

Sri Kaliswari College (Autonomous), Sivakasi

(Affiliated to Madurai Kamaraj University)

Re-Accredited with 'A' grade (CGPA 3.30) by NAAC)



Programme Scheme, Scheme of Examinations and Syllabi

(For those who join from June 2018 and afterwards)

Department of Biotechnology

UG – Biotechnology

Curriculum Design and Development Cell

Annexure K

Sri Kaliswari College (Autonomous), Sivakasi

(Affiliated to Madurai Kamaraj University)

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Programme Scheme, Scheme of Examinations and Syllabi

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UG– Biotechnology

Curriculum Design and Development Cell

HOD

Dean of Science

Dean of Academic Affairs

Principal

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

Members of Board of Studies (2018-2021)

S.No.	Board Members	Name and Designation
i.	Chairman of the Board	Dr.M.Sujatha Head, Department of Biotechnology, Sri Kaliswari College, Sivakasi.
ii.	University Nominee	Dr.H.Shakila, Associate Professor and Head, Department of Molecular Microbiology, School of Biotechnology, Madurai Kamaraj University, Madurai.
iii.	Academic Expert 1	Dr.A.Veeraravi, Professor, Department of Biotechnology, Science campus, Alagappa Universtiy, Karai
iv.	Academic Expert 2	Dr. E. Kannapiran, Professor, Department of Animal Health Management, Alagappa University, Karaikudi.
v.	Industrial Expert	Mr.C.Mariappan, Senior Assistant Manager, T. Stanes and Co., Ltd., Coimbatore.
vi.	Alumnus	Mr.T.Victor Athisayam, UGC-BSR JRF, Department of Plant Biotechnology, School of Biotechnology, Madurai Kamaraj University, Madurai.
Faculty Members in the Department		
vii.	Dr.R.Narayana Prakash	Senior Faculty in Biotechnology
viii.	Mr.T.Sriram	Associate Professor in Biotechnology
ix.	Mr.K.Siva	Assistant Professor in Biotechnology
x.	Ms.APreethi	Assistant Professor in Biotechnology
xi.	Dr.S.Prakash	Assistant Professor in Biotechnology
xii.	Mrs.P.Devi	Assistant Professor in Biotechnology
xiii.	Dr.K.Manikandan	Assistant Professor in Biotechnology
xiv.	Ms.G.Mareeswari	Assistant Professor in Biotechnology

Sri Kaliswari College (Autonomous), Sivakasi

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Programme Scheme, Scheme of Examinations and Syllabi

(For those who join from June 2018 and afterwards)

Department of Biotechnology

UG Programme – B.Sc. Biotechnology

Curriculum Design and Development Cell

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

B.Sc. Biotechnology (Semester) - (2018-2021)

Objectives, Outcomes, Regulation

Programme Objectives:

- To explain the students about the basic techniques used in biotechnology.
- To enable the students to understand about the basic concepts of Modern Biotechnology
- To impart knowledge to the students about the application of biotechnology in the environment.
- To provide a thorough knowledge about structure and function of Cells, bio molecules and cellular development..
- To gain knowledge about the mutation and population Genetics
- To provide familiarity with basic biochemistry laboratory techniques.

Programme Outcomes:

Knowledge:

PO 1: Well grounded knowledge in chosen subjects.

PO 2: Updated knowledge related to the subjects.

Skills:

PO1: Acquisition of cognitive skills.

PO2: Acquisition of Life skills for employment.

Attitude:

PO1: Holistic Personality Development through Self- directed and lifelong learning.

PO2: Eco Sensitivity, inclusive culture, moral upright less and social commitment

Programmes Specific Outcomes:

- **Knowledge:** Core course of Biotechnology to improve their knowledge and understating of the subject.
- **Skill Development:** Practical training in all aspects of biotechnology.
- **Higher level ability:** Technical skills like Plasmid DNA isolation, Isolation of bacteriophage&Phage titration, Preparation of serum, ELISA, Western blotting, Agarose Gel Electrophoresis, PCR develop higher level ability.

- **Progression to higher studies:** In-depth knowledge on Cell biology, Genetics, Biochemistry, Microbiology, Molecular biology, Immunology, Animal Biotechnology, rDNA technology, Plant biotechnology learned three years equip students to go for higher studies.

Regulation

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

Eligibility:

A Candidate who have passed higher secondary examinations(10 +2) conducted by the Board of Higher Secondary Education, Govt of Tamil Nadu or any other state board examinations accepted as Equivalent thereto by the syndicates subject to such conditions.

- a) Biology/ Physics/ Chemistry as subjects in the higher secondary education
- b) Candidates should have secured at least 60% in the above subjects and above in aggregates
- c) A relaxation of 10% marks in the aggregate will be given to SC/ST candidates

Medium of Instruction : English

Age Limit:

Max age limit : 21 Years

Age Relaxation:

SC/ST/OBC/MBC/DNC & Women : 3 years age relaxation

Differently Abled Students : 5 years age relaxation

Transitory Permission:

Students joined from 2018 - 2021 may be permitted to write their examinations in this pattern up to April 2026.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
Choice Based Credit System
UG Programme – B.Sc
2018 - 2021

Scheme of Examination / Question Paper Pattern

Theory Examination

The Internal and External marks should be allotted in the ratio 25:75.

