-	*H*	-
CLO-2 :	*H*	*H*	-	-	*M*	*M*	*H*	*M*	-	-	-	*H*
CLO-3 :	*H*	*H*	*M*	-	-	*M*	*H*		-	*H*	-	-
CLO-4 :	*H*	*M*	-	-	-	*M*	*H*		*M*	-	-	-
CLO-5 :	*H*	*M*	*M*	-	*L*	*H*	*H*		-	-	*M*	-

Duration (hour)		18	8	18	18	18
S-1	SLO-1	Spectroscopy- Introduction	Chromatography -introduction	Centrifugation- Introduction	Electrophoresis- Introduction	Radioisotopes Introduction
	SLO-2	Electromagnetic spectrum	Principle of Paper chromatography	Principle of centrifugation	Factors affecting migration rate-sample	Radioactivity
S-2	SLO-1	UV-Vis spectroscopy Beer-lamberts law	Procedure – paper chromatography	Types of centrifugation	Buffer	Radioactive decay
	SLO-2	Instrumentation of UV-Vis	Applications of paper chromatography	Types of centrifuge- Small bench, microcentrifuge.	Electric field	Half-life of radioisotopes
S-3	SLO-1	Application of UV-Vis	Principle of TLC	Low- speed, high speed centrifuge	Agarose gel electrophoresis	Measurement of radioactivity
	SLO-2	Fluorescence Spectroscopy-Stokesshift	Procedure –TLC	Ultracentrifuge	Supporting medium	Measurement based upon ionization- introduction
\S4-6	SLO-1	GLP-1 (pH meter)	Thin layer chromatography.	Protein dialysis	Differential centrifugation- chloroplast	Western blotting
	SLO-2					
S-7	SLO-1	Instrumentation	Applications of TLC		Types of electrophoresis	GM counter

						Instrumentation
	SLO-2	Application of FluorescenceSpectroscopy	Gel filtration chromatography -Principle	Types of rotor- components andhandling of rotors	Agarose gel electrophoresis- procedure	Application of GM counter
S-8	SLO-1	Mass spectroscopy- principle	Gel filtration chromatography - Procedure	Swinging bucket rotor	Applications	Scintillation Counter- Based on excitation -introduction
	SLO-2	Instrumentation of Mass spectroscopy	Applications of GFC	Fixed angle rotor	SDS PAGE-Procedure	Scintillation Counter- solid scintillation
S-9	SLO-1	Application of mass spectroscopy.	Column chromatography	Vertical rotor	Applications	Liquid scintillation
	SLO-2	Atomic absorption spectroscopy-Instrumentation.	Principle-Ion exchange chromatography	Elutraitor rotor	Native gel electrophoresis	Application of Scintillation counting
S-10-12	SLO-1	Study of UV – Visible Spectroscopy	Procedure- Ion exchangechromatography	SDS- PAGE.	Differential centrifugation	Southern blotting
	SLO-2					
S-13	SLO-1	Atomic absorption spectroscopy-Applications	Applications of IEC	Differential centrifugation	2 D electrophoresis	Autoradiography procedure
	SLO-2	Atomic emission spectroscopy- Instrumentation	Affinity chromatography-Principle	Density gradient centrifugation- Ratezonal centrifugation	Blotting introduction	Application of autoradiography
S-14	SLO-1	Application of Atomic emission spectroscopy	Affinity chromatography- Procedure	Isopycnic centrifugation	Southern blotting	Applications of radioisotopes- Clinical
	SLO-2	Principle of Nuclear magnetic resonance	Applications of Affinity chromatography	Introduction to Cell disintegration	Northern blotting	Applications of radioisotopes- Carbon dating
S-15	SLO-2	Instrumentation of Nuclear magneticresonance	HPLC-Principle, procedure	Cell disintegration- introduction	Western blotting	Applications of radioisotopes- Sterilizing
	SLO-2	Application of NMR	HPLC- Applications	Types of disintegration	Advantages of blotting technique	Safety aspects involved in handling radioisotopes
S-16-18	SLO-1	Paper chromatography.	Agarose gel electrophoresis	Cell disruption	Western blotting	Result interpretation- Southern blotting
	SLO-2					

Learning Resources	1. *Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology. Edited by Andreas Hoffmann.* Cambridge University Press, 2018. 2. David T. Plummer, An introduction to Practical Biochemistry, (3 rdEdition), Tata McGraw Hill, 2017.	3. Upadhyay., Biophysical Chemistry-, Himalaya Publication, Edition III, 2019. 4. M.L. Srivastava , Bioanalytical Techniques, Narosa Publishing House, 2011.

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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Course Code	UBT23302J	Course Name	ENZYMOLOGY	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)											
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	Independent and lifelong learning	PSO - 1	PSO - 2	PSO –3	PSO-4	PSO-5
CLO-1:	Gain knowledge on enzyme classification, nomenclature	3	80	70	H			M		-	H	-	-	-		
CLO-2:	Knowledge on active site amino acids in reactions	3	85	75	H	L	H			L	M	-				
CLO-3:	Applying knowledge to design drugs	3	75	70	H	L	H			-	M	L				
CLO-4:	Gains kknowledge on coenzymes	3	85	80	H	L	M			-	-	-				
CLO5:	Application of techniques for isolation and purification of enzymes	3	85	75	H	H	H	M		L	M	-				

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction to Enzymes.	Introduction- Chymotrypsin	Inhibition introduction	TPP- Structure and functions	purification of soluble enzymes-electrophoresis
	SLO-2	Properties and Nomenclature of Enzymes.	Chymotrypsin mechanism Acylation phase	Reversible inhibition- competitive	Reactions involving TPP	purification of soluble enzymes-electrophoresis
S-2	SLO-1	Classification - IUB system- group I, II,	Chymotrypsin mechanism deacylation phase	Deviation in MM equation- in the presence of Competetive inhibitor	Pyridoxal phosphate- Structure and functions	ion of membrane bound enzymes-chromatography
	SLO-2	Group III, IV	Lysozyme Introduction	Uncompetitive inhibition	Reactions involving PLP	Purification of membrane bound enzymes-chromatography
S-3	SLO-1	Group- V, VI	Lysozyme mechanism	Deviation in MM equation- in the presence of Uncompetetive inhibitor	Lipoic acids- Precursor, Structure and functions	Purification of membrane bound enzymes-electrophoresis
	SLO-2	Factors affecting enzyme action- Effect of temperature, pH.	Regulation of enzyme activity-Introduction	Non-competitive	Reactions involving lipoic acid	Purification of membrane bound enzymes- electrophoresis
S 4-6	SLO-1	Preparation of buffer.	Calculation for enzyme and specific activity of enzyme-Protease	Estimation of protein- urease	Optimum temperature determination- urease	Repetition lab
	SLO-2					
	SLO-3					
S-7	SLO-1	Enzyme specificity: Group specificity, absolute specificity.	Multienzyme comlpex	Irreversible inhibition	Vitamin B12- Structure and functions	Enzyme Immobilization – Introduction Physical method, Chemical method
	SLO-2	Stereospecificity, Bond Specificity	Isoenzymes-CK, LDH	Suicidal inhibition	Reactions involving Vitamin B-12	Entrapment and encapsulation.
S-8	SLO-1	Purity of enzymes- Enzyme activity,	Kinetics introduction	Allosteric inhibition	Functions of Vitamin B12	Importance of enzyme immobilization

	SLO-2	Specific activity.	Steady state kinetics and pre-steady state kinectics.	Introduction-coenzymes	Enzyme isolation introduction	Enzyme Immobilization – Applications
S-9	SLO-1	Enzyme units- Katal & IU.	Michaelis Menten Equation assumptions	Classification of coenzymes.	Steps of enzyme purification	Industrial application of immobilized enzymes.
	SLO-2	Metalloenzymes and metal activated enzymes, Active site -3D structure	Derivation of MM equation	Functions of coenzymes	Physical method of enzyme isolation	Industrial applications of enzyme-amykase
S 10-12	SLO-1 SLO-2 SLO-3	Estimation of protein	Optimum pH determination-protease	Enzyme activity of urease	Optimum temperature determination-urease	Repetition lab
S-13	SLO-1	Introduction to ES complex, Activation energy	Significance of MM equation	NADP- Precursor, Structure and functions	chemical methods of enzyme isolation	Industrial applications of enzyme-lipase, protease
	SLO-2	Theories of ES complex- collision theory, transition state theory.	Kcat, Kcat/Km	Reactions involving NADP	Biological methods of enzyme isolation	Introduction to enzyme application in clinical field
S-14	SLO-1	Lock and key Hypothesis.	Drawback of MM equation	FAD- Precursor, Structure and functions	Biological methods of enzyme isolation	Clinical applications of enzymes-LDH1, 2
	SLO-2	Induced fit Hypothesis	Line-weaver Burk plot	FAD	Preliminary purification Salting in, salting out	Clinical applications of enzymes-LDH3, 4, 5
S-15	SLO-1	Mechanism of enzyme catalysis- Acid-base catalysis	Importance of Line-weaver Burk plot	Reactions involving FAD	Dialysis	Clinical applications of enzymes -SGOT
	SLO-2	covalent catalysis, Metal ion catalysis, Proximity and orientation.	Drawback of LB plot, Eadie-Hofstee plots	FMN- Precursor, Structure and functions, Reactions involving FMN	Soluble enzymes & membrane bound enymes, purification of soluble enzymes-chromatography	Clinical applications of enzymes- SGPT
S 16-18	SLO-1 SLO-2 SLO-3 SLO-4	Enzyme activity of protease	Optimum temperature determination- protease	Optimum pH determination- urease	Affinity chromatography	Model Exam

Learning Resources	1. Nicholas C. Price and Lewis Stevens, *"Fundamentals of Enzymology"*, Oxford University Press, 2003. 2. Trevor Palmer and Philip Bonner, *"Enzymes - Biochemistry, Biotechnology, Clinical chemistry"*, 2nd edition, East-West Press Pvt. Ltd, 2004. 3. Lehninger, Nelson and Cox, *"Principles of biochemistry"*, 6th edition, W.H. Freeman & Company,2013. 4. Prakash M., Digmarti Bhaskara Rao,Jena T, Enzyme Biotechnology, 1st edition, Discovery Publication, 2010.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	-	30%	-	30%	-	30%	-	30%	-
Level 2	Apply Analyze	40%	-	40%	-	40%	-	40%	-	40%	-
Level 3	Evaluate Create	30%	-	30%	-	30%	-	30%	-	30%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. S. Vijayabharathi, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23303J	Course Name	BIOPROCESS TECHNOLOGY	Course Category	C	Discipline Specific Core Courses	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
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 types of fermentation			
CLR-5 :	Knowledge on industrial production			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	
CLO-1 :	*To understand the methods of strain improvement*	1	75	70	*L*	*H*	*H*	*H*	*L*	-	-	-	L	L	-	
CLO-2 :	*Having knowledge on design of bioreactor*	2	75	70	*M*	*M*	*L*	*M*	*L*	-	-	-	M	L	-	
CLO-3 :	*Applying knowledge to understand the techniques of screening microbes*	2	75	70	*M*	*M*	*M*	*M*	*L*	-	-	-	M	L	-	
CLO-4 :	*Understand about the microbial kinetics*	1	75	70	*M*	*M*	*M*	*M*	*L*	-	-	-	M	L	-	
CLO-5 :	*Having knowledge on downstream processing methods*	1	75	70	*H*	*M*	*M*	*M*	*L*	-	-	-	M	L	-	

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction to BioprocessTechnology	Strain improvement	Continuous Fermentation	Membrane Bioreactor	Purification of products
S-2	SLO-1	Types of Bioprocesses	Mutation	Functions of Fermenter	Bubble Column Bioreactor	Product Finishing
S-3	SLO-1	Media for industrial fermentations	Recombination	Components of Bioreactor	Downstream processing Introduction	Ethanol Production
S4-6	SLO-1	Isolation of starch /cellulosedegrading microorganism	Growth kinetics	Cell/Enzyme immobilization in alginate/polyacrylamide	Production of wine	Mushroom cultivation
S-7	SLO-1	Criteria for medium design	Microbial growth kinetics: Introduction	Types of Fermenters	Intracellular Products and Extracellular Products	Citric acid production
S-8	SLO-1	Sterilization	Fermenter- Introduction	Stirred Tank (Continuous) Bioreactor	Cell disruption mechanical and physical methods	Penicillin production
S-9	SLO-1	Inoculum preparation	Modes of Operation of fermenter	Airlift Bioreactor	Chemical methods	Beer Production
S-10-12	SLO-1	Isolation of starch /cellulosedegrading microorganism	Optimization of culture conditions foramylase production	Bread making	Mushroom cultivation	Vermicomposting – demonstration
S-13	SLO-1	Isolation of microbes	Types of Fermentation	Packed tower (Bed) Bioreactor	Enzymatic methods	Bioplastic Production

S-14	SLO-1	Screening of microbes	Batch Fermentation	Fluidized Bed Bioreactor	Removal of insoluble	PHA Production
S-15	SLO-2	Industrially importantmicroorganisms	Fed Batch Fermentation	Photobioreactor	Isolation of products	Applications of Bioprocess Technology
S-16-18	SLO-1	Growth kinetics.	Optimization of culture conditions foramylase production	Production of wine	Mushroom cultivation	Model Exam

Learning Resources	1. Biochemical Engineering by Harwey W. Blanch and Douglas S.Clark. Hall P T R,2002. 2. Yoshida T., "Applied Bioengineering - Innovations and Future Directions", Wiley-VCH, 2017	3. Shuler and Kargi, Bioprocess Engineering: Basic Concepts, 2ndEdition, Prentic 4. Najafpour G., "Biochemical Engineering and Biotechnology", 2ndEdition, Elsevier Science, 2017

Learning Assessment

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

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	*Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.*	Dr. Infant Santhose.B, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

SEMESTER III

Course Code	ULT23AE1J	Course Name	Applied Tamil – I	Course Category	AE	Ability Enhancement Courses (AE)	L	T	P	O	C
							1	0	2	2	2

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

Course Learning Rationale (CLR): *The purpose of learning this course is to:*

		Learning		
		1	2	3
CLR-1 :	தமிழின் எழுத்து, சொல் வளர்ச்சி வரலாற்றை அறியச் செய்தல்	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	மொழியைப் பிழையின்றி எழுதும் ஆற்றலை அடையச் செய்தல்			
CLR-3 :	வாய்மொழி வழக்காறுகளின் நுட்பங்களைத் தெரியச் செய்தல்			
CLR-4 :	கடிதம் எழுதும் முறை, கட்டுரை வரையும் முறை அறியச் செய்தல்			
CLR-5 :	படைப்பாற்றல் திறனை வளரச் செய்தல்			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	சொற்களைச் சரியான பொருண்மையில் பயன்படுத்தும் திறன் பெறுதல்	2	75	60
CLO-2 :	மொழியைப் பிழையின்றி எழுதுவதன் வழி மொழி ஆளுமை பெறுதல்	2	80	70
CLO-3 :	வாய்மொழி மரபின் கூறுகள் வழி, மக்களின் வாழ்வியல் விழுமியங்களை அறிந்துகொள்ளுதல்	2	70	65
CLO-4 :	அலுவலகப் பயன்பாடு, திறன் மேம்பாடு ஆகியவற்றை நுட்பமாகத் தெரிந்துகொள்ளுதல்	2	70	70
CLO-5 :	கவிதை, கதை படைக்கும் ஆற்றலை அறிந்துகொள்ளுதல்	2	80	70

Program Learning Outcomes (PLO)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	PSO -1	PSO -2	PSO-3
CLO-1 :	H	L	H	M	H	H	L	M	H	M	L	H	-	-	-
CLO-2 :	H	M	H	L	M	H	L	H	M	L	H	H	-	-	-
CLO-3 :	H	L	H	M	H	H	M	H	L	H	M	H	-	-	-
CLO-4 :	H	M	H	L	H	M	M	H	H	L	H	H	-	-	-
CLO-5 :	H	M	H	H	M	H	L	M	H	L	H	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	தமிழின் தொன்மை	மெய்யெழுத்துகளின் வகைகள்	வாய்மொழி மரபு, எழுத்து மரபு	தொடர் அமைப்பு	காலந்தோறும் கவிதை
	SLO-2	தமிழின் சிறப்புகள்	மூவினம்	வாய்மொழி மரபில் அனுபவம்	எளிய தொடர்	கவிதை வடிவம்
S-2	SLO-1	கருத்து – பரிமாற்றம்	ஒற்று இடுதல்	வாழ்வியல் தத்துவம்	நெடுந்தொடர்	மரபுக்கவிதை
	SLO-2	பயன்பாட்டுத்தமிழ்	வல்லினம் மிகும் இடங்கள்	பழமொழிகள்	பத்தி எழுதுதல்	வசனகவிதை
S-3	SLO-1	காலந்தோறும் தமிழ்	வல்லினம் மிகா இடங்கள்	பழமொழியும் மனித வாழ்வியலும்	ஒரு பொருளை மையமாகக் கொண்டு எழுதுதல்	புதுக்கவிதை/ புதிய வடிவக் கவிதைகள்
	SLO-2	எழுத்துகள் - அறிமுகம்	எழுத்துப்பிழை நீக்கம்	பழமொழியின் வடிவம்	காலந்தோறும் கடிதங்கள்	கவிதைக் களங்கள்
S-4	SLO-1	தமிழ் எழுத்து வரலாறு	பிழை நீக்கி எழுதுதலின் அவசியம்	வட்டார மொழி	தமிழில் கடித இலக்கியம்	கவிதை உள்ளடக்கம்
	SLO-2	எழுத்துகளின் வரிவடிவம்	பிழைகளும் மொழிச் சிக்கல்களும்	வட்டார மொழியில் சொலவடை	கடித வகைகள்	கவிதை எழுதும் முறை
S-5	SLO-1	எழுத்துகளின் பிறப்பு	எதிர்ச்சொல் வரலாறு	பழமொழியும் சொலவடையும்	கடிதம் எழுதும்முறை	தன்னுணர்ச்சிக் கவிதை

	SLO-2	உயிர் எழுத்துப் பிறப்பு	எதிர்ச்சொல்லின் உருவாக்கம்	பேச்சுநடையும் சொலவடையும்	அலுவல் கடிதம்	இயற்கை/ சமூகம் - கவிதை
S-6	SLO-1	மெய்யெழுத்துப் பிறப்பு	இணைச்சொல்லும் எதிர்ச்சொல்லும்	மரபுத்தொடர்	வாழ்த்து/ பாராட்டுக் / நட்புக் கடிதம்	காலந்தோறும் கதைகள்
	SLO-2	மொழி முதல் எழுத்துகள்	தமிழில் எதிர்ச்சொற்கள்	பழமொழி மரபுத் தொடர் வேறுபாடு	கட்டுரை வகைகள்	கதைகளில் கற்பனையும் உண்மையும்
S-7	SLO-1	மொழி இறுதி எழுத்துகள்	ஒரெழுத்து ஒருமொழி – அறிமுகம்	தமிழில் மரபுத்தொடர்	கட்டுரை எழுதும் முறை	வாய்மொழிக் கதை
	SLO-2	எழுத்து வேறுபாடும் பொருளும்	ஒரெழுத்து ஒருமொழியும் பொருளும்	விடுகதை	கட்டுரைக் களங்கள்	ஒரு பக்கக் கதை
S-8	SLO-1	ணகர - னகர - நகர வேறுபாடு	சொற்களின் தன்மைகள்	நுண்ணறிவு வெளிப்படுதல்	போட்டிக் கட்டுரை	சிறுகதை
	SLO-2	லகர – ளகர - ழகர வேறுபாடு	ஒரு சொல் பல பொருள்	கதை மரபில் நாட்டுப்புறக் கதைகள்	அனுபவக் கட்டுரை	கதை எழுதும் முறை
S-9	SLO-1	சொல்லும் பொருளும்	ஒரு பொருள் பல சொல்	தமிழில் நாட்டுப்புறக் கதைகள்	பயணக் கட்டுரை	சமூக உணர்வின் வெளிப்பாடு
	SLO-2	காலந்தோறும் சொற்கள்	சொல் உருவாக்கத்தின் பயன்கள்	நாட்டுப்புறக் கதைகளும் சமூக வரலாறும்	இதழியல் கட்டுரைகள்	நிகழ்வைக் கதை வழியே வெளியிடல்

Learning Resources	1. நல்ல தமிழ் எழுத வேண்டுமா?, அ. கி. பரந்தாமனார், பாரி நிலையம், 2010. 2. நாட்டுப்புற இயல் ஆய்வு, சு. சக்திவேல், மணிவாசகர் பதிப்பகம், சென்னை, 2006. 3. படைப்புக்கலை, மு. சுதந்திரமுத்து, அறிவுப் பதிப்பகம், சென்னை, 2008.	4. கதையியல், க. பூரணச்சந்திரன், அடையாளம் பதிப்பகம், சென்னை, 2012. 5. இணைய வழித் தரவுகள் : https://tamilheritage.org/

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	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 & Literaturel, 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	ULH23AE1J	Course Name	APPLIED HINDI-I	Course Category	*AE*	Ability Enhancement Courses (AE)	L	T	P	O	C
							1	0	2	2	2

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering Department	HINDI	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Explain and appreciate the Constant moral values of India*			
CLR-2 :	*Focus on Evaluating the social changes through prose*			
CLR-3 :	*To Display moral and social values in the field of religion and communal Unity*			
CLR-4 :	*To make translation of good literature and any relevant document from the Hindi Language to English andvice –versa*			
CLR-5 :	*To help the learners to tackle Administrative terminology*			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO)											
					1	2	3	4	5	6	7	8	9	10	11	12
					Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
CLO-1 :	*Understand the various forms of Prose and different aspects of social issues*	*2*	*75*	*80*	*H*	*H*	*H*	*M*	*L*	*H*	*L*	*M*	*L*	*L*	*H*	*M*
CLO-2 :	*To create an awerness on Ramayanan*	*2*	*80*	*90*	*H*	*H*	*H*	*M*	*L*	*H*	*H*	*M*	*L*	*L*	*H*	*M*
CLO-3 :	*To Examine the accuracy in Translation*	*2*	*75*	*95*	*H*	*H*	*M*	*L*	*H*	*H*	*M*	*H*	*M*	*M*	*H*	*H*
CLO-4 :	*To Provide technical writing skills*	*2*	*80*	*90*	*H*	*H*	*L*	*H*	*M*	*H*	*L*	*H*	*H*	*M*	*H*	*H*
CLO-5 :	*To evaluate the nuance in essays*	*2*	*85*	*90*	*M*	*H*	*M*	*H*	*L*	*H*	*H*	*L*	*H*	*M*	*H*	*H*

Duration (hour)		9	9	9	9	9
S-1	SLO-1	*KAHANI*	*NIBANDH*	*BAL RAMAYAN*	*ANUVAD*	*PARIBHASHIK SHABDAVALI*
	SLO-2	*AVDHARNA*	*VDHARNA*	*KHATHA VASHTU*	*AVDHARNA*	*ARTH*
S-2	*SLO-1*	*ARTH*	*ARTH*	*AVADHPURI MEN RAM*	*ARTH*	*PARIBHASHA*
	SLO-2	*SWARUP*	*SWARUP*	*RAM KE ADARSH KE PRATI PRERITKARNA*	*SWARUP*	*SWARUP*
S-3	*SLO-1*	*PARIBHASHA*	*PARIBHASHA*	*RAMAYAN KE PRATI RUCHI JAGANA*	*PARIBHASHA*	*PRAKAR*
	SLO-2	*KAHANI KE TATVA*	*AHABHARAT KE SAMAY KAHARAT-BHALKRISHNA BHATT*	*RAMAYAN KA SAMAJ MEN MAHATVA*	*PRAKAR*	*AVADHARNA*
S-4	*SLO-1*	*UDDESHYA*	*LEKHAK PARICHAYA*	*LOKJEEVAN KE PRATI JAGRUP KARNA*	*MAHATVA*	*PRAYOJAN*
	SLO-2		*PATH KA VISLESHAN*	*JANGAL AUR JANKPUR*	*UDDESHYA*	*UDDESHYA*
S-5	*SLO-1*	*ANTASH MAN KI JAGRITI*	*UDDESHYA*	*GURU KE PRATI ADAR BHAV*	*ANUBAD PRAKRIYA*	*MAHATVA*
	SLO-2	*EIDGAH – KAHANIPREMCHAND*	*SAMAJIK SAMRASTA*	*VIRTA KE BHAV KO JAGANA*	*VIVIDH PRAYOG*	*PRAYOG*
S-6	*SLO-1*	*KAHANI KA PARICHAYA*	*PAURANIK KAHANIYO SEAVAGAT KARANA*	*VIDHARM KA PRATIFAL*	*HINDI SE ANGREZI ANUVAD*	*UDDESHYA*
	SLO-2	*KAHANI VISLESHAN*	*MAHABHARAT EVAM RAMAYANKE SAMAJ KI TULNA*	*VAN JEVAN SE AVAGAT KARANA*	*ANGREZI SE HINDI ANUVAD*	*TAKANIKI SHABDAVALI KA MHATVA*
	SLO-1	*BAL MANOVIGYAN*	*BABUL AUR KAKTASH-RAMDARASH MISHRA*	*SITA KE ADARSH CHARITRA SEAVAGAT KARANA*	*ANUVAD KA PRAYOJAN*	*HINDI SE ANGREZI SHABD*
S-7	*SLO-2*	*ASMANTA KA CHITRAN*	*LEKHAK PARICHAY*	*RAM KE CHARITRA SE AVAGATKARANA*	*ANUVAD KA PRAYOG*	*ANGREZI SE HINDI SHABD*
	SLO-1	*DIP SE DIP JALE- USHA YADAV*	*PATH KA VISLESHAN*	*VIRTA KE BHAV JAGANA*	*SHROT BHASHA KA GYAN*	*EK DIN EK SHABD*
S-8	*SLO-2*	*SAPNE KE LIYE SANGHARSH*	*MANVATA KO JIVIT RAKHANEKI PRERNA*	*PATH KA VISLESHAN*	*LAKSHYA BHASHA KA GYAN*	*SHABDON KA VISLESHAN*

