

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(An Autonomous College)

Affiliated to Periyar University, Salem | Accredited by NAAC with 'A' Grade
Recognized by UGC under Section 2(f) & 12 (B)



ESTD-1994

**MUTHAYAMMAL
COLLEGE OF ARTS
AND SCIENCE**
(Autonomous)

A UNIT OF VANETRA GROUP

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DEGREE OF BACHELOR OF SCIENCE

Learning Outcomes - Based Curriculum Framework
- Choice Based Credit System

Syllabus for B.Sc., Biotechnology (Semester Pattern)

(For Candidates admitted from the academic year
2021 -2022 and onwards)

VISION

To redefine the scope of higher education by infusing into each of our pursuits, initiatives that will encourage intellectual, emotional, social and spiritual growth, thereby nurturing a generation of committed, knowledgeable and socially responsible citizens.

MISSION

- To Ensure State of the world learning experience
- To espouse value based Education
- To empower rural education
- To instill the spirit of entrepreneurship and enterprise
- To create a resource pool of socially responsible world citizens

DEPARTMENT OF BIOTECHNOLOGY

VISION

Provide job oriented, value based biotechnological education and to enable them for getting placements

MISSION

- To develop their knowledge to pursue higher education.
- To encourage research activities.
- To promote biotech education in to various application oriented disciplines.
- To make an awareness about of literacy, unity and equality.
- To develop the job oriented curriculum

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- PEO1:** Graduates will be able to promote learning environment to meet the industry expectation.
- PEO2:** Graduates will be incorporated the critical thinking with good Communication and Leadership skills to become a self-employed
- PEO3:** Graduates will be upholding the human values and environmental sustenance for the betterment of the society.

GRADUATE ATTRIBUTES

The Graduate attributes of B.Sc., Biotechnology are

- GA 1:** Analytical Reasoning
- GA 2:** Critical Thinking
- GA 3:** Problem Solving Skills
- GA 4:** Communication Skills
- GA 5:** Leadership Quality
- GA 6:** Team work
- GA 7:** Lifelong Learning

PROGRAMME OUTCOMES (POs)

- PO1:** Graduates will acquire dynamic skills through proper perception of the course objectives that leads to scientific and analytical comprehension of the concepts;
- PO2:** Graduates will focus on sustainable goals that might bring about spherical developments
- PO3:** Graduates will infuse a spirit converging on bricking a team work, interpersonal and administrative skills to think critically and execute effectively
- PO4:** Graduates will apply reasoning appropriately to scale the humps in learning and solute them to the core.
- PO5:** Graduates will engage the skills obtained in independent and collaborative learning as a perennal process.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Upon completion of the program,

- PSO1:** Graduates understand the basic concepts of Biotechnology and its applications on different living systems like microbes, animals and plants.
- PSO2:** Graduates should be able to embark upon research and develop new eco-friendly sustainable technologies in the domain of biotechnology, which can contribute to the hale and healthy environment and society.
- PSO3:** Graduates obtain knowledge and skill to get opportunities in industry, research institutions, academics, government organizations and entrepreneurship development.
- PSO4:** Develop problem solving ability by utilizing the conceptual knowledge, analytical techniques, computational thinking and statistical approaches
- PSO5:** Biotechnology courses to evaluate the real-life problems and develop a sense of social, ethical, environmental and professional responsibility

S.No.	Study Components	Part	Sem I		Sem II		Sem III		Sem IV		Sem V		Sem VI		No. of Paper	Total Credit
			No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit		
1	LANGUAGE - I	I	1	3	1	3	1	3	1	3					4	12
2	LANGUAGE - II	II	1	3	1	3	1	3	1	3					4	12
3	DISCIPLINE SPECIFIC COURSE(DSC)-THEORY	III	1	4	1	4	1	4	1	4	2	10	2	9	8	35
4	DSC - PRACTICAL	III	1	2	1	2	1	2	1	2	2	4	2	4	8	16
5	GENERIC ELECTIVE COURSES(GEC)- THEORY	III	1	4	1	4	1	4	1	3					4	15
6	GEC PRACTICAL	III			1	3			1	2					2	5
7	DISCIPLINE SPECIFIC ELECTIVE COURSES(DSE)	III									2	8	2	8	4	16
8	PROJECT WORK	III											1	4	1	4
9	INTERNSHIP	III							1	2					1	2
10	ONLINE - COMPETITIVE EXAMINATION	III											1	2	1	2
11	SKILL ENHANCEMENT COURSES(SEC)-SBEC	IV			1	2	1	2	1	2	1	2			4	8
12	NON MAJOR ELECTIVE COURSES(NMEC)	IV					1	2	1	2					2	4
13	PROFESSIONAL ENGLISH	IV	1	2	1	2									2	4
14	ABILITY ENHANCEMENT COMPULSORY COURSES(AECC)-EVS	IV			1	2									1	2
15	ABILITY ENHANCEMENT COMPULSORY COURSES(AECC)- VALUE EDUCATION - YOGA	IV	1	2											1	2
16	EXTENSION ACTIVITY	V											1	1	1	1
Cumulative Credits			7	20	9	25	7	20	9	23	7	24	9	28	48	140

Total No. of Subjects	48
Marks	4300

PART	No. of Credits
PART - I	12
PART - II	12
PART - III	95
PART - IV	20
PART - V	1
Grand Total	140

Extra Credit	2
	142

P.S. Mahalingam
HEAD
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Tamilnadu, India

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NAMAKKAL DISTRICT.



MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE(Autonomous) - Rasipuram - 637 408

Scheme of Examinations LOCF-CBCS Pattern

(for the Students Admitted from the Academic Year:2021-2022 Onwards)

Programme : B.Sc.BIOTECHNOLOGY

S.No.	PART	STUDY COMPONENTS	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
					Lect.	Lab.		CIA	ESE	TOTAL
SEMESTER - I										
1	I	LANGUAGE-I	21M1UFTA01	TAMIL-I	5	-	3	25	75	100
2	II	LANGUAGE-II	21M1UCEN01	COMMUNICATIVE ENGLISH-I	5	-	3	25	75	100
3	III	DSC THEORY - I	21M1UBTC01	CELL BIOLOGY	5	-	4	25	75	100
4	III	GEC THEORY - I	21M1UBCA01	ALLIED-BIOCHEMISTRY I	4	-	4	25	75	100
5	III	DSC PRACTICAL - I	21M1UBTP01	PRACTICAL: CELL BIOLOGY	-	3	2	40	60	100
6	IV	GEC PRACTICAL - I	21M2UBCAP1	PRACTICAL : ALLIED BIOCHEMISTRY	-	3				
7	IV	AECC - VALUE EDUCATION	21M1UVED01	YOGA	1		2	100		
8	IV	PROFESSIONAL ENGLISH - I	21M1UPEL01	PROFESSIONAL ENGLISH FOR LIFE SCIENCES - I	4		2	25	75	100
				TOTAL	24	6	20	265	435	600
SEMESTER - II										
1	I	LANGUAGE - I	21M2UFTA02	TAMIL-II	5	-	3	25	75	100
2	II	LANGUAGE - II	21M2UCEN02	COMMUNICATIVE ENGLISH - II	5	-	3	25	75	100
3	III	DSC THEORY - II	21M2UBTC02	GENETICS	4	-	4	25	75	100
4	III	GEC THEORY - II	21M2UBCA02	ALLIED-BIOCHEMISTRY II	4	-	4	25	75	100
5	III	DSC PRACTICAL - II	21M2UBTP02	PRACTICAL : GENETICS	-	3	2	40	60	100
6	III	GEC PRACTICAL - I	21M2UBCAP1	PRACTICAL : ALLIED-BIOCHEMISTRY	-	3	3	40	60	100
7	IV	SEC THEORY- I	21M2UBTS01	BIOINSTRUMENTATION	1	-	2	25	75	100
8	IV	AECC - ENVIRONMENTAL STUDIES	21M2UEVS01	ENVIRONMENTAL STUDIES	1	-	2	100		
9	IV	PROFESSIONAL ENGLISH - II	21M2UPEL02	PROFESSIONAL ENGLISH FOR LIFE SCIENCES - II	4	-	2	25	75	100
				TOTAL	24	6	25	330	570	800
SEMESTER - III										
1	I	LANGUAGE - I	21M3UFTA03	TAMIL-III	5	-	3	25	75	100
2	II	LANGUAGE - II	21M3UCEN03	COMMUNICATIVE ENGLISH - III	5	-	3	25	75	100
3	III	DSC THEORY - III	21M3UBTC03	MICROBIOLOGY	6	-	4	25	75	100
4	III	GEC THEORY - III	21M3USTA05	ALLIED: BIostatISTICS	5	-	4	25	75	100
3	III	DSC PRACTICAL - III	21M3UBTP03	PRACTICAL: MICROBIOLOGY		3	2	40	60	100
6	IV	SEC THEORY - II	21M3UBTS02	MUSHROOM TECHNOLOGY	3		2	25	75	100
7	IV	NMEC - I	21M3UBCN01	FUNDAMENTALS OF HUMAN PHYSIOLOGY	3	-	2	25	75	100
				TOTAL	27	3	20	190	510	700



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S.No.	PART	STUDY COMPONENTS	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
					Lect.	Lab.		CIA	ESE	TOTAL
SEMESTER - IV										
1	I	LANGUAGE - I	21M4UFTA04	TAMIL-IV	5	-	3	25	75	100
2	II	LANGUAGE - II	21M4UCEN04	COMMUNICATIVE ENGLISH - IV	5	-	3	25	75	100
3	III	DSC THEORY - IV	21M4UBTC04	MOLECULAR BIOLOGY	5		4	25	75	100
4	III	GEC THEORY - IV	21M4UCSA05	ALLIED - COMPUTER APPLICATIONS IN BIOLOGY	4	-	3	25	75	100
5	III	DSC PRACTICAL - IV	21M4UBTP04	PRACTICAL : MOLECULAR BIOLOGY	-	3	2	40	60	100
6	III	GEC PRACTICAL - II	21M4UCSAP5	PRACTICAL : ALLIED - OFFICE AUTOMATION	-	3	2	40	60	100
7	IV	SEC THEORY - III	21M4UBTS03	MEDICAL LABORATORY TECHNIQUES	3		2	25	75	100
8	IV	NMEC - II	21M4UBCN02	BIOCHEMISTRY IN DIAGNOSIS	2	-	2	25	75	100
				TOTAL	24	6	21	230	570	800
SEMESTER - V										
1	III	DSC THEORY - V	21M5UBTC05	GENETIC ENGINEERING	6		5	25	75	100
2	III	DSC THEORY - VI	21M5UBTC06	PLANT BIOTECHNOLOGY	6		5	25	75	100
3	III	DSC PRACTICAL - V	21M5UBTP05	PRACTICAL: GENETIC ENGINEERING AND PLANT BIOTECHNOLOGY		3	2	40	60	100
4	III	DSC PRACTICAL - VI	21M5UBTP06	PRACTICAL: IMMUNOLOGY, NANOBIOTECHNOLOGY AND BIOINFORMATICS		3	2	40	60	100
5	III	DSE - I	21M5UBTE01	IMMUNOLOGY	5	-	4	25	75	100
6	III	DSE - II	21M5UBTE02	NANOBIOTECHNOLOGY AND BIOINFORMATICS	5	-	4	25	75	100
7	IV	SEC - IV	21M5UBTS04	ALGAL BIOTECHNOLOGY	2		2	25	75	100
8	III	INTERNSHIP	21M5UBTIS1	INTERNSHIP						
				TOTAL	24	6	24	205	495	700



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Scheme of Examinations LOCF-CBCS Pattern

(for the Students Admitted from the Academic Year:2021-2022 Onwards)

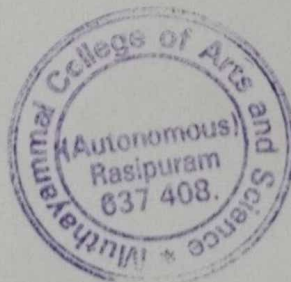
Programme : B.Sc.BIOTECHNOLOGY

S.No.	PART	STUDY COMPONENTS	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
					Lect.	Lab.		CIA	ESE	TOTAL
SEMESTER - VI										
1	III	DSC THEORY - VII	21M6UBTC07	ANIMAL BIOTECHNOLOGY	5		5	25	75	100
2	III	DSC THEORY - VIII	21M6UBTC08	ENVIRONMENTAL BIOTECHNOLOGY	5		5	25	75	100
3	III	DSE - III	21M6UBTE03	PROTEOMICS AND GENOMICS	5	-	4	25	75	100
4	III	DSE - IV	21M6UBTE04	BIOPROCESS TECHNOLOGY	4	-	4	25	75	100
5	III	DSC PRACTICAL - VII	21M6UBCP07	PRACTICAL: ENVIRONMENTAL BIOTECHNOLOGY AND ANIMAL BIOTECHNOLOGY		3	2	40	60	100
6	III	DSC PRACTICAL - VIII	21M6UBTP08	PRACTICAL: PROTEOMICS, GENOMICS AND BIOPROCESS TECHNOLOGY		3	2	40	60	100
7	III	PROJECT WORK	21M6UBTPR1	PROJECT WORK	3	-	5	40	60	100
8	III	ONLINE - COMPETITIVE EXAMINATION	21M6UBTOE1	COMPETITIVE ONLINE EXAMINATION IN OBJECTIVE BIOTECHNOLOGY	-	-	2	100		100
9	V	EXTENSION ACTIVITY	21M6UEXA01	EXTENSION ACTIVITY		-	1	100		
10		NAAN MUDHALVAN		MEDICAL CODING		-				
				TOTAL	22	6	30	420	480	800
				OVERALL TOTAL	145	33	140	1640	3060	4400
		EXTRA CREDIT COURSE	21M6UBTEC1	MOOC Courses offered in SWAYAM / NPTEL	-	-	2	-	-	-
		VALUE ADDED COURSE		AZOLLA AND SPIRULINA CULTIVATION			2			

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List of Elective Course(DSE) Details for B.Sc.,Biotechnology
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2021-2022 Onwards

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	V	21M5UBTE01	IMMUNOLOGY
2	V	21M5UBTE02	NANOBIOTECHNOLOGY AND BIOINFORMATICS
3	VI	21M6UBTE03	PROTEOMICS AND GENOMICS
4	VI	21M6UBTE04	BIOPROCESS TECHNOLOGY
5	V	21M5UBTE05	PHARMACEUTICAL BIOTECHNOLOGY
6	VI	21M6UBTE06	FOOD BIOTECHNOLOGY

List of Skill Based Elective Course (SEC) for B.Sc.,Biotechnology
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2021-2022 Onwards

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	II	21M3UBTS01	BIOINSTRUMENTATION
2	III	21M4UBTS02	MUSHROOM TECHNOLOGY
3	IV	21M5UBTS03	MEDICAL LABORATORY TECHNIQUES
4	V	21M5UBTS04	ALGAL BIOTECHNOLOGY
5		21M5UBTS05	DRUG DESIGNING
6		21M5UBTS06	VERMITECHNOLOGY



UG-REGULATION

1. Internal Examination Marks- Theory

Components	Marks
CIA I&II	15
Attendance	5
Assignment	5
Total	25

Attendance Percentage	Marks
96 %to 100%	5
91%to 95%	4
86%to 90%	3
81%to 85%	2
75%to 80%	1
Below 75%	0

2. QUESTIONPAPERPATTERNFORCIA I,II AND ESE(3HOURS) **MAXIMUM:75Marks**

SECTION-A (10 Marks) (Objective Type)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks

(10 x1=10 marks)

SECTION-B(10 Marks)(Short Answer)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks

(5 x 2 = 10 marks)

SECTION-C (25 Marks)(Either or Type)

Answer any **FIVE** questions

ALL Questions Carry **EQUAL** Marks Either or Type.

(5 x 5 = 25 marks)

SECTION-D (30 Marks) (Analytical Type)

Answer any **THREE** Questions out of **FIVE** questions

ALL Questions Carry **EQUAL** Marks

(3 x 10 = 30 marks)

(Syllabus for CIA-I 2.5 Unit ,Syllabus for CIA-II All 5 Unit)

2. a) Components for Practical CIA.

Components	Mark s
CIA -I	15
CIA - II	15
Observation Note	5
Attendance	5
Total	40

2. b) Components for Practical ESE.