Internal Marks :

- | | |
|---------------------|--|
| i. Test (3 Tests) | : 15 Marks (Average of the best two tests) |
| ii. Assignment | : 5 Marks (Average of two) |
| iii. Seminar / Quiz | : 5 Marks |
| Total | : 25 Marks |

External Question Paper Pattern :

Time: 3 Hours

Max.Marks: 75

The question paper for external exam will have three parts.

Part – A

(10 X 1 =10)

Question No.1 to 10 – All are Multiple Choices (2 Questions from Each Unit)

Part – B

(5 X 7 =35)

Choosing Either (a) or (b) Pattern (One question from Each Unit)

- Question No. 11. (a) or 11. (b) - From Unit I
12. (a) or 12. (b) - From Unit II
13. (a) or 13. (b) - From Unit III
14. (a) or 14. (b) - From Unit IV
15. (a) or 15. (b) - From Unit V

Part – C

(3 X 10 =30)

Answer any Three out of Five Questions (One Question from Each Unit)

Question No. 16 – 20.

- 16 - From Unit I
17 - From Unit II
18 - From Unit III
19 - From Unit IV
20 - From Unit V

Blue Print for Question Paper Setting

Component Unit	Knowledge			Understanding			Higher objective			Total Marks
	PART A	PART B	PART C	PART A	PART B	PART C	PART A	PART B	PART C	
UNIT I	1 (1) 2 (1)				11a (7)	16 (10)		11b (7)		26
UNIT II	3 (1) 4 (1)	12a (7)				17 (10)		12b (7)		26
UNIT III	6 (1)	13a (7)			13b (7)		5 (1)		18 (10)	26
UNIT IV	8 (1)		19 (10)		14a (7) 14b (7)		7 (1)			26
UNIT V	9 (1) 10 (1)	15a (7)			15b (7)	20 (10)				26
Total	8	21	10		35	30	2	14	10	130

- Knowledge based - 30%
- Understanding - 50%
- Higher Objective - 20%

Practical Examination (Non - Computer)

Internal Marks :

- | | |
|-----------------------|-------------------|
| i. Regular Practicals | : 30 Marks |
| ii. Record | : 10 Marks |
| Total | : 40 Marks |

External Marks :

- | | |
|----------------------|-------------------|
| i. Major Experiment | : 20 Marks |
| ii. Minor Experiment | : 10 Marks |
| iii. Spotters | : 20 Marks |
| iv. Record | : 10 Marks |
| Total | : 60 Marks |

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
Choice Based Credit System- Curriculum Structure
UG Programme-B.Sc Biotechnology
2018-2021

Part	Subject	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Credits
I	Tamil/Hindi	6(3)	6(3)	6(3)	6(3)	-	-	12
II	General English	6(3)	6(3)	6(3)	6(3)	-	-	12
III	Core Courses	4(4) 4P(4)	4(4) 4P(4)	4(4) 4P(4)	4(4) 4P(4)	5 (5) 5(5) 5(4) 5P(5)	5(5) 5(5) 5P(5) 5P(5)	71
	Allied Courses	4(3) 2P(2)	4(3) 2P(2)	4(3) 2P(2)	4(3) 2P(2)	-	-	20
	Optional Courses	-	-	-	4(3)	4(3)	4(3)	9
IV	Non - Major Elective	2(1)	2(1)	-	-	-	-	2
	Skill Based Courses	-	-	2(2)	-	2(1) 2(1)	2(2)	6
	Value Based Courses	-	-	2(1)	-	-	2(1)	2
	Enrichment Courses	2(1)	2(1)	-	-	-	-	2
	Environmental studies	-	-	-	-	-	2(1)	1
	Disaster Management	-	-	-	-	1(1)	-	1
	Value education	-	-	-	-	1(1)	-	1
V	Extension	-	-	-	(1)	-	-	1
Total hours (per week)		30	30	30	30	30	30	140 180

Sri Kaliswari College (Autonomous) Sivakasi
Department Of Biotechnology
Choice Based Credit System-Curriculum Pattern
UG Programme- B.Sc Biotechnology
2018-2021