S-9	*SLO-1*	*SAMASYA KA SMADHAN JAD MENHOTA HAI*	*AAJ KE SANDARBH ME MAHABHARAT KI UPYOGITA*	*PATH PRICHARCHA*	*ANUVAD KA DAYITVA*	*PATH PRICHARCHA*
	SLO-2	*PRASHNABHAYASH*	*PRASHNABHAYASH*	*PRASHNABHAYASH*	*ANUVAD KA ABHYASH*	*PRASHNABHAYASH*

Learning Resources	*Edited Book: "PRAYOJAN MULOK HINDI", SRIJONLOK PUBLICATION, 2023, New Delhi.* 1. Srijanlok Literary Magazine, Ara (Bihar – 802301) 2. https://hindisamay.com/ 3. https://ncert.nic.in/textbook.php?fhbr1=0-12 4. Prayojan mulak Hindi, Dr. Sontakke https://rajbhasha.gov.in/hi/ol_clause

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Shri. Santosh Kumar Editor : Srijanlok Magazine	*1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu*	*1. Dr.S Preeti. Associate Professor & Head,SRMIST*
Place: Vashishth Nagar, Ara – 802301		
		2. Dr. Md.S. Islam Assistant Professor, SRMIST
		3.Dr. S. Razia Begum, Assistant Professor, SRMIST
		4, Dr.Nisha Murlidharan Assistant Professor,VDP,SRM IST

Course Code	ULF23AE1J	Course Name	French for Specific purpose-I	Course Category	AE	Ability Enhancement Courses (AE)	L	T	P	O	C
							1	0	2	2	2

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering Department	French	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning	Program Learning Outcomes (PLO)

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 foreignerspeaking French

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Fundamental Knowledge	2 Application of Concepts	3 Link with Related	4 Procedural Knowledge	5 Skills in Specialization	6 Ability to Utilize	7 Skills in Modeling	8 Analyze, Interpret Data	9 Investigative Skills	10 Problem Solving Skills	11 Communication Skills	12 Analytical Skills
CLO-1 :	*To acquire knowledge about French language*	*2*	*75*	*80*	*H*	*M*	*H*	*H*	*M*	*H*	*H*	*L*	*M*	*M*	*H*	*L*
CLO-2 :	*To strengthen the knowledge on concept, culture, civilization and translation of French*	*2*	*80*	*90*	*M*	*H*	*L*	*H*	*H*	*M*	*H*	*M*	*L*	*L*	*H*	*M*
CLO-3 :	*To develop content using the features in French language*	*2*	*75*	*80*	*H*	*H*	*L*	*M*	*H*	*M*	*L*	*H*	*M*	*M*	*H*	*H*
CLO-4 :	*To interpret & Translate the French language into other language*	*2*	*75*	*90*	*H*	*L*	*M*	*H*	*M*	*H*	*H*	*M*	*L*	*H*	*M*	*L*
CLO-5 :	*To improve the communication, intercultural elements in French language*	*2*	*80*	*75*	*M*	*H*	*H*	*L*	*M*	*M*	*H*	*H*	*M*	*L*	*H*	*M*

Duration (hour)		9	9	9	9	9
S-1	SLO-1	TP de chimie	Le jour des examens	L'impératif négatif	Comprendre une lettre de motivation	Comprendre la structure d'un rapport destage
	SLO-2	Les exemples	Les activités	-Le passé composé avec être	Les exemples	Trouver des mots clés-
S-2	SLO-1	- Un TP au laboratoire-	Le sms à la française -	Les exemples	Repérer le présent	Les activités
	SLO-2	Les exemples	Les activités	Le passé composé des verbes pronominaux	Les activités	Comprendre un texte technique-
S-3	SLO-1	Comprendre un TP	Les examens	-La recherche de stage -	, le passé composé et	Les activités
	SLO-2	Les exemples	Les activités	Les exemples	Les activités	Les exemples
S-4	SLO-1	-Suivre un protocole expérimental -	-Donner des conseils	Les activités	le futur dans un texte	Relever des arguments dans un texte-
	SLO-2	Les activités	Les exemples	Le stage en France	Les exemples	Les activités
S-5	SLO-1	Lire des équations chimiques -	-Écrire et comprendre un sms -	Les activités	- Le rapport de stage et ledomaine des carburants -	Les exemples
	SLO-2	Les activités	Comprendre une interdiction	Le CV français	Les activités	Les activités
S-6	SLO-1	Identifier des formules chimiques àl'oral	Les activités	Les exemples	Le stage	Les activités
	SLO-2	Les exemples	-Donnez des consignes -	La lettre de motivation-	Les exemples	Les pronoms COI
	SLO-1	- L'infinitif pour exprimer un ordreou	Les exemples	Comprendre une offre de stage	La méthode du plan détaillé-	Les exemples

S-7	SLO-2	Les activités	Comprendre	Les exemples	Les activités	Les exemples
S-8	SLO-1	un conseil (dans les consignes) -	Les exemples	Les activités	Les exemples	Les activités
	SLO-2	Les exemples	et parler d'actions passées-	Comprendre et réaliser un CV	Le contenu du rapport de stage	Quelques verbes et leur preposition
S-9	SLO-1	La nominalisation	Les exemples	Les activités	Les exemples	Les activités
	SLO-2	Les exemples	L'impératif des verbes pronominaux	Les exemples	Les activités	Les exemples

Learning Resources	*Theory:* 1. "*Tech French*" French for Science and Technology, Ingrid Le Gargasson, Shariva Naik, Claire chaize, Les éditions Didier, India, 2011. 2. *https://www.fluentu.com/blog/french/french-grammar* 3. *https://www.elearningfrench.com/learn-french-grammar-online-free.html* 4. *https://www.lawlessfrench.com/grammar* 5. *https://blog.gymglish.com/2022/12/15/basic-french-grammar*

Learning Assessment											
	Bloom'sLevel of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (5%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	Internal Experts
1. Mr. Kavaskar DanasegaraneProcess Expert	*1. Dr. C.Thirumurugan Professor, Department ofFrench, Pondicherry University*	*1. Mr. Kumaravel K. Assistant Professor & Head, SRMIST, KTR*

Maersk Global Service Center Pvt. Ltd		
2.Mr. Sharath Raam Prasad Character Designer, Animaker Company Pvt.		*2. Mrs. Abigail, Assistant Professor, SRMIST, VDP*

Course Code	UBT23G01J	Course Name	MICROBIAL PHYSIOLOGY	Course Category	G	Generic Elective Course	L	T	P	O	C
							2	0	4	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	To learn types of microbes based on nutrition, basic transport mechanisms present in microbes for the uptake of nutrients	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	To learn bacterial growth and factors affecting microbial growth			
CLR-3 :	To make students acquainted with various aspects of microbial physiology and metabolism			
CLR-4 :	To learn the physiological and metabolic aspects of the microbes			
CLR-5 :	To learn families of phototrophic microorganisms and their energy synthesis			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	*Will have got acquainted with the diverse physiological groups of bacteria/archea and transport systems commonly employed by microbes.*	1	85	80	H	M				L	L		M	H		H
CLO-2 :	*Will have sufficient knowledge of bacterial bacterial growth curve, calculation of generation time and effect of environmental factors on the growth.*	2	85	80	M	H	H			M			H			L
CLO-3 :	*Will understand catabolic pathways of energy generation and conservation used by bacteria during growth on glucose under aerobic and anaerobic conditions. They will also become familiar with the concepts of aerobic respiration and fermentation in microbes.*	2	85	80	H	M	H			M		L		H		L
CLO-4 :	*Will have got conversant with the groups of microbes having ability to extract energy from inorganic compounds and assimilate carbon from CO2 (chemolithotrophs).*	3	85	80	H	M	L			L	H			M	H	
CLO-5 :	*Will have an added knowledge on the families of phototrophic microorganisms. Students would also be aware of differences between anoxygenic and oxygenic photosynthesis.*	3	85	80	M	L				H		L		L		

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Nutritional requirements of Microorganisms	Growth curve	Metabolism – Concept of aerobic respiration	Anaerobic respiration	Photosynthesis
	SLO-2				Denitrification; nitrate /nitrite andnitrate/ammonia respiration	
S-2	SLO-1	Autotrophs, Heterotrophs, Chemotrophs andOligotrophs.	Generation time	Anaerobic respiration	Anaerobic respiration- fermentative nitratereduction	Characteristics and types of Photosynthetic Prokaryotes
	SLO-2					
S-3-6	SLO-1	Isolation and culturing of photosynthetic bacteria	Effect of carbon and nitrogen sources on growthof E. coli	Measurement of growth by cell number usingHaemocytometer	Starch hydrolysis	Aminoacid fermentation
	SLO-2					
S -7	SLO-1	Nutrient transport Mechanisms-	Factors influencing microbial growth	Fermentation	Alcohol fermentation and Pasteur effect	C02 fixation- Oxygenic
	SLO-2					
S-8	SLO-1	Diffusion- Facilitated Diffusion	synchronous growth and continuous cultivation	Glycolysis	mixed acid fermentation	C02 fixation- Anoxygenic
	SLO-2					
S-9-12	SLO-1	Effect of temperature on growth ofmicroorganisms	Effect of salt on growth of E. coli	Acid and gas production from carbohydrates- lactose fermentation	Gelatin hydrolysis	Detection of Catalase production by microorganisms
	SLO-2					
S-13	SLO-1	Passive, Active transport, - Group translocation	Diauxic growth	TCA cycle	lactic acid fermentation- Homo and heterofermentative pathways	Bio luminescence
	SLO-2					
S-14	SLO-1	Concept of uniport, symport and antiport.	Endospore formation in bacteria	Electron transport chain	concept of linear and branched fermentation pathways.	Bio luminescence
	SLO-2					
S-15-18	SLO-1	Effect of pH on growth of microorganisms	Study and plot the growth curve of E. coli byturbidometric method		Casein hydrolysis	Urease test
	SLO-2					

Learning Resources	1. Microbiology, Dubey RC and Maheswari DK (2004), 1st Edition, S. Chand & CompanyLtd., NewDelhi. 2. Experiments in Microbiology, Plant pathology and Biotechnology, Aneja KR (2005), 4thEdition, New Age International Publishers, Chen 3. Prescott Microbiology, Joanne Willey, Kathleen Sandman and Dorothy Wood(2020). Mc Graw Hill Publication 4. https://www.frontiersin.org/books/Microbial_Physiology_and_Metabolism. https://onlinelibrary.wiley.com/doi/book/10.1002/0471223867

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr.D.Thirumurugan, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23S01T	Course Name	MATHEMATICAL CALCULATIONS INBIOLOGY	Course Category	S	Skill Enhancement Course	L	T	P	O	C
							1	0	0	2	1

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	Progressive Courses	Nil

Course Offering Department	Biotechnology	Data Book / Codes/Standards	

Course Learning Rationale(CLR):	The purpose of learning this course is to
CLR-1 :	*General ideology on basic mathematics*
CLR-2 :	*Upskilling the conversion of units used in Biology*
CLR-3 :	*enhance the knowledge on type of solution*
CLR-4 :	*Understand the nature of solution*
CLR-5 :	*Understand the microbial growth*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning: 1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)
CLO-1 :	Enhancing the ability on basic calculation	*2*	*75*	*80*
CLO-2 :	Enhancing the ability to conversion of factors	*2*	*80*	*90*
CLO-3 :	Clear ideology on type of solution	*2*	*75*	*80*
CLO-4 :	Analyze the nature of the solution	*2*	*75*	*90*
CLO-5 :	Analyze the growth pattern of the microorganism and cell concentration in blood	*2*	*80*	*75*

Program Learning Outcomes (PLO)

	1 Fundamental Knowledge	2 Analyze, Interpret Data	3 Reasoning ability	4 Ethical Practices	5 Team Work	6 Communication of complex biotechnological ideas	7 independent and lifelong learning	8 PSO - 1	9 PSO - 2	10 PSO – 3	11 PSO-4	12 PSO-5
CLO-1 :	H				L		H					
CLO-2 :	H	M	M	H	L							
CLO-3 :	H			H								
CLO-4 :	H		M									
CLO-5 :	H			M			H					

Duration (hour)		3	3	3	3	3
S-1	SLO-1	*Introduction to mathematics in biology*	*Conversion factors* and UnitCancellation	Concentration and Dilutions – Percent volume by volume (%v/v)	pH and pOH – Derivation of pH of water	Bacterial Growth Curve _ three phasesexplanation
	SLO-2	*Introduction to mathematics in biology*	*Conversion factors* and UnitCancellation	Concentration and Dilutions- Percent Volume by weight (%v/w)	pH Scale range	Calculation of generation time
S-2	SLO-1	*Significant digits*	*Conversion factors* and UnitCancellation	Calculation – Molarity , Molality and Normality	pH and pOH - calculations	Calculation of bacterial growth- Serial Dilution Method and Plotting the OD vs Time graph
	SLO-2	*Significant digits*	*Conversion factors* and UnitCancellation	Calculation – Molarity , Molality and Normality	Log and Anti-log - calculation	Calculation of bacterial growth- Serial Dilution Method and Plotting the OD vs Time graph
S-3	SLO-1	*Converting numbers from scientific todecimal notations*	Concentration and Dilutions - Mass percent (%w/w)	Calculation – Molarity , Molality and Normality	pH and pOH - calculations	*Measuring cell concentration on a hemocytometer*
	SLO-2	*Converting numbers from scientific todecimal notations*	Concentration and Dilutions- Percent weight by volume (%w/v)	Calculation – Molarity , Molality and Normality	Log and Anti-log - calculation	*Measuring cell concentration on a hemocytometer*

Learning Resources

1. Calculations for Molecular Biology and Biotechnology- A guide to mathematics in the laboratory". by Frank H. Stephenson. Academic Press- 2nd Edition (2014

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30	NIL	30	NIL	30	NIL	30	NIL	30	NIL
	Understand										
Level 2	Apply	50	NIL	50	NIL	50	NIL	50	NIL	50	NIL
	Analyze										
Level 3	Evaluate	20	NIL	20	NIL	20	NIL	20	NIL	20	NIL
	Create										
	Total	100		100		100		100		100	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	*Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.*	Dr.Vidhya VG, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23P01L	Course Name	INTERNSHIP- I	Course Category	P	Internship/ Project/ Community Outreach	L	T	P	C
							0	0	0	1

Pre-requisiteCourses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Physics and Nanotechnology	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1:	*assist the student's professional skill development useful to employer such as teamwork, communications and work ethics & details*
CLR-2:	*provide unique learning opportunities by exposing the student to the environment and expectations of professional performance*
CLR-3:	*expand the student's knowledge of a particular area(s) of interest to enhance employability*
CLR-4:	*help students to explore career alternatives/opportunities prior to their graduation*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
CLO-1:	*demonstrate the skill gained through work experience with mentors or successful professionals to support the early stages of their career*

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

Course Code	UCD23V02T	Course Name	Industry Oriented Employability Skills for Science	Course Category	V	Value Addition course	L	T	P	O	C
							2	0	0	2	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:*
CLR-1 :	*Demonstrate various principles involved in solving mathematical concepts related to permutation and combination and probability and interpret data*
CLR-2 :	*Learn the basic mechanics of grammar and develop resume-building practice and presentation skills in students*
CLR-3 :	*Understand the object oriented features*
CLR-4 :	*Prepare students for job interviews*
CLR-5 :	*Instill confidence in students and develop the necessary skills to face interview*

Course Learning Outcomes (CLO)	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behaviour	Life Long Learning
CLO-1 :	*Understand the concepts of permutation and combinations, probability and approach questions in a simpler and innovative method*	3	80	70	M	M	-	M	-	H	-	M	H	M	-	H	-	-	-
CLO-2 :	*Understand the different parts of speech and use them in sentences appropriately and also the importance of resume preparation*	3	85	75	M	-	-	M	-	H	-	-	-	-	H	-	-	L	H
CLO-3 :	*Understand the importance of object oriented features*	3	85	80	H	M	M	M	M	H	L	-	-	-	-	-	M	-	H
CLO-4 :	*Face interviews confidently*	3	85	80	M	M	H	M	M	H	L	-	-	-	-	-	M	-	H
CLO-5 :	*Develop their domain skills to face the interview*	3	85	80	M	M	H	M	M	H	L	-	-	-	-	-	M	-	H

Duration (hour)		6	6	6	6	6
S-1	SLO-1	*Permutation and Combination – Introduction*	*Change of voice*	*Object Oriented Programming - Introduction*	*Overloading & Overriding – Introduction*	*Time Complexity – Introduction*
	SLO-2	*Permutation and Combination – Problems*	*Change of voice*	*Introduction to Monolithic, POP, Structures, OOP*	*Overloading & Overriding*	*Time Complexity*
S-2	SLO-1	*Probability – Introduction*	*Change of speech*	*Translators – Introduction*	*Virtual Functions & Abstract Class – Introduction*	*Stacks & Queue - Applications*
	SLO-2	*Probability – Problems*	*Change of speech*	*Translators*	*Virtual Functions & Abstract Class*	*Stacks & Queue - Applications*
S-3	SLO-1	*Data Sufficiency – Introduction*	*Resume Writing - Introduction*	*Class – Introduction*	*Dangling Pointer – Introduction*	*Linked List & Operations – Introduction*
	SLO-2	*Data Sufficiency – Problems*	*Resume Writing - Introduction*	*Class*	*Dangling Pointer*	*Linked List & Operations*
S-4	SLO-1	*Puzzles - Selections*	*Resume Writing - Session 1*	*Object Abstraction – Introduction*	*Garbage Collector – Introduction*	*Types of Trees & BST – Introduction*
	SLO-2	*Puzzles - Selections*	*Resume Writing - Session 1*	*Object Encapsulation*	*Garbage Collector*	*Types of Trees & BST*

S-5	SLO-1	*Puzzles - Distribution*	*Types of Interviews - Group / Stress / HR*	*Polymorphism, Inheritance and Dynamics Binding – Introduction*	*Algorithm and Data Structures - Introduction*	*AVL Tree Operations – Introduction*
	SLO-2	*Puzzles - Distribution*	*Types of Interviews - Group / Stress / HR*	*Polymorphism, Inheritance and Dynamics Binding*	*Logical Thinking & Arrays*	*AVL Tree Operations*
S-6	SLO-1	*Cubes & Cuboids*	*Presentations - Introduction*	*Function Execution Sequence - Introduction*	*Structures & Pointers – Introduction*	*Introduction to P, NP, NP-Hard & NP-Complete Problems*
	SLO-2	*Cubes & Cuboids*	*Presentations - Activity*	*Stack & In Line Functions - Introduction*	*Structures & Pointers*	*Introduction to P, NP, NP-Hard & NP-Complete Problems*

Learning Resources	1. *Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition* 2. *Scott Bennett, The Elements of Resume Style: Essential Rules for Writing Resumes and Cover Letters That Work, AMACOM, 2014* 3. *Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007*	4. *Greg Perry, Dean Miller, C Programming Absolute Beginne, Que Publishing, 3rd Edition* 5. *Cay S. Horstmann, Core Java Fundamentals, Volume 1, 11th Edition, Prentice Hall, 2018* 6. *Langsam, Augenstein, Tanenbaum, Data Structures Using C and C++, 2nd Edition, Pearson Education, 2015.*

Learning Assessment					
Level	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)	CLA-4 (30%) #
		Theory	Theory	Theory	Theory
Level 1	Remember	10%	10%	30%	30%
	Understand				
Level 2	Apply	50%	50%	40%	40%
	Analyze				
Level 3	Evaluate	40%	40%	30%	30%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.
#CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr. M. Ponmurugan, Executive PMOSS, Cognizant Technology Solutions India Pvt. Limited, Chennai	*Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeedam, Coimbatore*	*Dr. Sathish K, HOD, Department of Career Guidance Cell, FSH, SRMIST* *Dr. Muthu Deepa M, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST*

SEMESTER IV

Course Code	UBT23401J	Course Name	FOOD BIOTECHNOLOGY	Course Category	C	Discipline Specific Core Courses	L	T	P	O	C
							3	0	3	2	4

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering Department	Biotechnology	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

CLR-1 :	To practice sterilization technique for personal and societal safety
CLR-2 :	Application of techniques for determines the quality of food.
CLR-3 :	Knowledge acquired to analysis a Qualitative 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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	*To learn basic sterilization technique for personal and societal safety*	1	*80*	*70*	*H*	*L*	*H*	*H*	*H*	*L*	*H*					
CLO-2 :	*Knowledge acquired for isolation and identification of food pathogens*	2	*85*	*75*	*H*	*H*	*M*	*M*	*M*	*M*	*M*					
CLO-3 :	*Understanding the techniques required for quality of water and milk*	2	*75*	*70*	*M*	*M*	*M*	*L*	*L*	*M*	*M*					
CLO-4 :	*Application of techniques required for Preparation of dairy products*	1	*85*	*80*	*L*	*M*	*L*	*L*	*M*	*M*	*L*					
CLO-5 :	*Knowledge acquired to determine the Quality checking of packaging material*	2	*85*	*75*	*M*	*L*	*L*	*M*	*M*	*M*	*M*					

Duration(hour)		18	18	18	18	18
S-1	SLO-1	Current scenario of food industry	Classification of food	Principles of thermal processing	Natural food toxicants	Principles of food preservation
S-2	SLO-1	Significance of food biotechnology	Shelf life of stable foods	Blanching	Food allergen	Preservation by fermentation: curing andpickling
S-3	SLO-1	Current national and internationalscenario of food industry	Food spoilage and food bornediseases	Thermal resistance of microorganisms	Food Quality assessment HACCP	Preservation by drying-sun drying
S 4-6	SLO-1 SLO-2	Lab 1: Principles and method ofsterilization–Heat, Filtration, Radiation & pasteurization	*Lab 4:* Identification of Molds by lactophenol cotton blue staining	*L*ab 7: Bacteriological Analysis ofWater by MPN method	Lab 9: Isolation and characterizationof lactobacillus from fermented milk products	Lab 11: Preparation and evaluation of probiotic/prebiotic foods
S-7	SLO-1	Inter disciplines involved in food tech	Food infection and Food intoxication	Thermal Death Time	Vinegar production	Preservation by low temperature
S-8	SLO-1	Basics of food microbiology	Introduction to food processing	Lethality concept.	Lactic acid production	Preservation of canning of food items
S-9	SLO-1	Food as a substrate for microorganism	Thermal resistance of microorganisms	Factor affecting heat resistance	Beer and wine production	Use of préservatives in foods

S	SLO-1		Lab 5: Standard Plate Count Method.			
10-12	SLO-2	Lab 2: Isolation and identification ofmicrobes from dairy products		Lab 7: Bacteriological Analysis ofWater by MPN method	Lab 9: Isolation and characterizationof lactobacillus from fermented milk products	Lab 12: Quality checking of packagingmaterials
S-13	SLO-1	Physical characteristics of food	Pasteurizations and Sterilization	Antimicrobial agents	*Food fermentation*	Importance and function of probiotic
S-14	SLO-1	Chemical characteristics of food	Different methods of sterilization	Food Adulteration	Microbiological examination of water	Prebiotic and symbiotic and their application
S-15	SLO-1	Isolation and identification of microbesfrom dairy products	*Different equipment used for foodhygiene*	Functional foods and Food Additives	Microbiological examination of food	*Types of packaging and package testingmethods*
S 16-18	SLO-1 SLO-2	Lab 3: Isolation and identification ofmicrobes from fermented products	*Lab 6:* Qualitative analysis of milk byMBRT test	Lab 8: Isolation of yeast from foods	*Lab 10: Study of food contaminants*	*Lab 13:* Testing methods of packagingmaterials

Learning Resources	1. Food Microbiology; WC Frazier; Tata McGraw Hill, Delhi. 2. Robertson GL, Food Packaging – Principles and Practice, CRC Press Taylor andFrancis Group, 2012 3. Fundamentals of Food Biotechnology, Byong H. Lee, John Wiley & Sons, 2014- 2nd ed 4. Ramaswamy H and Marcott M,Food Processing Principles and Applications CRC Press, 2006. 5. Food Microbiology. 2nd Edition By Adams M & Moss, M. 2008. RSC Publishing

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr.N. Banu, Bharathi Womens College (autonomous), Chennai	Dr. S. Thanigaivel , Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23402J	Course Name	GENETIC ENGINEERING	Course Category	C	Discipline-Specific Core Courses	L	T	P	0	C
							3	0	3	2	4

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

PCourse Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning	

		1	2	3
		Level of Thinking	Expected Proficiency(%)	Expected Attainment(%)
PCLR-1 :	Define the basics of restriction enzymes			
CLR-2 :	Categorizing the vectors and Gene transfer technique			
CLR-3 :	Practice on Gene cloning and Screening			
CLR-4 :	Study the PCR and its types			
CLR-5 :	Assess the Sequencing and Applications of Genetic engineering			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
					Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	Independent and life long learning	PSO-1	PSO-2	PSO-3	PSO – 4	PSO – 5
CLO-1 :	Recognize the role of restriction enzymes in Genetic engineering	*3*	*80*	*70*	H	M	M	H	L	M	H	H	H		M	
CLO-2 :	Relate vectors and Gene transfer techniques in Gene cloning	*3*	*85*	*75*	H	L	L	H	L	M	H	M	L		H	
CLO-3 :	Utilize the Gene cloning in Applications	*3*	*75*	*70*	H	M	M	H	H	H	H	H	H			
CLO-4 :	Importance of PCR techniques in Forensic science and viral evaluation	*3*	*85*	*80*	H	h	H	H	H	H	H	H	H		H	
CLO-5 :	Relate the sequencing technique in Genetic engineering	*3*	*85*	*75*	H	H	M	H	H	H	H	M	M			