Components	Marks
Completion of Experiments	50
Record	5
Viva	5
Total	60

3. Guidelines for Value Education Yoga and Environmental Studies (Part IV)

- The Course Value Education Yoga is to be treated as 100% CIA course which is offered in I Semester for I year UG students.
- The Course Environmental Studies is to be treated as 100% CIA course which is offered in II Semester for I year UG students.
- Total Marks for the Course=100

Components	Marks
Two Tests(2 x30)	60
Field visit and report (10+10)	20
Two assignments (2 x10)	20
Total	100

The passing minimum for this course is 40%

- In case, the candidate fails to secure 40% passing minimum, he/she may have to reappear for the same in the subsequent odd/even semesters.

4. Guidelines for Extension Activity (Part V)

- At least two activities should be conducted within semester consisting of two days each.
- The activities may be Educating Rural Children, Unemployed Graduates, Self Help Group etc.

The marks may be awarded as follows

No of Activities	Marks
2 x50 (Each Activity for two days)	100

5. Internship/Industrial Training, Mini Project and Major Project Work

Internship/Industrial Training		Mini Project	Major Project Work	
Components	Marks	Marks	Components	Marks
CIA* ²			CIA	
Work Diary	25	-	a) Attendance 10 Marks	
Report	50	50	b) Review /Work Diary* ¹	30 Marks
Viva-voce Examination	25	50		40
Total	100	100	ESE*²	
			a) Final Report 40Marks	
			b) Viva-voce 20Marks	60
			Total	100

*¹ Review is for Individual Project and Work Diary is for Group Projects (Group consisting of minimum 3 and maximum 5)

*² Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

6. Guidelines for Competitive Exams- Online Mode(Part III)- Online Exam 3 hours

Components	Marks
100 Objective Type Questions 100*1=100 Marks	100

Objective type Questions from Question Bank.

- The passing minimum for this paper is 40%
- In case, the candidate fails to secure 40% passing minimum, he/she may have to reappear for the same in the subsequent semesters.

B.Sc., - Biotechnology LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1UBT C01	CELL BIOLOGY	DSC THEORY - I	I	5	5			4
Objective	Student will be able to understand the structures and fundamental components of prokaryotic and eukaryotic cells.							
Unit	Course Content						Knowledge Levels	Sessions
I	Cell as a basic unit, Cell theory, Cell size and Shape, Prokaryotic and Eukaryotic organization, Structural comparison of microbial, plant and animal cells						K1	12
II	Cell wall and Membrane: Plasma membrane-Model of plasma membrane, fluidity of membranes, membrane proteins and their functions; Transport across the membrane Selective permeability of membranes; Cell adhesion; Cell junction.						K2	10
III	Structure and functions of cell organelle; Mitochondria, chloroplast, Endoplasmic reticulum, Golgi Complex, Lysosomes, Ribosomes, Peroxisomes, Glyoxisomes, Vacuoles, centrioles, cytosols, Microtubules and Microfilaments.						K2	10
IV	Cell cycle and Cell Signaling: Cell division, Cell cycle, Mitosis, Meiosis, Cell signaling, G protein receptors, Cell membrane traffic, Cellular senescence and Apoptosis.						K3	12
V	Specialized cells, Motile cells (Amoeboid, Ciliary, Flagella Movements, Nerve cells and Nerve impulse conduction, Muscle cells and Muscle contraction, Plant cells (Parenchyma cells, Xylem and Phloem Cells)						K3	11
Course Outcome	After completion of the course, students should be able to							
	CO1: Remember the model of a cell and Differentiate the structure of the prokaryotic and eukaryotic cell.						K1	
	CO2: Understand the structure and function of prokaryotic and eukaryotic cell membrane.						K2	
	CO3: Demonstrate the organization of cell organelles.						K2	
	CO4: Compare and contrast the events of cell cycle and its regulation.						K3	
	CO5: Distinguish the structure and function of specialized cells.						K3	
Learning Resources								
Text Books	1. Ajoy Paul., (2011) Text Book of Cell and Molecular Biology-Books and Allied (P) Ltd, Kolkata, 3rd Edition. 2. P.S.Verma & V.K. Agarwal, (2004) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand Publishing Company Pvt Ltd, New Delhi.							
Reference Books	1. Gerald Karp., (2004) Cell and Molecular Biology Concepts and Experiments-4TH Edition, John Wiley & Sons. 2. De Robertis., (2017) Cell Biology, Blaze Publishers and Distributors Pvt .Ltd., New Delhi 3. Sharp., Fundamentals of Cytology, McGraw Hill Company							
Website Link	1. https://mcb.berkeley.edu/courses/mcb110spring/nogales/mcb110_s2008_4signalin g.pdf 2. https://opentextbc.ca/biology/chapter/6-2-the-cell-cycle/							
	L-Lecture	T-Tutorial	P-Practical	C-Credit				

B.Sc.,-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1UBTC01	CELL BIOLOGY	DSC THEORY - I	I	5	5			4

CO-PO Mapping

CO Number	PO 1	P02	P03	P04	P05	PSO1	PS O2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M	S	S	S	M	M
CO2	S	L	M	M	S	S	S	M	M	S
CO3	M	S	M	M	S	S	S	M	M	S
CO4	M	S	M	S	S	M	M	L	L	M
CO5	S	S	S	M	M	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	--
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive sessions 4.ppt Presentation
Assessment Methods	1.Unit test 2.Assignment 3.CIA I & II

Designed By	Verified By	Approved By
<i>D. Kavitha</i> (Dr. D. KAVITHA)	<i>M. Suresh Kumar</i> (Dr. M. SURESHKUMAR)	<i>Ar. Suresh Kumar</i>



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1UBTP01	PARACTICAL: CELL BIOLOGY	DSC PRACTICAL - I	I	3			3	2
Objective	To teach students the basic techniques and instrument principles in Cell Biology							
S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions					
1	Microscopes and its parts.	K1	3					
2	Micrometry - Stage and Ocular Micrometer.	K1	3					
3	Cell Counting - Haemocytometer.	K2	3					
4	Mounting epithelium and observing living animal and plant cells using vital staining.	K1	3					
5	Mitosis in Onion root tip squash	K3	3					
6	Meiosis in grasshopper testis / flower buds.	K3	3					
7	Preparation of Permanent Slides - Muscle cells.	K2	3					
8	Observation of Permanent Slides - Cardiac muscle, Sperm cell.	K1	3					
9	Staining of macromolecules - Carbohydrates and Lipids.	K2	3					
10	Microtomy (Demo).	K2	3					
Course Outcome	CO1: Understand the laboratory rules and regulations and its importance.	K1						
	CO2: Recognise the cells by employing different types of microscopes	K2						
	CO3: Interpret the preparation of slides	K2						
	CO4: Interpret the cell division	K3						
	CO5: Examine the cell sectioning	K3						
Learning Resources								
Text Books	1. S. Rajan, R. Selvi Christy. (2015). Experimental Procedures in Life Sciences, Anjanaa Publications.							
Reference Books	1. Jyoti Saxena, Mamta Baunthiyal and Indu Ravi, (2019). Comprehensive Laboratory Manual of Life Sciences, Scientific Publishers. 2. Keith Wilson & John Walker, (2005). Principles and techniques of practical biochemistry and molecular biology, Cambridge Publication							
Website Link	1. https://www.bjcancer.org/Sites_OldFiles/_Library/UserFiles/pdf/Cell_Biology_Laboratory_Manual.pdf 2. https://sjce.ac.in/wp-content/uploads/2018/04/Cell-Biology-Genetics-Laboratory-Manual17-18.pdf							

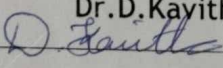
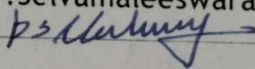
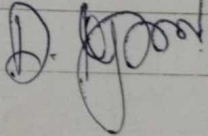
B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1UBTP01	PARACTICAL: CELL BIOLOGY	DSC PRACTICAL - I	I	3			3	2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	S	S	M	S	M	S
CO2	M	L	L	M	S	S	L	S	M	S
CO3	M	S	L	M	M	S	M	S	S	M
CO4	L	M	M	S	S	S	M	S	M	S
CO5	M	L	M	S	S	S	M	S	M	L
Level of Correlation between CO and PO				L-LOW		M-MEDIUM		S-STRONG		

Tutorial Schedule	1. Interactive Session 2. Discussion
Teaching and Learning Methods	1. Lectures 2. PPT Presentation
Assesment Methods	1. Model Practical 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Kayitha 	Dr.P.Selvamaleeswaran 	

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M2UBTCO 2	GENETICS	DSC THEORY-II	II	4	4			4
Objective	Understanding the concept and principles of genetics exchanges and Its expression in host and to provide an idea about gene regulations and its control							
Unit	Course Content	Knowledge Levels	Sessions					
I	History of Classical and Modern Genetics, Concept and organization of genetic material in bacteria, Plant and Animal, structure ,types, forms and functions of DNA and RNA. Genetic model organisms and significance (E. Coli, Arabidopsis thaliana, Coenorhabditis elegans).	K1-K3	12					
II	Mendelian inheritance, Non-Mendelian inheritance, Linkage, Crossing over, Chromosomal theory of inheritance, Sex linked and Sex limited inheritance. Natural gene transfer methods in bacteria.	K1-K2	11					
III	Fine structure of genes, Genetic code, Structural and numerical alterations of chromosome deletion, Inversion, Duplication, Translocation. Mutations -(Spontaneous and Induced), mutagens Biochemical basis of mutation.	K2	11					
IV	Ploidy -Euploidy and Aneuploidy, Inborn Genetic disorders, Inherited single gene disorders.	K1	10					
V	Cytogenetics, Human Karyotyping, Banding techniques, Human Genetic diseases, Gene therapy, Pedigree analysis.	K2-K3	11					
Course Outcome	After completion of the course, student should be able to							
	CO1: Memories an acquaintance on historical overview of microbial genetics and genetic Materials	K1						
	CO2: Comprehend the concept of replication of genetic materials	K2						
	CO3: Classify the genes and mutation	K2						
	CO4: Demonstrate the genetic exchange mechanism in microorganisms	K3						
	CO5: Sketch the Cytogenetics	K3						
Learning Resources								



Text Books	1. Ajoy Paul., 2011. Text Book of Genetics -Books and Allied (P)Ltd, Kolkata, 3rd Edition 2. Verma P.S. & Agarwal V.K., Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand Publishing.		
Reference Books	1. Leland Hartwell, Leroy Hood, Michael Goldberg, Lee Silver, Ruth Veres, Ann E. Reynolds, 1999. Genetics: From Genes to Genomes, McGraw-Hill Education 2. Peter J. Russell, 1997. Genetics (5th Edition), Benjamin-Cummings Pub Co 3. Strickberger, M.W., 1997. 4th Edition. Genetics-Printice hall 4. Alberts ., 2002. Molecular biology of the cell-Garland publications, 4th edition.		
Website Link	1. shorturl.at/irsuH 2. https://bit.ly/3cMK03V 3. https://cle.clinic/3wOOD4j		
L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Se m	Hours	L	T	P	C
21M2UBTC02	GENETICS	DSC THEORY - II	II	4	4			4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	L	L	L	S	S	M	L	M
CO2	S	M	L	M	M	S	S	M	L	M
CO3	S	S	L	M	M	S	S	S	L	M
CO4	S	S	M	M	S	S	S	S	L	M
CO5	S	S	M	M	S	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							
Tutorial Schedule	1. Interactive sessions 2. Quiz									
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation									
Assesment Methods	1. Unit test 2. Assignment 3. CIA I &									

Designed By	Verified By	Approved By
Dr.D.Kavitha <i>D. Kavitha</i>	Dr.M.Sureshkumar <i>Dr. M. Sureshkumar</i>	<i>A. h. 5</i>



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M2UBTP02	PRACTICAL: GENETICS	DSC PRACTICAL - II	II	3			30	2
Objective	To give hands on experience in Mitosis, visualize the sex chromatin under the microscope and quantification of important biological constituents of cell.							
S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions					
1	Mendel's law of genetics - Mono and Dihybrid crosses (Demo).	K1	6					
2	Rearing morphology of Drosophila (Mutant eye identification).	K2	6					
3	Observation of Genetic model organisms (Arabidopsis thaliana and Coenorhabditis elegans)- Permanent slides.	K2	3					
4	Isolation of spontaneous mutant cells.	K3	3					
5	Isolation of petite mutant yeast cell.	K3	3					
6	Identification of Barr body (Buccal epithelium smear).	K2	3					
7	Preparation of polytene chromosomes (Chironomus larvae salivary gland)- squash preparation.	K3	3					
8	Staining of DNA and RNA - Methyl green pyronin	K3	3					
Course Outcome	CO1: Understand the quantify the important biological constituents of cell.	K1						
	CO2: Analyze the sex chromatin present in different cells.	K2						
	CO3: Examine and evaluate the stages of Mitosis	K2						
	CO4: Analyze the sex chromatin present in different cells.	K3						
	CO5: Interpret the mixture of Nucleic Acids	K3						
Learning Resources								
Text Books	1. S. Rajan, R. Selvi Christy. (2015). Experimental Procedures in Life Sciences, Anjanaa Publications.							
Reference Books	1. Jyoti Saxena, Mamta Baunthiyal and Indu Ravi, (2019). Comprehensive Laboratory Manual of Life Sciences, Scientific Publishers. 2. Keith Wilson & John Walker, (2005). Principles and techniques of practical biochemistry and molecular biology, Cambridge Publication							
Website Link	1. https://bit.ly/3Bcnye3 2. https://bit.ly/3QcuY55 3. https://bit.ly/3wOVzhR							



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M2UBTP02	PARACTICAL: GENETICS	DSC PRACTICAL - II	II	3			30	2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
C01	M	M	M	S	S	S	M	S	M	S
C02	M	L	L	M	S	S	L	S	M	S
C03	M	S	L	M	M	S	M	S	S	M
C04	L	M	M	S	S	S	M	S	M	S
C05	M	L	M	S	S	S	M	S	M	L

Level of Correlation between CO and PO	L- LOW	M-MEDIUM	S- STRONG
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Tutorial Schedule	1. Interactive Session 2. Discussion
Teaching and Learning Methods	1. Lectures 2. PPT Presentation
Assesment Methods	1. Model Practical 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Kavitha <i>D. Kavitha</i>	Dr.M.Sureshkumar <i>MS</i>	<i>A. L. Sanyal</i>



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C	
21M2UBTS01	BIOINSTRUMENTATION	SEC- I	II	1	1			2	
Objective	To make the students to understand the basic principles of Bioanalytical instruments								
Unit	Course Content							Knowledge Levels	Session
I	Beer Lambert's law - Colorimeter and its applications. Spectrophotometer-Principle and its applications- Types of Spectrophotometer- UV, visible, Infrared Spectrophotometer.							K1	6
II	Principle and working of pH meter. Electrophoresis - Principle and its applications - Types of electrophoresis- Agarose Gel, SDS-PAGE and isoelectric focusing.							K2	5
III	Imaging techniques -EEG, ECG, CT SCAN, MRI SCAN, X-RAY, EMG, NMR, PET.							K3	7
IV	Centrifuge - Principle and its applications - Types of Centrifuge, Chromatography - Principle and its applications, Types- Paper, TLC, Column, Affinity and Ion-exchange.							K2	6
V	Biosensors- Principle and its applications- Electrochemical, Thermometric, Potentiometric-Optical, Piezo-electric and Amperometric Biosensors. GM Counter, Scintillation Counter, Autoradiography, Flow Cytometry. Working principle of Autoclave, Incubator and Hot air oven.							K3	6
Course Outcome	After completion of the course, student should be able to								
	CO1: Memorize the basics of Biological instrumentation.							K1	
	CO2: Describe the working principle and applications of fluorescence and radiation based techniques.							K2	
	CO3: Understand the need and applications of imaging techniques.							K3	
	CO4: Interpret Separating and Purifying the components							K2	
	CO5: Demonstrate the basics of instrumentation by analysis.							K3	
Learning Resources									
Text Books	1. Zubay.G.L,, 1993. Biochemistry, 4th Edi. WmC. Brown Publisher 2. A. Upadhyay, K. Upadhyay, and N. Nath, 2003. Biophysical Chemistry Principles . Techniques Handbook, Himalaya Publishing House								
Reference Books	1. H.V. Volkones., 2002. General Biophysics, Vol I& 2. S.Mahesh., 2003. Biophysics New Age International Private Lt 3. Ghatak, K.L., 2003. Techniques and Methods In Biology. PHI Learning Private Ltd. New Delh								
Website Link	1. https://bit.ly/3QfFXea 2. https://bit.ly/3THowGk 3. https://bit.ly/3cHEXBF								
	L-Lecture	T- Tutorial	P- Practical						C-Credit