Semester	Part	Course Code	Course Name	Hours	Credits
I	I	18UTAL11	Tamil/Hindi	6	3
	II	18UENL11	General English-I	6	3
	III	18UBTC11 18UBTC1P	Core Course - I: Cell Biology	4	4
			Core Course - II: Lab in Cell Biology and Genetics	4	4
		18UBTA11 18UBTA1P	Allied Course-I: General Chemistry-I	4	3
			Allied Course-I: Ancillary Chemistry practical in volumetric analysis	2	2
	IV	18UBTN11	Non Major Elective Course-I: Human Diseases - Communicable Diseases	2	1
18UBTE11		Enrichment Course -I: Fundamentals of Genetics	2	1	
		Total	30	21	
II	I	18UTAL21	Tamil/Hindi	6	3
	II	18UENL21	General English-II	6	3
	III	18UBTC21 18UBTC2P	Core Course- III : Biochemistry	4	4
			Core Course -IV : Lab in Biochemistry	4	4
		18UBTA21 18UBTA2P	Allied Course-II: General Chemistry-II	4	3
			Allied Course-II: Ancillary Chemistry practical in organic analysis	2	2
	IV	18UBTN21	Non Major Elective Course-II: Human Diseases – Non Communicable Diseases	2	1
18UBTE21		Enrichment Course-II: Human Physiology	2	1	
		Total	30	21	
III	I	18UTAL31	Tamil/Hindi-III	6	3
	II	18UENL31	General English-III	6	3
	III	18UBTC31 18UBTC3P	Core Course -V: Microbiology	4	4
			Core Course -VI: Lab in Microbiology	4	4
		18UBTA31 18UBTA3P	Allied Course-III : Biological Sciences	4	3
			Allied Course-III: Lab in Biological Sciences	2	2
	IV	18UBTS31	Skill Based Course-I: Basic Concepts of Biotechnology	2	2
18UBTV31		Value Based Course- I: Medicinal Plants	2	1	
		Total	30	22	
IV	I	18UTAL41	Tamil/Hindi-IV	6	3

	II	18UENL41	General English-IV	6	3	
	III	18UBTC41	Core Course -VII : Immunology and Immunotechnology	4	4	
		18UBTC4P	Core Course -VIII : Lab in Immunology and Immunotechnology	4	4	
		18UBTA41	Allied Course-IV: Food Biotechnology	4	3	
		18UBTA4P	Allied Course-IV: Lab in Food Biotechnology	2	2	
		18UBTO41	Major Elective Course-I: 1. Biostatistics 2. Fundamentals of Drug Designing 3. Consumer affairs	4	3	
		18UBTO42				
		18UBTO43				
	V		Extension		1	
			Total	30	23	
V	III	18UBTC51	Core Course -IX: Plant Biotechnology	5	5	
		18UBTC52	Core Course -X: Industrial Biotechnology	5	5	
		18UBTC53	Core Course -XI: Animal Biotechnology	5	4	
		18UBTC5P	Core Course -XII: Lab in Plant, Animal and Industrial Biotechnology	5	5	
		18UBTO51	Major Elective Course-II: 1. Bioinformatics 2. Genetically modified crops 3. Natural Products (Secondary metabolites)	4	3	
	18UBTO52					
	18UBTO53					
		IV	18UBTS51	Skill Based Course - II: IPR, Bioethics and Biosafety	2	1
			18UBTS52	Skill Based Course - III: Cancer Biology	2	1
			18UDMG51	Disaster Management	1	1
	18UVED51		Value Education	1	1	
			Total	30	26	
VI	III	18UBTC61	Core Course XIII : Recombinant DNA Technology	5	5	
		18UBTC62	Core Course XIV: Molecular Biology and Molecular Genetics	5	5	
		18UBTC6P	Core Course XV: Lab in Recombinant DNA Technology	5	5	
		18UBTC6Q	Core Course XVI: Lab in Molecular Biology and Molecular Genetics	5	5	
		18UBTO61	Major Elective Course-III: 1. Stem cell Biology 2. Biochemical techniques 3. DNA finger printing	4	3	
	18UBTO62					
	18UBTO63					
		IV	18UBTS61	Skill Based Course-IV: Functional Genomics	2	2
			18UBTV61	Value Based Course-II: Nano Biotechnology	2	1
			18UESR61	Environmental Studies	2	1
			Total	30	27	

Semester	I	II	III	IV	V	VI	Total
Credits	21	21	22	23	26	27	140

Dean of Science

Dean of Academic Affairs

Principal

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
(2018-2021)
Semester I

Core Course – I: Cell Biology (18UBTC11)
(For those who join from June 2018 and afterwards)

Credits	: 4	Int. Marks	: 25
Hours/Week	: 4	Ext. Marks	: 75
Duration	: 60 hrs	Max.Marks	: 100

Course Objectives:

- To provide a through knowledge about structure and function of Cell organelles, Biomolecules and cellular development.
- This paper will help the student get a grasp of the latest advances in cell biology.

Course Outcomes:

1. Thorough knowledge about structure and function of Cells, bio molecules and cellular development.
2. Knowledge about the role of the major cell organelles.
3. Fundamental features of prokaryotic and eukaryotic cells and methods used to examine them.
4. Knowledge on the specific processes and proteins involved in membrane transport.
5. Understand the major stages of the cell cycle.
6. Awareness on the latest advances in cell biology.

UNIT I **(12 hrs)**

Cell structure- Prokaryotic and Eukaryotic - Plant and Animal cells - structural features- a brief comparative account-Cell theory-Plasma membrane- chemistry and ultra structure- Fluid mosaic model-permeability and other functions.

UNIT II **(12 hrs)**

Endoplasmic reticulum and Golgi complex- morphology, structure and functions. Nucleus- ultra structure and organization- Chromosomes: morphology, structure- types: Giant chromosomes- polytene and lamp- brush chromosomes.

UNIT III **(12 hrs)**

Ultra structure and functions of Mitochondria, Chloroplasts, Lysosomes and Ribosomes.