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Basics of Genetic Engineering Principle of Genetic engineering Scope of Genetic Engineering Genetic Engineering in Geneticsagriculture and Animal husbandry	Application of Restriction Enzymes in Modern Biotechnology I	Basic Principle of GenecloningHistory of Gene cloning and Cloning strategy	Reverse-transcriptase PCR Real-time –PCR-RT-qPCR	DNA sequencing First Generation sequencing History of Sequencing
S-2	SLO-1	History of Genetic Engineering Traditional techniques in Geneticengineering	Introduction to cloning vectors: Prokaryotic Vectors: Plasmids	Screening for Recombinant	Characterization of PCR product and Uses of PCR	Second Generation sequencing
S-3	SLO-1	Role of Genetic engineering from traditional Biotechnology to ModernBiotechnology	Phagmid, Cosmid and Bacterial Artificial Chromosomes	Gene transfer techniques: Bacterial Conjugation and Transformation	Detection of Ancient DNA by PCR	Next-Generation Sequencing and Overview to NGS
S-4-6	SLO-1	Micropipette handling, pH measurement and buffer preparation.	Quantification of Genomic DNA By spectrophotometer	Preparation of competent cell	Isolation of RNA	CR
S -7	SLO-1	Discovery of Restriction EnzymesTypes of RE	Yeast Artificial Chromosomes.	Transduction	Detection of Viral infections PCR	Whole Genome Sequencing
S-8	SLO-1	Nomenclature of Restriction enzymes Blunt end and Sticky endRE	Expression Vectors	Microinjection	Cloning of PCR products	Third generation sequencing
S-9	SLO-1	Methylation sensitivity of restrictionenzymes Dam, Dcm and CpG methylases	Modifying Enzymes	Electroporation, Microprojectile, Shot Gun	Forensic DNA detection by PCR	Importance of sequencing
S-10-12	SLO-1	Agarose gel Electrophoresis	Restriction digestion of DNA by EcoRI andHindIII	Transform the competent cells in into EcoKIbacteria	Quantification of RNA byspectrophotometer	Real-Time PCR
S-13	SLO-1	Isoschizomers and Neoschizomers.	Polymerases	Ultrasonication, Liposome fusion	Application of PCR in Forensic Science	Applications of sequencing

S 14	SLO-1	Star Activity and Restriction Mapping Restriction Fragment LengthPolymorphism.	Ligases and Alkaline Phosphatases	Introduction to PCR – technique Principle of PCR Designing of primers	Problems and Limitations in PCR	Applications of Genetic Engineering
S-15	SLO-1	Application of Restriction Enzymes in modern biotechnology I	Recombinases	Types of PCR –Real-time PCR -qPCR	Factors influencing the PCR reactions	Genetherapy
	SLO-2					
S-16-18	SLO-1	Isolation of Genomic DNA	Ligation of ECORI and Hind IIIRestricted DNA by	Identification of recombinants – antibioticmarkers, Blue-white colony selection	PCR	Model Practical

learning Resources	1. Old, R. W., Primrose, S. B., & Twyman, R. M. (2001). Principles of Gene Manipulation: an Introduction to Genetic Engineering. Oxford: Blackwell Scientific 2. Lewin's "Genes" – 12th Edition, 2017. 3. Brown, T. A. (2006). Genomes (3rd ed.). New York: Garland Science Pub. 4. Isil Aksan Kurnaz (2015)Techniques in Genetic Engineering,Taylor &Francis group, Boca Raton London New York

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50%weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	20%	10%	15%	15%	10%	10%	15%	15%
	Understand										
Level 2	Apply	20%	20%	30%	20%	20%	20%	20%	30%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	10%	10%	15%	15%	10%	10%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr.N.Banu, Bharathi Womens College (Autonomous), Chennai	DR.D.Sankari ,Professor and Head ,Department of Biotechnology ,FSH ,SRMIST, KTR

Course Code	UBT23403J	Course Name	Nanobiotechnology	Course Category	C	Discipline Specific Core Courses	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	To make the students learn the basics of nanotechnology.
CLR-2 :	Understand the various methods in the synthesis
CLR-3 :	Analyze the techniques used in the nanomaterial preparation
CLR-4 :	Nature and properties of nanomaterials
CLR-5 :	Provide scientific understanding of application of nanomaterials

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Students can apply the properties of various nanomaterials*	1	*80*	*70*
CLO-2 :	*Suggest a suitable technique for the specific characterization different materials*	1	*85*	*75*
CLO-3 :	*Familiarity with working principles, tools and techniques in the field of nanomaterials*	1	*75*	*70*
CLO-4 :	*Understanding of the strengths, limitations and potential uses of nanomaterials*	2	*85*	*80*
CLO-5 :	*Design a nanobioparticle for specific application*	3	*85*	*75*

Program Learning Outcomes (PLO)											
1	2	3	4	5	6	7	8	9	10	11	12
Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
H	*H*	*M*	*M*	*L*	*M*	*L*					
M	*M*	*L*	*L*	*L*	*L*	*L*					
H	*H*	*M*	*L*	*L*	*L*	*L*					
M	*M*	*L*	*L*	*L*	*M*	*M*					
M	*M*	*M*	*M*	*M*	*M*	M					

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction and Definitions	Lipid nanoparticles	Nano formulations	Characterization of nanomaterials	Nanotechnology in healthcare of infectious
		Historical evolution Nanoscale dimensions and paradigm	Lipid nanoparticles	Emulsification techniques	Optical characterization and spectroscopy	Nanotechnology in Non-infectious diseases
S-2	SLO-1	Characteristics of nanostructures	Biological Methods	Methods of nanomaterials production	Uv visible spectroscopy	Nanopharmaceuticals
		Properties of nanomaterials	Greenery synthesis	Nanomaterial fabrication techniques	FTIR spectroscopy	Nanopharmaceuticals
S-3	SLO-1	Types of nanomaterials and their classifications	Chemical methods	Inert gas condensation	Dynamic Light Scattering	Diagnosis, sensors
			Chemical synthesis	Inert gas condensation	Stability of particles and Zeta potential	Biosensors
S4-6	SLO-1	General safety instruction for nanomaterials synthesis	Characterization of nanoparticles by UV-vis spectroscopy	Microwave assisted synthesis of nanoparticles	combustion method of nanoparticle synthesis	Application of synthesized nanoparticles
S-7	SLO-1	1D, 2D Nanoparticle	Top-down approaches	Arc discharge method	X-Ray Diffraction	Nanoparticles as a drug Delivery vehicles
		3D Nanocrystal	Top-down approaches	Arc discharge method	X-Ray Diffraction	Nanoparticles as a drug Delivery vehicles
S-8	SLO-1	Quantum Well	Bottom-up approaches	Plasma arc technique	SEM and EDAX	Biomedical applications of nanomaterials
		Quantum dot	Bottom-up approaches	Laser ablation technique	SEM and EDAX	Biomedical applications of nanomaterials
S-9	SLO-1	Quantum Wire	Particle agglomeration	Chemical vapor deposition	TEM	Multimodal nanoparticles
		Carbon based nanostructures	Particle aggregation	Chemical vapor deposition	TEM	Targeted drug delivery
S-10-12	SLO-1	Synthesis of nanoparticles using chemical reducing agents	Synthesis of nanoparticles by sol-gel methods	Synthesis of magnetic nanoparticles	Synthesis of ZnO nanoparticles by simple approach	Application of synthesized nanoparticles

S-13	SLO-1	Graphene and Graphene oxides	Growth and stabilization	Ion beam sputtering	Scanning tunneling microscopy	Nanobased Agri and Food Products
		Semiconductor nanomaterials	Self-assembly	Ion beam sputtering	Scanning tunneling microscopy	Nanocomposites for food packaging
S-14	SLO-1	Metal nanoparticles	Structure property relationship	Molecular beam epitaxy	Scanning (optical) probe microscopy	Nanopesticides and Nanofertilizers
		Metal oxide-based nanomaterials	Structure property relationship	Molecular beam epitaxy	Scanning (optical) probe microscopy	Nanopesticides and Nanofertilizers
S-15	SLO-2	Bionanomaterials	Luminescent quantum dots for biological labeling	Ball milling	Atomic force microscopy and molecular pulling	Nanotechnology for environment: contamination detection
		Polymeric materials	Nanoparticle molecular labels	Electrodeposition	Atomic force microscopy and molecular pulling	Nano remediation and applications
S-16-18	SLO-1	Synthesis of CuO nanoparticles by Co-precipitation method	Characterization of nanoparticles by UV-vis spectroscopy	Green synthesis of nanoparticles	Characterization of synthesized nanoparticles(either XRD or EDAX	Repeat/modal practical

Learning Resources	1. Bionanotechnology: Lessons from Nature Author: David S. Goodsell Publisher: Wiley- Liss ISBN: 047141719X. 2. C. A. Mirkin, C. M. Niemeyer, Eds., More concepts and applications (Wiley-VCH,Weinheim, 2007), Nanobiotechnology. 3. Nanobiotechnology: Concepts, Applications and Perspectives, Christof M.Niemeyer (Editor), Chad A. Mirkin (Editor) 4. Springer Handbook of Nanotechnology- BBhusan 5. Bio-Nanotechnology: A Revolution in Food, Biomedical andHealth Sciences Debasis Bagchi (Editor), Manashi Bagchi, Hiroyoshi Moriyama, Fereidoon Shahidi

Learning Assessment

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai i	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. PARTHIPAN.P, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR
		Dr. S. Thanigaivel, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	ULT23AE2J	Course Name	Applied Tamil – II	Course Category	AE	Ability Enhancement Courses (AE)	L	T	P	O	C
							1	0	2	2	2

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	அகராதி, கலைச்சொல் குறித்த நுட்பங்களை அறியச் செய்தல்			
CLR-2 :	நேர்காணல் செய்யும் திறனும் செய்தி வாசிப்பு முறைகளையும் தெரியச் செய்தல்			
CLR-3 :	விமர்சனத்தின் தன்மைகளும் செய்தியறிக்கை தயாரிக்கும் முறையையும் அறியச் செய்தல்			
CLR-4 :	பேச்சுக்கலையின் தனித்துவங்களைப் புரியச் செய்தல்			
CLR-5 :	கணினித்தமிழின் பல்வேறு நுட்பங்களைத் தெரியச் செய்தல்			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	அகராதித்துறை, கலைச்சொல்லாக்கத் துறையைத் தெரிந்துகொள்ளுதல்	2	75	60
CLO-2 :	ஊடகங்களில் மொழி ஆளுமையோடு செயல்படும் திறன் பெறுதல்	2	80	70
CLO-3 :	கலை, இலக்கிய விமர்சன முறைகளையும், செய்தியறிக்கை தயாரிக்கும் நுட்பங்களையும் தெரிந்துகொள்ளுதல்	2	70	65
CLO-4 :	பல்வேறு வடிவங்களைக் கொண்ட பேச்சுக்கலையை அறிவதன்வழி, சிறந்த மேடைப் பேச்சாளராக உருவாகும் தகுதியைப் பெறுதல்	2	70	70
CLO-5 :	தமிழைக் கணினி வழி, இணையம் வழி கொண்டுசேர்க்கும் உலகளாவிய செயல்பாடுகளை அறிந்துகொள்ளுதல்	2	80	70

Program Learning Outcomes (PLO)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	PSO -1	PSO -2	PSO-3
CLO-1 :	H	L	H	M	H	H	L	M	H	M	L	H	-	-	-
CLO-2 :	H	M	H	L	M	H	L	H	M	L	H	H	-	-	-
CLO-3 :	H	L	H	M	H	H	M	H	L	H	M	H	-	-	-
CLO-4 :	H	M	H	L	H	M	M	H	H	L	H	H	-	-	-
CLO-5 :	H	M	H	H	M	H	L	M	H	L	H	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	தமிழில் அகராதிகள்	நேர்காணல் அறிமுகம்	விமர்சனம் – அறிமுகம்	பேச்சுக்கலை	கணினித்தமிழ்
	SLO-2	ஒரு மொழி இருமொழி அகராதி	ஆளுமைத்திறன்	விமர்சனத்தின் நோக்கம்	பேச்சின் அடிப்படைகள்	கணினி வழித் தட்டச்சு
S-2	SLO-1	பன்மொழி அகராதி	நோக்கம் – கண்டறிதல்	விமர்சன வகைகள்	தன்னம்பிக்கையும் பேச்சும்	தட்டச்சு செய்யும் மென்பொருட்கள்
	SLO-2	உயிர்/ மெய் எழுத்துகள்	நேர்காணல் முறைகள்	இலக்கிய விமர்சனம்	பேச்சின் வகைகள்	எழுத்துருக்கள்
S-3	SLO-1	உயிர்மெய் எழுத்துகள்	இனிய சொற்கள் பயன்பாடு	திரை விமர்சனம்	மேடைப் பேச்சு	யூனிகோடு எழுத்துருக்கள்/ பிற எழுத்துருக்கள்
	SLO-2	அகராதிக்கான அடிப்படைகள்	நேர்காணல் வகைகள்	கலை விமர்சனம்	பட்டிமன்றப் பேச்சு	குரல் வழி தட்டச்சு
S-4	SLO-1	அகராதி உருவாக்கப் பயிற்சி	நேரடியாக வினா விடை	விமர்சகர் தகுதிகள்	சொற்பொழிவு முறை	எழுத்து வழி தட்டச்சு
	SLO-2	அகராதி உருவாக்கப் பயிற்சி	அச்சு ஊடக நேர்காணல்	தேர்ந்த புலமை	பேச்சின் நுட்பங்கள்	தட்டச்சு செய்யும் பயிற்சி

S-5	SLO-1	கலைச்சொல் அறிமுகம்	காட்சி ஊடக நேர்காணல்	எழுத்துவடிவ விமர்சனம்	பேச்சாளர்களும் பேசும் முறைகளும்	தட்டச்சு செய்யும் பயிற்சி
	SLO-2	பிறமொழிச் சொற்களும் தமிழில் கலைச் சொற்களும்	கேட்பு ஊடக நேர்காணல்	காட்சி வடிவ விமர்சனம்	பேச்சு - எடுத்துரைப்பும் உடல்மொழியும்	பிழை திருத்திகள்
S-6	SLO-1	கலைச்சொல்லாக்க நெறிமுறைகள்	கள ஆய்வில் நேர்காணல்	விமர்சனம் செய்யும் பயிற்சி	நவீன தொழில்நுட்பங்களில் பேச்சு முறைகள்	தமிழில் பிழை திருத்தம் செய்யும் மென்பொருட்கள்
	SLO-2	கலைச்சொல் உருவாக்க உத்திகள்	நேர்காணல் செய்யும் பயிற்சி	விமர்சனம் செய்யும் பயிற்சி	பேச்சாளர்க்குரிய தகுதிகள்	வலைப்பூ உருவாக்கம்
S-7	SLO-1	துறைசார் சொற்கள்	நேர்காணல் செய்யும் பயிற்சி	செய்தியறிக்கை	பேச்சுப் பயிற்சி	வலைப்பூவில் எழுதும் முறைகள்
	SLO-2	புதிய கண்டுபிடிப்புகளும் கலைச்சொற்களும்	செய்தி வாசிப்பு முறைகள்	சமூக நிகழ்வை எழுதுதல்	பேச்சுப் பயிற்சி	வலைப்பூவின் பயன்கள்
S-8	SLO-1	பயன்பாட்டுச் சொற்கள்	செய்தி வாசிப்பு நுட்பங்கள்	செய்தியாளர்க்குரிய தகுதிகள்	கலந்துரையாடலின் நோக்கம்	தமிழ் இணைய நூலகங்கள்
	SLO-2	கலைச்சொல்லாக்கப் பயன்பாடுகள்	உச்சரித்தல்	உற்றுநோக்குதல்	கலந்துரையாடலின் தனித்தன்மைகள்	இணைய நூலகப் பயன்பாடுகள்
S-9	SLO-1	கலைச்சொல் உருவாக்கப் பயிற்சி	பிழையின்றி வாசித்தல்	சமநிலையில் எழுதுதல்	தம் கருத்தைத் தெளிவாக உரைத்தல்	தமிழ்த் தொடரடைவுகள்
	SLO-2	கலைச்சொல் உருவாக்கப் பயிற்சி	வாசித்தலும் உணர்வும்	செய்தியறிக்கை தயாரித்தல்	கலந்துரையாடல் பயிற்சி	தொடரடைவின் பயன்பாடுகள்

Learning Resources	**1.** அகராதியியல், பெ. மாதையன், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர், 1997. **2.** பேச்சுக்கலை, ம. திருமலை, மீனாட்சி புத்தக நிலையம், மயூராவளாகம், மதுரை, 2009. **3.** பேச்சாளராக, அ.கி.பரந்தாமனார், பாரி நிலையம், சென்னை, 1961	**4.** இணையத் தமிழ், சந்திரிகா சுப்பிரமணியன், சந்திரோதயம் பதிப்பகம், மதுரை, 2020. **5.** நேர்காணல், மின்னூலகம், தமிழ் இணையக் கல்விக் கழகம், https://www.tamilvu.org/

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
	Understand										
Level 2	Apply	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
	Analyze										
Level 3	Evaluate	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	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 & Literaturel, 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	ULH23AE2J	Course Name	APPLIED HINDI-II	Course Category	AE	Ability Enhancement Courses (AE)	L	T	P	O	C
							1	0	2	2	2

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-1 :	*To find and analyze different types of Cinema*	Level of Thinking	Expected Proficiency	Expected Attainment	Fundamental	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
CLR-2 :	*To Discover the print Media in the present World*															
CLR-3 :	*Writing report for Employability*															
CLR-4 :	*Writing Reviews and Create Job Oriented learning*															
CLR-5 :	*To Acquire technical words for various job Prospects*															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	*To Understand the History and Documentary in Hindi Cinema*	*2*	*75*	*80*	*H*	*H*	*H*	*M*	*L*	*H*	*L*	*M*	*L*	*L*	*H*	*M*
CLO-2 :	*To Comprehend Media Studies*	*2*	*80*	*90*	*H*	*H*	*H*	*M*	*L*	*H*	*H*	*M*	*L*	*L*	*H*	*M*
CLO-3 :	*To Evaluate report Writing*	*2*	*75*	*95*	*H*	*H*	*M*	*L*	*H*	*H*	*M*	*H*	*M*	*M*	*H*	*H*
CLO-4 :	*Enhance their Writing Skills in Media Studies*	*2*	*80*	*90*	*H*	*H*	*L*	*H*	*M*	*H*	*L*	*H*	*H*	*M*	*H*	*H*
CLO-5 :	*To Understand and usage of technical words in Hindi*	*2*	*85*	*90*	*M*	*H*	*M*	*H*	*L*	*H*	*H*	*L*	*H*	*M*	*H*	*H*

Duration (hour)		9	9	9	9	9
S-1	SLO-1	*HINDI CINEMA*	*MEDIA AUR HINDI BHASHA*	*REPORTARJ LEKHAN*	*FILM REVIEW& VIGYAPAN*	*PARIBHASHIK SHABDAVALI*
	SLO-2	*CINEMA KI AVDHARNA*	*AVDHARNA*	*AVDHARNA*	*ARTH*	*RTH*
S-2	SLO-1	*UDBHAV*	*SWARUP*	*SWARUP*	*PARIBHASHA*	*ARIBHASHA*
	SLO-2	*VIKASH*	*MAHATVA*	*DDESHYA*	*SWARUP*	*WARUP*
S-3	SLO-1	*DOCUMENTRI MOVE KI AVDHARNA*	*MEDIA MEN BHASHA KAPRAYOG*	*AHATVA*	*AWADHARNA*	*RAKAR*
	SLO-2	*COMERCIAL MOVE KI AVDHARNA*	*UTTARDAYITVA*	*REPORTARJ LEKHAN KE PRATIRUCHI JAGANA*	*FILM REVIEW KA MAHATTVA*	*VADHARNA*
S-4	SLO-1	*PRAYOJAN*	*PRINT MEDIA*	*REPORTAJ KI BHUMIKA*	*VIGYAPAN AUR BAZAR*	*RAYOJAN*
	SLO-2	*UDDESHYA*	*ELECTRONIC MEDIA*	*PRAYOJAN*	*VIGYAPAN AUR ROZGAR*	*DDESHYA*
S-5	SLO-1	*MAHATVA*	*MEDIA KI JIMMEDARI*	*PRAYOG*	*PRINT VIGYAPAN*	*AHATVA*
	SLO-2	*PRAKAR*	*SMACHAR LEKHAN*	*UTTARDAYITVA*	*VIGYAPAN KI BHASHA*	*RAYOG*
	SLO-1	*PRISHTHBHUMI*	*REPORTER KE GUN*	*RIPOTARJ LEKHAN*	*AWADHARNA*	*DDESHYA*

S-6	SLO-2	*KARYASHALA*	*SAHAJTA*	*PUNRIKSHAN*	*ARTH*	*AKANIKI SHABDAVALI KA MHATVA*
S-7	SLO-1	*DOCUMENTRY KI VIDHI*	*NISPAKSHTA*	*LEKHAN VIDHI*	*PARIBHASHA*	*HINDI SE ANGREZI SHABD*
	SLO-2	*DOCUMENTRY AUR COMERCIALMOVE MEN ANTAR*	*PEET PATRAKARITA*	*SAMAJIK DAYRA*	*SWARUP*	*ANGREZI SE HINDI SHABD*
S-8	SLO-1	*COMERCIAL KI VIDHI*	*UTTARDAYITVA*	*SAHITYA ME RIPOTARJ LEKHAN*	*VIGYAPAN KE PRAKAR*	*EK DIN EK SHABD*
	SLO-2	*MOVE VISLESHAN*	*BHASHA GYAN*	*PARIYOJNA KARYA*	*VIGYAPAN KI VISHESHTAYEN*	*SHABDON KA VISLESHAN*
S-9	SLO-1	*PARICHARCHA*	*PARICHARCHA*	*PARICHARCHA*	*VIGYAPAN MANG*	*PATH PRICHARCHA*
	SLO-2	*PRASHNABHYASH*	*PRASHNABHYASH*	*PRASHNABHYASH*	*VIGYAPAN KA PRABHAV*	*PRASHNABHAYASH*

Learning Resources	*Edited Book: "PRAYOJAN MULOK HINDI", SRIJONLOK PUBLICATION, 2023, New Delhi.* 1. Film Banti Hai aur Banati Bhi hai, Lekhika – Sonal, Neolit Publication 2. https://navbharattimes.indiatimes.com/entertainment/movie-review/articlelist/2325387.cms?curpg=3	3. https://epustakalay.com/book/4858-hindi-patrakarita-by-dr-krishnbihari-mishra/ 4. https://hindisamay.com/ 5. https://rajbhasha.gov.in/hi/hindi-vocabulary

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Shri. Santosh Kumar Editor : Srijanlok Magazine Place: Vashishth Nagar, Ara – 802301	*1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu*	*1. Dr.S Preeti. Associate Professor & Head, SRMIST*
		2. Dr. Md.S. Islam Assistant Professor, SRMIST
		3.Dr. S. Razia Begum, Assistant Professor, SRM IST
		4, Dr.Nisha Murlidharan Assistant Professor, VDP,SRM IST

Course Code	ULF23AE2J	Course Name	French for Specific purpose-II	Course Category	AE	Ability Enhancement Courses (AE)	L	T	P	O	C
							1	0	2	2	2

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related	Procedural Knowledge	Skills in Specialization	Ability to Utilize	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
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 foreignerspeaking French															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	o enable the students to overcome the fear of speaking a foreign language and take position as a foreignerspeaking French	*2*	*75*	*80*	*H*	*M*	*H*	*H*	*M*	*H*	*H*	*L*	*M*	*M*	*H*	*L*
CLO-2 :	*To strengthen the knowledge on concept, culture, civilization and translation of French*	*2*	*80*	*90*	*M*	*H*	*L*	*H*	*H*	*M*	*H*	*M*	*L*	*L*	*H*	*M*
CLO-3 :	*To develop content using the features in French language*	*2*	*75*	*80*	*H*	*H*	*L*	*M*	*H*	*M*	*L*	*H*	*M*	*M*	*H*	*H*
CLO-4 :	*To interpret the French language into other language*	*2*	*75*	*90*	*H*	*L*	*M*	*H*	*M*	*H*	*H*	*M*	*L*	*H*	*M*	*L*
CLO-5 :	*To improve the communication, intercultural elements in French language*	*2*	*80*	*75*	*M*	*H*	*H*	*L*	*M*	*M*	*H*	*H*	*M*	*L*	*H*	*M*

Duration (hour)		9	9	9	9	9
S-1	SLO-1	TOEIC	Les quantificateurs	Les prépositions de lieu	Les verbes irréguliers	La negation
	SLO-2	Qu'est-ce que c'est/	le génitif	Les activités	le futur et	l'interrogation
S-2	SLO-1	À qui est-il destiné ?	Les adjectifs	Les prépositions de temps -	le conditionnel	Les activités
	SLO-2	Les compétences évaluées	et pronoms possessifs	Les activités	les modaux	l'exclamation
S-3	SLO-1	Le nom	les pronoms	les temps et	La suggestion	Les activités
	SLO-2	Le pluriel des noms	Les pronoms personnels	Les activités	le conseil	l'emphase
S-4	SLO-1	Les indénombrables	les pronoms compléments	les aspects-	Les exemples	Les exemples
	SLO-2	Les noms composés	Les activités	Les activités	le reproche	Les activités
S-5	SLO-1	L'adjectif	pronoms réfléchis	Le présent simple	Les activités	l'impératif
	SLO-2	Les comparatifs	Les activités	Les activités	L'obligation	Les activités
S-6	SLO-1	les superlatifs	les adverbes	Le présent be+ing	la permission	la voix passive
	SLO-2	les articles définis (the)	Les activités	Les activités	l'interdiction	Les exemples
S-7	SLO-1	les articles indéfinis (a, an)	La place de l'adverbe dans la phrase	*Les exemples*	La capacité	les subordonnées relatives
	SLO-2	Les exemples	Les activités	Le prétérit simple - Le prétéritbe+ V-ing	l'incapacité	Les activités
	SLO-1	Les adjectifs	L'ordre des adverbes	Les exemples	les verbes à particule	Les subordonnées circonstancielles