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M2UBTS01	BIOINSTRUMENTATION	SEC-I	II	1	0			2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	L	S	S	S	M	S	S
CO2	S	M	L	M	M	S	S	M	M	S
CO3	S	M	S	M	M	S	S	M	M	S
CO4	M	L	L	L	S	S	M	S	S	S
CO5	S	M	M	L	M	S	S	M	L	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive Session 4. PPT Presentation
Assesment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Kavitha <i>D. Kavitha</i>	Dr.M.Sureshkumar <i>M. Sureshkumar</i>	<i>A. h. bany</i>

B.Sc.,-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Se m	Hours	L	T	P	C
21M3UBT03	MICROBIOLOGY	DSC THEORY - III	III	6	6	0	0	4
Objective	To understand the early developments of Microorganisms, classification and observation, structure and Diseases.							
Unit	Course Content						Knowledg e Levels	Session s
I	History and scope of Microbiology-Abiogenesis and Biogenesis-Germ theory of diseases. Microscopy-Light Microscopy, Bright field, Dark field, Phase contrast, Differential Interference contrast microscopy, Fluorescence and Electron microscopy.						K1-K3	10
II	Diversity of microbial world - Organizing, classifying and naming of microorganism - Whittaker's five system of classification. Bacterial Taxonomy - Methods in bacterial identification - Bergey's systematic classification of bacteria.						K1-K2	12
III	Cell Structure: Bacteria, Fungi, Algae and Protozoa. Stain and Staining techniques-Simple, Differential (Gram and Acid fast) and Special Staining (Endospore, Capsular, Flagella), Fungal Staining. Permanent Slide Preparation.						K2-K3	12
IV	Survival at extreme environments - Starvation - Adaptive mechanisms in thermophilic, alkalophilic, osmiophilic and barophilic, psychrophilic microorganisms: Hyperthermophilies and halophiles. Pandemic and Epidemic diseases-H1N1 Swine Flu, COVID-19, SARS Tuberculosis, Leprosy, and Malaria.						K2-K4	10
V	Sterilization-Physical and Chemical methods, Culture media and its types, Microbial growth - Growth curve, Measurement and factors affecting growth, Pure culture techniques, Anaerobic culture, Preservation of Cultures.						K2-K3	11
Course Outcome	After completion of the course, students should be able to							
	CO1: To gain knowledge about historical perspective of Microbiology and principle and application of various types of Microscopy						K1	
	CO2: To Classify and nomenclature explain the structure and general characteristics of Microorganisms						K1	
	CO3: Explain the structure and general characteristics of Microorganisms like bacteria, algae, fungi and protozoan and staining techniques						K2	
	CO4: To Know about Survival of microorganism and acquire knowledge on pathogens.						K2	
	CO5: Acquire knowledge on Sterilization, media preparation and maintenance of culture						K3	
Learning Resources								
Text Books	1. R.C. Dubey and D.K. Maheshwari , 2005. A textbook of Microbiology, S. Shand and company limited publication. 2. Michael J Pelczar, Chan ECS and Kreig R, 1998. Microbiology, 5th edition, Tata Mc Graw Hill Education New Delhi.							
Reference Books	1. Prescott LM, Harley JP and Klein DA. (2005). Microbiology, 6th Edition, McGraw Hill. 2. Talero KP and Talero A. (2002). Foundations in Microbiology, 4th Edition, McGraw Hill.							

	3. Peter F. Stanbury, Allan Whitaker, Stephen J. Hall. 2016. Principles of Fermentation Technology. 3rd Edn. Elsevier Science Ltd. Netherlands.				
Website Link	1. https://bit.ly/3AJF9sk 2. https://www.agrimoon.com/wp-content/uploads/AGRICULTURAL-MICROBIOLOGY.pdf 3. https://microbiologyinfo.com/different-size-shape-and-arrangement-of-bacterial-cells/				
	L-Lecture		T-Tutorial	P-Practical	C-Credit

B.Sc.,-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3UBTC03	MICROBIOLOGY	DSC THEORY - III	III	6	6			4

CO-PO Mapping										
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	S	L	S	S	M	L	M
CO2	S	M	L	M	M	S	S	M	S	M
CO3	S	S	L	M	M	S	S	S	S	M
CO4	S	S	M	M	S	S	S	S	L	M
CO5	S	S	M	M	S	S	S	S	M	M

Level of Correlation between CO and PO

L-LOW

M-MEDIUM

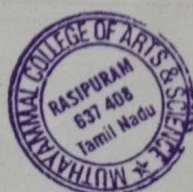
S-STRONG

Tutorial Schedule	--
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive sessions 4.ppt Presentation
Assessment Methods	1.Unit test 2.Assignment 3.CIA I & II

Designed By	Verified By	Approved By
<i>D. Kavitha</i>	<i>M. Suresh Kumar</i>	<i>A. h. Suresh</i>

(Dr. D. KAVITHA)

(Dr. M. SURESHKUMAR)



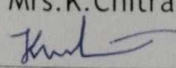
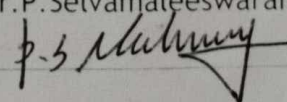
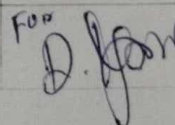
B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3UBTP03	PRACTICAL: MICROBIOLOGY	DSC PRACTICAL - III	III	3	0	0	3	2
Objective	To provide the students with a basic fundamental knowledge of how microorganisms grow, react with specific types of growth media and their biochemical reactions with media used in identification.							
S.No.	List of Experiments / Programmes						Knowledge Levels	Sessions
1	Sterilization Techniques & sterilization of Media, Glass wares.						K2-K3	3
2	Preparation of different types of Media (solid & liquid).						K2-K1	3
3	Pure culture Isolation and enumeration of microorganism from soil and water						K2-K3	3
4	Staining techniques: Simple staining, Differential staining (Gram's staining, Acid fast Staining)						K2-K3	3
5	Determination of motility: Hanging drop method.						K2-K3	3
6	Bacterial characterization Technique by biochemical tests: IMVIC.						K2-K3	3
7	Measurement of Growth rate of bacteria - Turbidometric method.						K2-K3	3
8	Antibiotic sensitivity Test - Kirby Bauer (Disc and well diffusion method) .						K2-K3	3
9	Isolation of antibiotic resistant mutant.						K2-K3	3
10	Determination of motility: Hanging drop method.						K2-K3	3
Course Outcome	CO1: Develop the basic laboratory techniques of a biotechnology						K1	
	CO2: To analysis and characterization of micro organism						K1	
	CO3: To gain the knowledge of principles of microbial culture and awareness of health and safety issues and handling microbial pathogens						K2	
	CO4:To develop understanding about microbial growth curve, antibiotech sentivity methode.						K2	
	CO5: Analysis of resistant mutant organism						K3	
Learning Resources								
Text Books	1. Benson HJ. (1999). Microbiological Applications: A Laboratory manual in General Microbiology, 7th Edition, McGraw Hill. 2. Bani Baral, Anandita Mandal, (2015). Clinical Microbiology Laboratory Manual And Workbook, CBS Publishers & Distributors							

Reference Books	1. John G. Holt, Noel R. Krie, (1984). Bergey's Manual of Systematic Bacteriology, Springer New York, NY 2. Atlas, R.M. (2010). Handbook of Microbiological Media (4th ed.). CRC Press.
Website Link	1. https://faculty.washington.edu/korshin/Class-486/MicrobiolTechniques.pdf 2. https://www.cnm.edu/programs-of-study/math-science-engineering/microbiology-lab-manual 3. https://bit.ly/3wP8fVZ

B:Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3UBTP03	PRACTICAL: MICROBIOLOGY	DSC PRACTICAL - III	III	3			3	2

CO-PO Mapping											
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5	
C01	M	M	M	S	S	S	M	S	M	S	
C02	M	L	L	M	S	S	L	S	M	S	
C03	M	S	L	M	M	S	M	S	S	M	
C04	L	M	M	S	S	S	M	S	M	S	
C05	M	L	M	S	S	S	M	S	M	L	
Level of Correlation between CO and PO	L-LOW			M-MEDIUM			S-STRONG				

Tutorial Schedule	
Teaching and Learning Methods	1. Practicals based Learning 2. Discussion 3. Interactive Session
Assesment Methods	1. Unit test 2. Assignment/Observation 3. CIA I & II

Designed By	Verified By	Approved By
Mrs.K.Chitra 	Dr.P.Selvamaleeswaran 	

B.Sc., -Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Se m	Hours	L	T	P	C
21M3UB TS02	MUSHROOM TECHNOLOGY	SEC- II	III	3	3			2
Objective	To learn about the concepts of mushroom cultivation and the importance of embarking on self-employment							
Unit	Course Content						Knowle dge Levels	Sessi ons
I	Natural Habitats- Humicolous, Lignicolous and Coprophilous. Differentiation of edible and poisonous mushroom. Description of Edible Types. Nutritional properties; medicinal values, Production of value added products.						K1	6
II	Basic materials required in mushroom cultivation. Methods used for commercial cultivation - mushroom substrate selection, substrate soaking, and pasteurization.						K1-K2	6
III	Preparation of spawn substrate, process of spawn culture, culture maintenance, and mother spawn production and storage of spawn. Harvesting of mushrooms: methods of harvesting; grading, packaging and storing mushroom						K2-K3	6
IV	Design and layout of mushroom farm. Equipment and tools and other infrastructure facilities required, safety measures in the farm. Approximate expenditure for establishing the production unit. Storage of fresh mushrooms and dry mushrooms. Preservation of mushroom.						K3	6
V	Banking - loan facilities; Government sponsored schemes and subsidies, legal processes in company / industry registration and agricultural finance, and patenting.						K3	6
Course Outcom e	After completion of the course, students should be able to							
	CO1: Understand the concepts of mushroom cultivation						K1	
	CO2: Selection of important types of Mushroom and its nutritive values						K2	
	CO3: Know the Opportunities to start mushroom farms with the support of schemes						K2	
	CO4: Examine the infrastructure, expenditure, production and preservation of mushrooms						K3	
	CO5: Develop the confidence and personal skills in mushroom cultivation						K3	
Learning Resources								
Text Books	1. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur. 2. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi							
Referen ce Books	1. Subba Rao, N. S. and Dommergues, Y. R. (1998). Microbial Interactions in Agriculture and Forestry. Vol. I, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. 2. Verma, A. (1999). Mycorrhiza. Springer Verlag, Berlin							
Website Link	1. https://bit.ly/3elm2gw 2. https://bit.ly/3Tlywiv 3. https://bit.ly/3Qg5zHJ							
	L-Lecture		T-Tutorial		P-Practical		C-Credit	

B.Sc.,-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3UBTS02	MUSHROOM TECHNOLOGY	SBEC II	III	3	3			2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	L	S	S	S	M	S	S
CO2	S	M	L	M	M	S	S	M	M	S
CO3	S	M	S	M	M	S	S	M	M	S
CO4	M	L	L	L	S	S	M	S	S	S
CO5	S	M	M	L	M	S	S	M	L	S

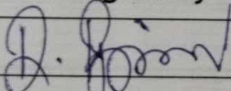
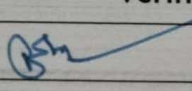
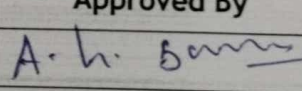
Level of Correlation
between CO and PO

L-LOW

M-MEDIUM

S-STRONG

Tutorial Schedule	--
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive sessions 4.ppt Presentation
Assessment Methods	1.Unit test 2.Assignment 3.CIA I & II

Designed By	Verified By	Approved By
		

(Dr. D. RAJASEKARAN)

(Dr. M. SURESHKUMAR)



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBTC04	MOLECULAR BIOLOGY	DSC THEORY - IV	IV	5	5			4
Objective	To gain knowledge about the structure and function of nucleic acids (DNA and RNA) and their mechanism							
Unit	Course Content						Knowledge Levels	Sessions
I	Central dogma of molecular Biology. DNA Replication in Prokaryotic and Eukaryotic organisms, Mechanism of DNA replication, Enzymes and accessory proteins involved in DNA replication. DNA Repair: light and dark mechanisms						K1-K3	12
II	Transcription in Prokaryotic and Eukaryotic organisms, RNA polymerase. Transcriptional and post-transcriptional gene silencing. Modifications in RNA. 5' cap formation, 3'-end processing and polyadenylation, splicing, Editing, Nuclear export of mRNA						K1-K2	12
III	Translation-Prokaryotic and eukaryotic translation, the translation machinery, Mechanisms of initiation, elongation and termination, co- and post-translational modifications of proteins. Import into nucleus, mitochondria and chloroplast. Receptor mediated endocytosis						K3	12
IV	Regulation of gene expression in prokaryotes: Operon concept-lac operon, trp operon. Regulation of gene expression in Eukaryotes. Hormonal control of gene expression						K4	12
V	Oncogenes and Tumor Suppressor Genes-Viral and cellular oncogenes, tumor suppressor genes from humans, Structure, function and mechanisms p53 tumor suppressor proteins. Homologous Recombination-Holliday junction						K4	12
Course Outcome	After completion of the course, student should be able to							
	CO1:Remember basics concepts of molecular biology and their molecular significance						K1	
	CO2: Discuss about transcription in Uni and multicellular organisms						K1	
	CO3:Execute the mechanism of post translational modification of proteins						K2	
	CO4:Differentiate the regulation gene expression prokaryotes and eukaryotes						K3	
	CO5:Evaluate the structure and function of tumor suppressor gene						K3	
Learning Resources								
Text Books	1. Freifelder.D and Malacinski, G.M. 1996. Essentials of molecular biology.2nd Edition Panima Publishing Co. 2. Rorastogi.S.c. 2008. Cell and Molecular Biology, second edition, New Age International Pvt.Ltd. New Delhi							
Reference Books	1. Lewin B, 2000, Genes VII, Oxford University press, Oxford, New York. 2. Weaver, R.F & Hedrick P. W; Genetics. Third Edition, 1997, WCB McGraw-Hill Publishers. 3. Lodish H, Berk A, Zipursky L, Matsudaira P, Baltimore D And Darnell J, 2000. Molecular Cell Biology, 4th Edition, WH Freeman & Co, New York							
Website Link	1.https://bit.ly/3QbmD1C 2.https://bit.ly/3D3PvGh 3.https://bit.ly/3qvK5RH							

L-Lecture

T-

P-

C-Credit

Tutorial Practical

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBTCO 4	MOLECULAR BIOLOGY	DSC THEORY - IV	IV	5	5			4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	S	S	S	S	M	S
CO2	S	L	M	M	S	S	S	M	M	S
CO3	S	S	S	M	L	M	S	M	S	M
CO4	M	S	M	L	M	S	S	M	M	S
CO5	S	M	M	S	M	S	S	M	M	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM			S-STRONG				

Tutorial Schedule	1. Interactive sessions 2. Quiz
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assesment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Rajasekaran	Dr.M.Sureshkumar	A. h. bannu

D. Rajasekaran

Dr. M. Sureshkumar



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBTP 04	PRACTICAL: MOLECULAR BIOLOGY	DSC PRACTICAL - IV	IV	3			30	2
Objective	To imparts practical knowledge on Nucleic acid isolation, digestion and ligation.							
S.No.	List of Experiments / Programmes						Knowle dge Levels	Sessi ons
1	Isolation of DNA from bacterial cells						K1	3
2	Analysis of DNA by agarose gel electrophoresis						K2	3
3	Estimation of DNA by DPA Method						K2	3
4	Isolation of RNA from bacterial cells						K2	3
5	Estimation of RNA by Orcinol Method						K2	3
6	Analysis of DNA & RNA Quality and Quantity.						K2-K3	3
7	Extraction of total protein from dal / lentil samples						K3	3
8	Separation of amino acids by TLC						K3	1
9	Isolation and purification of protein (Dialysis).						K3	2
10	Estimation of Protein by Lowry's method.						K3	3
11	Separation of protein by SDS PAGE.						K3	3
Course Outcome	CO1: Understand the basic laboratory techniques of a biotechnology							
	CO2: Describe the quantity of macromolecules							
	CO3: Apply the techniques for molecule separation							
	CO4: Practice the macromolecules purification technique							
	CO5: Demonstrate the protein separation techniques							
Learning Resources								
Text Books	1.Frederick. M.A., Roger. B.R., David. D. M., Seidman. J. G., John A. S., Kevin. S., (2003). Current Protocols in Molecular Biology, John Wiley and Son,							
Reference Books	1. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2013). Molecular Biology of Gene, 7 th edition, Pearson. 2. Krebs, J. E., Kilpatrick, S.T., Goldstein, E.S. (2013). "Lewin's Genes XI", 11th revised edition, Jones and Bartlett Publishers Inc.							
Website Link	1. https://webstor.srmist.edu.in/web_assets/downloads/2021/20BTC502J-lab-manual.pdf 2. https://www1.villanova.edu/content/dam/villanova/engineering/FacultyResearch/DrugDiscovery/2017LabManual.pdf							