UNIT IV **(12 hrs)**

Cell cycle- mitosis and meiosis, Dynamics of cell division. Significance of mitosis and meiosis. Cell growth- normal and abnormal cell growth (cancer).

UNIT V **(12 hrs)**

Light, compound, Electron microscopes a brief account. Sub cellular fractionation: Ultra centrifugation, Differential and density gradient centrifugation. Peroxisomes – formation, enzyme content and their role.

Text Books:

1. Verma, P.S and V.K. Agarwal, Cell biology, Genetics, “Molecular biology and Ecology”, S. Chand and Co. New Delhi, 2008.
2. Ajay Paul, M., “Text Book of Cell and Molecular Biology”, Books and Allied Pvt. Ltd. Kolkata, 2007.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1-1.2	3
		3	3.10, 3.18, 3.19	32 – 36
		5	5.1-5.13	94 -107
II	1	6	6.1 - 6.4	130 – 139
		7	7.1 - 7.5	140-147
		12	12.1-12.8	201-209
		13	13.1-13.7	211-220
III	1	8	8.1-8.8	150-155
		10	10.1 - 10.8	170-175
		11	11.1 - 11.9	180-182
		14	14.1 - 14.11	232-239
IV	2	18	18.1 - 18.6	263-265
V	2	2	2.1 - 2.6	18-22

Reference Books :

1. James Darnet, Harvey Lodish, David Baltimore, “Molecular Cell biology”, Scientific American Books Ins, 2005.
2. Gupta, P.K., “Cell and Molecular biology”, Rastogi publication, India, Second edition, 2000.
3. Wilson and Marrison, “Cytology”, Reniform publications, New York, 2007.
4. De Robertis, E.D.P. and E.M.F. De Robertis, “Cell and molecular biology”, Eighth International Edition, 1988.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester I
(2018-2021)

Core Course - II: Lab in Cell Biology and Genetics (18UBTC1P)
(For those who join from June 2018 and afterwards)

Credits	: 4	Int. Marks	: 40
Hours/Week	: 4	Ext. Marks	: 60
Duration	: 60 hrs	Max.Marks	: 100

Course Objectives:

- To impart the practical knowledge on Cell Biology.
- To learn the basic techniques of cell biology.

Course Outcomes:

1. Familiar in basic biochemistry laboratory techniques.
2. Understand the basic Biochemical estimations.
3. Analyze the methods including graphing and statistical analysis.
4. Problem solving skills and analytical thinking skills.
5. Familiar with laboratory skills.

Cell Biology:

1. Parts and functioning of compound microscope.
2. Study of cell organelles by photo micrographs.
3. Study the different living and non-living cell inclusions-Starch grains, Raphides and Cystolith.
4. Study of mitosis by smear technique using onion root tip.
5. Study of different stages of meiosis from permanent slides.
6. Study of different types of giant chromosome – Polytene and Lampbrush
7. Chromosomes from permanent slides.

Genetics:

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

Reference Books:

1. Palanivelu P, “Analytical biochemistry and separation techniques”, MKU, Madurai, 2012.
2. Gunasekaran. P, “Laboratory Manual in Microbiology”, New Age International, 2007.
3. Jayaraman J, “Laboratory manual of Biochemistry”, New age international publishers, Sixth Edition, 2002.
4. Keith Wilson, John Walker, “Principles and Techniques of Practical Biochemistry” Cambridge University Press, Fifth Edition, 2000.
5. Douglas A Skoog, F.James Holler, Timothy A. Nieman, “Principles of Instrumental Analysis”, Brooks Cole publishers, Fifth Edition, 1997.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester I
(2018-2021)

Non Major Elective Course-I: Human Diseases-Communicable Diseases (18UBTN11)
(For those who join from June 2018 and afterwards)

Credit	: 1	Int. Marks	: 25
Hours / week	: 2	Ext. Marks	: 75
Duration	: 30 hrs	Max. Marks:	100

Course Objectives:

- To enable the student to know about the ubiquitous nature of pathogens and host - pathogen relationships.
- To create awareness on diseases caused by the microorganisms.
- To understand about the diagnosis and treatment of various diseases.

Course Outcomes:

1. Understand the ubiquitous nature of pathogens and host - pathogen relationships.
2. Awareness on diseases caused by the microorganisms and the prevention methods and vaccination.
3. Understand about the diagnosis and treatment of various diseases.
4. Awareness on diseases and ensure the sanitation and hygiene.

UNIT I **(6 hrs)**

Introduction to Infectious Diseases, Infection, Parasite, Pathogen, Pathogenicity, Pathogenesis- Frequency of Disease, Characteristics of Infectious Diseases, Disease Cycle and Transmission of Pathogen, Host pathogen interactions.

UNIT II **(6 hrs)**

Pathogenesis, Occurrence, Epidemiology, Diagnosis and Treatment of *Streptococcus*, *Mycobacterium*, *Salmonella* and *Leptospirosis*.

UNIT III **(6 hrs)**

Pathogenesis, Occurrence, Epidemiology, Diagnosis and Treatment of Dermatophytes, Aspergillosis and Candidiasis.