S-8	SLO-2	Les exemples	Les activités	- Le présent perfect be+ing	les verbes suivis de V-ing	Les activités
S-9	SLO-1	pronoms possessifs (this et that)	les prépositions-	Le past perfect simple -	d'un infinitif avec sans to	A ne pas confondre
	SLO-2	Les activités	Les exemples	Le past perfect be + ving -	Les exemples	Les activités

Learning Resources	*Theory:* 1. ''*Réussir le noueau TOEIC*'' Détails des épreuves, méthodologie, grammaire, et vocabulaire, Studyrama. 2. *https://www.fluentu.com/blog/french/french-grammar*	3. *https://www.elearningfrench.com/learn-french-grammar-online-free.html* 4. *https://www.lawlessfrench.com/grammar* 5. *https://blog.gymglish.com/2022/12/15/basic-french-grammar*

Learning Assessment											
	Bloom'sLevel of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (5%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	30%	30%	30%	30%	20%	20%	20%	20%	30%	-
Level 2	Apply Analyze	40%	50%	50%	40%	50%	50%	50%	50%	50%	-
Level 3	Evaluate Create	30%	20%	20%	30%	30%	30%	30%	30%	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	Internal Experts
1. Mr. Kavaskar DanasegaraneProcess Expert Maersk Global Service Center Pvt. Ltd	*1. Dr. C.Thirumurugan Professor, Department ofFrench, Pondicherry University*	*1. Mr. Kumaravel K. Assistant Professor & Head, SRMIST, KTR*
2.Mr. Sharath Raam Prasad Character Designer, Animaker Company Pvt.		*2. Mrs. Abigail, Assistant Professor, SRMIST, VDP*

Course Code	UBT23G02T	Course Name	DEVELOPMENTAL BIOLOGY	Course Category	D	*Discipline Specific Elective*	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning	Program Learning Outcomes (PLO)

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-1 :	Introduction to developmental biology concepts															
CLR-2 :	Understanding of Gametogenesis, fertilization and early development															
CLR-3 :	Gain knowledge on Early Embryonic Development															
CLR-4 :	Gain knowledge on Late Embryonic Development															
CLR-5 :	Understanding of Morphogenesis and organogenesis in plants															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	*The candidates will have wide conceptual knowing of developmental biology*	1	75	70	H				L		H					
CLO-2 :	*The candidates will understand development of gametes and its fertilization*	1	75	70	H	M	M	H	L							
CLO-3 :	*The candidate will know the concepts of early embryonic development*	1	75	70	H			H								
CLO-4 :	*The candidate will know the concepts of late embryonic development*	1	75	70	H		M									
CLO-5 :	*The candidates will understand the importance of development in plants*	1	75	70	H			M			H					

Duration (hour)		12	12	12	12	12
S-1	SLO-1	concepts of development	Production of gametes	Gametogenesis	Implantation of embryo in humans	Organization of shoot and root apical meristem
S-2	SLO-1	Potency, Commitment	Cell surface molecules in sperm-egg recognition in animals	Spermatogenesis and oogenesis w.r.t. mammals	Formation of human placenta	Organization of shoot and root apical meristem
S-3	SLO-1	Specification, Induction	Embryo sac development	vitellogenesis in birds	Formation of human placenta- Functins	Shoot development
S-4	SLO-1	Competence, Determination	Double fertilization in plants	Fertilization: external (amphibians),internal (mammals	other types of placenta on the basis of histology	root development
S-5	SLO-1	Differentiation, Morphogenetic gradients	Zygote formation	blocks to polyspermy	epitheliochorial type	Leaf development and
S-6	SLO-1	Cell fate and cell lineages	Cleavage	Early development of frog and humans (structure of mature egg and its membranes	endotheliochorial type	Phyllotaxy
S-7	SLO-1	Genomic equivalence and the cytoplasmic determinants	Blastula formation, Embryonicfields	patterns of cleavage	hemochorial type	Transition to flowering
S-8	SLO-1	Genomic equivalence and the cytoplasmic determinants	Gastrulation Formation of germ layers inanimals	fate map	Metamorphic events in frog life cycle- Introduction	Floral meristems
S-9	SLO-1	Imprinting	Embryogenesis	types of morphogenetic movements	Stages of life cycle	Floral development- *Arabidopsis*

S-10	SLO-1	Imprinting	Establishment of symmetry inplants	types of morphogenetic movements	hormonal regulation	Floral development- *Antirrhinum.*
S-11	SLO-1	Mutants	Seed formation	Fate of germ layers	Differentiation of neurons	Programmed cell death, aging
S-12	SLO-1	Transgenics in analysis of development	Germination	Neurulation in frog embryo	Sex determination	Senescence

Learning Resources	1. Biochemistry and Molecular Biology of Plants BY Bob B. Buchanan 2. Prescott's Microbiology 11th Edition 3. Human Embryology and Developmental Biology, 6th Edition by Bruce M. Carlson

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%		40%		40%		40%		40%	-
Level 2	Understand	40%		40%		40%		40%		40%	-
Level 3	Apply	20%		20%		20%		20%		20%	-
Level 4	Analyze	-	-	-	-	-	-	-	-	-	-
Level 5	Evaluate	-	-	-	-	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-	-	-	-	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr .N. Banu, Professor, Bharathi Women's College (Autonomous), Chennai	Dr. N. Prasanth Bhatt, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23S02T	Course Name	ENTREPRENEURSHIP IN BIOTECHNOLOGY	Course Category	S	Skill Enhancement Course	L	T	P	O	C
							2	0	0	2	2

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Understand the scope and concept of entrepreneurship			
CLR-2 :	Understand the principles of management			
CLR-3 :	Knowledge on funding agencies for startups and their roles			
CLR-4 :	Knowledge on biotechnological sectors for start ups			
CLR-5 :	Learn about startups in pharma and clinical research			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
					Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	Independent and lifelong learning	PSO-1	PSO-2	PSO–3	PSO-4	PSO-5
CLO-1 :	To understand and develop entrepreneurial traits	2	80	75	H	-	L	-	M	L	L	-	-	-	M	-
CLO-2 :	To develop sales and marketing skills	2	85	80	H	-	L	-	M	L	L	-	-	-	H	-
CLO-3 :	Apply knowledge to identify start up ideas	3	75	70	-	H	M	-	M	H	H	-	-	-	H	-
CLO-4 :	Gain knowledge on modern biotechnological sectors for start ups	2	85	80	H	M	M	-	L	H	H	-	-	-	H	L
CLO-5 :	Apply knowledge to create and run a start up	3	75	70	-	H	H	-	H	H	M	-	-	-	H	L

		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
Duration (hour)		6	6	6	6	6
S-1	SLO-1	Entrepreneurship – Concept	Management principles	Funding agencies for start ups	Agricultural sector, food, and nutrition	Start-ups - drug designing
S-2	SLO-1	Entrepreneurship – Scope	Management principles	Funding agencies - types	Mushroom cultivation, polyhouse	Pharma companies
S-3	SLO-1	Entrepreneurial traits,	Functions of a manager	Funding agencies - roles	Dairy farming	Diagnostic labs
S-4	SLO-1	Creativity	Concept of sales	Governmental institutions for start ups	Apiculture	Clinical research
S-5	SLO-1	Innovation	Concept of marketing	Governmental institutions - types	Organic formulation	Waste management- solid, biogas
S-6	SLO-1	Problem solving games	Product development	Governmental institutions - roles	Animal feed	Vermicomposting

Learning Resources	
	1. *"Biotechnology Entrepreneurship: Starting, Managing, and Leading Biotech Companies", Craig Shimasaki, Academic Press, 2014.*
	2. *"Entrepreneurship: New Venture Creation", David H. Holt, Pearson Education, 2016.*
	3. *"Getting started in Entrepreneurship", Jack M. Kaplan, John Wiley & Sons, 2001.*
	4. *"Essentials of Management", H. Koontz & H. Weihrich, 9th Edition, McGraw Hill, 2012.*

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	40%	-	30%	-	40%	-	30%	-	40%	-
Level 2	Apply Analyze	40%	-	40%	-	40%	-	40%	-	40%	-
Level 3	Evaluate Create	20%	-	30%	-	20%	-	30%	-	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. G. Swamynathan, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UCD23V05T	Course Name	Career Readiness and Professional Skills	Course Category	V	Value Addition Course	L	T	P	O	C
							2	0	0	2	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:*
CLR-1 :	*Enable students to understand reasoning skills and mathematical concepts*
CLR-2 :	*Prepare students for job interviews*
CLR-3 :	*Learn structured query language (SQL) to an intermediate/advanced level*
CLR-4 :	*Learn the benefits of Python as a scripting language*
CLR-5 :	*Develop life-long skills students can use to seek jobs, internships and make career changes*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Learning: Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	*Solve the problems on reasoning*	*3*	*80*	*75*	*H*	*M*	*-*	*-*	*-*	*M*	*-*	*H*	*-*	*H*	*-*	*H*	*M*	*-*	*-*
CLO-2 :	*Face interviews confidently*	*3*	*80*	*75*	*-*	*-*	*M*	*-*	*M*	*-*	*-*	*-*	*L*	*-*	*H*	*-*	*-*	*H*	*H*
CLO-3 :	*Understand the importance and major issues of database security and the maintenance of data integrity*	*3*	*75*	*70*	*H*	*M*	*-*	*M*	*H*	*-*	*M*	*-*	*-*	*-*	*-*	*M*	*-*	*H*	*M*
CLO-4 :	*Utilise essential programming components including variables, conditional logic, loops, and functions to create simple programs*	*3*	*75*	*70*	*H*	*-*	*M*	*M*	*-*	*H*	*-*	*-*	*-*	*M*	*-*	*H*	*-*	*H*	*M*
CLO-5 :	*Assist students in choosing a career path during their course*	*3*	*75*	*70*	*-*	*M*	*M*	*-*	*H*	*-*	*M*	*-*	*-*	*-*	*H*	*-*	*-*	*H*	*H*

Duration (hour)		*6*	*6*	*6*	*6*	*6*
S-1	*SLO-1*	*Partnership*	*Self-Image and Self-Presentation*	*SQL - Introduction to SQL*	*SQL – Joins*	*Class coding basics*
	SLO-2	*Partnership related solving problems*	*Etiquettes*	*SQL Statement Classes*	*SQL – inner joins –Join Syntax*	*Class coding basics – quiz session*
S-2	*SLO-1*	*Cryptarithmetic*	*Interview Skills - Introduction*	*Introduction to Databases*	*Introducing Python*	*Understanding Data Structures*
	SLO-2	*Cryptarithmetic – solving problems*	*Do's and Don'ts during Interview*	*SQL - Databases & RDBMS*	*Introducing Python Object Types*	*Python for Data*
S-3	*SLO-1*	*Ordering, Ranking*	*Mock Interview – Session 1*	*SQL data types - Introduction*	*Python - Data Types & Operators*	*Python Data Types*
	SLO-2	*Grouping*	*Mock Interview – Session 2*	*SQL data types*	*Python's Core Data Types*	*Overview of Python Data Types*
S-4	*SLO-1*	*Venn Diagrams concepts*	*Mock Interview – Session 3*	*SQL - Syntax*	*Introduction to Functions*	*Python Structures*
	SLO-2	*Venn Diagrams solved questions*	*Mock Interview – Session 4*	*SQL – Data Type Syntax*	*Why use Functions*	*Overview of Python Data Structures*
S-5	*SLO-1*	*Types of Paragraph*	*HR Round – Practice Session*	*SQL – Commands Introduction*	*Python – Functions basic*	*Python - Collections*
	SLO-2	*Paragraph Forming Questions*	*HR personal Interview –Mock-Session*	*SQL - DDL, DML Commands*	*Coding functions*	*Improving Code readability*
S-6	*SLO-1*	*Types of Sentences*	*Email Etiquettes*	*SQL - Subqueries*	*Introduction to Classes*	*Collection Module*
	SLO-2	*Ordering of Sentences*	*Email Drafting – Do's and Don'ts*	*Non-correlated Subqueries*	*Why Use Classes?*	*Collection Module in Python*

Learning Resources	1. *Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition* 2. *Dr. Agarwal.R.S, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Limited, 2018 Edition* 3. *Edgar Thrope, Test of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition*	4. *Bhatnagar R P, English for Competitive Examinations, Trinity Press, 2016* 5. *C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.* 6. *Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.*

Learning Assessment					
Level	Bloom'sLevel of Thinking	Continuous Learning Assessment (100% weightage)			
		CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)	CLA-4 (30%)#
		Theory	Theory	Theory	Theory
Level 1	Remember	20%	10%	25%	25%
	Understand				
Level 2	Apply	50%	50%	50%	50%
	Analyze				
Level 3	Evaluate	30%	40%	25%	25%
	Create				
	Total	100 %	100 %	100 %	100 %

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.
CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr. M. Ponmurugan, Executive PMOSS, Cognizant Technology Solutions India Pvt. Limited, Chennai	*Dr. G. Saravana Prabu, Asst. Professor, Department of English, Amrita Vishwa Vidhyapeedam, Coimbatore*	*Dr. Sathish K, HOD, Department of Career Guidance Cell, FSH, SRMIST* *Ms. Deepalakshmi S, Assistant Professor, Department of Career Guidance Cell, FSH, SRMIST*

Course Code	UCD23P04L	Course Name	Internship Report– II	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to,
CLR-1 :	Demonstrate skills learnt in the real time environment.
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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	To get an inside view of an industry and organization/company	3	80	70	L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Students can choose a company of their own interest for internship for a period of minimum TEN weeks (Part-time) to learn about the application of their related field in real time environment. All students have to give a presentation about their observations made by them in internship as per the schedule given. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
internship	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	UCD23P05L	Course Name	Project Work – II	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Demonstrate skills learnt in the real time environment.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
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																		
Course Learning Outcomes (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	3	80	70	L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Students can choose problems of their own interest to develop software package using the programming languages/tools available. 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.

Learning Assessment				
	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
internship	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

Course Code	UCD23P06L	Course Name	Apprenticeship – II	Course Category	IAPC	Internship/Apprenticeship / Project/ Community Outreach	L	T	P	O	C
							0	0	8	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Demonstrate skills learnt in the real time environment.			
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			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	ICT Skills	Leadership Skills	Life Long Learning
CLO-1 :	To get an inside view of an industry and organization/company	3	80	70	L	H	M	H	L	M	L	L	L	L	L	H	M	L	L
CLO-2 :	To gain valuable skills and knowledge	3	85	75	M	H	H	M	L	M	L	L	M	L	L	H	M	L	L
CLO-3 :	To make professional connections and enhance networking	3	75	70	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-4 :	To get experience in a field to allow the student to make a career transition	3	85	80	M	H	M	H	L	M	M	L	M	L	M	H	M	L	L
CLO-5 :	To get an inside view of an industry and organization/company	3	85	75	H	H	M	H	L	M	M	M	M	L	M	M	M	L	L

Students can choose a company of their own interest for *Apprenticeship* for a period of minimum TEN weeks (Part-time) to learn about the application of their related field in real time environment. All students have to give a presentation about their observations made by them in internship as per the schedule given. At the end of the internship period, every student shall submit a structured internship report within 15 days from the date of the completion of the internship period.

Learning Assessment				
	Continuous Learning Assessment (50% weightage)		Final Evaluation (50% weightage)	
internship	Review – 1	Review – 2	Project Report	Viva-Voce
	20%	30 %	30 %	20 %

SEMESTER V

Course Code	UBT23501J	Course Name	Cheminformatics	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	T provide a basic learning in the emergin area of chemical sciences and usage of cheminformatics in the industry
CLR-2 :	Introduce students to different methods of cheminformatics
CLR-3 :	Gain practical experience through exercises with representative methods used in cheminformatics
CLR-4 :	Help in understanding use of cheminformatics in modern drug research
CLR-5 :	Understanding the various applications of cehminformatics

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)											
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO -	PSO -	PSO –	PSO-4	PSO-
CLO-1 :	construct dynamic mathematical models from given interaction diagrams,	1	80	70	H	M				L	L		M	H		H
CLO-2 :	run simulations by choosing appropriate numerical methods for the solution ofthe equations	2	85	75	M	H	H			M			H			L
CLO-3 :	analyze the qualitative behavior of the systems in terms of stability of solutionsand steady states	1	75	70	H	M	H			M		L		H		L
CLO-4 :	recognize, exemplify and explain typical network motifs for metabolic pathways,	2	85	80	H	M	L			L	H			M	H	
CLO-5 :	apply algorithms for sensitivity analysis and parameter fitting	2	85	75	M	L				H		L		L		

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction	Code Rules	Energy minimization	Drug design and discovery	Virtual screening
	SLO-2	Evolution of Chemo-informatics	Normalization	molecular dynamics	structure-based drug design	Virtual screening
S-2	SLO-1	History of Chemical InformationScience	Chemical Database Design and theirtools	molecular dynamics	structure-based drug design	docking of ligands
	SLO-2	Use of Chemo-informatics	Chemical Database Design and theirtools	enzyme active site	QSAR	docking of ligands
S-3-6	SLO-1	SMILES representation of moecules	SMILES Representation of moecules	Linear representation of moecules	Linear representation of moecules	Chemdraw
S -7	SLO-1	Prospects of Chemo-informatic	SMILES Notation	Binding sites	3D-QSAR Methods	Protein structure
	SLO-2	Drugs, Ligands and Receptors	Linear Notation	Applications	3D-QSAR Methods	Drug action enzymes
S-8	SLO-1	Drugs, Ligands and Receptors	SMILES Notation	Computational Techniques in the DrugDesign Process	Pharmacophore Design	Drug action receptors
	SLO-2	Major Classification of Drugs	Linear Notation	Computational Techniques in the DrugDesign Process	Pharmacophore Design	Drug action receptors
S-9-12	SLO-1	chemdraw	chemdraw	ISIS tool	QSAR	ADMET prediction
S-13	SLO-1	Major Classification of Drugs	Structure based Searches	Drug Metabolism	Ligand-Based Design	Drug design target interaction
	SLO-2	Drug Solubility	Structure based Searches	Chemical and PhysicochemicalParameters in Drug Design	Ligand-Based Design	Prediction of Binding Modes
S-14	SLO-1	Cheminformatics Database	Protein structure, PDB	Chemical and PhysicochemicalParameters in Drug Design	De Novo Drug Design	Protein– ligand binding free energies
	SLO-2	Prodrugs and Soft Drugs	Development of New Drugs	Introduction to drugs	De Novo Drug Design	ADMET
S-15-18	SLO-1	Docking	Pharmacophore generation	Pharmacophore generation	Protein -ligand docking	Protein-protein docking

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

Learning Resources	
1. Combinatorial Chemistry and Molecular Diversity in Drug Discovery, Eric M. Gordon , James F.Kerwin 2. Molecular Modeling: Basic Principles and Applications, 3rd Edition,Hans-Dieter	3. Höltje, Wolfgang Sippl, Didier Rognan,GerdFolkers

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. Vidhya VG, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23502J	Course Name	PLANT BIOTECHNOLOGY	Course Category	C	Discipline Specific Core Courses	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning
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*	

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Understand the basic concepts of plant and organelle genome*	1	80	70
CLO-2 :	*Understand the concepts of tissue culture techniques*	2	85	75
CLO-3 :	*Gain knowledge on genetic engineering of plants*	1	75	70
CLO-4 :	*Apply knowledge vectors and protoplast isolation methods*	2	85	80
CLO-5 :	*Apply knowledge on plant tissue culture and genetic engineering of plants*	2	85	75

Program Learning Outcomes (PLO)											
1	2	3	4	5	6	7	8	9	10	11	12
Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
H	M	M	M	M	L	L	L	M	-	L	-
H	M	M	M	M	L	H	M	M	-	L	-
M	M	M	M	M	L	M	M	M	-	L	-
M	M	M	M	M	L	M	M	M	-	L	-
M	M	M	M	M	L	M	M	M	-	L	-

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Plant biotechnology –Introduction	Gibberellins Abscisic Acid	Arabidopsis thaliana – genomeAnalysis	PEG	Golden rice
S-2	SLO-1	Sterilization methods	Ethylene	Production of secondary metabolites	DEAE	Transposable Elements in plants
S-3	SLO-1	Different types of media	Totipotency of plant cells	embryogenesis	Agrobacterium Technology	Molecular farming
S4-6	SLO-1	Preaparation of Macro nutrients stock solution	Preparation of Plant tissue culturemedia	Root Induction - organogenesis	Somatic Embryogenesis	Isolation of Agrobacterium from root nodules of legumes
S-7	SLO-1	Media components	Micropropagation	Somatic embryogenesis	Protoplast technology	SCP
S-8	SLO-1	Composition of MS media	Micropropagation	Somaclonal variation	Isolation of plant protoplasts	Plant cell Bioreactors
S-9	SLO-1	Gamborg media	Callus induction	Diagnosis using enzyme markers	Fusion of Protoplast	Plant cell as Bioreactors
S-10-12	SLO-1	Preaparation of Micro nutrients stock solution	Explant collection and Sterilization	Shoot induction - organogenesis	Protoplast Isolation Mechanical method	Isolation of Agrobacterium from root nodules of legumes
S-13	SLO-1	Plant growth regulators	Caulogenesis,	Gene transfer methods used inplants	Regeneration of Protoplast	Hydrophonics
S-14	SLO-1	Auxins	Rhizogenesis	Electroporation	Transgenic Plants	Aquaphonics
S-15	SLO-2	Cytokinin	Applications of Organogenesis	Gene Gun	Bt cotton	ELSI
S-16-18	SLO-1	Preparation of Hormones stock solution	*In vitro* Seed Germination	Callus Induction	Protoplast Isolation Enzymatic method	Model Exam

Learning Resources	
	1. C Neil Stewart Jr. Plant Biotechnology and Genetics, John Wiley & Sons, Inc., NewJersey 2008 2. Dubey R.C.,"Textbook of Biotechnology" reprint 2005.S. Chand publishers, 2001 3. IgnacimuthuS,*"Plant Biotechnology"*, Tata Mcgraw-Hill Pub., New Delhi, 2006. 4. Murray.D.R, Advanced methods in plant breeding andbiotechnology, CAB International 1998 5. Slater. A, Scott.N.W, Fowler,M.R, Plant Biotechnology -The genetic manipulation of plants, Oxford University Press 2008

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	*Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.*	Dr. Infant Santhose.B, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23503T	Course Name	Signal Transduction	Course Category	C	Discipline Specific Core course	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning
CLR-1 :	*Understanding cell communication process.*	
CLR-2 :	*Knowledge on types of receptors.*	
CLR-3 :	*Knowledge on mechanism of hormonal action.*	
CLR-4 :	*Understanding the importance of hormonal balance.*	
CLR-5 :	*Understanding the hierarchy of hormone secretion.*	

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1 Level of Thinking(Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)	Program Learning Outcomes (PLO) 1 FundamentalKnowledge	2 Analyze, InterpretData	3 Reasoning ability	4 Ethical Practices	5 Team Work	6 Communication ofcomplex biotechnological	7 Independent andlifelong learning	8 PSO - 1	9 PSO - 2	10 PSO – 3	11 PSO-4	12 PSO-5
CLO-1 :	*Students gains knowledge on different modes of communication between cells*	*3*	*80*	*80*	*H*	*L*	-	-	-	*M*	*H*	-	-	-	-	-
CLO-2 :	*Students understand biochemical mechanisms of all hormones*	*3*	*80*	*80*	*H*	*M*	*M*	-	-	*H*	*H*	-	-	-	--	-
CLO-3 :	*Students acquire knowledge about calcium homeostasis*	*3*	*90*	*80*	*H*	*M*	*M*	-	-	*M*	-	-	-	-	-	-
CLO-4 :	*Students can understand the difference between hypo and hyper level causes, symptoms of different hormones.*	*3*	*90*	*80*	*H*	*H*	-	-	-	*M*	*H*	-	-	-	-	-
CLO-5 :	*Students understand the impact of cross talk in communication.*	*3*	*90*	*90*	*H*	*M*	-	-	-	*M*	*H*	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Hormones: Chemical classification ofhormones.	Protein kinases (PKA, PKB, PKC, PKG).	Physiological and biochemical actions of hypothalamic hormones	Pathophysiology of thyroxine secretion: Hyper and hypothyroidism	Hormones of adrenal gland: Physiology and Biochemical actions of Cortisol and aldosterone.
S-2	SLO-1	Functions of hormones and their regulation.	Protein kinases (PKA, PKB, PKC, PKG).	Physiological and biochemical actions of hypothalamic hormones	Pathophysiology of thyroxine secretion: Hyper and hypothyroidism.	Hormones of adrenal gland: Physiology and Biochemical actions of Cortisol and aldosterone.
S-3	SLO-1	Chemical signaling - endocrine, paracrine, autocrine, intracrine and neuroendocrine mechanisms.	Receptor tyrosine kinases – EGF	Physiological and biochemical actions of hypothalamic hormones	Regulation of calcium homeostasis: PTH,Vitamin D and calcitonin.	Hormones of adrenal gland: Physiology and Biochemical actions of Cortisol and aldosterone.
S-4	SLO-1	Chemical signaling - endocrine, paracrine, autocrine, intracrine and neuroendocrine mechanisms.	insulin and Ras - MAP kinase cascade	Physiological and biochemical actions ofanterior pituitary hormones	Regulation of calcium homeostasis: PTH,Vitamin D and calcitonin.	Adrenal medullary Hormones: Epinephrineand Norepinephrine.
S-5	SLO-1	Hormone receptors - extracellular andintracellular.	insulin and Ras - MAP kinase cascade	Physiological and biochemical actions ofanterior pituitary hormones	Mechanism of Ca2+ regulation.	Adrenal medullary Hormones: Epinephrine and Norepinephrine.
S-6	SLO-1	Hormone receptors - extracellular andintracellular.	Non receptor tyrosine kinase- erythropoietin receptor JAK – STAT Pathway	Physiological and biochemical actions ofanterior pituitary hormones	Mechanism of Ca2+ regulation.	Adrenal medullary Hormones: Epinephrine and Norepinephrine.
S-7	SLO-1	Receptor - hormone binding, G proteincoupled receptors	Non receptor tyrosine kinase- erythropoietin receptor JAK - STATpathway	Physiological and biochemical actions ofposterior pituitary hormones	Regulation of Growth: growth hormone and somatomedin.	Hyper and hypo secretion of adrenal cortex and adrenal medullary hormones.