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBTP04	PRACTICAL: MOLECULAR BIOLOGY	DSC PRACTICAL - IV	IV	3			30	2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	S	M	L	M	S	S
CO2	S	M	M	S	M	S	S	S	M	S
CO3	S	M	M	S	M	S	M	S	M	S
CO4	M	L	M	S	M	S	M	S	L	M
CO5	S	M	M	S	S	S	L	M	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	1. Interactive sessions 2. Quiz
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assesment Methods	1. Unit test 2. Assignment/Observation 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Kavitha <i>D. Kavitha</i>	Dr.M.SureshKumar <i>M. Suresh Kumar</i>	<i>A. h. Sanyal</i>



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBTS02	MEDICAL LABORATORY TECHNOLOGY	SEC- III	IV	3	3			2
Objective	Demonstrate an understanding of the underlying scientific principles of laboratory testing, including technical, safety, governmental regulations and standards in clinical laboratory science							
Unit	Course Content						Knowledge Levels	Sessions
I	The use of the laboratory - Basic laboratory principles - Code of conduct of medical laboratory personnel -Organization of clinical laboratory and role of medical laboratory technician - Safety measures						K1	6
II	Incubator, Hot Air Oven, Water Bath - Anaerobic Jar, Centrifuge, Autoclave -Microscope - Fundamentals of Microscopy, Resolution & Magnification, Light Microscopy, Electron Microscopy- Glassware - Description of Glassware, its use, handling and care						K1-K2	6
III	Requirement of Blood Collection - Blood collection - Phlebotomy - Sampling errors - Collection and preservation of biological fluids - Anticoagulants - Preservation of samples - Chemical preservatives - Process of analyzing the specimens - The laboratory report.						K3	6
IV	Buffer and pH- Preparation of reagents : Normal , per cent and Molar solution - normal saline -Methods of measuring liquids- Clinical Laboratory records- Modern Laboratory set up - Quality control: Accuracy, Precision, and Reference values.						K3	6
V	Types of analyzers - Semi-auto analyzer - Batch analyzer - Random Access auto- analyzers. The use of chemicals and their interactions, danger signs, production techniques, and disposal methods						K3	6
Course Outcome	After completion of the course, student should be able to							
	CO1: Undersand the basic principles of laboratory						K1	
	CO2: Classify the fundamental knowledge of theory and principles related to laboratory Instruments						K2	
	CO3: Explain the hematology and associate correct laboratory values to the condition						K3	
	CO4: Employ the components that makes up a valid quality assurance program in Clinical Chemistry.						K3	
	CO5: Apply laboratory procedures according to appropriate safety standards.						K3	
Learning Resources								

Text Books	1. Fischbach, 2005. Manual of lab and diagnostic tests, Lippincott Williams Wilkins, New York. 2. Gradwohls, 2000. Clinical laboratory methods and diagnosis. (ed) Ales C. Sonnenwirth and Leonard jarret, M.D.B.I., New Delhi.			
Reference Books	1. J Ochei and Kolhatkar, 2002. Medical laboratory science theory and practice, Tata McGraw- Hill, New Delhi. 2. Kanai L. Mukherjee, 2007, Medical laboratory technology Vol.1.Tata McGraw Hill			
Website Link	1. https://bit.ly/3BgVhD5 2. https://bit.ly/3CV7kam 3. https://bit.ly/3qhav4F			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBTS02	MEDICAL LABORATORY TECHNOLOGY	SEC- III	IV	3	3			2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	S	M	M	S
CO2	S	L	M	M	S	S	M	M	S	S
CO3	M	L	M	L	M	S	M	M	S	S
CO4	S	M	M	M	S	S	S	M	S	M
CO5	M	S	S	M	S	S	S	S	M	M
Level of Correlation between CO and PO		L-LOW		M-MEDIUM	S-STRONG					

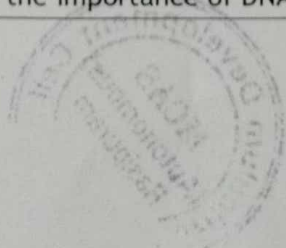
Tutorial Schedule	1. Interactive sessions 2. Quiz
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assesment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Kavitha <i>D. Kavitha</i>	Dr.M.Sureshkumar <i>M. Sureshkumar</i>	<i>A. H. Samy</i>



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTC05	GENETIC ENGINEERING	DSC THEORY - V	V	6	6			5
Objective	To provide students basic knowledge in Genetic engineering and to familiarize about molecular techniques involved in manipulation of genetic material for achieving the desired goal							
Unit	Course Content						Knowledge Levels	Sessions
I	History and basic steps involved in genetic engineering, Enzymes involved in genetic engineering (Nucleases, Restriction enzymes and their types, DNA ligases and ligation, Kinases, Phosphatases, Reverse transcriptase, Deoxynucleotidyl transferases, DNA polymerase), Restriction mapping.						K1	12
II	Basic design of cloning vectors - plasmid (pBR322 and pUC 18/19), cosmids, phage vectors (lambda and M13), phagemid, yeast vectors (YE _p , YR _p , YI _p), shuttle vectors, BAC and YAC Expression of cloned genes - general features of an expression vector, expression of eukaryotic gene in prokaryotes - advantages and limitations						K2	10
III	Gene transfer techniques - physical (Electroporation, microinjection and biolistic transformation), chemical (CaCl ₂ mediated transformation and Lipofection), transduction. Selection of recombinants - blue and white screening and plus and minus screening.						K2	11
IV	Hybridization techniques: Nucleic acid and immuno probes (radio active & non radio active). PCR- steps involved, Guidelines for PCR primer designing, variants of PCR (multiplex, nested, quantitative real time, RT- PCR), applications and limitations. Blotting - southern, northern and western blotting						K3	12
V	DNA sequencing - Maxam Gilbert (chemical) & Sanger's, Nicolson sequencing & Introduction to NGS. Gene therapy, Human Genome Project. Construction of genomic and cDNA library						K3	10
Course Outcome	After completion of the course, student should be able to							
	CO1: Apply landmark discoveries in developing a number of facile molecular techniques used in rDNA technology						K1	
	CO2: Learn how to select the suitable hosts for the individual vectors for different purposes						K2	
	CO3: Know the extraordinary power of restriction and other enzymes in molecular cloning and genetic manipulations						K2-k3	
	CO4: Understand PCR principle, types and its importance						K3	
	CO5: Demonstrate the importance of DNA sequencing						K3	



Learning Resources	
Text Books	1. Primrose Sandy B. and Richard Twyman, Principles of Gene Manipulation and Genomics (7th Edition), Wiley-Blackwell 2006. 2. Dubey R.C, Advanced Biotechnology (1st edition), Chand and Company, 2014.
Reference Books	1. Sathyanarayanan U, Biotechnology (2013) Books and allied (P) ltd. 2. Brown T. A, Gene Cloning and DNA Analysis: An Introduction, (6th Edition) WileyBlackwell, 2010. 3. Winnacker L Ernst, From genes to clones -Introduction to gene technology (4th edition), Panima Publishing Corporation, 2003.
Website Link	1. https://www.teachengineering.org/lessons/view/uoh_genetic_lesson01 2. https://opentextbc.ca/biology/chapter/10-1-cloning-and-genetic-engineering/

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTC05	GENETIC ENGINEERING	DSC THEORY -V	V	6	6			5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M	S	M	S	M	S
CO2	S	L	S	M	S	S	M	S	M	S
CO3	S	M	S	S	M	S	M	S	M	S
CO4	S	M	S	S	S	S	S	S	M	S
CO5	S	M	M	M	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	Interactive Session
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr. Raghu Chandrasekaran	Dr. P. Selvamaleeswaran	<i>[Signature]</i>

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B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTC06	PLANT BIOTECHNOLOGY	DSC THEORY - VI	V	6	6			5
Objective	Student will be able to understand the PTC Media preparation and different techniques in plant tissue culture.							
Unit	Course Content						Knowledge Levels	Sessions
I	Introductory history - Laboratory organization - sterilization techniques - nutrition for plant cells, types of media - MS - Nitsch & Nitsch media, Gamborg's media, White's Media. Structure and function of Growth regulators - Auxins, Cytokinins and Gibberellins. Somatic embryogenesis, Green house effect.						K1	12
II	Protoplast isolation, Culture regeneration, fusion. Somatic hybrids, cybrids, cryopreservation, Synthetic seeds - Terminator seed concept. Gene transfer techniques in plants. Applications of transgenic plants. Establishment and maintenance of callus and suspension cultures.						K2	10
III	Haploid production, Anther and microspore culture. Gynogenesis, embryo culture and rescue in agricultural and horticultural crops. Agrobacterium mediated gene transfer technology - microinjection - particle bombardment						K2	10
IV	Plant micro propagation - micro grafting - invitro clonal multiplication - Clonal orchards - meristem culture and virus elimination shoot tip culture. Edible vaccines from plants - Banana, Watermelon.						K3	12
V	Somaclonal and Gamatoclonal variation in vitro cultures, Secondary metabolites in plants - production -screening - applications. Role of tissue culture in agriculture, forestry. Biodiversity and conservation.						K3	11
Course Outcome	After completion of the course, student should be able to							
	CO1: Remember the PTC Laboratory Organization						K1	
	CO2: Understand the structure and function of plant metabolites						K2	
	CO3: Demonstrate the PTC Techniques.						K2-K3	



	CO4: Compare and contrast the events of plant growth in PTC	K3	
	CO5: Distinguish the function of Transgenic plants	K3	
Learning Resources			
TextBooks	1. Plant biotechnology by Ramawath, 2003, S. Chan Dana co, edition 2, 2003. 2. Introduction to Plant Biotechnology Chawla,(2003) (2nd edn) Oxford and IBH Publishers		
Reference Books	1. Plants, Genes and Agriculture, Chrispeel M.J, Sadava D.E, 1994, Jones and Barlett Publication, Boston.		
Website Link	1. https://edurev.in/search/PLANT%20BIOTECHNOLOGY		

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards									
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C	
21M5UBTC06	PLANT BIOTECHNOLOGY	DSC THEORY -VI	V	6	6				5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M	S	M	S	M	S
CO2	S	L	S	M	S	S	M	S	M	S
CO3	S	M	S	S	M	S	M	S	M	S
CO4	S	M	S	S	S	S	S	S	M	S
CO5	S	M	M	M	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	Interactive Session
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

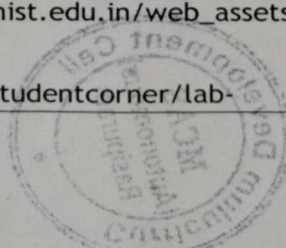
Designed By	Verified By	Approved By
Dr. P. Selvamaleeswaran <i>p.s. Mahalingam</i>	Dr. P. Selvamaleeswaran <i>p.s. Mahalingam</i>	<i>[Signature]</i>



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B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTP05	PRACTICAL: GENETIC ENGINEERING AND PLANT BIOTECHNOLOGY	DSC PRACTICAL - V	V	3			3	2
Objective	To teach students the basic techniques and instrument principles in Cell Biology							
S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions					
1	Preparation of media.	K ₁						
2	Sterilization Techniques.	K ₁						
3	Micropropagation	K ₁						
4	Callus culture	K ₂						
5	Synthetic seed culture	K ₂						
6	Isolation of plant DNA	K ₂						
7	Restriction digestion	K ₂						
8	Ligation Technique	K ₂						
9	Isolation of plasmid DNA & Detection in AGE	K ₃						
10	Bacterial Transformation.	K ₃						
Course Outcome	CO1: Identify about the culture media and techniques used in plant cell cultures	K ₁						
	CO2: Differentiate and get trained in different plant tissue culture techniques	K ₁						
	CO3: Acquire skills on techniques of genetic engineering	K ₂						
	CO4: Describe the mechanism of action and the use of restriction & ligase enzymes in biotechnology	K ₂						
	CO5: Understand the isolation and transformation procedure	K ₃						
Learning Resources								
Text Books	1. Razdan. M.K., (2003). Introduction to plant tissue culture, second edition, Science Publishers.							
	2. Frederick. M.A., Roger. B.R., David. D. M., Seidman. J. G., John A. S., Kevin. S., (2003). Current Protocols in Molecular Biology, John Wiley and Son,							
Reference Books	1. Michael, R. G., Sambrook. J., (2012). Molecular Cloning - A Laboratory Manual", 4th edition, Cold Spring Harbor Laboratory Press.							
Website Link	1. https://webstor.srmist.edu.in/web_assets/downloads/2021/20BTC502J-lab-manual.pdf .							
	2. https://jru.edu.in/studentcorner/lab-							



manual/agriculture/Lab%20Manual%20PPB.pdf
3. https://bit.ly/3ekSj7r

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBT P05	PRACTICAL: GENETIC ENGINEERING AND PLANT BIOTECHNOLOGY	DSE PRACTICAL - V	V	3			3	2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	S	S	M	S	M	S
CO2	M	L	L	M	S	S	L	S	M	S
CO3	M	S	L	M	M	S	M	S	S	M
CO4	L	M	M	S	S	S	M	S	M	S
CO5	M	L	M	S	S	S	M	S	M	L
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	
Teaching and Learning Methods	1. Practicals based Learning 2. Discussion 3. Interactive Session
Assessment Methods	1. Unit test 2. Assignment/Observation 3. CIA I & II

Designed By	Verified By	Approved By
Dr.P.Selvamaleeswaran <i>p.s. Selvamaleeswaran</i>	Dr.P.Selvamaleeswaran <i>p.s. Selvamaleeswaran</i>	<i>[Signature]</i>



[Signature]
(Dr. S. SHARATHA)

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hou rs	L	T	P	C
21M5UBTP0 6	PARACTICAL: IMMUNOLOGY, NANOBIOTECHNOLOGY AND BIOINFORMATICS	DSC PRACTICA L - VI	V	3			3	2
Objective	To Know about basic immunological and nanobiotechnological techniques							
S.No.	List of Experiments / Programmes	Knowledge Levels	Sessions					
1	Identification of blood cells	K1	3					
2	Blood cell analysis- total count, differential count	K1	3					
3	Preparation of plasma and serum	K2	3					
4	ABO Blood grouping	K2	3					
5	Widal test for typhoid fever	K2	3					
6	Anti-streptolysin O (ASO) test	K1	3					
7	C-Reactive protein (CRP) test	K1	3					
8	Rheumatoid arthritis(RA) test	K1	3					
9	Preganancy test for detection of HCG	K2	3					
10	Rapid Plasma Reagent test (RPR)	K1	3					
11	Radial immunodiffusion test	K2	3					
12	Double immunodiffusion test	K2	3					
13	Rocket immuno electrophoresis test	K2	3					
14	Immuno electrophoresis test	K2	3					
15	Counter Current immune electrophoresis	K2	3					
16	ELISA	K3	3					
17	Synthesis of nanoparticles	K3	3					
18	Retrieval of genebank entry using accession number	K2	3					
19	Primary structure analysis of protein	K2	3					
After completion of the course, students should be able to								
Course Outcome	CO1: Classify the differential count of blood cells	K1						
	CO2: Understand the differentiation of plasma and serum	K1						
	CO3: To know about blood groups and its importance	K2						
	CO4: To Know about antigen and antibody interactions in the precipitation test	K2						
	CO5: Understand the process and chemical reactions of nanoparticle synthesis	K3						
Learning Resources								
Text Books	1. Kanai Mukherjee, (1997). Medical Lab Technology Procedure Manual For Diagnostic Tests, TATA MCGRAW HILL							
Reference Books	1. Noel R. Rose, Herman Friedman, John L. Fahey. (1986). Manual of Clinical Laboratory Immunology. ASM. 2. Clark WR, (1991). The Experimental Foundations of Modern Immunology; John Wiley and Sons Inc. New York.							