UNIT IV **(6 hrs)**

Pathogenesis, Occurrence, Epidemiology, Diagnosis and Treatment of Malaria, amoebiasis and ascariasis.

UNIT V **(6 hrs)**

Pathogenesis, Occurrence, Epidemiology, Diagnosis and Management of HIV, Hepatitis B and Influenza Viral Infections (H1N1).

Text Books:

1. R.C.Dubey and D.K.Maheshwari, “A Text Book of Microbiology”, S.Chand and Company, New Delhi, 2013.
2. Ananthanarayan and Paniker’s, “Textbook of Microbiology for Nurses”, Universities press India private limited, 2010.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	20	1	572 – 576
II	2	15	15.1	80 – 85
		18	18.1	102 - 105
		24	24.1	148
		19	19.4	116 – 118
III	1	21	2	596 – 598, 604 – 606
IV	2	34	34.4	214 – 217, 209 – 211
		35	35.1	219 – 221
V	2	30	30.1	179 – 182
		29	29.1	171 – 174
		33	33.4, 33.1, 33.1	203 – 204, 199, 200

Reference Books:

1. Prescott, Harvey, Klein, “Microbiology”, -McGraw Hill, Ninth Edition, 2013.
2. A.Mani, A.M. Selvaraj, L.M. Narayanan, N.Arumugam, “Microbiology”, Saras publication, Nagercoil, 2014.
3. A.S.Rao, “Introduction to Microbiology”, PHI learning private limited, New Delhi, 2009.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester I
(2018-2021)

Enrichment Course- I: Fundamentals of Genetics (18UBTE11)

(For those who join from June 2018 and afterwards)

Credit	: 1	Int. Marks : 25
Hours/Week	: 2	Ext. Marks : 75
Duration	: 30 hrs	Max.Marks : 100

Course Objectives:

- To Study the principle of Mendelian Genetics.
- To analyze the characteristics of lethal disorders.
- To gain knowledge about the mutation and population Genetics.

Course Outcomes:

1. Knowledge in genetics and science.
 2. Understand about monohybrid and dihybrid plants.
 3. Structure and function of genes, chromosomes and genomes.
 4. Understand how traits get passed down through generations.
 5. Fundamentals of molecular biology.
-

UNIT I **(6 hrs)**

Mendelian Genetics: Mendel's work – Mendel's Method-Experiments-Observations and Results. Rediscovery of Mendel's work- Mendel's law- Terminology- Back/test cross-Complete and Incomplete Dominance.

UNIT II **(6 hrs)**

Lethal Factor: Non Allelic Gene Interactions-Complementary Gene-Epistasis-Duplicating Genes-pleiotropism-Allelic gene interaction- Multiple alleles-Blood Group Inheritance-Rh factor.

UNIT III **(6 hrs)**

Genes and chromosomes: Linkage and Crossing - Over-Theories of Crossing Over-Cytological Basis- Mapping of Chromosomes- Sex determination and sex linked inheritance (colour blindness only).

UNIT IV **(6 hrs)**

Mutation: Gene mutation- Molecular Basis of Gene Mutation-Base Substitution-Tatumerism- Mutagens- Chromosomal Aberrations- Deletion- Duplication- Translocation-Inversion- Ploidy.

UNIT V **(6 hrs)**

Population Genetics-Gene Pool Concept- Hardy Weinberg law- Gene Frequencies Calculations and Factors Affecting Hardy- Weinberg law.

Text Books:

1. Gardener, A.J. Simmons M.J and Snusted, “Principles of Genetics”, John Willey and sons, NewYork, 2008.
2. Snustad, Simmons “Principal of Genetics”, John Wiley and Sons, Fourth Edition, 2008.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	3	3.1-3.9	42-99
II	1	4	4.1-4.20	69-89
III	1	6	6.1-6.9	115-139
		7	7.3-7.4	119-121
		8	8.11-8.13	123-139
IV	2	18	18.1-18.9	649-690
V	2	13	13.10-13.12,13.16-13.18	480-499

References Books:

1. Ajoy Paul, “Genetics from genes to genome”, Arunabha Sen Publisher,2011.
2. John Gardner, Simmons and Snustad “Principal of Genetics”, Eight Edition, John Wiley, 2011.
3. Tamarin M, Robert J Thomson, “Principles of Genetics”, Seventh Edition, 2012.
4. Hartl and W.Jones, “Essential Genetics”, Third Edition, 1999.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

UG Programme - B.Sc

Semester II

(2018-2021)

Core Course– III: Biochemistry (18UBTC21)

(For those who join from June 2018 and afterwards)

Credits : 4

Int. Marks : 25

Hours/Week : 4

Ext. Marks : 75

Duration : 60 hrs

Max.Marks : 100

Course Objectives:

- To provide a thorough knowledge about structure and function of Cells, bio molecules and cellular development.
- This paper will help the student get a grasp of the latest advances in cell biology.