S-8	SLO-1	Receptor - hormone binding, G protein	Steroid hormone Receptor	Physiological and biochemical actions of	Physiology and biochemical actions of	Hyper and hypo secretion of adrenal
		coupled receptors		posterior pituitaryhormones	Growth factors- EGF, PDGF and Erythropoietin.	cortex and adrenal medullary hormones.
S-9	SLO-1	second messengers - cAMP, cGMP, IP3,DAG, Ca2+	Steroid hormone Receptor, Receptorregulation	Physiological and biochemical actions ofposterior pituitary hormones	Physiology and biochemical actions of Growth factors- EGF, PDGF andErythropoietin.	Male and female sex hormones.
S-10	SLO-1	Effector systems –adenylcyclase	Receptor regulation	Biosynthesis of thyroid hormone and its regulation, Role of TRH and TSH in T4synthesis and response.	Physiology and biochemical actions of Growth factors- EGF, PDGF andErythropoietin.	Male and female sex hormones.
S-11	SLO-1	Guanylcyclase	crosstalk.	Biosynthesis of thyroid hormone and its regulation, Role of TRH and TSH in T4synthesis and response.	Endocrine disorders - gigantism,acromegaly, dwarfism, pygmies.	Biochemical functions of sex hormones.
S-12	SLO-1	Phospholipase-C	Cycle Test-1	Physiological and biochemical action ofThyroxine.	Cycle test-2	Biochemical functions of sex hormones.

Learning Resources	1. Lehninger: Principles of Biochemistry(2017)7thed., Nelson,D.L.andCox,M.M. W.H. Freeman & Company (New York) 2. Vander'sHumanPhysiology(2019)15thed.,Widmaier,E.P.,Raff,H.andStrang, K.T. McGraw Hill International Publications (USA)	3. Endocrinology (2007) 6thed., Hadley, M.C. and Levine, J.E. Pearson Education (New Delhi), Inc. 4. The Cell: A Molecular Approach (2009) 5th Ed. Cooper, G.M. and Hausman, R.E. ASM Press & Sunderland, (Washington DC), Sinauer Associates. (MA).

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	30%	-	30%	-	30%	-	15%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	20%	-
	Analyze										
Level 3	Evaluate	20%	-	30%	-	30%	-	30%	-	15%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. S.Vijayabharathi, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23D01T	Course Name	BIOFERTILIZER TECHNOLOGY	Course Category	D	Discipline Specific Elective Courses	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		Learning			Program Learning Outcomes (PLO)												
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking(Bloom)	Expected Proficiency(%)	Expected Attainment(%)	FundamentalKnowledge	Analyze, InterpretData	Reasoning ability	Ethical Practices	Team Work	Communication ofcomplex biotechnological	Independent andlifelong	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLR-1 :	To gain knowledge on the various marine habitats and microorganisms															
CLR-2 :	To know about various animals and its communication methods in sea															
CLR-3 :	To understand how marine organisms are employed for various applications															
CLR-4 :	Deals with diversity, culturing of biomass and its economic applicability															
CLR-5 :	Application of marine organisms in product production and its quality management															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	Will know the various microorganism from the marine sources and their significance	2	85	75	*H*	*L*	-	-	-	*M*	*H*	-	-	-	-	-
CLO-2 :	Know the higher organisms from flora & fauna and how they interact with one another	2	85	75	*H*	*M*	*M*	-	-	*H*	*H*	-	-	-	--	-
CLO-3 :	Deals with organisms that sustain the extreme environment and its products of significance	2	85	70	*H*	*M*	*M*	-	-	*M*	-	-	-	-	-	-
CLO-4 :	Knowing the diversity, production kinetics and products harvested from marine sources	2	85	75	*H*	*H*	-	-	-	*M*	*H*	-	-	-	-	-
CLO-5 :	Scope of marine industry, production, export, maritime benefits and security	3	85	70	*H*	*M*	-	-	-	*M*	*H*	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Biofertilizers – Definition, History	Introduction to Bacterial Biofertilizers	Actinorrhizal symbiosis	Fungal Community Dynamics	Organic farming and climate change
S-2	SLO-1	Biofertilizers - types	Azospirillum - isolation	Nitrogen Fixation	Strain selection in Biofertilizers	Organic crop management
S-3	SLO-1	Biofertilizers - Components	Mass multiplication	Root Nodule Formation	Formulation of Biofertilizers	Biopesticides
S-4	SLO-1	Soil Ecosystem	Carrier based inoculant	Blue green algae and Azolla in ricecultivation.	Mobilization of Biofertilizers	Natural predators
S-5	SLO-1	Microbial Consortium	Azotobacter classification	Mycorrhizal Fungi as Biofertilizers	Quantity and Quality Assurance	Cultural practice
S-6	SLO-1	Plant – Microbe interaction	Characteristics	Types of Fungal biofertilizers	Application Methods	Rotation design for organic system
S-7	SLO-1	Introduction to Algal Biofertilizers	Crop response to Azotobacter inoculum	Importance of Ectomycorrhiza	Commercialization and Scaling Up	Transition to organic agriculture
S-8	SLO-1	Cyanobacterial Biofertilizers	Maintenance and mass multiplication	Importance of Endomycorrhiza	National and Regional BiofertilizersDevelopment centers	Organic food and human health
S-9	SLO-1	Anabaena	Rhizobium isolation	Vesicular Arbuscular Mycorrhiza(VAM Fungi)	Organic farming	Bio compost making methods
S-10	SLO-1	Nostoc, Spirulina	Identification	Isolation	Green manuring	Types of Biocompost
S-11	SLO-2	Algalization	Mass multiplication	Inoculum production of VAM	Concepts and principles of organicfarming	Method of vermicomposting
S-12	SLO-1	Field applications of cyanobacterial Biofertilizers	Carrier based inoculants	Influence on growth and yield of cropplants.	Key indicators of sustainableagriculture	Field Application

Learning Resources	1. "Biofertilizers in Sustainable Agriculture" by R. K. Gupta and Maria R. B. Costa. 2. "Biofertilizers: A Manual on Commercial Production Technology" by A. Saravanan, M. Jeevaratnam, and B. Loganandhan 3. "Biofertilizers and Organic Farming: Towards a Sustainable Agriculture" edited by. Subba Rao and D. Venkateswarlu	4. "Agricultural Biotechnology: Challenges and Prospects" bySantaniello, Vittorio, et al. 5. "Agroforestry: Principles and Practices" by Nair, P. K. R

Learning Assessment											
	Bloom's Levelof Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100%		100%		100%		100%		100%	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	*Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.*	Dr. Infant Santhose.B, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23D02T	Course Name	PHARMACEUTICAL BIOTECHNOLOGY	Course Category	D	Discipline Specific Elective Course	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-1 :	*Understand the various classifications of drugs and their routes of administration*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLR-2 :	*Understand the importance of recombinant therapeutic proteins and phytopharmaceuticals*															
CLR-3 :	*Address the significance of antibiotics and the various anti-microbial tests in detecting and treating infectious diseases*															
CLR-4 :	*Recognize the significance of the drug discovery process*															
CLR-5 :	*Gain insights into the crucial role of vaccines and their types in preventing diseases*															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	Classify drugs based on chemistry, mode of action, dosage forms and explain their different routes of administration	1	75	65	H	-	M	-	-	L	M	-	-	-	-	-
CLO-2 :	Gain comprehensive understanding of recombinant protein production, their applications, compare and contrast various recombinant expression systems and recognize the significance of phytopharmaceuticals	2	80	70	M	-	H	L	-	-	H	-	-	M	H	-
CLO-3 :	Understand the importance of antibiotics, their mode of action, evaluate the different classes of antimicrobial agents and describe the various types of pharmacological assays.	3	75	65	M	M	H	L	-	M	M	-	-	L	-	-
CLO-4 :	Develop an understanding of the various steps in drug discovery process and comprehend the different phases of clinical trials	3	80	70	M	L	H	M	-	M	M	-	-	-	H	-
CLO-5 :	Classify the vaccines based on composition, perceive their applications and understand the economic and legal aspects of pharmaceutical biotechnology	2	70	60	M	-	H	M	-	-	H	-	-	-	H	-

Duration(hour)		12	12	12	12	12
S-1	SLO-1	Introduction	Recombinant therapeutic proteins	Antimicrobial agents	Process of drug discovery and development	Vaccines
	SLO-2					Concept & Production
S-2	SLO-1	Scope of PharmaceuticalBiotechnology	Classification of therapeutic proteins	Antibiotics	Target identification	Vaccine Types
	SLO-2			Source		Inactivated
S-3	SLO-1	Sources of drugs	General scheme of recombinantprotein production	Antibiotics	Validation	Attenuated vaccines
	SLO-2			Classification		
S-4	SLO-1	Classification of pharmacologicalagents based on chemistry	Recombinant protein Expressionsystems	Antibiotics	Assay development	Recombinant Vaccines
	SLO-2		Bacterial cell system	Mode of action		
S-5	SLO-1	Classification of pharmacologicalagents based on mode of action	Yeast Cells	Antimicrobial resistance	Lead optimization	Peptide vaccines
	SLO-2					

S-6	SLO-1 SLO-2	Classification of pharmacologicalagents based on mode of action	Insect Cell Lines	Antimicrobial activity studies Anti-bacterial	Pre-clinical testing	DNA Vaccines
S-7	SLO-1 SLO-2	Classification of pharmacologicalagents based on dosage form	Mammalian Cell Lines	Antimicrobial activity studies Anti-viral	Clinical trials involved in drug discovery Phase I trials	Edible vaccines
S-8	SLO-1 SLO-2	Routes of drug administration	Transgenic Animals	Antimicrobial activity studies Anti-fungal	Clinical trials involved in drug discovery Phase II trials	Nanodrugs
S-9	SLO-1 SLO-2	Enteral	Applications of recombinanttherapeutic proteins	Antimicrobial activity studies Anti-parasitic	Clinical trials involved in drug discovery Phase III trials	Prebiotics
S-10	SLO-1 SLO-2	Parenteral	Phytopharmaceuticals	Pharmacological Assays	Regulatory approvals and Phase IV trials	Probiotics
S-11	SLO-2 SLO-2	Inhalation	General Classes	*In vitro* assays	High throughput screening	Nutraceuticals
S-12	SLO-1 SLO-2	Topical	Properties	*In vivo* assays	Role of Artificial Intelligence in drug discovery	Economic and legal considerationsin Pharmaceutical Biotechnology

Learning Resources

1. Pharmaceutical biotechnology-Concept and applications. Gray Walsh, *Wiley John & Sons, Inc.* (2003).
2. Biotechnology, Satyanarayana U, Boooks and allied (P) lts, 2010
3. Pharmacology and Pharmacotherapeutics, 26th Edition, RS Satoskar & Nirmala Rege & SD Bhandarkar
4. Pharmaceutical Biotechnology by Dann, J.A, Crommelin& Robert D., Sindelar, Oct. 2002, *Taylor & Francis*
5. https://www.fda.gov/patients/learn-about-drug-and-device-approvals/drug-development-process

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA–1(10%)		CLA–2(10%)		CLA–3(20%)		CLA–4(10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level1	Remember Understand	30%		30%		30%		30%		30%	
Level2	Apply Analyze	40%		40%		40%		40%		40%	
Level3	Evaluate Create	30%		30%		30%		30%		30%	
	Total	100 %		100 %		100 %		100 %		100 %	

[#CLA–4canbefromanycombinationofthese:Assignments,Seminars,TechTalks,Mini-Projects,Case-Studies,Self-Study,MOOCs,Certifications,Conf.Paperetc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. S. Samuel Joshua Pragasam,Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23G03J	Course Name	MUSHROOM CULTIVATION	Course Category	G	Generic Elective Courses	L	T	P	O	C
							0	0	8	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
CLR-1 :	Understanding about the mushroom cultivation	1	2	3
CLR-2 :	Understanding about the culture preparation		
CLR-3 :	Knowledge on cropping of Mushroom		
CLR-4 :	Knowledge on Cultivation methods		
CLR-5 :	Understanding about the Pest and Disease Management		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Fundamental Knowledge	2 Analyze, Interpret Numbers	3 Reasoning ability	4 Ethical Practices	5 Team Work	6 Communication of complex biotechnological ideas	7 independent and lifelong learning	8 PSO -1	9 PSO - 2	10 PSO – 3	11 PSO-4	12 PSO-5
CLO-1 :	To understand the different types of cultivable Mushrooms	3	80	70	M	H	L	L	M	L	L	-	-	-	-	-
CLO-2 :	Having knowledge on Spawn and culture Preparation	3	85	75	M	L	L	L	M	L	H	-	-	-	-	-
CLO-3 :	Applying knowledge on cropping on Mushroom	3	75	70	M	L	L	L	M	L	H	-	-	-	-	-
CLO-4 :	To learn about the Cultivation Methods	3	85	80	M	L	L	L	M	L	H	-	-	-	-	-
CLO-5 :	Having knowledge on Pest and Disease control	3	85	75	M	M	L	L	M	L	H	-	-	-	-	-

Duration (hour)		24	24	24	24	24
S-1 – 6	SLO-1	Introduction to types of Mushroom	Preparation of mother spawn, commercial spawn and its storage	Cultivation of oyster mushroom	Cultivation of ganoderma	Diseases caused by fungi, bacteria and abiotic factors
S-6 - 12	SLO-1	Orientation to a mushroom farm	Compositing methods	Cultivation of paddy straw mushroom	Cultivation of cordyceps militaris	Market survey and cost benefit analysis
S-13 -18	SLO-1	Preperation of pure culture	Spawning, casing, cropping of Mushrooms	Cultivation of milky mushroom	Identification of insects affecting button mushroom	Management of spent mushroom substrate (sms)
S-19 - 24	SLO-1	Maintainance of cultures	Post harvest handling	Cultivation of shiitake	Identification of indicator moulds inbutton mushroom crop	Model Exam

Learning Resources	1. Marimuthu, T. et al. (1991). Oster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore. 2. Pandey R.K, S. K Ghosh, 1996. A Hand Book on Mushroom Cultivation. Emkey Publications.	3. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. PVT.LTD, New Delhi. 4. V.N. Pathak, Nagendra Yadav and Maneesha Gaur, Mushroom Production and Processing Technology/ Vedams Ebooks Pvt Ltd., New Delhi (2000

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	0%	10%	0%	10%	0%	10%	0%	10%	0%	10%
	Understand										
Level 2	Apply	0%	40%	0%	40%	0%	40%	0%	40%	0%	40%
	Analyze										
Level 3	Evaluate	0%	50%	0%	50%	0%	50%	0%	50%	0%	50%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	*Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.*	Dr. Infant Santhose.B, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23S03T	Course Name	BIOETHICS AND IPR	Course Category	S	Skill Enhancement Courses	L	T	P	O	C
							1	0	0	2	1

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering Department	Biotechnology	Data Book / Codes/Standards		Nil	

CLR-1 :	Understanding the ethical issues in Biotechnology
CLR-2 :	Through Knowledge on conserving the intellectual property and patenting
CLR-3 :	Knowledge on models designed to patent the biological materials
CLR-4 :	Safety measures to be handled before using potent vulnerable cultures and fragileinstruments
CLR-5 :	Wide knowledge on different environmental issues are been exposed

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)
CLO-1 :	*Identify the problem prone areas in Biotechnology*	1	75	70
CLO-2 :	*Understand the different ways to conserve the intellectual rights*	1	75	70
CLO-3 :	*Identify the possibilities in biological materials that deserve for patenting*	2	75	70
CLO-4 :	*Handle instruments with utmost care and safety precautions that ensures goodlaboratory practice*	2	75	70
CLO-5 :	*Address different environmental issue and a wide knowledge on the law enforcementrelated to Environment*	2	75	70

	1 Fundamental Knowledge	2 Analyze, Interpret Data	3 Reasoning ability	4 Ethical Practices	5 Team Work	6 Communication of complex biotechnological ideas	7 independent	8 PSO-1	9 PSO-2	10 PSO-3	11 PSO-4	12 PSO-
CLO-1 :	H				L		H					
CLO-2 :	H	M	M	H	L							
CLO-3 :	H			H								
CLO-4 :	H		M									
CLO-5 :	H			M			H					

		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
Duration (hour)		3	3	3	3	3
S-1	SLO-1	Introduction to Bioethics, Legal impact of Biotechnology, Socio economical impact of biotechnology	IPR – Introduction, necessity,advantages and disadvantages	Safeguard of IPR- Protection, Plant GeneticResources (PGR	Forms to be filled for Patent filing,Prerequisites for patent filing	Reading a patent, Formats for citingprior art,
S-2	SLO-1	Ethical concerns in Biotechnologyresearch, Committees to approve Bioethical issues	IPR- Patents, Trade secrets	General Agreement of Tariffs and Trade (GATT), Trade related Intellectual Property (TRIP)	Rules and regulations of Indian PatentRights	Patenting for Higher Plants andhigher Animals
S-3	SLO-1	OECD guidelines, Ethical violations thathave occurred in history	Copyrights, Trademarks	Different types of patent agencies	Patents – Biological materials, live forms,GMO, Genes and DNA sequences	Discussions

Learning Resources	
	1. Singh B.D., Biotechnology, kalyani publishers, 2009. 2. Chawla H.S., Introduction to plant Biotechnology, Science publishers, 2004. 3. Shaleesha A, Stanley, Bioethics, Wisdom educational service, 2008. 4. Das H.K., Text book of Biotechnology, Wiley Publishers, 2010.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr.N.Prasanth Bhatt, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23P02L	Course Name	INTERNSHIP-II	Course Category	P	Internship/ Project/ Community Outreach	L	T	P	O	C
							0	0	0	0	1

Pre-requisiteCourses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Physics and Nanotechnology	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1:	*assist the student's professional skill development useful to employer such as teamwork, communications and work ethics & details*
CLR-2:	*provide unique learning opportunities by exposing the student to the environment and expectations of professional performance*
CLR-3:	*expand the student's knowledge of a particular area(s) of interest to enhance employability*
CLR-4:	*help students to explore career alternatives/opportunities prior to their graduation*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
CLO-1:	*demonstrate the skill gained through work experience with mentors or successful professionals to support the early stages of their career*

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

SEMESTER VI

Course Code	UBT23601J	Course Name	ANIMAL BIOTECHNOLOGY	Course Category	C	. Discipline Specific Core Courses	L	T	P	0	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Define the Basics of cell culture			
CLR-2 :	Find the Animal Diseases and Diagnosis			
CLR-3 :	Spell the Transgenic Animals			
CLR-4 :	Describe the Micromanipulation techniques			
CLR-5 :	Definition of Livestock			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	Independentand lifelongleaming	PSO-1	PSO-2	PSO -3	PSO – 4	PSO – 5
CLO-1 :	Experiment with cell culture techniques	2	85	80	H	M	M	H	L	M	H					
CLO-2 :	Development of techniques to treat the Animal disease	3	85	80	H	H	M	H	L	M	H					
CLO-3 :	Importance of Transgenic animals	3	85	80	H	M	H	H	M	H	H					
CLO-4 :	Interpretation of Micromanipulation in IVF -ET	3	85	80	M	H	H	H	M	H	H					
CLO-5 :	Analysis of Livestock in Indian economy	3	85	80	L	H	L	H	M	H	H					

Duration (hour)		24	24	24	24	24
S-1	SLO-1	Introduction to Animal Cell Culture	Types of cell culture	Monoclonal antibodies	Introduction to Micromanipulationtechniques	Sperm -mediated genetransfer (SMGT)
	SLO-2					
S-2	SLO-1	Historical background	Monolayer, Suspension ,Clone cultureMass culture-microcarrier culture (monolayer) Stem cell culture	Diagnosis of Animal diseases by Monoclonal antibodies	Equipements used in Micromanipulationtechniques	Testis -mediated genetransfer (TMGT)
	SLO-2					
S-3	SLO-1	Setup of Animal cell cultureLaborotary	Biology and Charecterization of cell culture	Diagnosis of Animal diseases by Moleculartechniques	Enrichment of sample preparation for IVF- ET	Importance of Transgenic animals inBiotechnology
	SLO-2					
S-4	SLO-1	Basic Aseptic Techniques	Contamination testing of cell culture	Diagnosis of Animal diseases by PCR	Breeding of farm Animals	Stemcell culture in the production ofTransgenic animals
	SLO-2					
S 5-8	SLO-1			Seperation of cells by suitable method	Primary cell culture and its maintenance	Cell cycle analysis
	SLO-2	GLP : Laminar Flow Hoods, CO2 incubator, Open and closed cultures,Microscopes,	Hazards and Safety in Cell CultureLaboratory			
S-9	SLO-1	Natuarl Media and Chemically definedmedia	Viability measurement and cytotoxicity	In-situ hybridization	Introduction to Transgenic animals	Applications of Animal cell cultureTechnology
	SLO-2					
S-10	SLO-1	Media with Serum and Without serum	Mesurement of growth parameters	Northern and sourthern blotting	History of Transgenic Animals	Advances in Cell technology
S-11	SLO-1	Advantages and Disadvantages ofserum in media	Cell cycle analysis of animal cells	RFLP	Cocepts of Transgenic animal technology	Products obtained from animal cells
	SLO-2					

S-12	SLO-1 SLO-2	Animal cell culture- maintenance	Cell strain	Therapy of Animal diseases	Procedure for the production of TransgenicAnimals	Opportunities and challenges in Animal cellculture
S 13-16	SLO-1 SLO-2	Thawing and Cryopreservation	Maintenance of cell lines	Tredtional method to modern technologies tocure animal disease	Vector mediated gene transfer	Regulations in Animal biotechnology
S-17	SLO-1 SLO-2	Characters of Cells	Animal Diseases –Bacterial and Viraldiseases	Recombinent cytokines in Animal diseases	DNA Microinjection-Pronuclearmicroinjection	Livestock Resources
S-18	SLO-1 SLO-2	Cells in primary culture	Animal Diseases – Viral diseases	Monoclonal antibodies in therapy	ES Cells –Embryonic Stem cells	Role of Livestock in farmers Economy inIndia
S-19	SLO-1 SLO-2	Cells in secondary culture	Diagnosis of Various animal Diseases	Animal vaccine	Somatic cell Nuclear transfer -SCNT	Livestock Bill in India
S-20	SLO-1 SLO-2	Passaging and Subculturing	Monoclonal antibodies	Animal vaccine in animal infections	Gene transfer into gametes	Revision
S 21-24	SLO-1 SLO-2	GLP: centrifuge, Refrigerators andFreezers, pipetting aids, Miscellaneous small items of Equipments, Materials, filters, Miscellaneous Items.	Isolation of cells by Enzymatic method	Viable cell count	Mesurement of growth parameters	Revision

Learning Resources	**1.** Freshney, R. I. (2010). Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley-Blackwell, 2010. 6th Edition. **2.** Davis, J. M. (2008). Basic Cell Culture. Oxford University Press. New Delhi. 10 | P a g e 3.Butler, M. (2004). Animal Cell Culture and Technology. Taylor and Francis. New York, USA. 4.Masters J.R.W. Animal Cell Culture: Practical Approach. Oxford University Press.2000

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr.D.Sankari, Professor and head Department of Biotechnology FSH SRMIST KTR

Course Code	UBT23602J	Course Name	IMMUNOTECHNOLOGY	Course Category	C	Discipline Specific Core Courses	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning	Program Learning Outcomes (PLO)

		Learning			Program Learning Outcomes (PLO)												
CLR-1 :	Understanding the basics of immunology	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-2 :	Understanding the properties of antigens and function of immunoglobulins															
CLR-3 :	Understanding the importance antigrnantibogy interaction in defense action															
CLR-4 :	Knowledge on B & T cell response															
CLR-5 :	Knowledge on immunological basis of AIDS, transplantation															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO -1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	Acquired basic Knowledge on immune cells, organs	1	75	70	H			L								
CLO-2 :	Basic Knowledge on antigen, immunoglobulins	1	75	70	H	H	H									
CLO-3 :	Strong basis for understanding the interactions of antigen & antibody	2	75	70			M		H							
CLO-4 :	Better knowledge gained about immune response	2	75	70				H	H							
CLO-5 :	Better knowledge gained about immune response in disease	2	75	70		H				H						H