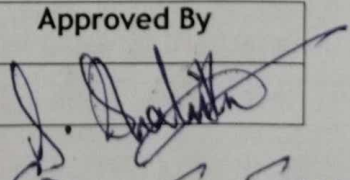
Website Link	1. https://www.avit.ac.in/lab/immunology_bioprocess_engineering_lab/download/17BTCC89/lab_manual.pdf 2. https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC106J-lab-manual.pdf
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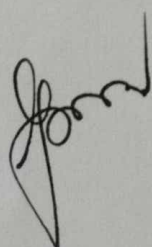
B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBT P06	PARACTICAL: IMMUNOLOGY, NANOBIO TECHNOLOGY AND BIOINFORMATICS	DSE PRACTICAL - VI	V	3			3	2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	S	S	M	S	M	S
CO2	M	L	L	M	S	S	L	S	M	S
CO3	M	S	L	M	M	S	M	S	S	M
CO4	L	M	M	S	S	S	M	S	M	S
CO5	M	L	M	S	S	S	M	S	M	L
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	
Teaching and Learning Methods	1. Practicals based Learning 2. Discussion 3. Interactive Session
Assessment Methods	1. Unit test 2. Assignment/Observation 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Rajasekaran	Dr.P.Selvamaleeswaran	




(Dr. S. Srinivasan)

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTE01	IMMUNOLOGY	DSE - I	V	5	5			4
Objective	To Know about cell and organs of the immune system and it's biological mechanism							
Unit	Course Content						Knowledge Levels	Sessions
I	Historical background of immunology. Scope of immunology. Types of immunity-Innate and Acquire immunity. Cells and organs of the immune system. Antigens: factors that influences immunogenicity. Adjuvants, Epitopes, Haptens and Mitogens, Abzymes						K1	11
II	Structure, class and properties of immunoglobulins. Biosynthesis of antibody. Hybridoma technology and monoclonal antibody production in mice and it's applications. Antigen and antibody interactions: RIA, ELISA, Western blotting and flow cytometry.						K2	10
III	Generation organization of major histocompatibility complex. Antigen processing & presentation. T-lymphocyte antigen reorganization and activation. B-lymphocyte Activation and antibody production. Effector mechanism of cell mediated immunity. Effector mechanism of humoral immunity.						K3	12
IV	Cytokines: Properties, types and functions; Cytokine receptors, Cytokine related diseases, Therapeutic uses; Complement functions and components, Complement activation pathways and its biological consequences. Hypersensitivity reactions. Concept of Immunization and strategies in vaccine development: Traditional and novel vaccines.						K4	12
V	Hypersensitivity reactions: types and mechanism. Immunity infectious diseases, Autoimmune diseases, Transplantation Immunology, Immunosuppressive therapy, Clinical transplantations, Origin of cancer, Oncogenes and cancer induction, Tumor antigens and immune response, Cancer immunotherapy.						K4	11
Course Outcome	After completion of the course, student should be able to							
	CO1: Understand the history and scope of immunology.						K1	
	CO2: Understand the structure and functions of immunoglobulins						K1	
	CO3: Understand the biological process of B and T cell activation and proliferation.						K2	
	CO4: To Know about vaccine development and it's applications						K2	
	CO5: Understand about symptoms and prevention of allergy, autoimmune diseases and cancer diseases						K3	



Learning Resources	
Text Books	1. Owen Judith A, Punt Jenni, Stranford, Sharon A, Jones Patricia P, Kuby, Janis, (2013) Immunology, 7th Edition, WH Freeman & Co. New York 2. Rajasekara Pandian M and Senthilkumar B. (2007). Immunology and Immunotechnology. Panima Publishing Corporation, New Delhi.
Reference Books	1. Goldsby R. A., Kindt T. J., Osborne B. A., Kuby J. (2003). Immunology, 6th Edition, WH Freeman & Co. New York 2. Tizard I. R. (1995). Immunology, 4th Edition. Saunders College Publishing Harcourt. Brace College Publishers 3. Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt, (2017). Roitt's Essential Immunology. Willey Blackwell
Website Link	1. https://microbenotes.com/vaccines-introduction-and-types/ 2. https://www.sinobiological.com/resource/antibody-technical/hybridoma-technology 3. https://ocw.mit.edu/courses/hst-176-cellular-and-molecular-immunology-fall-2005/pages/lecture-notes

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTE01	IMMUNOLOGY	DSE - I	V	5	5			4

CO-PO Mapping										
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M	S	S	S	M	M
CO2	S	L	M	M	S	S	S	M	M	S
CO3	M	S	M	M	S	S	S	M	M	S
CO4	M	S	M	S	S	M	M	L	L	M
CO5	S	S	S	M	M	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM				S-STRONG			

Tutorial Schedule	
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive Session 4. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Rajasekaran	Dr.P.Selvamaleeswaran	

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P.S. Selvamaleeswaran

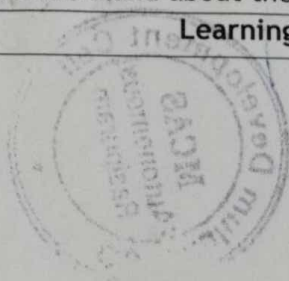
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B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C	
21M5UBTE02	NANOBIOTECHNOLOGY AND BIOINFORMATICS	DSE - II	V	5	5			4	
Objective	Student will be able to understand the Nanoparticles and Data bank.								
Unit	Course Content	Knowledge Levels	Sessions						
I	Nanobiology - concepts, definitions, prospects; nanoparticles - size, shape, properties. Bionanoparticles- Nanostarch, nano composites - dendrimers. Hot - Dot nanoparticles. Types of biomaterials. Biodegradable polymers.	K1	12						
II	Methods of nanobiotechnology - Analysis of bimolecular nanostructures by Atomic Force Microscopy, Scanning Probe Electron Microscopy. Nanofabrication - lithography. Drug nanoparticles - structure and preparation, Liposomes, Cubosomes and hexosomes.	K2	10						
III	Nanotubes, Nanorods, Nanofibers and Fullerenes for nanoscale drug . Bio nanoelectronics. Applications of nanobiotechnology in medicine, drug designing , Medical, social and ethical considerations of nanobiotechnology	K2	10						
IV	Bioinformatics - definition, introduction, history and scope. Databanks - Gen Bank, PDB. Literature DataBanks - PubMed. Biological databases including both proteins and nucleic acids - sequence - EMBL, DDBJ. Structural databases - CATH, SCOP, RASMOl. Specialized database - genome data base, EST.	K3	12						
V	Sequence Alignment based on Matrices (BLOSUM and PAM), Needleman and Wunch Algorithm, Multiple Sequence Alignment, tools for sequence alignment - BLAST, FASTA. Clustal W.	K3	11						
Course Outcome	After completion of the course, student should be able to								
	CO1: Understand the Nano Particles size and shape.	K1							
	CO2: Understand the Analysis of bimolecular nanostructures	K1							
	CO3: Understand the drug designing and cancer treatment	K2							
	CO4: Compare and contrast the events of cell cycle and its regulation.	K2-K3							
	CO5: Understand about the sequence Alignment .	K3							
Learning Resources									



TextBooks	1.Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E.Lemons. Biomaterials Sciences: An Introduction to Materials in Medicine 2nd Edition 2.M.Niemayer, Chad A. Mirkin, 2004. Nanobiotechnology: Concepts, applications and perspectives, Wiley VCH publishers.3.David. S. Goodsell., 2006. Bionanotechnology: Lessons from Nature, Jhonwiley.4. Revathi K., Chandrasekaran R., Textbook of Bioinformatics 2018
Reference Books	1.Bioinformatics sequence and Genome Analysis,DavidW.Mount 2nd Edition. 2.K.K. Jain, Naobiotechnology: Molecular Diagnosis, Tailor L. Francis Group.
Website Link	https://pages.cs.wisc.edu/~bsettles/ibs08/lectures/01-intro.pdf https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBTA5301.pdf

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTE02	NANOBIOTECHNOLOGY AND BIOINFORMATICS	DSE - II	I	5	5			4

CO-PO Mapping

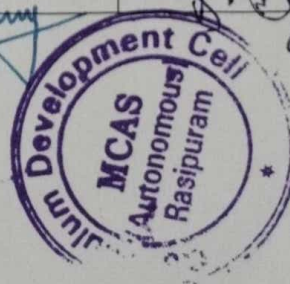
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M	S	S	S	M	M
CO2	S	S	M	M	S	S	S	M	M	S
CO3	M	M	M	S	S	M	M	M	M	S
CO4	S	L	M	S	S	M	M	M	L	M
CO5	S	S	S	M	M	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	Interactive Session
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
K. Chitra	Dr.P.Selvamaleeswaran	<i>[Signature]</i>

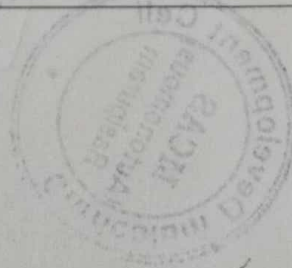
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P.S. Mahalingam



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B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTS 03	ALGAL BIOTECHNOLOGY	SEC- IV	V	2	2			2
Objective	To equip students with importance and significance of algae in food science, their use of bioactive compounds and its commercial applications							
Unit	Course Content						Knowledge Levels	Sessions
I	A general account and classification of Algae - distribution - range of thallus organization - pigmentation- flagellation- reserve food-Reproduction (vegetative-asexual-sexual) ; Lifecycle patterns - -salient features of algal divisions (Harold C Bold) - phylogeny - Fossil algae.						K1	12
II	Structure and reproduction with reference to the following algal forms - Anabaena, Chlorella, Volvox, Chara, Ectocarpus, Sargassum, Polysiphonia and Gracilaria. (excluding the developmental stages).						K2	10
III	Algal production systems; Strain selection; Algal growth curve; Culture media; indoor cultivation methods and scaling up. Measurement of algal growth. Large-scale cultivation of algae. Evaporation and uniform dispersal of nutrients; Harvesting algae. Drying.						K2	10
IV	Economic importance of algae: Algae as food and fodder, use of algae in agriculture and space research, commercial products of algae: Agar Agar, Alginates, Carrageenin, diatomite, mucilage, minerals and elements.						K3	12
V	Liquid seaweed fertilizer: Method of preparation and application. Biodiesel from algae: algae producing biodiesel; Advantages over other sources of biodiesel; Cultivation and extraction methods. Phycoremediation. Role of algae in nanobiotechnology.						K3	11
Course Outcome	After completion of the course, student should be able to							
	CO1: Remember the model of a cell and Differentiate the structure of algae						K1	
	CO2: Understand the classification of algae.						K1	
	CO3: Demonstrate the production of algal bioactive compounds						K2	
	CO4: Compare and contrast the biomolecules of algae						K2	
	CO5: Distinguish the industrial application of algae						K3	
Learning Resources								



Text Books	1. Barsanti, Laura And Paolo Gualtieri. 2005 Algae-Anatomy, Biochemistry and Biotechnology. Taylor & Francis, London, New York. 2. Sambamurthy, A. V. S. S. 2006. A Textbook of Algae. I. K. International Pvt. Ltd., New Delhi
Reference Books	1. BECKER, E.W. 1994 Microalgae-Biotechnology and microbiology. Cambridge University Press. 2. TRIVEDI, P.C. 2001 Algal Biotechnology. Pointer publishers, Jaipur, India.
Website Link	1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4993174/ 2. https://byjus.com/biology/single-cell-protein/ 3. https://biokamikazi.files.wordpress.com/2013/09/principles_of_fermentation_technology-stanburry_whittaker.pdf

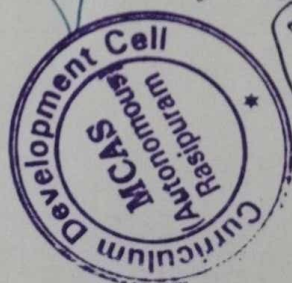
B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards									
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C	
21M2UBTS04	ALGAL BIOTECHNOLOGY	SEC- IV	V	2	2				2

CO-PO Mapping

CO Number	PO 1	PO2	PO 3	PO 4	PO 5	PSO1	PSO 2	PS O3	PSO 4	PSO 5
CO1	S	L	S	S	L	S	M	S	M	M
CO2	S	M	S	S	M	S	S	S	L	S
CO3	S	L	S	S	L	S	L	M	M	S
CO4	S	L	S	S	L	S	S	S	S	L
CO5	S	M	S	S	M	S	L	S	S	S
Level of Correlation between CO and PO			L-LOW			M-MEDIUM			S-STRONG	

Tutorial Schedule	1. Interactive Session
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Kavitha <i>D. Kavitha</i>	Dr.P.Selvamaleeswaran <i>P.S. Selvamaleeswaran</i>	<i>S. Shanthi</i>



(Dr. S. Shanthi)

B.Sc.,-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTIS1	INTERNSHIP TRAINING	INTERNSHIP	V					
Objective	The main purpose of this internship program is to particularly provide exposure to the working environment of various industries and research institutions/Company. During this period, the Students will get hands on training in the diverse areas of biotechnology.							
GUIDELINES FOR INTERNSHIP TRAINING PROGRAMME							Knowledge Levels	Sessions
1	Duration of the Internship Programme is 15 Days During the Vacation which falls at the end of the 4th Semester						K4	
2	Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ Government organizations/ Micro/ Small/ Medium enterprises to make them ready for the industry. The students will select the institutions, industries and trainer like Clinical Lab/ Programme Effluent Treatment Plant/ Sugarcane Industry/ Fruit and Beverage Industries/ Dairy/ Horticulture Research Station/ Soil Testing Organic Farming/ Medical Coding/ TNAU/ Veterinary University/ Plant Tissue culture Lab/ Molecular Biology Lab/Hospitals/ Bio Fertilizer Unit/ Mushroom Production Unit and Biotechnology relevant company/Industries.							
3	A staff member of a department (guide) will be monitoring the performance of the candidate							
4	Students request letter/profile/ interest areas may be submitted to the particular industries/Companies for their willingness for providing the internship program.							
5	After Getting the willingness from the internship provider, the student must submit the Joining Report/ Letters / Email to the department by in person.							
6	Student will maintain the work diary and attendance properly.							
7	Every student is required to prepare a file containing documentary proofs of the activities							

	done by them like Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed by the industry to the Institute immediately after the completion of the training.		
8	After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period with original Training Certificate to be obtained from the industry/company.		
9	The Internship report should be soft cover book bound, the cover of the report should be of white color printed with black ink and the text for printing should be identical as prescribed for the title page. The Internship Training Certificate also included in the report.		
10	The evaluation of these activities will be done by Head of the Department/ Project Head/ faculty mentor with External Examiner.		
Course outcome	Internships are educational and career development opportunities, providing practical experience in a field or discipline. Students will get hands on training in the diverse areas of biotechnology.	K4	
	L-Lecture	T-Tutorial	P-Practical
			C-Credit

B.Sc., -Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTIS1	INTERNSHIP TRAINING	INTERNSHIP	V	-	-	-	-	-

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	L	S	S	S	M	M
CO2	S	S	M	S	L	S	M	S	M	M
CO3	S	M	S	S	S	S	S	S	S	M
CO4	S	M	S	S	S	S	S	S	S	M
CO5	S	L	S	S	L	S	S	S	S	S

Level of Correlation
between CO and PO

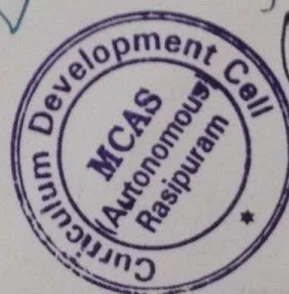
L-LOW

M-MEDIUM

S-STRONG

Tutorial Schedule	
Teaching and Learning Methods	1. Interactive Session 2. PPT Presentation
Assessment Methods	1. Work Diary- 25% 2. Internship Training report preparation: 50% 3. Viva Voce: 25%

Designed By	Verified By	Approved By
Dr.P.Selvamaleeswaran <i>p.s. Mahalingam</i>	Dr.P.Selvamaleeswaran <i>p.s. Mahalingam</i>	<i>S. S. SHANMUGAN</i>