Course Outcomes:

1. Knowledge about structure and function of Cells, bio molecules and cellular development.
2. Awareness on the latest advances in cell biology.
3. Concepts of molecular and functional organization of a cell and its subcellular components.
4. Understand structure and interrelationship of various biomolecules and consequences of deviation from normal.
5. Awareness about digestion and assimilation of nutrients and consequences of malnutrition.
6. Understand the various aspects of metabolism and their regulatory pathways.

UNIT I

(12 hrs)

Structure, functions and Classification of Carbohydrates with example. Metabolism- Glycolysis, Pentose Phosphate Pathway, TCA Cycle and its energetics.

UNIT II

(12 hrs)

Structure, Classification and properties of aminoacids. Deamination, Transamination and Decarboxylation reactions of aminoacids. Structural Organization of Proteins (Primary, Secondary, Tertiary and Quaternary) Metabolism of Aromatic Aminoacids and Urea Cycle.

UNIT III

(12 hrs)

Structure, functions and classification of Lipids and fattyacids. Biosynthesis and beta oxidation of fatty acids. Structure and biological properties of Cholesterol.

UNIT IV

(12 hrs)

Watson and Crick model of DNA, RNA (mRNA, tRNA, rRNA)-Salvage pathway of Purines and Pyrimidines.

UNIT V

(12 hrs)

Classification and Nomenclature of Enzymes-Coenzymes, Cofactors-Water Soluble and fat soluble Vitamins-dietary sources and functions-Biologically valuable minerals (Copper, Iron and Zinc).

Text Books:

1. Jain J.L., Sunjay Jain, Nitin Jain, “Fundamentals of Biochemistry”, S.Chand and company Ltd, Sixth Edition, 2007.
2. U.Sathyanarayana, “Text book of Biochemistry”, Uppala author publisher interlinks, Third Edition, 2006.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	5	5.1 - 5.5	73-75
		6	6.1 - 6.6	78-82
		7	7.1 - 7.4	85-90
		8	8.1 -8.4	95-100
		21	21.1-21.5	458-521
		22	22.1-22.6	540-555
II	1	9	9.1 - 9.15	641 – 670
		26	26.1-26.5	821-855
III	1	13	13.1 - 13.5	244 - 268
		24	24.1 - 24.6	564 – 593
IV	2	5	5.1 - 5.8	69 – 84
		17	17.1 -17.8	387-400
V	2	6	6.1 - 6.5	85 -87
		7	7.7	91-94

Reference Books :

1. Lehninger.A.L.,Nelson.D.L.,Cox,.M.M, “Principles of Biochemistry”, W.H.Freeman and company, Newyork, Sixth edition, 2004.
2. Voet .D.,Voet J.G.,and Pratt,C.W, “Fundamentals of Biochemistry”, John wiley and sons Newyork, 1999.
3. Berg J.M., Tymouzko, J.L. and Stryer.L, “Biochemistry” W.H.Freeman company, Newyork, Sixth edition, 2007.
4. Murray R.K., D.K.Granner, P.A.Mayes and V.W.Rodwell, “Harper’s Biochemistry”, Mc Graw Hill Publications, Twenty ninth edition, 2012.
5. Eric E.Conn, Paul K Stumpf, George Bruening,Roy H. Doi. “Outlines of Biochemistry”, John wiley and sons, 2005.

Sri Kaliswari College (Autonomous), Sivakasi

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(2018-2021)

Semester II

Core Course – IV: Lab in Biochemistry (18UBTC2P)

(For those who join from June 2018 and afterwards)

Credits	: 4	Int. Marks	: 40
Hours/Week	: 4	Ext. Marks	: 60
Duration	: 60 hrs	Max. Marks	: 100

Course Objectives:

- To provide familiarity with basic biochemistry laboratory techniques.
- To enable the students to learn basic Biochemical estimations.
- To expose the students familiar with the equipments available in our laboratory.

Course Outcomes:

1. Familiar in basic biochemistry laboratory techniques.
2. Understand the basic Biochemical estimations.
3. Analyze the methods including graphing and statistical analysis.
4. Problem solving skills and analytical thinking skills
5. Familiar with laboratory skills.

-
1. Colorimeter and spectrophotometer (Principle and application).
 2. pH meter and preparation of buffers.
 3. Estimation of Proteins (Lowry's).
 4. Estimation of Glucose (Dinitrosalicylic acid).
 5. Estimation of Ascorbic acid.
 6. Optimum pH, Optimum temperature of Salivary amylase.
 7. Paper Chromatography for amino acid separation.

Reference Books :

1. Keith Wilson, John Walker, "Principles and Techniques of Practical Biochemistry", Cambridge University Press, Fifth Edition, 2000.
2. Dr.P.Palani velu, "Analytical biochemistry and separation techniques", Twenty first century Publications, 2000.
3. Douglas A Skoog, F.James Holler, Timothy A.Nieman, "Principles of Instrumental Analysis", Cole publishers, Fifth Edition, 1997.
4. Jayaraman J, "Laboratory manual of Biochemistry", New age international publishers, Sixth Edition, 1999.