Duration (hour)		24	24	24	24	24
S-1	SLO-1	Immunology- Introduction andHistory. Scope of Immunology	B cells - specificity, affinity and affinity maturation	MHC and Antigen Presentation	Hypersensitivity-I and II	Immunoprophylaxis andimmunotherapy
	SLO-2					
S-2	SLO-1	Types of immunity-innate(Introduction),	Antibodies - Different classes of Immunogolbulins	complement activation and itsbiological consequences,	Hypersensitivity-III IV	Production of polyclonal andmonoclonal antibodies
	SLO-2					
S-3	SLO-1	Innate immune cells- monocytes and macrophages, neutrophils andNK cells.	T cell Function & development	Complement System – Pathwaysintroduction and importance	Autoimmunity	Production of polyclonal andmonoclonal antibodies
	SLO-2	Innate immune molecules- cytokinesand chemokines, histamine, bradykinin, serotonin, leukotrienes				
S-4-6	SLO-1	Lab safety rules	Single Radial immunodiffusion	Rocket immunoelectrophorosis	Demo of RT PCR and its application inviral detection	Production of polyclonal andmonoclonal antibodies
	SLO-2					
S 7	SLO-1	Adaptive immunity- Antigen, B cells,T cells,	Cytokines: general nature of cytokines	Classical, Lectin & alternativepathways	Vaccines - killed attenuatedorganisms, toxoid	DOT ELISA
	SLO-2	clonal selection theory				
S-8	SLO-1	Immunological memory	Antigen Receptors: recognition of		DNA Vaccine, RNA Vaccines	Immunoprecipitation, RIA,
	SLO-2		antigen by B cell and	Immune Responses to Infection-Key defences against different types of infections		
S-9	SLO-1	Lymphoid organs- primary	Antigen Receptors: T cell receptors	Immune Evasion: microbes toevade host immune response	Recombinant Vaccines	avidin-biotin mediated assay,
	SLO-2	Secondary organs				

S-10-12	SLO-1 SLO-2	Agglutination: ABO Blood groupingand ASO	Ouchterlony double immunodiffusion	ELISA- Sandwich ELISA	Widal test	fluorescent immunoassay
S-13	SLO-1 SLO-2	Antigen and Immunogen- Antigenicity and immunogenicity	B –cell Maturation and Activation	Immunodeficiency- primary immunodeficiencies	Harmful side effects of vaccines andits case studies	immunohistochemistry,
S 14	SLO-1 SLO-2	Types of Antigens, Affinity andAvidity	T cell Maturation and Activation	Acquired immunodeficiencies	Complement fixation test.	DOT ELISA
S-15	SLO-1 SLO-2	Properties of Antigen. Adjuvants,Haptens	Kinetics of primary and secondary immune responses	Allergic diseases	immunoblotting.	Iimmunoelectrophoresis,
S-16-18	SLO-1 SLO-2 SLO-2	Separation of mononuclear cellsfrom peripheral blood	Counter current immunoelectrophorosis	Collection of Blood by Vein Puncture and isolation of Bloodcomponents	WBC counting using flow cytometry	immunoelectrophoresis,

Learning Resources	1. Richard A. Goldsby "Immunology" 2. Barbara, A. Osborne, Janis KubyImmunology", 5th Edition, W. H. Freeman & Company, 2006 3. Ivan Roitt. Element of Immunology. Wiley Blackwell publication, 13th edition, 2017 4. https://muhammad1988adeel.files.wordpress.com/2011/04/kuby-immunology-6th-edition.pdf

Learrning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	20%	20%	20%	10%	15%	15%	10%	10%	15%	15%
Level 2	Apply Analyze	20%	20%	30%	20%	20%	20%	20%	30%	20%	20%
Level 3	Evaluate Create	10%	10%	10%	10%	15%	15%	10%	10%	15%	15%
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	*Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.*	Dr.Prasanth Bhatt N, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23603T	Course Name	RESEARCH METHODOLOGY	Course Category	C	DISCIPLINE SPECIFIC ELECTIVE	L	T	P	O	C
							4	0	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil

Course Offering Department	BIOTECHNOLOGY	Data Book/Codes/Standards	Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes(PLO)

CLR-1 :	*Know the basics of research, sources of research problems and questions*	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
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*															

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking	Expected Proficiency(%)	Expected Attainment(%)	Fundamental Knowledge	Analyze, InterpretData	Reasoning ability	Ethical Practices	Team Work	Communication ofcomplex biotechnological idea	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	*Understand the types of research, the steps involved in a research process, define a research problem, develop a research question*	1	85	80	H	M	H	-	-	M	L	-	-	-	-	-
CLO-2 :	*Carry out literature survey, postulate research hypothesis and perform descriptive statistics*	2	80	70	M	H	H	-	-	L	M	-	-	-	-	-
CLO-3 :	*Demonstrate the ability to identify various sampling and data collection methods, represent research data graphically*	3	70	60	M	H	M	-	L	H	-	-	-	M	-	-
CLO-4 :	*Apply principles of ethics in performing and reporting biological research*	2	75	65	L	-	M	H	-	M	M	-	-	-	L	-
CLO-5 :	*Identify the various types of scientific articles, write research papers and thesis, and know about the various funding agencies*	3	80	70	M	L	-	-	-	H	M	-	-	-	-	-

Duration(hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Research	Literature survey	Sampling types	Research ethics	Types of scientific articles
	SLO-2	Meaning and objective of research	Introduction			
S-2	SLO-1	Significance and purpose of research	Sources of literature survey	Sampling methods	General principles of ethics inresearch	Review articles
	SLO-2		Library, Books			
S-3	SLO-1	Types of research	Sources of literature survey	Sampling methods	General principles of ethics inresearch	Short communications
	SLO-2		Online databases			
S-4	SLO-1	Types of research	Methods for online literature survey	Types of data	Conflict of interest	Research articles
	SLO-2		Boolean queries	Primary and Secondary		
S-5	SLO-1	Research Process Flow	Hypothesis	Methods of primary data collection	Plagiarism detection softwares	Components of a research article
	SLO-2			Experiments		
S-6	SLO-1	Steps involved in a research process	Types of hypothesis	Survey	Role of Institutional Ethics Committee(IEC)	Choosing the appropriate journal
	SLO-2					

S-7	SLO-1	Steps involved in a research process	Postulating a hypothesis	Questionnaire	Role of Institutional Animal EthicalCommittee (IAEC)	Writing a research article
	SLO-2					
S-8	SLO-1	Defining a research problem	Measures of central TendencyMean	Interview	3Rs in animal testing	Thesis
	SLO-2					
S-9	SLO-1	Sources of research problem	Measures of central TendencyMedian	Methods of secondary data collection	Critical evaluation	Layout of a thesis
	SLO-2					
	SLO-1	Research Question	Measures of central TendencyMode	Graphical representation of data	Critically evaluating a research report	Use of reference managing softwares
S-10	SLO-2			Line graphs and bar graphs		
	SLO-1	Sources of research questions	Measures of dispersionRange	Graphical representation of data	Patents	National Funding Agencies
S-11	SLO-2			Histograms		
	SLO-1	Steps in conceiving a researchquestion	Measures of dispersionStandard Deviation	Graphical representation of dataPie charts	Preparing for conference presentations	International Funding Agencies
S-12	SLO-2					

Learning Resources:

1. *Handbook of Research Methodology. A Compendium for Scholars & Researchers.* Dr. Shanti Bhushan Mishra, Dr. Shashi Alok. 2011
2. *Research Methodology Methods and Techniques,* 2nd Revised Edition, C.R. Kothari., 2004
3. Biostatistics: A foundation for analysis in the Health Sciences, 10th Edition, W.W Daniel. Publisher, Chad L Cross, John Wiley and Sons.
4. Introduction to Biostatistics, A Guide to Design, Analysis and Discovery. 1st Edition, Ronald N. Forthfer and Eun Sun Lee. Elsevier.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment(50%weightage)								FinalExamination(50%weightage)	
		CLA–1(10%)		CLA–2(10%)		CLA–3(20%)		CLA–4(10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level1	Remember	30%		30%		30%		20%		30%	
	Understand										
Level2	Apply	40%		40%		40%		40%		40%	
	Analyze										
Level3	Evaluate	30%		30%		30%		40%		30%	
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr.N. Banu, Bharathi Womens College (Autonomous), Chennai	Dr. S. Samuel Joshua Pragasam,Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23D03T	Course Name	FORENSIC SCIENCE	Course Category	D	Discipline Specific Elective Course	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-1 :	How forensic science gained prominence and various departments in forensic science.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills
CLR-2 :	Understanding the Crime Scene Investigation and evidence collection															
CLR-3 :	How the evidences left during the crime is analyzed															
CLR-4 :	How to analyze the consequences of a crime															
CLR-5 :	Learning different BEOSP															
CLR 6	Candidates understanding on Cyber forensic															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	Overall Understanding the scope and development of Forensic Science.	2	85	80	H	L				L		L	L	L		
CLO-2 :	Overall Understanding the Crime Scene Investigation	3	85	80	M	H				M		M	H	M		
CLO-3 :	Overall Knowledge on Duties of forensic scientist	3	85	80	H	H				M		H	H	M		
CLO-4 :	Facilities offered by forensic science laboratory	3	85	80	H	H				M		H	H	M		
CLO-5 :	Knowledge on different BEOSP	3	85	80	L	H				H		H	H	M		
CLO 6	Candidates understanding on Cyber forensic	3	85	80	M	H	-	-	-	M	-	H	H	M	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Definition and scope of ForensicScience.	scene of crime- PRIMARY CRIME SCENE, SECONDARY CRIME SCENE	Finger Prints, Principles of Fingerprint Analysis	Toxicology- Medico-Legal Aspects OfPoisoning	Brain electrical oscillation signatureproficiency (BEOSP)
S-2	SLO-1	History and Development ofForensic Science	Securing the Crime Scene, Recording the Crime Scene, sketching,photography,	Collecting Fingerprints	Classification Of Poison- Routes Of Administration	Cyber forensic
S-3	SLO-1	Development of Forensic Science in India and Organizational set up of Forensic ScienceLaboratories	Tools for Evidence Collection, Chain of Custody, Standard/Reference Samples,	Foot prints- Process offingerprint	Action Of Poison- Factors ModifyingAction of Poisons	Polygraph test
S-4	SLO-1	Anthropometric bureau, Finger printbureau, Department of explosives	Preservation of exhibits/evidences	Footprint analysis	INJURIES AND SEX RELATEDISSUES	DNA Analysis- DNA fingerprinting

S-5	SLO-1	Serologist to the Government ofIndia, Government examiner of questioned document	Principles of Forensic Document Examination	Blood Evidence: Basics andPatterns	Injury- njuries by MechanicalViolence,	Tape and video authenticationSpeaker identification etc.
S-6	SLO-1	Footprint section, Note forgerysection, Ballistics laboratory	Limitations of forensic documentexamination	Blood Stain Pattern Analysis	Sex related issues- sexual offences	Case studies on Sedition charges(Atleast 2)
S-7	SLO-1	Central forensic sciencelaboratories	Physical evidence; types,significanceand collection	Collection and Preservationof Blood Stain Analysis	Examination of the Victim Examination of the Accused	Case studies on Economic offences(Atleast 2)
S-8	SLO-1	Recommendations of scientific advisory committee to the cabinet	Locard's Exchange Principle	Semen Analysis, Medicolegal importance of Age	medico-legal aspects of sexualoffences	Visit to a police station to know theprocedural aspects after a crime.
S-9	SLO-1	Detection of Counterfeit Currency	Tools and techniques	Types Of Witnesses- Inquest, types of inquest	POCSO Act and its provisions	An online discussion with forensicexperts on their field experts
S-10	SLO-1	Intro to IPC	PERSONAL IDENTIFICATION- forensic anthropology,	CONSENT- Types ofconsent	Case studies on few sexual crimes (Atleast 2)	An online discussion with forensicexperts on their field experts
S-11	SLO-1	Intro to CrPC	age determination,	THANATOLOGY- Types, Modes,	Case studies on few Murders (At least2)	Discussions
S-12	SLO-1	forensic medicine and Indiancriminal laws	photoanthropometry		Case studies on few Criminal conspiracies (At least 2)	Discussions

Learning Resources	1. Introduction to Forensic Science in Crime Investigation –Dr.RukmaniKrishnamurty, "*Selective and Scientific Books*", 1st edition 2011 2. Richard Saferstein, 2001, Criminalistic: "*An Introduction to Forensic Science*". 7th editionPrentice-Hall, New Jersey. 3. L.J. Kaplan, 2001. "*A laboratory manual for the introduction to the Crime Lab*".Williamstown, Massachusetts. 4. Moenseens, A.A., Starrs, J.E., Henderson, C.E. and Inabare, F.E., 1995. ScientificEvidence in Civil and Criminal cases, IV edition, Foundation Press, Westbury, NewYork. 5. Fishes, B.A.J., 2000. "*Techniques of Crime Scene Investigation*". VI edition CRC Press,Boca Raton, 2000 6. Criminal Manual (Cr.P.C., I.P.C. & Evidence)

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	20%	-	20%	-	20%	-	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr.N.Prasanth Bhatt, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23D04T	Course Name	BIOENERGY	Course Category	D	Discipline Specific Elective Course	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning

CLR-1 :	Understanding of basics of bioenergy	1	2	3
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			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Knowledge about bioenergy and sources and their need for sustainable developments	2	80	70
CLO-2 :	Understanding of wood based bioenergy production methods and their importance	2	80	70
CLO-3 :	Understanding of algae based bioenergy production methods and their importance	2	85	70
CLO-4 :	Knowledge about biogas production process	2	85	70
CLO-5 :	Knowledge about biodiesel production methods and recent advanced techniques in bioenergy production.	3	85	70

Program Learning Outcomes (PLO)

	1	2	3	4	5	6	7	8	9	10	11	12
	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO -1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	M	M	H	L	L	H	L					
CLO-2 :	M	M	M	M	L	H	M					
CLO-3 :	M	L	H	L	L	H	L					
CLO-4 :	L	M	H	H	M	M	M					
CLO-5 :	H	H	M	L	M	M	L					

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Bioenergy	Wood Bioenergy-introduction	Algae Based Bioenergy	Anaerobic digestion	Biodiesel production
		Concepts of Bioenergy				Production process
S-2	SLO-1	Bioenergy Development	Wood Energy Sources	Algae as a Sustainable Feedstock for MultipleUses	The anaerobic digestion process for biogas production	Batch process
		Policy, Government Research programs				Continuous process
S-3	SLO-1	Feedstocks	Values and Benefits of Wood Bioenergy	Importance of Light in Photosynthesis-algal growth	Benefits of anaerobic digestion	Noncatalyzed systems- biox process
						Supercritical process
S-4	SLO-1	Biomass Materials and Sources	Managing Wood Biomass for Bioenergy	Biofuel Production from Algae Biomass	The fermenting bacteria and methanogen relationship	Post reaction processing
		Forest-Based Feedstocks				Ester/glycerol separation
S-5	SLO-1	Agriculture-Based Feedstocks	Direct Combustion Options	Algae Strain Selection: Algae Types, Strains, and Use in Biofuel Production	The process of starting a digester	Ester washing
						Other ester treatments
S-6	SLO-1	Waste-Based Feedstocks	Biochemical Technological Processes	Algae Cultivation:	Operation and control of a digester	Treatment and recovery of side streams
				Photobioreactors		
S-7	SLO-1	Agroforestry Feedstocks	Thermochemical Processes	Open System	Role of mixing in biogas production	Pretreatment of high free fatty acid feedstocks
		Biomass from Conservation Lands		Fermenters		
S-8	SLO-1	Advanced Fuels from Algae	Economics Of Woody Bioenergy	Algae Harvesting	Effect of speed on mixing	Microbial fuel cell
						Bio-sensitized solar cells (BSSC)

S-9	SLO-1	Biomass Supply and Availability	Economics Of Woody Bioenergy Production	Oil Extraction from Harvested Algae Biomass	Types of anaerobic digesters	Photobioreactors
						Bacteriorhodopsin
S-10	SLO-1	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-2					
S-11	SLO-2	Co-Products and Byproducts	Bioenergy from Perennial Grass Biomass	Integrated Algal Biofuel Production	Attached growth system	Socio economic impacts of bio energy
	SLO-2		Biomass Conversion			
S-12	SLO-1	Social, Economic, and Environmental Impacts	Environmental Impact of Grass Biomass	Life Cycle Analysis, Economics, and Environmental Impacts	Merits and demerits of biogas consumption	Government initiatives and role to improve theuse of bioenergy
	SLO-2		Economic Considerations for Grass Biomass			

Learning Resources	
	1. Anju Dahiya, Bioenergy Biomass to Biofuels, Academic Press (2015) 2. Wei-Hsin Chen, Keat Teong Lee, Hwai Chyuan Ong, Biofuel and Bioenergy Technology, MDPI(2019) 3. Renewable Energy, Sorensen B. (2010); Fourth Edition, Academic press 4. Introduction to Bioenergy (Energy and the Environment) , Vaughn C.Nelson and Kenneth L. Starcher (2016), CRC Press, New Delhi

Learning Assessment

	Bloom's Levelof Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. PARTHIPAN.P, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23G04J	Course Name	TISSUE ENGINEERING	Course Category	C	PROFESSION CORE	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Know about the cell interaction and matrix			
CLR-2 :	Have knowledge on Tissue organization and its types			
CLR-3 :	Understand about stem cells and its importance			
CLR-4 :	Know about tissue synthesis			
CLR-5 :	Know about curing the diseases			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	*Know about the cell interaction and matrix*	1	75	70	H				L		H					
CLO-2 :	*Have knowledge on Tissue organization and its types*	1	75	70	H	M	M	H	L							
CLO-3 :	*Understand about stem cells and its importance*	1	75	70	H			H								
CLO-4 :	*Know about tissue synthesis*	1	75	70	H		M									
CLO-5 :	*Know about curing the diseases*	1	75	70	H			M			H					

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Cell types,	Structure and organization of tissues- Introduction	Tissue grafting- Introduction	Three-Dimensional Scaffolds- Introduction	Stem Cell therapy – Gastrointestinal
S-2	SLO-1	cell-cell interaction	Epithelial,	Types of tissue grafting	Three-Dimensional Scaffolds methods	Kidney
S-3	SLO-1	Cell differentiations,	connective	Application of stem cells in tissue grafting	Tissue Engineering and Transplantation Techniques - Immunoisolation Techniques	Heart
S-4	SLO-1	cell matrix	muscle tissues- Universal Characteristics of Muscle	Stem cells - properties.	Modes of Cell and Tissue Delivery	Lung disorders
S-5	SLO-1	Biology of cells in culture	Microscopic Anatomy of Skeletal Muscle	Stem cells - Classification.	Modes of Cell and Tissue Delivery	Eye Diseases
S-6	SLO-1	cell culture bioreactors -introduction	Nerve tissues- Anatomy of aNeuron	Types of Stem cells - embryonic stem cells	Breast reconstruction- Introduction	Alzheimer
S-7	SLO-1	Types of Bioreactors	Classification of Neuron	Adult stem cells	Breast reconstruction- techniques	Inflammatory bowel disease
S-8	SLO-1	Three-Dimensional organization of Cells in Culture	Nerve fibres	Induced pluripotent stem cells- deriving them	Regeneration of Bone and Cartilage- Introduction	Liver diseases
S-9	SLO-1	Organ Culture,	The Nerve-Muscle Relationship	Hematopoietic Stem Cells	Technitue for Regeneration of Bone and Cartilage	Diabetes
S-10	SLO-1	Histotypic culture	The Nerve-Muscle Relationship	Mesenchymal Stem Cells	Bioartificial Pancreas - Introduction	Muscular dystrophy
S-11	SLO-1	Organotypic Culture	Artificial organs	Application of these stem cells	Techiniques	Multiple sclerosis
S-12	SLO-1	Application of these cultures	Bioprinting of Organs and Tissue		Regeneration of hepatocytes.	Spinal cord injury

Learning Resources	1. Griffiths, A. J. F., Wessler, S. R, Carroll, S. B., Doebley, J. (2010). An Introduction to Genetic Analysis (10thed.). W.H. Freeman & Company (New York). ISBN:10: 1- 4292-2943-8 2. Pierce, B.A. (2012). Genetics - A Conceptual Approach (4thed.). W.H. Freeman & Co. (New York). ISBN:13: 978-1-4292-7606-1 / ISBN:10:1-4292-7606-1. 3. Snustad, D. P., Simmons, M. J. (2015). Principles of Genetics (7th ed.). ISBN: 978-1- 119-14228-7

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%		20%		20%		40%		30%	
Level 2	Understand	40%		20%		20%		40%		30%	
Level 3	Apply	10%		30%		20%		-		20%	
Level 4	Analyze	10%		30%		40%		20%		20%	
Level 5	Evaluate	-	-	-	-	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-	-	-	-	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	1. Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. N. Prasanth Bhatt, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23P03L	Course Name	Mini project	Course Category	P	Internships/ Project Work	L	T	P	O	C
							0	0	4	2	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil

Course Offering Department	Biotechnology	Data Book / Codes/Standards	Nil

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning

		1	2	3
CLR-1 :	To test the ability to identify research gap	Bloom'sLevel	Bloom'sLevel	Bloom'sLevel
CLR-2 :	To test the ability to idetify the problem			
CLR-3 :	To test the ability to devise a plan of study			
CLR-4 :	To teach how to determine the methodology			
CLR-5 :	To test the practical knowledge			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
					Fundamental Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning
CLO-1 :	Knowledge on reading the review of literature				H	H	H	H	-	-	-	H	H	-	H	H
CLO-2 :	Knowledge on problem solving methods				H	H	H	H	-	-	-	H	H	-	H	H
CLO-3 :	Knowledge on devising methodologies				H	H	H	H	-	-	-	H	H	-	H	H
CLO-4 :	Hands- on knowledge on various techniques				H	H	H	H	-	-	-	H	H	-	H	H
CLO-5 :	Knowlwdge to interpret the results				H	H	H	H	-	-	-	H	H	-	H	H

Learning Assessment								
	Continuous Learning Assessment(50% weightage)				Final Evaluation(50% weightage)			
	Seminar	Review – 3			Dissertation	Presentation		
		Overview of the Dissertation	Research findings	Oral Presentation andInteraction			Research Outcome**	Viva-Voce
Project Work	10%	10%	20%	10%	20%	10%	10%	10%
Total	50%				50%			

SEMESTER VII

Course Code	UBT23701J	Course Name	ENVIRONMENTAL BIOTECHNOLOGY	Course Category	C	Discipline Specific Core Courses	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

CLR-1 :	To test the ability to identify research gap
CLR-2 :	To test the ability to idetify the problem
CLR-3 :	To test the ability to devise a plan of study
CLR-4 :	To teach how to determine the methodology
CLR-5 :	To test the practical knowledge

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)	1 Fundamental Knowledge	2 Analyze, Interpret Data	3 Reasoning ability	4 Ethical Practices	5 Team Work	6 Communication of complex biotechnological ideas	7 independent and lifelong learning	8 PSO - 1	9 PSO - 2	10 PSO – 3	11 PSO-4	12 PSO-5
CLO-1 :	Applying knowledge on aerobic waste water treatments and its methodologies	2	80	75	M	M	M	L	L	H	M					
CLO-2 :	Applying knowledge on solid waste management and bioremediation	2	80	75	M	H	M	L	L	H	M					
CLO-3 :	Having knowledge on organic and inorganic contaminants	2	85	75	M	H	L	L	L	M	L					
CLO-4 :	Applying nanobiotechnology knowledge for waste managements	2	85	75	H	M	L	L	L	H	M					
CLO-5 :	Applying recent tools and techniques for sustainable management of environmental pollutions	3	85	75	H	H	L	L	M	H	L					

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Basics of Environmental biotechnology	Overview of atmosphere	Introduction to waste water	Solid waste management -introduction	Heavy metal contamination
	SLO-2	Ecosystem concept				Removal of heavy metals
S-2	SLO-1	Structure of Ecosystems	Overview of hydrosphere	Sources and impacts	Sources of solid waste materials	Metals, radionuclides
	SLO-2	Functions of Ecosystems				Phosphates & nitrates management
S-3	SLO-1	Abiotic components	An overview of lithosphere	Aerobic process	Treatment methods physical, chemical and biological	Role of indigenous microorganisms on bioremediation
	SLO-2	Functions of Abiotic components		Preliminary treatments		
S-4	SLO-1	Biotic components	An overview of biosphere	Primary treatments	Bioaugmentation	Phytoremediation of oil spill
	SLO-2	Functions of Biotic components		Screening and grit chamber	Factors affecting bioaugmentation	Phytoremediation of heavy metals contaminations
S-5	SLO-1	Forest ecosystems	Environmental pollution- Introduction	Secondary treatments methods	Biostimuation	Nano-bioremediation
	SLO-2	Marine ecosystems			Factors affecting Biostimuation	Nano-bioremediation of organic pollutants
S-6	SLO-1	Global issues-introduction	Air pollution source	Activated sludge	Bioleaching-importance	Photocatalysis
	SLO-2	Ozone depletion-sources	Impacts and control methods		Mechanisms of bioleaching	Photocatalytic degradation of organic pollutants
S-7	SLO-1	Ozone depletion-impacts	soil pollution source	Trickling filters	Bioleaching methods	Biosurfactants role in degradation
	SLO-2	Global warming	Impacts and control methods			Degradative plasmids
S-8	SLO-1	Controlling measures of ozone depletion	water pollution source	Rotating biological contactors	Oil spill impacts	Molecular techniques in bioremediation
	SLO-2	Controlling measures of ozone depletion	Impacts and control methods		Treatments of oil spill	Molecular techniques in bioremediation

S-9	SLO-1	Acid rain – Natural sources	Noise pollution sources	Oxidation pond and oxidation ditch	PAHs impacts on environment and health	Immobilization technology in waste management
	SLO-2	Acid rain due to anthropogenic activities	Impacts and control methods	Tertiary treatments	Treatment methods of PAHs contamination	Immobilization technology -advantages
S-10	SLO-1	Acid rain impacts	Thermal and light pollution	Anaerobic treatments methods -Background	Xenobiotic types and sources	Anaerobic digestion
	SLO-2	Acid rain controlling methods	Impacts and control methods	Anaerobic degradation of organic matter		Biogas production
S-11	SLO-2	Awareness on global issues	Measurements of pollutants	Anaerobic filter systems	Treatments methods for xenobiotics	Extraction of biogas
	SLO-2	Awareness on global issues	Spectroscopic methods (UV and FTIR)			Extraction of biogas
S-12	SLO-1	Sustainable approaches for management of ecosystems	Chromatography methods (GCMS, LCMS, HPLC)	Upflow anaerobic sludge blanket (UASB)	Impacts of pesticides and insecticides	Methods of odour control
	SLO-2	Sustainable approaches for management of ecosystems	AAS, ICPMS, and XRF	Advantages of anerobic process	Impact of surfactants	Discussion

Learning Resources	1. Waste water engineering - treatment, disposal and reuse, Metcalf and Eddy Inc.,Tata McGraw Hill, New Delhi. 2. Environmental Chemistry, AK. De, Wiley Eastern Ltd, New Delhi. 3. Bioremidation, Baaker, KH and Herson D.S., 1994. Mc.GrawHillInc, NewYork. 4. Industrial and Environmental Biotechnology - Nuzhat Ahmed,Fouad M. Qureshi and Obaid Y. Khan, 2006. Horizon Press.