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTC07	Animal Biotechnology	DSC THEORY - VII	VI	5	5			5
Objective	Student will be able to understand the basic knowledge in animal tissue culture techniques, sericulture and aquaculture.							
Unit	Course Content						Knowledge Levels	Sessions
I	Introduction to Animal Cell Culture: Historical background. Good Laboratory Practices (GLP), sterilization methods and techniques. Types of Cell culture Media.						K1	12
II	Basic Techniques of mammalian cell culture; Disaggregation of animal tissue. Primary culture & secondary culture, cell line, cell strain, cell clone. Evolution of cell line & continuous cell line, characterization of cell lines. Monolayer, suspension culture. Organ culture, Embryo culture. Immobilized cultures, Maintenance of cell culture. Common cell culture contaminants.						K2	10
III	Sericulture, Commercial production of silk, Baculoviruses as animal viral vector. Silkworm as a bioreactor. Biotechnology of aquaculture, apiculture						K3	10
IV	In vitro fertilization and Embryo transfer: Method of In vitro fertilization, GIFT, ZIFT, Embryo transfer, ICSI, Embryo splitting, Fertility control & regulation, test tube babies. Cryopreservation.						K3	12
V	Applications of animal tissue culture for invitro testing of drugs. Production of transgenic animals - Transgenic mice-Retroviral vector -Microinjection-Embryonic stem cell method. Cell culture based vaccines. Ethical values in animal biotechnology						K3	11
Course Outcome	After completion of the course, student should be able to							
	CO1: Remember the model of a cell and Differentiate the History and scope of animal cell culture technique.						K1	
	CO2: Understand the disaggregation and primary cell line.						K2	
	CO3: Understand about life cycle of Silk worm, Apiculture and Aquaculture						K2-K3	
	CO4: Understand and Analysis of Embryo transfer						K3	



	techniques.	
	CO5: Production of Transgenic animals.	K3
Learning Resources		
Text Books	1. R.C. Dubey., A Text Book of Biotechnology. S. Chand & Co Ltd, New Delhi. 2. U. Satyanarayana, 2008. Biotechnology, Books and Allied (p) Ltd 3. M. Ranga, 2006. Animal Biotechnology, Studam publishers.	
Reference Books	1. Sudha Gangal, Animal Tissue culture. Second edition. University Press (India) Pvt Ltd. Hyderabad. 2. R. Sasidhara, 2006. Animal Biotechnology, MJP Publishers 3. Animal Biotechnology Recent concepts and Developments .P. Ramadass	
Website Link	1. https://www.deshbandhucollege.ac.in/pdf/resources/1589512953_Z(H)-VI-Biotech-4.pdf 2. https://www.aminotes.com/2019/04/animal-biotechnology-notes.html	

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTC07	Animal Biotechnology	DSC THEORY - VII	VI	5	5			4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	M	S	S	S	M	M
CO2	M	L	M	S	S	S	S	M	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	L	M	S	M	M	L	M	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	Interactive Session
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
K.Chitra	Dr. P. Selvamaleeswaran	



Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTC08	ENVIRONMENTAL BIOTECHNOLOGY	DSC THEORY - VIII	VI	5	5			5
Objective	The course ensures the students to understand about the environmental biotechnology and transgenic products, therapeutics and its applications							
Unit	Course Content						Knowledge Levels	Sessions
I	Definition - concept and scope - Application of biotechnology - Role of microbial systems - Principles - Characteristics - Genetically engineered organisms - Merits and demerits - Bio tools for environmental monitoring - Role of biotechnology in environmental protection.						K1-K3	11
II	Biotechnology of wastewater treatment - Bioreactors - Microbial system in waste water stabilization - Biofilms - immobilization technology in waste water treatment - Microbial metabolism and growth kinetics - oil degradation - biodecolourization - Reed bed technology - Rhizosphere engineering - Biofiltration and Bioindicators.						K1-K2	10
III	Soil pollution - Bioremediation - Principles - Biodegradation of agro chemicals and other organic compounds - Biotransformation of xenobiotic compound - Role of GEMS in degradation of xenobiotics; Bioscrubbers - Biomining of metals - Biopulping.						K3	11
IV	Bio processes in waste treatment - Production of value added products from waste - single Cell Protein (SCP), ethanol, methane and hydrogen, amino acids, vitamins -Enzyme production from wastes - Biodegradable plastics - Environmental implications -.Biotechnology of Microbial composting - Biofertilizers- Biopesticides						K4	11
V	Bioindicators -Biomarkers -Biosensors -Biomonitoring - Polluted environment - Short and long term monitoring of remediated sites						K4	12
Course Outcome	After completion of the course, student should be able to							
	CO1: An understanding of global issues and source of environmental pollution.						K1	
	CO2: Discuss about to formulate technique for bioremediation process						K1	
	CO3:Execute to advanced knowledge on environmental sample analysis.						K2	
	CO4:Differentiate the bioproducts from the environment						K2	

	CO5: Evaluate the structure and function of environment biotechnology	K3	
Learning Resources			
Text Books	Chatterji. A.K., 2003. Introduction to Environmental Biotechnology. Prentice Hall of India Pvt. Ltd., New Delhi.		
Reference Books	Miller Jr. G. T., 2004. Environmental Science. Tenth Edition. Thompson Brooks/Cole. United States. 3. Kumar H.D, 1998. A text book on biotechnology. II Edition, Affiliated east west press Pvt. Ltd., New Delhi		
Website Link	https://www.biotecharticles.com/Category-23/0/Environmental-Biotechnology.html		

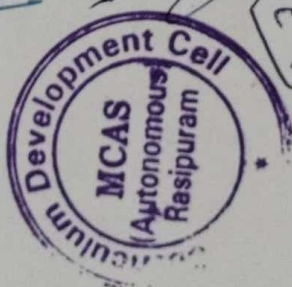
B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M5UBTC06	ENVIRONMENTAL BIOTECHNOLOGY	DSC THEORY - VI	VI	5	5			5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	S	S	L	S	S	S	S	S
CO2	S	M	S	S	M	S	S	S	L	S
CO3	S	L	S	S	L	S	L	M	M	S
CO4	S	L	S	S	L	S	S	S	S	L
CO5	S	M	S	S	M	S	L	S	S	S
Level of Correlation between CO and PO				L-LOW		M-MEDIUM		S-STRONG		

Tutorial Schedule	1. Interactive Session
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Kavitha	Dr.P.Selvamaleeswaran	



(Dr. S. Srinivasan)

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTE03	PROTEOMICS AND GENOMICS	DSE - III	VI	5	5			4
Objective	To make the students to understand the basic concept of genomics and proteomics and its relevance in biotechnology							
Unit	Course Content						Knowledge Levels	Sessions
I	Definition: Genome organizations, Principles of gene expression, Genome mapping - Physical mapping and Genetic mapping, Chromosome walking						K1 - K2	9
II	Nucleotide sequencing methods - Chemical & chain termination method, Shot gun method, Pyrosequencing and Next generation sequencing methods (whole genome sequencing)						K2 - K3	12
III	Transcriptomics - transcript analysis - global gene expression analysis, micro arrays - differential gene expression, serial analysis of gene expression (SAGE). DNA Databases						K2 - K3	10
IV	Proteomics - Introduction, Protein detection & Methods of Analysis of Proteins, Protein purification and Separation techniques, Two dimensional PAGE for proteome analysis						K2	9
V	Protein characterization - MALDI-TOF and Peptide mass finger printing, Protein sequencing, Protein-protein interactions (Two hybrid interaction screening), Protein arrays, Applications of proteome analysis to drug development.						K2 - K3	10
Course Outcome	After completion of the course, student should be able to							
	CO1: Understand the concept of genome and principle of gene expression and mapping.						K1	
	CO2: Describe the principle and applications of different sequencing techniques.						K1	
	CO3: Comprehend the importance of transcriptomics.						K2	
	CO4: Know the importance of protein separation and purification in proteome analysis.						K2	
	CO5: Demonstrate the basics of protein characterization, sequencing and drug development.						K3	
Learning Resources								
Text Books	1. Ajoy Paul., 2011. Text Book of Genetics- from Genes to Genomes- Books and Allied (P) Ltd, Kolkata. 2. Keith Wilson and John Walker, 2010. Principles and techniques of practical biochemistry-, Cambridge University Press, 7th edition							

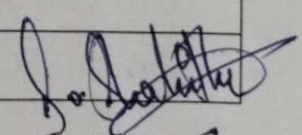
Reference Books	1. U.Sathayanarayana, Biotechnology, Books and allied (p) ltd., India, 2008. 2. Hubert Rehn, 2006 Protein Biochemistry and Proteomics -, Academic press. 3. Liebler, Humana W., 2002. Introduction to proteomics: Tools for new Biology CBS pub.
Website Link	1. https://opentextbc.ca/biology/chapter/10-3-genomics-and-proteomics/ 2. https://www.khanacademy.org/science/ap-biology/gene-expression-and-regulation/biotechnology/a/dna-sequencing 3. https://microbiologynotes.org/proteomics-introduction-methods-types-and-application/

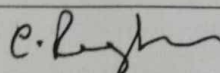
B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTE03	PROTEOMICS AND GENOMICS	DSE - III	VI	5	5			4

CO-PO Mapping

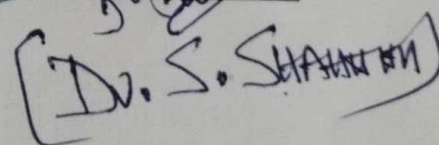
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M	S	M	S	M	S
CO2	S	L	M	M	S	S	M	S	M	S
CO3	S	M	M	M	M	S	M	S	S	M
CO4	S	M	M	M	S	S	S	S	M	M
CO5	S	M	M	M	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	Interactive Session
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assesment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr. Raghu Chandrasekaran	Dr. P. Selvamaleeswaran	






[Dr. S. Shanmugam]

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2022-2023 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTE04	BIOPROCESS TECHNOLOGY	DSE - IV	VI	4	4			4
Objective	Student will be able to understand the commercial production through upstream and downstream processing							
Unit	Course Content						Knowledge Levels	Sessions
I	Historical developments in Fermentation. Screening of industrially important microbes. Strain improvement. Inoculum development. Media formulation, Sterilization, Types of fermentation. Enzymes & cell immobilization techniques.						K1	12
II	Stoichiometry of cell growth and kinetics. Batch and continuous culture. Bioreactor- Design, parts and their function. Types of bioreactors- CSTR, Air lift, Bubble column, Packed bed, Tower.						K2	10
III	Monitoring and control of process variables (Temperature, pH and DO). Computational control of fermentors. Downstream processing: definition, cost involved in downstream processing, Typical steps involved in Downstream processing. , Criteria for downstream processing, Target application of product vs cost, separation of cells and broth.						K2	10
IV	Commercial production of various bioprocess based products (Bioethanol, butanol, citric acid, acetic acid), Antibiotics-penicillin, streptomycin, tetracycline. Single cell protein; amino acids: glutamic acid, lysine.						K3	12
V	Industrial Enzymes: Thermophilic enzymes, Lipases, Proteolytic enzymes in meat, leather & detergent industries, Enzymes in Fermentation process, cellulose & metal degrading enzymes. Enzyme Engineering- Designer enzymes.						K3	11
Course Outcome	After completion of the course, student should be able to							
	CO1: Knowledge about historical events in fermentation.						K1	
	CO2: Understand the growth and kinetics of cell						K1	
	CO3: Demonstrate control of variables and downstream processing						K2	
	CO4: Commercial production and product formation						K2	
	CO5: Various applications of industrial enzymes						K3	
Learning Resources								

Text Books	A. H. Patel, 2005. Industrial Microbiology - MacMillan Publishers. 4. Satyanarayana. U, 2008. Biotechnology, , Books and Allied (p) Ltd
Reference Books	El - Mans, E.M.T., and Bryce, C.F.A. 2002. Fermentation Microbiology and Biotechnology. Taylor & Francis group.
Website Link	https://opentextbc.ca/biology/chapter/bioprocess technology/

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTE04	BIOPROCESS TECHNOLOGY	DSE - IV	VI	4	4			4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M	S	S	S	M	M
CO2	S	S	M	M	S	S	S	S	S	S
CO3	S	S	S	M	S	S	S	M	M	S
CO4	M	S	M	S	S	M	M	L	L	M
CO5	S	S	S	M	M	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	Interactive Session
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr. K. Revathi	Dr. P. Selvamaleeswaran	<i>[Signature]</i>

[Signature]

[Signature]

[Signature]
(Dr. S. Srinath)



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTP07	PRACTICAL: ENVIRONMENTAL BIOTECHNOLOGY AND ANIMAL BIOTECHNOLOGY	DSC PRACTICAL - VII	VI	3			3	2
Objective	To ensure the students to understand about the production of transgenic products and their therapeutic applications							
S.No.	List of Experiments / Programmes						Knowledge Levels	Sessions
1	Isolation of soil microorganisms- rhizobium, azotobacter and mycorrhiza.						K1	3
2	Estimation of soil alkalinity.						K2	3
3	Isolation of rhizobium from root nodules.						K2	3
4	Vermicomposting.						K2	3
5	Estimation of the BOD and COD						K2	3
6	Conduct MPN test for coliforms.						K2-K3	3
7	Preparation of animal cell culture media.						K3	3
8	Preparation & sterilization of balanced salt solution and DBSS.						K3	1
9	Disaggregation of tissues - trypsinization.						K3	2
10	Culture of chick embryo fibroblast (monolayer)						K3	3
11	Isolation of genetic DNA from animal tissue						K3	3
12	Inoculation of virus and observation- Demo.						K3	3
Course Outcome	CO1: Understand the basic laboratory techniques of a biotechnology						K1	
	CO2: Describe the quality of environment						K1	
	CO3: Apply the techniques in agricultural and environment						K2	
	CO4: Practice the skills in animal tissue culture						K2	
	CO5: Demonstrate the results involved in animal tissue culture technique						K3	
Learning Resources								
Text Books	1. Freshney.R.I, "Culture of Animal cells: A manual of basic technique", Fifth edition, Wiley Publishers, 2010. 2. Benson HJ. Microbiological applications: a laboratory manual in general microbiology. WCB/McGraw-Hill; 1998							
Reference Books	1. Leach.C.K, In vitro cultivation of Animal cell, Butterworth and Heinmann Ltd., 1994. 2. Cullimore DR. Practical manual of groundwater microbiology. CRC Press;							

	2007 Dec 17
Website Link	https://www.mooc-list.com/course/cell-culture-basics-canvasnet https://nptel.ac.in/courses/102/104/102104059/

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBTP07	PRACTICAL: ENVIRONMENTAL BIOTECHNOLOGY AND ANIMAL BIOTECHNOLOGY	DSC PRACTICAL - VII	VI	3			3	2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	S	S	M	S	M	S
CO2	M	L	L	M	S	S	L	S	M	S
CO3	M	S	L	M	M	S	M	S	S	M
CO4	L	M	M	S	S	S	M	S	M	S
CO5	M	L	M	S	S	S	M	S	M	L
Level of Correlation between CO and PO				L-LOW		M-MEDIUM		S-STRONG		

Tutorial Schedule	1. Interactive Session
Teaching and Learning Methods	1. Lectures 2. Hands on Training 3. Demo 4. Discussion
Assessment Methods	1. Model test 2. Observation 3. Record

Designed By	Verified By	Approved By
Dr. D. Kavitha <i>D. Kavitha</i>	Dr. P. Selvamaleeswaran <i>P. Selvamaleeswaran</i>	<i>S. Selvamaleeswaran</i>



(Dr. S. Selvamaleeswaran)

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2022-2023 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTP08	PRACTICAL: PROTEOMICS, GENOMICS AND BIOPROCESS TECHNOLOGY	DSC PRACTICAL - VIII	VI	3			3	2
Objective	To imparts practical knowledge on Nucleic acid isolation, digestion and ligation							
S.No.	List of Experiments / Programmes						Knowledge Levels	Sessions
1	Isolation of industrially important enzymes in microorganism (amylase and protease).						K1	3
2	Isolation of Antibiotic Producing Microorganism.						K2	3
3	Production & Estimation of citric acid.						K2	3
4	Qualitative analysis of milk						K2	3
5	Production & Estimation of Biomass (SCP), Dry weight & Wet weight methods.						K2	3
6	Immobilization of yeast cells & Enzymes.						K2	3
7	Genomic sequence submission tool (BankIt)						K3	3
8	Molecular visualization of protein (Amylase) using RASMOL						K3	3
9	Prediction of tertiary structure of protein using SWISS-MODEL server						K3	3
10	PCR (DEMO)						K3	3
Course Outcome	CO1: Understand the basic laboratory techniques of a biotechnology						K1	
	CO2: Describe the quantity of antibiotics						K1	
	CO3: Apply the techniques to arrest the cells/enzymes						K2	
	CO4: Practice the gene submission						K2	
	CO5: Demonstrate the protein separation techniques						K3	
Learning Resources								
Text Books	Bioprocess Technology- fundamentals and applications, S O Enfors & L Hagstrom (1992), RIT, Stockholm.							
Reference Books	Singer M and Berg P (1991). Genes and Genomes: A Changing Perspective; University Science Books, CA, USA. Pennington SR, Dunn MJ (Eds.) (2002) Proteomics: From Protein Sequence to Function,							
Website Link	https://onlinecourses.nptel.ac.in/noc19_bt31/preview							