Sri Kaliswari College (Autonomous), Sivakasi
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Semester II
(2018 - 2021)

Non Major Elective Course - II: Human Diseases -Non Communicable Diseases (18UBTN21)
(For those who join from June 2018 and afterwards)

Credit	: 1	Int. Marks	: 25
Hours / Week	: 2	Ext. Marks	: 75
Duration	: 30 hrs	Max. Marks	: 100

Course Objectives:

- To enable the students to know about the Health and Diseases.
- To impart knowledge about various metabolic related disorders.
- To create awareness on in borne metabolic disorders.

Course Outcomes:

1. Knowledge about the Health and Diseases.
2. Understand about various metabolic related disorders.
3. Awareness on in borne metabolic disorders.
4. Understand about diagnosis, treatment and prevention method.

UNIT I **(6 hrs)**

Introduction to Human Health – Definition - Physical Health - Mental Health and Social Health- Macronutrients and Micronutrients – Physiological functions - Dietary sources – Requirements - Deficiency conditions.

UNIT II **(6 hrs)**

Differences Between Communicable and Non-Communicable Diseases - Coronary Heart Disease – Hypertension - Rheumatic Heart Diseases – Stroke - and Cancer.

UNIT III **(6 hrs)**

Diabetes Mellitus: Glucose tolerance tests - Sugar levels in blood -**Disorder of Lipids:** Atherosclerosis - Obesity. Alzheimer’s disease-Parkinson syndrome.

UNIT IV **(6 hrs)**

Disorders of Liver and Kidney: Jaundice - Liver Cirrhosis - Kidney Failure - Normal Functions of Liver and Kidney.

UNIT V **(6 hrs)**

Genetic disorder diseases: Phenylketonuria – albinism- Down syndrome – Turner syndrome – Klinefelter syndrome - Erythroblastosis fetalis.

Text Books:

1. U.Satyanarayana, U.Chakrapani, “Biochemistry (With clinical concepts and case studies)”, Books and allied Pvt.ltd, Fourth revised edition, 2015.
2. Alistair F.smith, Peter W.H.Rae, “Clinical biochemistry”, Black well science publications, Sixth edition, 2005.
3. Dr.U.Satyanarayana, “Essentials of Biochemistry”, Books and allied Pvt. Ltd, 1999.

Unit	Text book No.	Chapter	Section	Page No.
I	1	3	3.18	403 – 410, 410 - 422
	2	1	-	5 – 19
II	1	2	2.8	190
	2	12	-	168 – 169
III	1	3	3.13, 3.14	244, 325, 326 – 327
IV	2	8	-	110,118
		4	-	51,59 – 60
		12	-	168 – 169
	3	4	4.10,4.21	117, 118,263,266
V	3	4	4.10, 4.15	110 – 111, 185 -186
		3	3.15	184 – 185

Reference Books:

1. J.L.Jain, Sunjay Jain, Nitin Jain, “Fundamentals of Biochemistry”, S.Chand and Company Ltd, 2007.
2. Jeremy M.Berg, John L.Tymoczko, Lubert stryer , “Biochemistry”, W.H.Freeman and company, New York, Sixth Edition, 2007.

Sri Kaliswari College (Autonomous), Sivakasi
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Semester II
(2018-2021)

Enrichment Course-II: Human Physiology (18UBTE21)
(For those who join from June 2018 and afterwards)

Credit	: 1	Int. Marks	: 25
Hours / week	: 2	Ext. Marks	: 75
Duration	: 30 hrs	Max. Marks	:100

Course Objectives:

- To understand the nutritional requirements and Basal Metabolic Rate.
- To make the students familiar with the process of respiration
- To make the students understand the role of Hemoglobin.
- To help the students in understanding the mechanism of hormones in our body.

Course Outcomes:

1. Understand about nutrition and their values.
2. In depth analysis of the internal organs and their working mechanisms.
3. Understand about important of hormones and their role in health
4. Importance of health and exercise.
5. Knowledge about physiology of digestion and absorption of nutrition.
6. Awareness on the ultra structure and activities of bones and muscles.

UNIT I **(6 hrs)**

Structure of Human Digestive system-Nutritive Requirements – Carbohydrates, Proteins, Lipids, Vitamins and Minerals. Physiology of Digestion, Absorption and Assimilation- Hormonal Control of Digestion. Basal Metabolic Rate (BMR).

UNIT II **(6 hrs)**

Structure of Human Respiratory system. Mechanism of Breathing: External respiration and Internal respiration. Structure of Mammalian Heart. Heart beat- Mechanism of circulation –Origin and Conduction of Heart beat –.Circulatory system: Composition of Blood and its function, Blood pressure, ECG.

UNIT III **(6 hrs)**

Structure of Human Kidney – Mechanism of Urine Formation: Glomerular filtration – Tubular reabsorption and Secretion – Counter Current Mechanism – Hormonal Regulation. Thermoregulations.

UNIT IV **(6 hrs)**

Ultra Structure of skeletal muscle. Voluntary and Non voluntary muscles Mechanism of muscle contraction- Theories. Structure of Neuron – Origin and Conduction of Nerve Impulse. Synaptic Transmission –Neuromuscular Junction. Circadian Rhythms and Biological Clocks, Neurotransmitter.