Learning Assessment

	Bloom's Levelof Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember										
	Understand	30%	-	30%	-	30%	-	30%	-	30%	-
Level 2	Apply										
	Analyze	40%	-	40%	-	40%	-	40%	-	40%	-
Level 3	Evaluate										
	Create	30%	-	30%	-	30%	-	30%	-	30%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. PARTHIPAN.P, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23D05J	Course Name	STEM CELL BIOLOGY	Course Category	D	Discipline Specific Elective Course	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

CLR-1 :	Define the Introduction of Stem cells and its Environment
CLR-2 :	Describe the Types of Stem cells
CLR-3 :	Illustrate the Isolation and Culturing of Stem cells
CLR-4 :	Research the Ethics and Guidelines and Controversies in Stem cell research
CLR-5 :	Asses the Application of Stem cells in Various diseases

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLO-1 :	Recall the basics of Stem cells and its sources	2	75	80	H	H	H	M	M	H	M	H		M	H	
CLO-2 :	Distinguish the types of Stem cells and Evolutionary Mechanism	2	70	75	H	H	M	H	M	M	L	H		L	H	
CLO-3 :	Execute the Isolation, culturing and differentiation of Stem cells	2	70	75	H	H	H	H	M	H	M	H	M	H	H	
CLO-4 :	Debate the controversies in stem cell research	2	65	70	H	M	L	L	H	H	H	H		H	H	H
CLO-5 :	Agree the Therapeutic approach of Stem cells	2	65	70	M	H	H	H	H	H	M	H	L	M	H	H

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction to stem cells	Embryonic stem cells	Differentiation of stem cells	Stem cell ethics and policies	Applications of stem cells in Medicine
S-2	SLO-1	Definition and basics of stem cells	Adult stem cells	Isolation and culturing of ESCs	Ethical Concerns in stem cell research	Neurodegenerative diseases
S-3	SLO-1	Sources of stem cells Properties of stem cells	Hematopoietic stem cells Mesenchymal stem cells	Differentiation of ESCs Isolation and culturing of ASCs	Stem cell research: Hype, hope Controversies in stem cell research	Cardiac diseases Diabetes
S-4-6	SLO-1	GLP: Stem cells	Isolation of Hematopoietic Stem cells	Characterization of HSCs by Flowcytometry	Viability Measurement of HSCs	Differentiation of HSCs
S-7	SLO-1	Classification of stem cells	Neural stem cells	Differentiation of ASCs	Guidelines for embryonic stem celltherapy	Burns and kidney malfunctions
S-8	SLO-1	Cellular potency	Cardiac stem cells	Isolation and culturing of iPSC	Adult stem cell therapy	Gastrointestinal disorders
S-9	SLO-1	Plasticity of stem cells Stem cell niche microenvironment	iPSC Similarities between iPSC and Embryonicstem cells	Differentiation of iPSC Transdifferentiation of ESCs, ASCs,iPSCS.	Stem cell therapy in clinical applications. Progress in clinical trials-International	Liver diseases Pancreatic diseases
S-10-12	SLO-1	Proper Equipment: Stem cells isolation and Maintenance	Culturing of HSCs	Cryopreservation of HSCs	Cytotoxicity analysis of HSCs	Differentiation of HSCs
S-13	SLO-1	Introduction to Stem cell niche	Cancer stem cells	Factors influencing the proliferationand	Challenges in clinical trials	Spinal cord diseases

			Introduction to stem cell signalingpathways	differentiation of stem cells		
S-14	SLO-1	Introduction to Types of stem cells	Molecular and evolutionary mechanisms of origin of cancer stem cells.	Hormonal Role in Differentiation	Role of stem cells in regenerative Medicine	Lung Regeneration
S-15	SLO-1	Stem cell niche and its role in cancer	Molecular and evolutionary mechanism maintenance of cancerstem cells	Asymmetric cell division Telomerase in relevance to stem cell development and differentiation	Role of stem cells in tissue engineering	Hematopoietic stem cell transplantationfor cancer.
S-16-18	SLO-1	Reagents: Stem cells isolation and Maintenance	Passaging and Sub culturing of HSCs	.Thawing of Cryopreserved HSCs	Differentiation of HSCs	Model Practical

Learning Resources	1. Stem cells by C.S Potten., Elsevier, 2006. 2. Essentials of Stem Cell Biology by Robert Lanza., fourth edition. Elsevier 2014. 3. Stem cell biology and Gene Therapy by Peter Quesenberry., First Edition, Wiley-Liss, 1998. 4. Embryonic Stem cells – Protocols by KursadTurksen., Second Edition Humana Press, 2002

Learning Assessment

	Bloom's Levelof Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	20	20	10	10	20	20	10	10	20	20
Level 2	Apply Analyze	15	15	20	20	20	20	30	30	20	20
Level 3	Evaluate Create	15	15	20	20	10	10	10	10	10	10
	Total	100 %		100 %		100 %		100 %			

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr.N.Banu,Assistant Professor , Bharathi Womens College (Autonomous), Chennai	Dr.D.Sankari, Professor and Head Department of Biotechnology ,FSH ,SRMIST, KTR

Course Code	UBT23D06J	Course Name	ALGAL BIOTECHNOLOGY	CourseCategory	C	Discipline Specific Elective Courses	L	T	P	O	C
							3	0	3	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

CLR-1 :	Learning the collection, maintenance and preservation of algal culture.
CLR-2 :	Studying the basic and applied science behind the production of mass culture.
CLR-3 :	Teaching students about applications and future potential of algae.
CLR-4 :	Educating the students on the commercial production of algae
CLR-5 :	Learning about the Futuristic approach in algae

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	To acquire the knowledge of Algal culturing techniques.	2	75	80	*H*	*L*	*L*	*M*	*M*	*L*	H	L	M	-	L	-
CLO-2 :	Understand the concepts of tissue culture techniques	2	70	75	*H*	*L*	*L*	*M*	*M*	*L*	H	M	M	-	L	-
CLO-3 :	To learn lab organization and nutritional importance of different algae.	2	70	75	*M*	*L*	*L*	*M*	*M*	*L*	H	M	M	-	L	-
CLO-4 :	Understand about the algal isolation, identification and cultivation method.	2	65	70	*M*	*L*	*L*	*M*	*M*	*L*	H	M	M	-	L	-
CLO-5 :	To describe structure, functions and the economic importance of algae.	2	65	70	*M*	*L*	*L*	*M*	*M*	*L*	H	M	M	-	L	-

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction to Algae	Types of algae culture medium	Medium for Spirulina	Macroalgae cultivation	Principles of mass cultivation of microalgae
S-2	SLO-1	Life cycle of Algae	Bold Basal Medium	Isolation of algal samples	Designing of photobioreactor	Economic Importance of Microalgae
S-3-6	SLO-1	Collection of algae.	Isolation of Algae.	Cultivation of algae using BBM	Phycoremediation - Demo	Separation of essential biomolecules from algae using TLC
S-7	SLO-1	Role Algae in Ecosystem.	Chu 10 medium	ANTIBIOTIC TREATMENT	potential of microalgae for SCP	Business economics for algae
S-8	SLO-1	Techniques for cultivation of Algae in laboratory	Medium for diatoms	Modern microalgal isolation method	carotene	Processing of algae
S-9-12	SLO-1	Microscopic observation of algae	Screening of Algae	Estimation of biomass	Inoculum development pilot scale production.	Separation of essential biomolecules from algae using Column Chromatography
S-13	SLO-1	Sterilization	Medium for volvox culturing	Open pond system for algae cultivation	Biofertilizer	Futuristic approaches in algal biotechnology.
S-14	SLO-1	Preparation of stock solutions	Medium for blue-green algae (BG11)	Closed culture system	Biodiesel	Revision
S-15-18	SLO-1	Quantification of collected algae	Cultivation of algae using BG 11	Immobilization of algal cells with alginate.	Qualitative estimation of protein from algae.	Model Exam

Learning Resources	1. BARSANTI, LAURA AND PAOLO GUALTIERI 2005 Algae-Anatomy, Biochemistry and Biotechnology.Taylor & Francis, London, New York. 2. BECKER, E.W. 1994 Microalgae-Biotechnology and microbiology. Cambridge University Press. 3. TRIVEDI, P.C. 2001 Algal Biotechnology. Pointer publishers, Jaipur, India.	4. Rogers K.2011."Fungi, Algae and Protists". FirstEdition.BritanicaEducational Publishing. 5. Encyclopaedia Britannica, 2011. Plants, Algaeand Fungi".Encyclopaedia Britannica Inc

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	*Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.*	Dr. Infant Santhose.B, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23G05T	Course Name	MARINE BIOTECHNOLOGY	Course Category	C	Discipline Specific Core Course	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	To gain knowledge on the various marine habitats and microorganisms	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	To know about various animals and its communication methods in sea			
CLR-3 :	To understand how marine organisms are employed for various applications			
CLR-4 :	Deals with diversity, culturing of biomass and its economic applicability			
CLR-5 :	Application of marine organisms in product production and its quality management			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	Will know the various microorganism from the marine sources and their significance	1	75	70	H			L								
CLO-2 :	Know the higher organisms from flora & fauna and how they interact with one another	1	75	70	H	H	H									
CLO-3 :	Deals with organisms that sustain the extreme environment and its products of significance	2	75	70			M		H							
CLO-4 :	Knowing the diversity, production kinetics and products harvested from marine sources	2	75	70				H	H							
CLO-5 :	Scope of marine industry, production, export, maritime benefits and security	2	75	70		H				H						H

Duration (hour)		11	12	12	12	12
S-1	SLO-1	Classification of the marineenvironment	Marine plants	Marine viruses and Giruses	Species abundance, richness and diversity indices	Seafood, microbiology, factors, influencing, microbial, growth and activity
S-2	SLO-1	Marine microbial habitats- Estuarine Ecosystems: Rocky shores, Sand dunes,	Invertebrates: sponges, cnidarians, polychaetes,	Giant bacteria and their significance	Biogeography, Recruitment, Growth, Mortality,	Seafood, Borne pathogens, bacteria fungi,viruses
	SLO-2	Salt marshes, Deep-sea, hydrothermal vents, mangroves and coral reefs				
S-3	SLO-1	Diversity of Marine microorganisms-Archaea, Bacteria, Cyanobacteria	crustaceans, marine worms, molluscs,echinoderms,	Unculturable bacteria: occurrence,characteristics and exploitation	Culture of microalgae and invertebrates;	Toxins influencing food spoilage
S 4	SLO-1	Algae, Fungi,	arthropods, Non- craniate (non-vertebrate) chordates	Barophilic organisms & their applications	Marine biomass and productivity- primary production, photosynthetic efficiency	Microbes as food single cell protein (SCP), microbial neutraceuticals
S-5	SLO-1	viruses, viroids and prions.	Adaptations of organisms to different habitats	Seaweeds for removal of metal pollutants	Secondary production, productivity distribution in ocean environment	Quality management – concepts, planning, system, quality control
S-6	SLO-1	Characteristics of marine microorganisms.	Marine Vertebrates	GFP, RFP characteristics and their applications	Mechanism and factors affecting primary production,	Novel product development, marketing and sea food export

S-7	SLO-1	Specialized microorganisms-Extremophiles: barophiles, thermophiles, psychrophiles	Marine fishes (bony, cartilaginous, jawlessfishes)	Green mussel adhesive protein	Preservation and processing – chilling methods, phenomena of rigor mortis,spoilage changes- causative factors	Marine Products Export DevelopmentAuthority (MPEDA)
S 8	SLO-1	halophiles,	Marine tetrapods (amphibians, reptiles,birds, mammals)	Chitosan : products and applications	Salt curing, pickling and smoking;Freezing and cold storage,	Novel products – nutritionpromotion
S-9	SLO-1	actinomycetes,	Plankton (phytoplankton and zooplankton)	Biomimetics	Canning procedures; Role ofpreservatives in processing.	Drugs from Sea
S-10	SLO-1	polyextremophiles,	Bio-communication in oceans, Microbe-microbe interaction	Barnacles and their effect on animals and shipping industry	Packing – handling fresh fish, frozen packs, individually quick frozen (IQF), layered and shatter packs	Pearl Production as an alternative to naturalcollection
S-11	SLO-1	anaerobes	Quorum sensing, Microbe-metazoaninteraction	Biofouling and measures to control it	Fishery by-products, cannery waste, feeds, silage, .	Linkage between marine Biotechnology andShipping Industry
S 12	SLO-1		Population connectivity,		fish gelatin, fish glue, chitin	Discussion on economic importance of marine resources and maritime security.
					pearl essence, fertilizer	

Learning Resources	1. Essentials of Marine Biotechnology, Prof. Dr. Se-Kwon Kim. 2. Handbook of Marine Biotechnology, Prof. Dr. Se-Kwon Kim.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	50%	-	40%	-	50%	-	30%	-	50%	-
	Understand										
Level 2	Apply	40%	-	40%	-	30%	-	30%	-	30%	-
	Analyze										
Level 3	Evaluate	10%	-	20%	-	20%	-	40%	-	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	*Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.*	Dr. Infant Santhose.B, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23G06T	Course Name	Biomaterials	Course Category	G	Generic elective	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

CLR-1 :	Learn the basics of science behind the materials
CLR-2 :	Understand the properties of biomaterials
CLR-3 :	Learn the characteristics and classifications of biomaterials
CLR-4 :	Learn the different types of materials and composites used for implantations
CLR-5 :	Determine the bodily functions and applications of biomaterials in artificial organs

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	Identify and classify the type of biomaterials according to the ASTM standards	1	80	70	H	H	L	H	M	M	M					
CLO-2 :	Understand the structural properties of various biomaterials	1	85	75	H	M	L	M	M	M	L					
CLO-3 :	Determine the characteristics of biomaterials suitable for the implantation	2	75	70	H	H	H	M	M	M	M					
CLO-4 :	Study the functional properties of the materials implanted into the body	2	85	80	H	M	M	M	L	L	M					
CLO-5 :	Can design the materials specific to the body targets with biocompatible parameters	3	85	75	M	L	M	L	L	M	M					

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Basics of material science	Metallic biomaterial	Polymeric and ceramic implant materials	Tissue replacement implants	Toxicological screening of biomaterials
	SLO-2	Definition of biomaterials	Metals as implant material	Application medical	Medical compatibility issues	Effects on human intervention
S-2	SLO-1	Requirements of a materials	Types of metallic implant materials	Natural polymers	Sutures	Biocompatibility
	SLO-2	Grading of materials	Stainless steels	Synthetic polymers	Surgical tapes	Parameters to check the biocompatibility
S-3	SLO-1	Need for biomaterials	Co-based alloys	Classes and types of polymers	Host tissue response	Blood compatibility
	SLO-2	Usefulness of biomaterials	Ti and Ti-based alloys	Thermosets, thermoplastics	Interfacial tissue reaction	Tissue compatibility
S-4	SLO-1	Generations of implants	Ceramic implant materials	Elastomer and merits and demerits	Inflammation and foreign body response	Toxicity tests
	SLO-2	Opportunities and limitations	Bio ceramics, Aluminum oxide	Acrylic polymers	adaptive immunity	Acute and chronic toxicity studies
S-5	SLO-1	Classification of materials	Glass ceramics and medical use	fluorocarbon polymers	Systemic toxicity	In situ implantation
	SLO-2	Types of biomaterials	Importance of stress-corrosion cracking	Silicon rubbers	Hypersensitivity	tissue culture
S-6	SLO-1	Natural biomaterials	Host tissue reaction with bio metal	Viscoelastic behavior	Blood coagulation	Haemolysis
	SLO-2	PLA and PHAs	Corrosion behavior	Sreep-recovery	Blood materials interactions	thrombogenic potential test
S-7	SLO-1	HA, chitosan's	Importance of passive films for tissue adhesion	Stress-relaxation	Composite implant materials	systemic toxicity
	SLO-2	Alginate and fibroin	Hard tissue replacement implant	Strain rate sensitivity	Mechanics of improvement	Intracutaneous irritation
	SLO-1	Polymers, silicone biomaterials,	Orthopedic implants	Denture base resins	Incorporating different elements	Artificial hemoglobin synthesis

S-8	SLO-2	Medical fibers and synthetic polymers	Biocompatible factors	Properties of resins	Composite theory of fiber reinforcement	Artificial blood
S-9	SLO-1	Ceramics	Dental implants	Maxillofacial Prosthetic	short and long fibers	Artificial Heart
	SLO-2	Metals and semiconductors	Fixation and capping process	Materials used in prosthetics	fibers pull out	Prosthetic Cardiac Valves
S-10	SLO-1	Smart polymers	Soft tissue replacement implants	Latexes	Polymers filled with osteogenic fillers	Artificial lung
	SLO-2	Bioresorbable and bio erodible materials	Percutaneous planning	Vinyl plastisols, Sillicone rubbers	Hydroxyapatite	Oxygenator
S-11	SLO-2	Bulk properties of the materials	Skin implants	Polymers as Biomaterials	Hard tissue replacement	Artificial Kidney
	SLO-2	Surface properties	Skin compatibility	Hydrogels	Hard tissue Implants	Dialyser membrane
S-12	SLO-1	Micro and nano properties of materials	Heart valve materials	PTFE, PMMA	Host tissue reaction	Carcinogenicity
	SLO-2	Characterizations of biomaterials	Cardiac valve implants	PVDF, PE, PEG	Osseointegration	Mutagenicity

Learning Resources	1. Biomaterials Science: An Introduction to Materials in Medicine, By Buddy D. Ratner, et. al. Academic Press, San Diego, 1996. 2. Sujata V. Bhat, Biomaterials, Narosa Publishing House, 2002. 3. J B Park, Biomaterials – Science and Engineering, Plenum Press, 1984. 4. John Enderle, Joseph D. Bronzino, Susan M.Blanchard, "Introduction to Biomedical Engineering", Elsevier, 2005.

Learning Assessment

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. S. Thanigaivel Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23P04L	Course Name	INTERNSHIP-III	Course Category	P	Internship/ Project/ Community Outreach	L	T	P	O	C
							0	0	0	0	2

Pre-requisiteCourses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Physics and Nanotechnology	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1:	*assist the student's professional skill development useful to employer such as teamwork, communications and work ethics & details*
CLR-2:	*provide unique learning opportunities by exposing the student to the environment and expectations of professional performance*
CLR-3:	*expand the student's knowledge of a particular area(s) of interest to enhance employability*
CLR-4:	*help students to explore career alternatives/opportunities prior to their graduation*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
CLO-1:	*demonstrate the skill gained through work experience with mentors or successful professionals to support the early stages of their career*

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

Course Code	UBT23P05L	Course Name	Project Phase-I	Course Category	P	Internships/ Project Work	L	T	P	O	C
							0	0	8	2	4

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

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
CLR-1 :	To test the ability to identify research gap	Bloom'sLevel	Bloom'sLevel	Bloom'sLevel	Fundamental Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning
CLR-2 :	To test the ability to idetify the problem															
CLR-3 :	To test the ability to devise a plan of study															
CLR-4 :	To teach how to determine the methodology															
CLR-5 :	To test the practical knowledge															
CLR 6	To teach how to write a dissertation															
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:															
CLO-1 :	Knowledge on reading the review of literature	*1*	*80*	*70*	H	H	H	H	-	-	-	H	H	-	H	H
CLO-2 :	Knowledge on problem solving methods	*1*	*85*	*75*	H	H	H	H	-	-	-	H	H	-	H	H
CLO-3 :	Knowledge on devising methodologies	*2*	*75*	*70*	H	H	H	H	-	-	-	H	H	-	H	H
CLO-4 :	Hands- on knowledge on various techniques	*2*	*85*	*80*	H	H	H	H	-	-	-	H	H	-	H	H
CLO-5 :	Knowlwdge to interpret the results	*3*	*85*	*75*	H	H	H	H	-	-	-	H	H	-	H	H
CLO 6	Understanding the importance of presentation and dissertation				H	H	H	H	-	-	-	H	H	-	H	H

Learning Assessment								
	Continuous Learning Assessment(50% weightage)				Final Evaluation(50% weightage)			
	Seminar	Review – 3			Dissertation	Presentation	Research Outcome**	Viva-Voce
		Overview of the Dissertation	Research findings	Oral Presentation andInteraction				
Project Work	10%	10%	20%	10%	20%	10%	10%	10%
Total	50%				50%			

SEMESTER VIII

Course Code	UBT23801J	Course Name	Biopython	Course Category	C	Discipline Specific Core	L	T	P	O	C
							2	0	4	2	4

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

Course Learning Rationale(CLR):	The purpose of learning this course is to	Learning	Program Learning Outcomes (PLO)

		1	2	3
		Level of Thinking(Bloom)	Expected Proficiency(%)	Expected Attainment(%)
CLR-1 :	*Understand basics of Biopython package*			
CLR-2 :	*Gain knowledge in sequence manipulation and plotting*			
CLR-3 :	*Perform cluster analysis*			
CLR-4 :	*Perform genome analysis*			
CLR-5 :	*Support parsing a bioinformatics file into a format specific record object*			

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	11	12
		FundamentalKnowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication ofcomplex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	*To learn Biopython programming language and its application in scientific and commercial* domain	1	85	80	H	M	H	-	-	M	L	-	-	-	-	-	-
CLO-2 :	To encounter challenges with handling and processing massive biological data sets	2	80	70	M	H	H	-	-	L	M	-	-	-	-	-	-
CLO-3 :	To understand and solve real time biology research problems	3	70	60	M	H	M	-	L	H	-	-	-	M	-	-	-
CLO-4 :	To study parsing, representation and analysis of sequence files.	2	75	65	L	-	M	H	-	M	M	-	-	-	L	-	-
CLO-5 :	To learn and to apply Scilab in Bioinformatics Data Analysis	3	80	70	M	L	-	-	-	H	M	-	-	-	-	-	-

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction to Biopython	Sequence Analysis	Calculating structural properties (e.g., RMSD, secondary structure)	Data Visualization	Sequence Analysis
	SLO-2	Overview of Biopython and its features	Basic sequence statistics and calculations	Superimposing protein structures	Plotting sequence data (e.g., sequence logos)	Basic sequence statistics and calculations
S-2	SLO-1	Installation and setup	Searching for motifs and patterns	Visualizing protein structures	Visualizing protein structures and annotations	Searching for motifs and patterns
	SLO-2	Sequence Manipulation	Calculating sequence similarity and identity	Phylogenetics	Creating phylogenetic tree plots	Calculating sequence similarity and identity
S-3-6	SLO-1	parsing sequence file	Bio.Seq module	python string operations	find, split and strip in sequences	creating new complement sequence
	SLO-2			slicing, counting, concatenation in sequences		
S -7	SLO-1	Sequence objects and methods	Finding open reading frames (ORFs)	Introduction to phylogenetic trees and their representation	Integrating Biopython with Matplotlib and Bio.Graphics for advanced visualization	Introduction to phylogenetic trees and their representation
	SLO-2	Sequence parsing from files and strings	Sequence Alignment	Reading and writing tree files (e.g., Newick format)	Advanced Topics	Reading and writing tree files (e.g., Newick format)

S-8	SLO-1	Sequence alignment and manipulation	Pairwise sequence alignment algorithms	Constructing phylogenetic trees using different algorithms	Working with large datasets efficiently	Constructing phylogenetic trees using different algorithms
	SLO-2	Transcription, translation, and reverse complement	Multiple sequence alignment methods	Calculating evolutionary distances and branch support	Integration of Biopython with machine learning libraries (e.g., scikit-learn)	Calculating evolutionary distances and branch support
S-9-12	SLO-1	creating reverse_complement sequence	GC Content prediction	Transcription	Translation	Bio.AlignIO
S-13	SLO-1	File Format Handling	Handling alignment files and formats	Database Access	Customizing Biopython functionalities and creating extensions	Handling alignment files and formats
	SLO-2	Reading and writing FASTA files	Analyzing and visualizing sequence alignments	Accessing NCBI's Entrez utilities for database queries	Accessing NCBI's Entrez utilities for database queries	Analyzing and visualizing sequence alignments
S-14	SLO-1	Parsing GenBank and other sequence-related file formats	Protein Structure Analysis	Retrieving data from online biological databases (e.g., UniProt, KEGG)	Retrieving data from online biological databases (e.g., UniProt, KEGG)	Protein Structure Analysis
	SLO-2	Parsing PDB files for protein structures,Working with BLAST output files	Parsing and analyzing PDB files	Parsing and analyzing data obtained fromdatabases	Parsing and analyzing data obtained fromdatabases	Parsing and analyzing PDB files
S-15-18	SLO-1	Pairwise Alignments	Clustal Alignments	Bio import motifs	Creating Simple DNA Motif	Creating a Sequence Log