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M6UBTP08	PRACTICAL: PROTEOMICS, GENOMICS AND BIOPROCESS TECHNOLOGY	DSC PRACTICAL - VIII	VI	3			3	2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	S	S	M	S	M	S
CO2	M	M	L	M	S	S	M	S	M	S
CO3	M	S	L	M	M	S	M	S	S	M
CO4	L	L	L	S	S	S	M	S	L	S
CO5	M	L	M	S	S	S	M	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	
Teaching and Learning Methods	1. Practicals based Learning 2. Discussion 3. Interactive Session
Assessment Methods	1. Unit test 2. Assignment/Observation 3. CIA I & II

Designed By	Verified By	Approved By
DR. K. Revathi	Dr. P. Selvamaleeswaran	

R. Thiriy

p.s. Mahalingam

[Dr. S. Shanmugam]



B.Sc., Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
21M6UBTPR1	PROJECT WORK	PROJECT WORK	VI	3			3	5
Objective	<ul style="list-style-type: none"> To inculcate/impart skills on project design, experimental execution and research reporting To enhance their skills as on writing thesis dissertation 							
Details	Course Content						Knowledge Levels	Sessions
Format for the preparation of the Project Report	The final stage of work consists of the 1. Title Page 2. Bonafide Certificate 3. Acknowledgement 4. Table of contents 5. List of tables and figures 6. Abbreviation						K1- K2	
Text of the Project	The following structure of project work should be followed to maintain the uniformity in preparation and presentation. Chapter 1 - Introduction This chapter explains the selection of the topic and its relevance, definitions of related aspects, characteristics, different concepts pertaining to the topic etc can be covered by the candidate. Chapter 2 -Aim and Objectives This chapter describes the primary goal of the project, how it intends to accomplish it. Chapter 3 - Review of Literature This chapter gives clear cut information about studies done on the respective topic/research. This would assist students to undertake further study on the same topic/research. Chapter 4 -Materials and Methods This chapter is the vital component of the topic/research. It describes all the procedures and methods used for their work in detail with flow charts. Chapter 5- Result and Discussion This chapter presents the Research Findings and Interpret their work with the previous research findings. Results tables and figures to be in colour. Chapter 6- Summary The chapter provides as the overview of the key research findings If required, more chapters of data analysis could be added. 7. Bibliography						K3- K4	

	8. Appendix		
	<p>Typing Instruction: Paper: 8 ½ * 11 inches in size. Only one side of the sheet should be typed. Margin: The left side margin should not be less than 1.5 inches (or 40 mm) the right, top and Bottom Margin one inch (or 25 mm). Font: Times New Roman, subject matter -12 font size in running format, Heading and Section headings should be capitalized - 14 font size.</p>		
Headings and Titles	<p>1. Heading and Section headings should be capitalized and centered- 14 font sizes with Bold. 2. Subdivision headings should be typed from the left hand margin sentence case -12 font sizes with Bold. 3. Paragraphs should be indented seven space for pica type and nine for elite type.</p>		
Tables and Figures	<p>1. The table number (E.g. Table 1/ Figure 1/Graph 1) typed in capitals should be separated from the text by two or three spaces. 2. An asterisk should be used if an explanatory note to a table is necessary. 3. The note should be placed immediately below the table.</p>		
	<p>Line Spacing: The text of the thesis should be 1.5 lines spacing Pagination: Pages of the text are numbered continuously in Arabic numerals.</p>		
	<p>Bibliography Any works of other researchers, if used either directly or indirectly, should be indicated at appropriate places in the report/thesis. The citation may assume any one of the following forms. APA Style. APA in-text citation style uses the author's last name and the year of publication, for example: Kuby, 2005/Verma and Agarwal, 2005/Verma et al., 2005. For citing Books Fuller,C. (2019) Platelets. Cambridge: Biostate Publishing. p 33-39. Citing Journal Abdullah, M., Atta, A., and Allohedan, H. 2018. Green synthesis of hydrophobic magnetite nanoparticles coated with plant extract and their application as petroleum oil spill collectors. <i>Nanomaterials</i>, 8(1):855-859. Citing Thesis or Dissertation Saranya A, A study of Nanoparticle Synthesis, unpublished Ph.D Thesis, Chennai: Indian Institute of Technology, 2020.</p>	K5	

	Citing Thesis or Dissertation Saranya A, A study of Nanoparticle Synthesis, unpublished Ph.D Thesis, Chennai: Indian Institute of Technology, 2020.			
Binding specification	The thesis should be hardcover book bound, the cover of the thesis should be of in color printed with black ink and the text for printing should be identical as prescribed for the title page.			
SCHEDULE	IV Semester: 1. November- Selection of topic 2. December - Literature Collection & Design the project 3. January - Execution of their designed work 4. February - Report Preparation, First & Second draft, and Final draft Correction. 5. March-Review Presentation & Submission of Project.			
Course Outcome	CO1: Provide the opportunity to do research in reputed Institutes/Laboratories			K1
	CO2: Understand the experimental design and execution of their research			K2
	CO3: Interpret the research work/topic with the previous findings			K3
	CO4: Analyze their research work and its importance			K4
	CO5: Design their project and enhance the thesis writing skill			K5
	L-Lecture	T-Tutorial	P-Practical	C-Credit



B.Sc., Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
21M6UBTPR1	PROJECT WORK	PROJECT WORK	VI	3			3	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	M	L	L	L	M	S	S	S
CO2	S	S	S	S	L	M	S	S	S	S
CO3	S	S	S	S	L	S	S	S	M	M
CO4	S	S	S	M	L	S	S	S	M	M
CO5	M	M	M	S	L	M	M	S	L	S
Level of Correlation between CO and PO					L-LOW		M-MEDIUM		S-STRONG	

Tutorial Schedule	-
Teaching and Learning Methods	-
Assessment Methods	1. Review Meeting I- 15 Marks 2. Review Meeting II- 15 Marks 3. Attendance- 5 Marks 4. Student Work Diary - 5 Marks
	1. Project Presentation - 40 Marks 2. Viva-Voce - 20 Marks

Designed By	Verified By	Approved By
Dr.P.Selvamaleeswaran <i>p.s. selvamaleeswaran</i>	Dr.P.Selvamaleeswaran <i>p.s. selvamaleeswaran</i>	<i>[Signature]</i>

[Signature]
[Signature]



B.Sc., Biotechnology – Objective Biotechnology for Competitive Examination Syllabus-LOCF-CBCS-
Pattern with effect from 2021-2022 Onwards

CourseCode	CourseTitle	Course Type	Sem	Hours	L	T	P	C
21M6UBTOE 1	Biotechnology for Competitive Examinations	Self study Online -Competitive Examination	VI	-	-	-	-	2
Objective	Creating awareness on competitive examinations among the students. Imparting knowledge about the appearing for Competitive Examinations and its impacts on developing an attitude of appearing for such exams.							
	Course Content						Knowledge Levels	Sessions
	<p>Objective Biotechnology MCQ comes under the Biotechnology courses like cell Biology, Biological chemistry, Microbiology, Environmental and Nano Biotechnology, Genetics and Molecular Biology, Immunology & Immunotechnology, Genetic Engineering, Genomics, Proteomics, Bioinformatics, Plant and Animal Biotechnology, Bioprocess technology, Research methodology, Biostatistics etc. Major emphasis has been put forth to include recent developments in the subjects. This course helpful for students who prepare for competitive and entrance examinations.</p> <p>Rules for creating MCQ pattern</p> <ol style="list-style-type: none"> Objective type online examination will be conducted at the end of the 6th semester. Questions must be taken from all previous question papers of CSIR-NET, SET, NEET, UPSC, IBPS and Common Entrance Test for Ph.D. <p>3. Test critical thinking</p> <p>Multiple choice questions to test the superficial knowledge. Learners to interpret facts, evaluate situations, explain cause and effect, make inferences, and predict results.</p> <p>4. Emphasize Higher-Level Thinking</p> <p>Use memory-plus application oriented questions. These questions require students to recall principles, rules or facts in a real life context.</p> <p>Example 1: <u>Ability to Justify Methods and Procedures</u></p> <p>Which is correct regarding the peptides in the Ramachandran Plot?</p> <ol style="list-style-type: none"> The sequence of the peptide can be deduced It is not possible to conclude whether a peptide adopts entirely helix or entirely beta-sheet conformation Peptides that are unstructured will have all the backbone dihedral angles in the disallowed regions The occurrence of a beta-turn conformation in a peptide can be deduced. <p>Example 2: <u>Ability to Interpret Cause-and-Effect Relationships</u></p> <p>Which of the following statements is true about cell theory?</p> <ol style="list-style-type: none"> The Cell theory does not apply to fungi The Cell theory does not apply to virus The Cell theory does not apply to algae The Cell theory does not apply to microbes. <p>5. Mix up the order of the correct answers Keep correct answers in random positions and don't let them fall into</p>						K1-K5	

	<p>a pattern that can be detected</p> <p>6. Use a Question Format Multiple-choice items to be prepared as questions (rather than incomplete statements) Incomplete Statement Format:</p> <ul style="list-style-type: none"> • The capital of California is in Direct Question Format ____ Less effective. • In which of the following cities is the capital of California? - This is Best format. <p>7. Keep Option Lengths Similar Avoid making your correct answer the long or short answer</p> <p>8. Avoid the “All the Above” and “None of the Above” Options Students merely need to recognize two correct options to get the answer correct</p> <p>9. HOD instruct the faculty members to prepare minimum 500 questions booklet with solutions and circulate among the students.</p> <p>10. Each Department to prepare the Questions (MCQ pattern with four answers) and submit to ICT.</p>		
Course Outcome	CO1: Learn the subject at MCQ Level	K1	
	CO2: Understand how to appear for an interviews where subject knowledge will be examined	K2	
	CO3: Comprehensive understanding of current technologies, skills, and tools necessary for career	K3	
	CO4: Interpret the different types of questions for Competency developed	K4	
	CO5: Evaluate and prepare the students to meet the challenges of modern competitive world.	K5	
Learning Resources	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Kapoor H C, UGC - CSIR - Life Sciences, Cosmos Publication. 2. Ritambhara Richharia, UGC/CSIR-NET Life Science, Rama Publication. 		
Website Link	<ol style="list-style-type: none"> 1. https://www.sanfoundry.com/1000-life-sciences-questions-answers/ 2. https://www.examtiger.com/biology-general-science-mcq/ 3. https://mcq.jobsandhan.com/life-science/ 4. https://www.eurekaselect.com/ebook_volume/1539 		

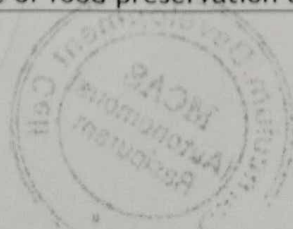
L-Lecture T-Tutorial P-Practical

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	S	S	M	S	M	S	S	S	M	M			
CO2	S	S	M	S	M	S	S	S	S	M			
CO3	S	M	S	S	S	S	S	S	S	M			
CO4	S	M	S	S	S	S	S	S	S	S			
CO5	S	L	S	S	L	S	S	S	S	S			
Level of Correlation between CO and PO					L-LOW		M-MEDIUM		S-STRONG				
Tutorial Schedule					NET/SET/GATE/CET/TRB /NEET Old question papers –solutions –online mock test								
Teaching and Learning Methods					Self study , Group discussion , Audio-Video Learning, learning through mock test								
Assessment Methods					100 multiple choice questions through computer based online examinations passing minimum is 50%								
Designed By Dr. D. KAVITHA <i>D. Kavitha</i>					Verified By Dr. P. SELVAMALEESWARAN <i>P. Selvamaleeswaran</i>			Approved By <i>[Signature]</i> <i>[Signature]</i>					



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
	FOOD BIOTECHNOLOGY	DSE-V		5	5			4
Objective	To understand the importance of food biotechnology and to familiarize with the basic concepts and regulations followed in developing food products.							
Unit	Course Content						Knowledge Levels	Sessions
I	Micro-organisms in natural food products and their control, food poisoning and microbial toxins. Role of microorganisms in fermented products - organisms used for fermented food products. Microbial production of yoghurt, cheese, beer and wine. Microbial fermentation of tea, coffee and cacao. Health aspects of fermented foods.						K1	10
II	Food borne diseases. Food Allergens. Antioxidants. Food colors (natural & artificial food colourants). Food flavoring agents (Emulsifiers & Stabilizers in food). Food Sweeteners (Saccharine, Acesulfane, Aspartame & Sucrolose). Enzymes in food preparation. Food carcinogens & mutagen (N - nitrosamines, Acrylamide & their mode of action).						K1-K2	10
III	Principles and methods of food preservation - Thermal processing, Drying and dehydration, Evaporation, Irradiation, Fermentation, Modified atmosphere, Chemical preservatives and Biopreservatives. Packaging principles and operation - package functions and design, shelf life of packaged foodstuffs - methods to extend shelf life						K2 - K3	10
IV	Characteristics of food raw materials, preparative operations in food industry, cleaning of food raw materials, sorting of foods, grading of foods. Sensory evaluation of food quality, quality factors for consumer safety. Responsibilities of regulatory agencies at national and international level (FDA, USDA, EPA, FSIS, EEC, BRAI)						K2	10
V	Plant design and layout, cleaning and sanitation of process plants. Classification & Characterization of waste from food industry. Treatment methods for solid & liquid waste. Genetically Modified Food - Bovine somatotropin & lactoferrin in milk, Edible vaccine. Algae as a source of food, feed & single cell protein						K2-K3	10
Course Outcome	After completion of the course, student should be able to							
	CO1: Comprehend the role of microorganism in the food products						K1	
	CO2: Know the importance of additives and enzymes in food preparation						K1	
	CO3: Apply knowledge of food preservation and packaging to						K2	



	extend shelf life	
	CO4: Understand about the operations, evaluations and regulations in food industry	K2
	CO5: Demonstrate the significance of design and sanitation of process plants along with waste treatment	K3
Learning Resources		
Text Books	1. B.Siva 2011. Food Processing & Preservation -PHI Learning Pvt Ltd. 2. D.G. Rao, 2010. Fundamentals of Food Engineering -PHI Learning Pvt Ltd	
Reference Books	1. Michael P. Doyle, Larry. R. Food Microbiology - Fundamentals & Frontiers 2. Yiu Hui & G. Khachatourians, Food Biotechnology ibek 3. Laramie & Bhunia, Fundamentals of Food Microbiology, CRC Press. 4. Frazier, W.C. and Westhoff, D.C. (2003) Food Microbiology. 18th Edition, Tata McGraw Hill, Inc., New York	
Website Link	1. https://lab-training.com/beneficial-role-of-microorganisms-in-food-industry/ 2. https://www.creative-enzymes.com/blog/applications-of-enzymes-in-the-food-industry/ 3. https://www.pharmatutor.org/articles/colouring-agents-used-in-food-products 4. https://foodandnutrition.org/november-december-2017/food-additives-emulsifiers/	
L-Lecture T-Tutorial P-Practical C-Credit		

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
	FOOD BIOTECHNOLOGY	DSE-V		2				2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	M	S	M	S	M	S
CO2	S	L	M	S	M	S	M	S	M	S
CO3	S	M	L	M	M	S	M	M	M	S
CO4	M	L	S	S	M	M	M	S	M	S
CO5	M	S	M	S	M	M	S	S	M	S
Level of Correlation between CO and PO			L-LOW			M-MEDIUM			S-STRONG	

Tutorial Schedule	Interactive Session
Teaching and Learning Methods	1. Lectures 2. Discussion 3. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr. Raghu Chandrasekaran	Dr. P. Selvamaleeswaran	

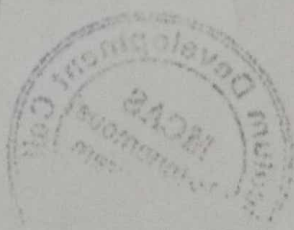
C. Raghu

P.S. Selvamaleeswaran

Dr. S. S. Shanmugasundaram



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
	PHARMACEUTICAL BIOTECHNOLOGY	DSE- VI	VI	5	5			4
Objective	To Know about classification and importance of drugs and benefits							
Unit	Course Content						Knowledge Levels	Sessions
I	History & principles of pharmacology. Classification of drugs and benefits. General principle of drug actions.Measurement of drug action.Pharmacokinetics and Pharmacodynamics						K1	10
II	Introduction to the different pathways of drug metabolism. Chemotherapeutic drugs- Protein synthesis inhibitors, Anti-inflammatory,Antibacterial, Antiviral, Anticancer drugs, Analgesic drugs and Antiprotozoal drugs						K2	10
III	Drug delivery and development. Production of biological - Human insulin, HGH, Erythropoietins, IFN, TNF, IL, Clotting factor VIII. Recombinant vaccines.						K2	12
IV	Drug Nanoparticles- Structure and Preparation, Liposomes, Cubosomes and Hexosomes.Fundamentals- Physicochemical Principles of Nanosized Drug Delivery Systems-Nanotubes, Nanorods, Nanofibers, and Fullerenes for Nanoscale Drug Delivery, Carbon nanotubes biocompatibility and drug deliver						K3	12
V	Cancer chemotherapy and Gene therapy methods,types and applications. Prenatal diagnosis: Amniocentesis, Fetoscopy, Chronic Villi sampling. Tools used for diseases: CT Scan, MRI, Biosensor and endoscopy.						K3	11
Course Outcome	After completion of the course, student should be able to							
	CO1: Classify the drugs and benefits						K1	
	CO2: Understand about pathways of drug metabolism						K2	
	CO3: Classify the recombinant vaccines and benefits						K2	
	CO4: Understand about nanoparticles preparation and uses						K3	
	CO5:To know about types of tools used for different kinds of diseases						K3	
Learning Resources								
Text Books	1. A concise Text book of Pharmacology.Sixth edition.Sathya Publications 2.S.S.Purohit,Kaknanj,Saleja(2006) Pharmaceutical Biotechnology. student edition 3. Deepshika P Katare (2008).Pharmaceutical Biotechnology Basic and Applications, capital publishing company							



Reference Books	1. H.P. Rang; (2003) Pharmacology-Elsevier Science limited,fifth edition.Elsevier science limited 2. Richard A Harvey(2000).Pharmacology.second edition Lippincott williams & wilkins
Website Link	https://www.rehabspot.com/drugs/drug-classifications/ https://accesspharmacy.mhmedical.com/content.aspx?bookid=2147&sectionid=161352227

L-Lecture T- Tutorial
P-Practical C-Credit

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
	PHARMACEUTICAL BIOTECHNOLOGY	DSE - VI		4	4			4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	L	L	S	S	M	L	M
CO2	S	M	L	M	M	S	S	M	L	M
CO3	S	S	L	M	M	S	S	S	L	M
CO4	S	S	M	M	S	S	S	S	L	M
CO5	S	S	M	M	S	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive Session 4. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.D.Rajasekaran	Dr.P.Selvamaleeswaran	<i>[Signature]</i>

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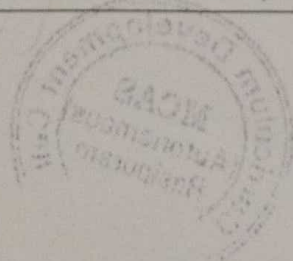
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B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2022-2023 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
	DRUG DESIGNING	SEC		2	2			2
Objective	Student will be able to understand the drug and designing							
Unit	Course Content						Knowledge Levels	Sessions
I	History of Drug Discovery and Development. Drug Discovery, Drug Development, Source of Drugs, Structural effects on drug action						K1	12
II	Drug design: General approach to discovery of new drugs - lead discovery - lead modification - physiochemical principles of drug action - drug stereo chemistry -drug action - 3D database search - computer aided drug design - docking - molecular modeling in drug design - structure based drug design - pharmacophores - QSAR.						K2	10
III	Enzyme kinetics, Enzyme inhibition and activation, Approaches to the Rational Design of Enzyme Inhibitors						K2	10
IV	Receptor Theory , Receptor Complexes and Allosteric Modulators , Second and Third Messenger Systems , Molecular Biology of Receptors , Receptor Models and Nomenclature , Receptor Binding Assays , Lead Compound Discovery, of Receptor agonists and antagonist.						K3	12
V	Prodrug Forms of Various Functional Groups , Ester prodrugs of compounds containing -COOH or -OH , Prodrugs of compounds containing amides, imides, and other acidic NH , Prodrugs of Amines , Prodrugs for compounds containing carbonyl groups.						K3	11
Course Outcome	After completion of the course, student should be able to							
	CO1: Knowledge about drug and its source						K1	
	CO2: Understand the new discovery of drug						K1	
	CO3: Kinetics receptors in enzyme						K2	
	CO4: Approach on receptor theory						K2	
	CO5: Analysis of prodrug formation						K3	
Learning Resources								
Text Books	Kerns, E.H.; Di, L. Drug-Like Properties: Concepts, Structure Design and Methods: from ADME to Toxicity Optimization, Academic Press, Oxford, 2008							



Reference Books	Burger's Medicinal Chemistry and Drug Discovery, 6th Edition, Vol. 1. Principles and Practice, edited by M. E. Wolff, John Wiley & Sons: New York, 2003. Principles of Medicinal Chemistry, 7th Edition, edited by T.L. Lemke, D. A. Williams, V. F. Roche, and S.W. Zito, Williams and Wilkins: Philadelphia, 2013
Website Link	https://opentextbc.ca/biology/chapter/bioprocess-technology/

L-Lecture T-Tutorial P-Practical C-Credit

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
	DRUG DESIGNING	DSC THEORY - I	VI	5	55			4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M	S	S	S	M	M
CO2	S	S	M	M	S	S	S	S	L	S
CO3	S	S	S	M	S	S	S	M	M	S
CO4	M	S	M	L	S	M	M	M	L	M
CO5	S	S	S	L	M	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive Session 4. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr. K. Revathi	Dr.P.Selvamaleeswaran	

Dr. K. Revathi
9/15/22

P.S. Selvamaleeswaran

Dr. S. Shanmugan



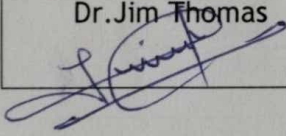
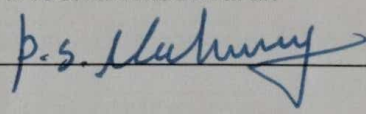
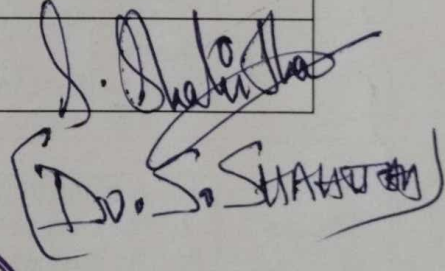
B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
	VERMITECHNOLOGY	SEC						
Objective	To Know about vermitechology and vermi composting methods.							
Unit	Course Content					Knowledge Levels	Sessions	
I	Earth worm classification-Morphological and Anatomical characteristics. Biology of Lampito muritti.					K1	3	
II	Vermicomposting materials and their classification. Feeding habits and food for composting worms.					K2	3	
III	Vermicomposting methods such as-small scale and large scale pit method, heap method, window method etc. Factors affecting vermicomposting such as pH,Moisture, Temperature etc.					K3	3	
IV	Vermicomposting: General procedure in homes. Maintance of vermicomposting beds. Harvesting the worms. Earthworm predators, parasites and pathogens.					K4	3	
V	Application of Vermicomposting in Agriculture and Horticultural practices. Advantage of Vermicomposting					K4	3	
Course Outcome	After completion of the course, student should be able to							
	CO1: Understand the history and scope of Vermitechology and worms.					K1		
	CO2: Understand the methods and factors affecting adaption of worms.					K1 .		
	CO3: Understand the biological process of B and T cell activation and proliferation.					K2		
	CO4: To Know about maintanence and harvesting about Worms.					K2		
	CO5: Understand about the importance and advantages of vermitechology.					K3		
Learning Resources								
Text Books	1 . Aravind kumar APH Publications(2005) 2. The complete technology book on vermiculture and vermicompost, Asia Pacific Business Press(2004)							
Reference Books	1. C.A Edwrds, J.R.Lofty (2013). 2. Shweta Yadav,V.K.Singh (2014). 3. Clive A. Edwards, (2010).							
Website Link	1. https://www.lap-publishing.com 2. https://www.globalsciencebook.info 3. https://academia.edu							
	L-Lecture	T-Tutorial	P-Practical	C-Credit				

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards										
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C		
	VERMITECHNOLOGY	SEC		2						2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M	S	S	S	M	M
CO2	S	S	M	M	S	S	S	S	L	S
CO3	S	S	S	M	S	S	S	M	M	S
CO4	M	S	M	L	S	M	M	M	L	M
CO5	S	S	S	L	M	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							

Tutorial Schedule	
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive Session 4. PPT Presentation
Assessment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr. Jim Thomas 	Dr. P. Selvamaleeswaran 	 Dr. S. S. Shanmugam



B. Sc., Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3UBTN01	CONCEPTS OF BIOTECHNOLOGY	NMEC- I	III	2	2			2
Objective	To provide an introduction to genetics, molecular biology, tools and applications of biotechnology.							
Unit	Course Content						Knowledge Levels	Sessions
I	Scope of Biotechnology. History of Biotechnology: Conventional and Modern Biotechnology - Biotech industries.						K1	4
II	Tools used in gene cloning - Restriction endonucleases - Types - Features. Ligases - Linkers, adaptors and homopolymer tails. Modifying enzymes.						K1-K2	4
III	Vectors- plasmids- pBR322. Cosmid vector, Animal vector- SV40.						K3	4
IV	Gene transfer methods- Vector mediated and vector less method.						K3	4
V	PCR, RFLP, RAPD and blotting techniques						K3	4
Course Outcome	After completion of the course, students should be able to							
	CO1: Understand the basic principles of Biotechnology						K1	
	CO2: Classify the fundamental knowledge of gene cloning tools						K1	
	CO3: Explain the vector system						K2	
	CO4: Employ the components of vector system						K2	
	CO5: Apply the molecular techniques for biotechnology						K3	
Learning Resources								
Text Books	1. Gupta P.K, (2004), Biotechnology and Genomics, Rastogi publication.							
Reference Books	1. Dubey, R. C. (2007), A text book of Biotechnology, S.Chand& Company Ltd. New Delhi. 2. Brown, T.A (1996), Gene cloning and DNA analysis, Blackwell science, Osney Mead, Oxford.							
Website Link	1. https://madhavuniversity.edu.in/biotechnology.html 2. https://bit.ly/3RzN7uG							
	L-Lecture		T-Tutorial		P-Practical		C-Credit	

B.Sc.,-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3UBTN01	CONCEPTS OF BIOTECHNOLOGY	NMEC I	III	2	2			2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	S	S	S	S	M	S
CO2	S	L	M	L	S	S	M	S	S	M
CO3	M	M	L	M	S	S	S	M	S	M
CO4	S	M	M	L	S	S	S	M	M	S
CO5	S	M	L	M	S	S	M	S	M	S

Level of Correlation
between CO and PO

L-LOW

M-MEDIUM

S-STRONG

Tutorial Schedule	--
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive sessions 4.ppt Presentation
Assessment Methods	1.Unit test 2.Assignment 3.CIA I & II

Designed By	Verified By	Approved By
<i>P. S. Selvamaleeswaran</i>	<i>M. Sureshkumar</i>	<i>A. K. Suresh</i>

(Dr. P. SELVAMALEESWARAN)

(Dr. M. SURESHKUMAR)



B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBT N04	MOLECULAR TECHNIQUES	NMEC- IV	IV	2	20			2
Objective	To understand the basic principles, working mechanism of instruments and its applications							
Unit	Course Content						Knowledge Levels	Sessions
I	Electrophoresis Techniques- AGE, PAGE, ISOELECTRIC FOCUSING						K1	4
II	Blotting Techniques- Southern, Northern and Western Blotting						K1-K2	4
III	Centrifuge- types and Applications						K3	4
IV	Chromatography- types and Applications						K3	4
V	Biosensor types and applications. Autoradiography						K3	4
Course Outcome	After completion of the course, student should able to							
	CO1: Knowledge about the importance, opportunities and challenges in							
	CO2: Understand about the biosafety guidelines.							
	CO3: Utilize molecular diagnostics tools							
	CO4: Identify the the macromolecular separations							
CO5: Demonstrate the various techniques and tools necessary for								
Learning Resources								
Text Books	1. Zubay.G.L., 1993. Biochemistry, 4th Edi. Wmc. Brown Publishers							
Reference Books	1. Upadhyay., Biophysical Chemistry-, Himalaya Publication, Edition III 2. S.Mahesh., 2003 Biophysics New Age International Private Ltd. 3. Ghatak, K.L., 2003. Techniques And Methods In Biology. Phi Learning Private Ltd. New							
Website Link	1. https://www.google.com/search?client=firefox-bd&q=spectroscopy 2. https://study.com/academy/lesson/medical-imaging-techniques-types-uses.html 3. https://www.erswhitebook.org/chapters/principles-of-respiratory-investigation/imaging							
L-Lecture T-Tutorial P-Practical C-Credit								

B.Sc-Biotechnology Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4UBT N04	MOLECULAR TECHNIQUES	NMEC IV	IV	2	30			2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	S	S	S	S	M	S
CO2	S	L	M	L	S	S	M	S	S	M
CO3	M	M	L	M	S	S	S	M	S	M
CO4	S	M	M	L	S	S	S	M	M	S
CO5	S	M	L	M	S	S	M	S	M	S
Level of Correlation between CO and PO	L-LOW	M-MEDIUM		S-STRONG						

Tutorial Schedule	
Teaching and Learning Methods	1. Lectures 2. Discussion 3. Interactive Session 4. PPT Presentation
Assesment Methods	1. Unit test 2. Assignment 3. CIA I & II

Designed By	Verified By	Approved By
Dr.P.Selvamaleeswaran	Dr. D. Rajasekaran	

p.s. Selvamaleeswaran

D. Rajasekaran

[Signature]



VALUE ADDED COURSE

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C	
21M5UBTVA1	AZOLLA AND SPIRULINA CULTIVATION	VALUE ADDED COURSE	VI	35					
Objective	To familiarize with the cultivation of azolla and spirulina and also it's applications								
Unit	Course Content							Knowledge Levels	Sessions
I	Introduction to Azolla, Types of Azolla, Biomass, Growing conditions, Economics importance.							K1-K2	7
II	Azolla as a biofertilizer, Nutritional value of Azolla, Pit preparation for Azolla.							K1-K2	7
III	Media preparation for Azolla, Mass Cultivation of Azolla, Factors affecting Azolla.							K2-K3	7
IV	Spirulina: Introduction, Types, Cultivation methods and Economic importance							K3-K4	7
V	Factors affecting growth for spirulina, large scale and small scale production. Harvesting, Marketing and uses of Azolla and Spiulina							K2-K4	7
Course Outcome	After completion of the course, student should be able to								
	CO1: Understand the introduction of spirulina								
	CO2: Discuss about azolla as biofertilizer								
	CO3: Cultivation methods for azolla								
	CO4: Introduction to spirulina production								
CO5: Develop the harvesting and marketing skill									

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
	Azolla and Spirulina Cultivation	Value Added Course	III					

-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	L	S	M	S	S	S	L	S
CO2	S	S	S	M	M	S	S	M	S	S
CO3	S	L	S	S	L	S	L	M	M	S
CO4	S	M	S	L	M	S	S	L	S	L
CO5	S	M	S	S	M	S	L	S	S	S
Level of Relation between CO and PO	L-LOW	M-MEDIUM	S-STRONG							



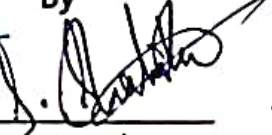
Practical Schedule

Teaching and Learning Methods

1. Lectures 2. Discussion 3. Interactive Session 4. PPT Presentation

Assessment Methods

1. Unit test 2. Assignment 3. Seminar 4. CIA I & II

Designed By 	Verified By 	Approved By 
Dr.K. REVATHI	DR. P. SELVAMALEESWARAN	