Learning Resources	**1.** Biopython Tutorial and Cookbook , Jeff Chang, Brad Chapman, Iddo Friedberg, Thomas Hamelryck,Michiel de Hoon, Peter Cock, Tiago Antao, Eric Talevich, Bartek Wilczy´nsk **2.** ttps://biopython.org/wiki/Documentation

Learning Assessment

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

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr. Vidhya VG, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23D07T	Course Name	HUMAN PHYSIOLOGY	Course Category	D	Discipline Specific Elective Course	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Understand about blood and its components
CLR-2 :	Gain knowledge on digestive system
CLR-3 :	Gain knowledge on excretory and cardiovascular system
CLR-4 :	Understand about respiratory and nervous system
CLR-5 :	Gain knowledge on reproductive system and endocrine glands

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)												
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	
		Level of Thinking(Bloom)	Expected Proficiency(%)	Expected Attainment(%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication ofcomplex biotechnological ideas	Independent andlifelong learning	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	
CLO-1 :	Learn about the structure and functions of RBC, WBC, and platelets	1	85	80	H	L	L	-	-	L	H	-	-	-	-	M	
CLO-2 :	Understand the process of digestion	2	80	75	H	M	L	-	-	L	H	-	-	-	-	M	
CLO-3 :	Learn about the anatomy of the heart	1	85	80	H	M	M	-	-	H	L	-	-	-	-	M	
CLO-4 :	Learn about the functioning of the brain and spinal cord	2	80	75	H	M	L	-	-	H	M	-	-	-	-	H	
CLO-5 :	Understand about hormones and its functions	1	80	75	H	L	M	-	-	H	H	-	-	-	-	H	

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Human physiology - overview	Introduction to digestive system	Introduction to excretory system	Introduction to respiratory system	Introduction to reproductive system
S-2	SLO-1	Cellular physiology - Introduction	Salivary gland	Excretory system - organization	Anatomy of respiratory tract	Reproductive system
S-3	SLO-1	Cell lineages	Anatomy of stomach	Formation of urine	Mechanics of respiration	Spermatogenesis
S-4	SLO-1	Cell lineages	Anatomy of pancreas	Regulation of urine formation	Mechanics of respiration	Spermatogenesis
S-5	SLO-1	Blood components	Anatomy of small intestine	Introduction to cardiovascular system	Factors regulating respiration	Structure of ovary
S-6	SLO-1	RBC - structure	Anatomy of large intestine	Anatomy of Heart	Introduction to nervous system	Ovulation
S-7	SLO-1	RBC - functions	Anatomy of liver	Cardiac cycle	Central nervous system	Menstrual cycle
S-8	SLO-1	Erythropoiesis	Secretions in fundus	Cardiac cycle	Peripheral nervous system	Endocrine glands - Introduction
S-9	SLO-1	WBC - structure	Secretions in duodenum	Principles of circulation	Autonomic nervous system	Pituitary gland
S-10	SLO-1	WBC - functions	Secretions of pancreas	Heart rate	Structure of the neuron	Thyroid gland
S-11	SLO-1	Platelet - structure	Bile and its significance	Factors regulating heart rate	Anatomy of the brain	Parathyroid gland
S-12	SLO-1	Platelet – functions	Absorption by small intestine	Factors influencing BP	Anatomy of the spinal cord	Endocrine functions of pancreas

Learning Resources	1. "Text Book of Medical Physiology", G. K. Pal, 4th Edition, Elsevier, 2014. 2. "Textbook of Medical Physiology", Indu Khurana, 3rd Edition, Elsevier. 2018. 3. *"Text Book of Human Anatomy", T.S. Ranganathan, 5th Edition, S. Chand & Co. Ltd., 1996.*

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	40%	-	40%	-	40%	-	40%	-	40%	-
Level 2	Apply Analyze	40%	-	40%	-	40%	-	40%	-	40%	-
Level 3	Evaluate Create	20%	-	20%	-	20%	-	20%	-	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

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

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Course Code	UBT23D08T	Course Name	MEDICAL BIOTECHNOLOGY	Course Category	D	Discipline Specific Elective Courses	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

CLR-1 :	Understanding the basic concepts of medical biotechnology & drug design
CLR-2 :	Understanding the techniques used for disease diagnosis
CLR-3 :	Knowledge on ART & ACC
CLR-4 :	Knowledge on the types of vaccines
CLR-5 :	Knowledge on gene therapy & its applications

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	*To understand the applications of medical biotechnology*	1	80	70	*H*	*L*	*M*	*M*	*M*	-	-	-	-	-	-	-
CLO-2 :	*Application of techniques for the diagnosis of diseases*	1	85	75	*H*	*L*	*M*	*M*	*M*	-	-	-	-	-	-	-
CLO-3 :	*Applying knowledge to understand the use of animal cell culture*	1	75	70	*H*	*L*	*M*	*M*	*M*	-	-	-	-	-	-	-
CLO-4 :	*Understand the vaccination process and the use of various vaccines*	2	85	80	*H*	*L*	*M*	*M*	*M*	-	-	-	-	-	-	-
CLO-5 :	*Having knowledge on gene therapy and stem cell therapy*	2	85	75	*H*	*L*	*M*	*M*	*M*	-	-	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Medical Biotechnology –Introduction	Diagnosis techniques –Invasive Techniques	Assisted Reproductive technology	Introduction to Vaccines	Hybridoma Technique
S-2	SLO-1	Medical Biotechnology –Basic concepts	Diagnosis techniques – Non-Invasive Techniques	Assisted Reproductive technology	Vaccines - Formulation	Gene therapy
S-3	SLO-1	Medical Biotechnology –Basic concepts	Point-of-care Diagnosis technology andAdvancements	Pregnancy Diagnostics	Vaccines - Conventional	Gene therapy – ex vivo
S-4	SLO-1	Medical Biotechnology –Scope	Diagnosis of pathogenic microbes – Classical methods	Pregnancy Diagnostics	Vaccines - Recombinant	Gene therapy – in vivo
S-5	SLO-1	Medical Biotechnology – Applications	Diagnosis of pathogenic microbes – Modern methods	Animal cell culture	Synthetic peptide	Cell and Tissue Engineering
S-6	SLO-1	Medical Biotechnology –Applications	Introduction to Next generation Sequencing and its diagnostic applications	Animal cell culture - Media	DNA Vaccines	Stem cell therapy
S-7	SLO-1	Drug designing –Introduction	Polymerase Chain Reaction and its Diagnostic applications	Cell line development and characterization	Vaccine's administration and adverse effect monitoring	Stem cell therapy
S-8	SLO-1	Drug designing –Methods	Diagnosis using enzyme markers	Maintenance of cell lines	Vaccines preventable diseases – common target and global impact	Nanomedicines
S-9	SLO-1	Drug designing –Methods	Diagnosis using DNA markers	Cell culture quality control	Antibiotics	Pharmacogenomics and personalized medicines
S-10	SLO-1	Developmental process	Diagnosis using Protein markers	Organ culture	Antibiotics – mode of action	Bioinformatics in medical biotechnology

S-11	SLO-2	Developmental process	Immunodiagnostics	Organ culture - Applications	Antibiotics. - application	Biopharmaceutical production anddevelopment
S-12	SLO-1	Developmental process	Biosensors for disease diagnosis	Imaging and Analytical Techniques for organ culture studies	Antibiotic resistance	Challenges in Global Health Diagnostics

Learning Resources	1. *Jogdand, S. N. Medical Biotechnology, Himalaya Publishing house, Mumbai, 2005.* 2. *Trevan. "Biotechnology: The Biological Principles* 3. *B. R. and Pasternak. Molecular Biotechnology: Principle and applications ofrecombinant DNA.*

Learning Assessment

	Bloom's Levelof Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100%		100%		100%		100%		100%	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	*Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.*	Dr. Infant Santhose.B, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23D09T	Course Name	CANCER BIOLOGY	Course Category	D	Discipline Specific Elective Course	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	*Explain the complex nature of cancer and elements that causes cancer*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	*Orientation to behavioral changes in cell basic function- growth, division and death cycle*			
CLR-3 :	*Comprehensive ideology of genetics behind Cancer*			
CLR-4 :	*Explain the meddling and adaptation of cancer cell to microenvironment and its growth*			
CLR-5 :	*Push the perceptive limits and throw the lights on possible treatment for cancer*			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	Understand the important terminology in cancer and potent carcinogens	1	85	80	H	M	H	-	-	M	L	-	-	-	-	-
CLO-2 :	Have clear idea on the cell basic function	2	80	70	M	H	H	-	-	L	M	-	-	-	-	-
CLO-3 :	Understand role of genes in cell and deregulation of genes in Cancer	3	70	60	M	H	M	-	L	H	-	-	-	M	-	-
CLO-4 :	Cognize the metastasis of cancer and how its survive even at distant site	2	75	65	L	-	M	H	-	M	M	-	-	-	L	-
CLO-5 :	Understand the possible ways involved in detection and treatment of Cancer	3	80	70	M	L	-	-	-	H	M	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	*General ideology about Cancerand Properties of Cancer*	*Cell cycle: different phase, role ofCyclin and CDK*	*Cancer critical genes : Oncogenes, Tumour Suppressorgenes and Viruses_-Loss of mutation and gain of mutation*	*Cancer Invasion: Routes of transport*	*Identification and detection of cancergenes*
	SLO-2	*General ideology about Cancerand Properties of Cancer*	*Cell cycle: different phase, role ofCyclin and CDK*	*Cancer critical genes : Oncogenes,*	*Cancer Invasion: Routes of transport*	*Identification and detection of cancergenes*
S-2	SLO-1	*Origin of Cancer and its heterogeneity nature*	*Cell cycle: different phase, role ofCyclin and CDK*	*Cancer critical genes : Oncogenes,*	*Cell- Cell recognition, Cell-ECM interaction*	*Drug resistance – Drug metabolism*
	SLO-2	*Origin of Cancer and its heterogeneity nature*	*Cell cycle: different phase, role ofCyclin and CDK*	Mutation- genetic Instability -Types of DNA damage	*Cell- Cell recognition, Cell-ECM interaction*	*Drug resistance – Drug metabolism*
S-3	SLO-1	*Pathological grade, Different formsand Stages of cancer*	*Regulation of Cyclin and CDk*	Mutation- genetic Instability -Types of DNA damage	*Cell- Cell recognition, Cell-ECM interaction*	*Chemotheraphy- Alkylating agents*
	SLO-2	*Pathological grade, Different formsand Stages of cancer*	*Regulation of Cyclin and CDk*	*Loss of mutation and gain of mutation*	*Cell- Cell recognition, Cell-ECM interaction*	*Chemotheraphy- Alkylating agents*
S-4	SLO-1	*Epidemiology: Factors that influence cancer*	*Regulation of Cyclin and CDk*	*Tumour Suppressor genes : pRB*	*Adhesion molecules- Cadherins,Integrins in Cancer*	*Chemotheraphy- Alkylating agents*
	SLO-2	*Epidemiology: Factors that influence cancer*	*Regulation of Cyclin and CDk*	*Tumour Suppressor genes : pRB*	*Adhesion molecules- Cadherins,Integrins in Cancer*	*Chemotheraphy- Alkylating agents*

S-5	SLO-1	*Epidemiology: Factors that influence cancer*	*Checkpoints G1/S, G2/M and M-phase*	*Tumour Suppressor genes : p53*	*Adhesion molecules- Cadherins,Integrins in Cancer*	*Chemotheraphy- Anti-metabolitesagents*
	SLO-2	*Epidemiology: Factors that influence cancer*	*Checkpoints G1/S, G2/M and M-phase*	*Tumour Suppressor genes : p53*	*Adhesion molecules- Cadherins,Integrins in Cancer*	*Chemotheraphy- Anti-metabolitesagents*
S-6	SLO-1	Pathology in Oncology	*Checkpoints G1/S, G2/M and M-phase*	*Proto-oncogene and mutation thatconvert to oncogene*	*Proteolytic enzymes in Cancer*	*Natural products as Inhibitors*
	SLO-2	Pathology in Oncology	*Checkpoints G1/S, G2/M and M-phase*	*Proto-oncogene and mutation thatconvert to oncogene*	*Proteolytic enzymes in Cancer*	*Natural products as Inhibitors*
S-7	SLO-1	Pathology in Oncology	*DNA damage regulation*	*Proto-oncogene in growth factorand altered behavior in cancer*	*Proteolytic enzymes in Cancer*	*Radiotherapy*
	SLO-2	Pathology in Oncology	*DNA damage regulation*	*Proto-oncogene in growth factorand altered behavior in cancer*	*Proteolytic enzymes in Cancer*	*Radiotherapy*
S-8	SLO-1	*Carcinogens: Physical andChemical carcinogens*	*DNA damage regulation*	*Proto- oncogene in Growth factor receptor: RTK and dysfunction ofRTK in Cancer*	*Three step invasion process*	*Hormone therapy*
	SLO-2	*Carcinogens: Physical andChemical carcinogens*	*DNA damage regulation*	*Proto- oncogene in Growth factorreceptor: RTK and dysfunction of RTK in Cancer*	*Three step invasion process*	*Hormone therapy*
S-9	SLO-1	*Carcinogens: Physical andChemical carcinogens*	*Apoptosis- Intrinsic and extrinsicpathway*	*Altered pathway :Receptor kinases pathway :RAS-RAF-MEK-ERK-MAPK*	*Metastatic cascade*	*Immunotherapy*
	SLO-2	*Carcinogens: Physical andChemical carcinogens*	*Apoptosis- Intrinsic and extrinsicpathway*	*Altered pathway :Receptor kinases pathway :RAS-RAF-MEK-ERK-MAPK*	*Metastatic cascade*	*Immunotherapy*
S-10	SLO-1	*Types of Chemical carcinogens:Direct and indirect carcinogens*	*Apoptosis- Intrinsic and extrinsicpathway*	*Altered Kinase signaling pathway: PI-3K-PDK1-PKB Pathway*	*Metastatic cascade*	*Photodynamic therapy*
	SLO-2	*Types of Chemical carcinogens:Direct and indirect carcinogens*	*Apoptosis- Intrinsic and extrinsicpathway*	*Altered Kinase signaling pathway: PI-3K-PDK1-PKB Pathway*	*Metastatic cascade*	*Photodynamic therapy*
S-11	SLO-2	*Types of Chemical carcinogens:Direct and indirect carcinogens*	*Defects of the apoptosis machinery incancer cells*	*Viral Oncogenesis and types ofvirus that cause cancer*	*Growth at secondary site- Tumor angiogenesis and lymphagenesis*	*Gene therapy*
	SLO-2	*Types of Chemical carcinogens:Direct and indirect carcinogens*	*Defects of the apoptosis machinery incancer cells*	*Viral Oncogenesis and types ofvirus that cause cancer*	*Growth at secondary site- Tumor angiogenesis and lymphagenesis*	*Gene therapy*
S-12	SLO-1	*Other factors that influence cancer*	*Defects of the apoptosis machinery incancer cells*	*Different ways by which Viruscause Cancer in host cell*	*Cancer Screening: Biomarkers*	REVISION
	SLO-2	*Other factors that influence cancer*	*Defects of the apoptosis machinery in*	*Different ways by which Virus*	*Cancer Screening: Biomarkers*	MODEL EXAM
			cancer cells	*cause Cancer in host cell*		

Learning Resources

1. King R.J.B., *Cancer Biology*, Addision Wesley Longmann Ltd, U.K., 1996
2. Maly B.W.J., *Virology a practical approach*, IRL press, Oxford, 1987.
3. Dunmock.N.J and Primrose S.B., *Introduction to modern Virology*, Blackwell Scientific Publications.
4. Ruddon.R.W., *Cancer Biology*, Oxford University Press, Oxford, 1995.

Learning Assessment											
	Bloom's Levelof Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr.Arumugam Perumal, Director ARMATS BIOTEK Training and Research Institute, Chennai	Dr. N. Banu, Assistant Professor, Department of Botany, Bharathi Womens College, Chennai.	Dr.G. Swamynathan, Assistant Professor, Dept. of Biotechnology, FSH, SRMIST, KTR

Course Code	UBT23D10T	Course Name	DIAGNOSTIC TOOLS	Course Category	D	Discipline Specific Elective Courses	L	T	P	O	C
							4	0	0	2	4

Pre-requisiteCourses	Nil	Co-requisiteCourses	Nil	ProgressiveCourses	Nil
Course Offering Department	Biotechnology	Data Book / Codes/Standards		Nil	

Course Learning Rationale(CLR):	The purpose of learning this course is to
CLR-1 :	Understanding the scope and significance of diagnostic products
CLR-2 :	Knowledge on ELISA and other disease diagnostics
CLR-3 :	Know how diagnosis of heart is performed
CLR-4 :	Keeping up to date with cancer diagnosis
CLR-5 :	Importance of biomarkers in the current scenario of diagnosis

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning: Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	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	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	To understand the scope, significance of diagnostic industry and basic diagnostics	1	75	70	H			L								
CLO-2 :	To use ELISA and Spectrometry as a diagnostic tool	2	75	70		H		M								H
CLO-3 :	medical tests to diagnose heart conditions	2	75	70		H		H								H
CLO-4 :	Having knowledge on Cancer diagnosis and its applications	2	75	70		H		H		H						H
CLO-5 :	Introductory knowledge to use biomarkers in diagnostics	1	75	70	H			H			H					H

		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
Duration (hour)		12	12	12	12	12
S-1	SLO-1	Diagnostic industry - introduction	ELISA	*medical tests to diagnose heartconditions*	*Introduction to Cancer diagnosis- Physical, laboratory, Imaging, Biopsy*	*Biomarker*
S-2	SLO-1	Diagnostic industry – scope	ELISA for Infection detection andQuantification	*Blood tests*	*Lab tests used in cancer diagnosis*	Diagnosing diseases or predictingrisks of disease
S-3	SLO-1	Diagnostic industry - significance	ELISA for Immunological assays	*Electrocardiogram (ECG)*	*Lab tests used in cancer diagnosis*	*ABO biomarker*
S 4	SLO-1	Enzyme assays- Invasive	UV spectrophometer applications indiagnostics	*How to read ECG Demo Virtual class*	*Types of biopsy procedures used todiagnose cancer-Needle & Endoscopy*	*cytogenetic and molecular genetic biomarkers*
S-5	SLO-1	Enzyme assays- Non – invasive	Cell staining and microscopy.	Exercise stress test	*Skin biopsy, Bone marrow biopsy*	*1. biomarker Philadelphia chromosome*
S 6	SLO-1	Blood sample analysis for diseasediagnosis	Malaria pathology and diagnostics.	Echocardiogram (ultrasound)	*Surgical biopsy, Biopsy analysis andresults*	*2. Protein C deficiency*
S-7	SLO-1	*Démonstration of drawing BloodVirtually*	Tuberculosis pathology anddiagnostics.	How is ECHO performed Demo	Introduction to diagnosis for digestivedisorders	3. EGFR Expression G6PD deficiency

S-8	SLO-1	Urine sample analysis for diseasediagnosis	HIV/AIDS pathology, diagnostics, and	Coronary angiogram- Demo class (Virtual)	Lab tests- Fecal occult blood test &Stool culture	Biomarkers in clinical trialsand drug discovery
S-9	SLO-1	*Démonstration of Urine analysisVirtually*	HIV/AIDS disease monitoring	Coronary computed tomography angiogram (CCTA)	Imaging tests- Barium beefsteak mealvirtual demo	Examples/case studies
S-10	SLO-1	Blood/sputum cultures.	HIV reporting procedures and ethicsinvolved in it	Virtual sessions for Heart conditions	Colorectal transit study	Examples/case studies
S-11	SLO-1	Principle of sphygmomanometer	General procedure for Sexuallytransmitted diseases	Virtual sessions for arterial block release	Endoscopic procedures-Colonoscopy,	Discussions
S-12	SLO-1	Blood Pressure Monitors & itsAdvancements	*Handling procedures for satety atdiagnostic centers*		Endoscopic retrograde cholangiopancreatography (ERCP)	Discussions
S-13	SLO-1				Capsule endoscopy, Gastricmanometry	

Learning Resources	1. Dr. Rajneesh Prajapat, Textbook Medical Diagnostics: 2. Hem Raj. Vinesh Medical Diagnostic (Skill Enhancement Course) 3. Maxine A. Papadakis, Stephen J. McPhee, Michael W. Rabow, Kenneth R. McQuaid. Current Medical Diagnosis & Treatment 2022

Learning Assessment

Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination(50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	40%	-	40%	-	40%	-	40%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	20%	-	20%	-	20%	-	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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Course Code	UBT23G07T	Course Name	DISEASE MANAGEMENT	Cours Category	D	Discipline Specific Elective Courses	L	T	P	O	C
							4	0	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Understanding the basic concepts of Health			
CLR-2 :	Understanding about the communicable diseases			
CLR-3 :	Knowledge on Occupational health hazards			
CLR-4 :	Knowledge on the Management of Infectious Diseases			
CLR-5 :	Knowledge on the health indicators			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	independent and lifelong learning	PSO - 1	PSO - 2	PSO – 3	PSO-4	PSO-5
CLO-1 :	*To know about the good healthy habits*	1	75	70	H				L		H					
CLO-2 :	*Preventive measures for Communicable diseases*	1	75	70	H	M	M	H	L							
CLO-3 :	*To Ensure safety in the working environment*	1	75	70	H			H								
CLO-4 :	*To know about the control of Infectious diseases*	1	75	70	H		M									
CLO-5 :	*Having knowledge on situation of health in India*	1	75	70	H			M			H					

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Basic concepts and Definition	Communicable diseases	Occupational Health and Safety	Disease: Introduction	Health and Disease
S-2	SLO-1	Need for good health	Mode of disease transmission	Occupational health hazards	Principles of disease control	Basic concepts and Definition
S-3	SLO-1	Factors affecting health	Epidemic diseases	Physical hazards	Infection	Disease control
S-4	SLO-1	Basic sanitation	Endemic diseases	Chemical hazards	Portal of entry of Infection	Levels of Prevention
S-5	SLO-1	Personal hygiene	Vaccination	Biological hazards	Types of diseases	Determinants of health
S-6	SLO-1	Balanced diet	Management of Hygiene in public places	Occupational diseases	Deficiency diseases	Indicators of health
S-7	SLO-1	Food habits	Hygiene in Railwaystations	Prevention of occupational diseases	Infectious diseases	Health situation in India
S-8	SLO-1	Cleanliness	Hygiene in Bus stands	Control of occupational diseases	Pollution diseases	Advancement of health aids in India
S-9	SLO-1	Food adulterants	Hygiene in other public places	Health protection measures for workers	Microbial flora of human	International bodies in health protectionand promotion
S-10	SLO-1	Avoiding smoking	Hospitals – Nosocomial	Health education	Host - Parasite relationship	Role of quarantine Rules and Laws in health
S-11	SLO-2	Drugs	Hospital acquired infections	First aid	Management of communicable diseases	Enforcement in the preventive measuresof pandemic diseases
S-12	SLO-1	Alcohol	Hygiene in educational institutions	Management of medical emergencies	Management of Non communicablediseases	Revision

Learning Resources	1. *Robbin, Cotran and Kumar .,"Robbin's Textbook of Pathology" 6th edition, Elsevier publisher, 2013.* 2. Ananantanarayan, R. and Paniker, C.J.K "Textbook of Microbiology" 8th edition. Universities Press, Orient Blackswan, 2005. 3. *Roger Detels, Robert Beaglehole, Mary Ann Lansang, Martin Gulliford., "Oxford Textbook of Public Health", 5th edition. Oxford press, 2011* 4. *Park K, "Textbook of Preventive & Social Medicine" 22nd edition, Banarsidas Bhanot publishers, 2013.*

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	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100%		100%		100%		100%		100%	

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Course Code	UBT23P06L	Course Name	Project Phase-II	Course Category	P	Internships/ Project Work	L	T	P	O	C
							0	0	12	2	6

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

Course Learning Rationale(CLR):	The purpose of learning this course is to,	Learning

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To test the ability to identify research gap			
CLR-2 :	To test the ability to idetify the problem			
CLR-3 :	To test the ability to devise a plan of study			
CLR-4 :	To teach how to determine the methodology			
CLR-5 :	To test the practical knowledge			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Knowledge on reading the review of literature*	3	75	70
CLO-2 :	*Knowledge on problem solving methods*	3	75	70
CLO-3 :	*Knowledge on devising methodologies*	3	75	70
CLO-4 :	*Hands- on knowledge on various techniques*	3	75	70
CLO-5 :	*Knowlwdge to interpret the results*	3	75	70

Program Learning Outcomes (PLO)

1	2	3	4	5	6	7	8	9	10	11	12
Fundamental Knowledge	Analyze, Interpret Data	Reasoning ability	Ethical Practices	Team Work	Communication of complex biotechnological ideas	Independent and lifelong learning	PSO -1	PSO -2	PSO – 3	PSO-4	PSO-5

Learning Assessment								
	Continuous Learning Assessment(50% weightage)				Final Evaluation(50% weightage)			
	Seminar	Review – 3			Dissertation	Presentation	Research Outcome**	Viva-Voce
		Overview of the Dissertation	Research findings	Oral Presentation andInteraction				
Project Work	10%	10%	20%	10%	20%	10%	10%	10%
Total	50%				50%			