UNIT V**(6 hrs)**

Endocrine and Exocrine glands-Pituitary- Thyroid, Adrenal-Ovary- Testis-Hormones and its functions- Reproductive system in human- Menstrual cycle.

Text Books:

1. P.S.Verma, B.S.Tyagi, V.K.Agarwal, “Animal Physiology”, S.Chand and company Ltd, India, 2002.
2. N.Arumugam, A.Mariakuttikan, “Animal Physiology”, Saras Publication, Nagercoil, 2013.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	3	3.1 - 3.5	28 - 30, 43, 54,57 - 59
		5	5.1	83
		4	4.1	61 - 63
		5	5.4	90 - 98, 119 - 121
		7	7.1	144
II	1	8	8.1	195 - 201
		11	11.5 - 11.9	245 - 247, 249 - 253
III	1	9	9.3 - 9.7	211 - 213, 215 – 219
		10	10.1 - 10.5	220 – 222
IV	1	12	12.1 - 12.4	259 - 263, 271 - 276
		13	13.1 - 13.5	281 - 285, 290 - 295 303
V	1	14	14.1 - 14.5	310 - 328, 331 - 335 336 - 340
		16	16.5	376 - 389
	2	3		209

Reference Books:

1. Murray Harper’s, “Illustrated Biochemistry”, Appleton and Lange, 2010.
2. Ganong , “Review of Medical Physiology”, Lang Medical Publications, 2003.

Sri Kaliswari College (Autonomous), Sivakasi

Department Of Biotechnology

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Semester III

(2018 - 2021)

Core Course – V: Microbiology (18UBTC31)

(For those who join from June 2018 and afterwards)

Credits : 4

Hours /Week: 4

Duration : 60 hrs

Int. Marks : 25

Ext. Marks : 75

Max. Marks : 100

Course Objectives:

- To enable students to understand the diversity of microbes and importance of classification of microorganisms.
- To help the students to understand the influence of microorganisms and microbiological applications on everyday life.

Course outcomes:

1. Apply appropriate terminology relating to the structure, metabolism, genetics, and ecology of prokaryotic microorganisms, eukaryotic microorganisms, and viruses.
2. Understand the nutritional requirement of microorganisms.
3. Knowledge about the interactions between pathogenic microorganisms and susceptible hosts that results in infection and disease.
4. Knowledge on methods of sterilization used in the control of microorganisms and apply this understanding to the prevention and control of infectious diseases.
5. Understand the interaction between the microorganisms and plants, animals.

UNIT I

(12 hrs)

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

UNIT II

(12 hrs)

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

UNIT III

(12 hrs)

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

UNIT IV

(12 hrs)

Cultural Characteristics, Morphology and Pathogenesis of Bacteria- *Escherichia coli*, *Salmonella*, *Mycobacterium*. Fungi- *Aspergillus*, *Candida*. Viruses- HIV, HBV, Virions and Prions.

UNIT V**(12hrs)**

Interactions between Microorganisms-Mutualism, Commensalism, Antagonism, Exploitation and Parasitism - Plant Microbe Interaction-Symbiosis, Mycorrhizae, Nitrogen Fixation. Host Pathogen Interaction – Mechanism of Microbial Pathogenesis.

Text Books:

1. P.D.Sharma , “A Text Book For University Students”, Rastogi Publications, Third Edition, 2015.
2. Ananthanarayanan and J. Panicker, “Text book of Microbiology” ,University Press Publishers, Ninth edition 2013.
3. Ananthanarayanan and J. Panicker, “Text book of Microbiology for nurses”, University Press Publishers, 2010.
4. R.C.Dubey and D.K. Maheswari, “A Text book of Microbiology”, S.Chand Publication,1999.
5. Michael J.Pelczar, C.S.Chan and Noel R.Krieg,“ Microbiology” , McGrew- Hill publication,1993.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1		4 -20
		2		22 -32
II	3	4	4.28	167 - 168
	4	1		44 - 45
		1		49 - 52
		1		37 - 41
III	2	1	1.2-1.3	15-22, 24-26, 28-38
	4	1		117 - 121
	1	4		82 , 83,88 -91
IV	2	3	3.29	274 - 279
		5	5.64	608-610, 611- 612
	4	15		417 -420
V	1	22		542-545
		14		381 - 387
	4	16		425 , 400 -403
	5	17	17.18,17.19	350-352
		18	18.13	380 -381

Reference Books :

1. Michael T.Madigan John M. Martin and Jack Parker, “Brock Biology of Microorganisms”, Prentice Hall International, Inc., London, 2002.
2. Gerar J. Tortora, Berdell R. Funke, Christine and L. Case, “Microbiology- An Introduction”, Benjamin Cummings , Tenth Edition ,2016.
3. Danial V.Lim, “Microbiology”, Kendall Hunt Publication , Third Edition ,2003.

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UG Programme - B.Sc
Semester III
(2018 - 2021)

Core Course -VI: Lab in Microbiology (18UBTC3P)
(For those who join from June 2018 and afterwards)

Credits	: 4	Int.Marks	: 40
Hours / Week	: 4	Ext.Marks	: 60
Duration	: 60 hrs	Max.Marks	: 100

Course Objectives:

- To enable the students acquire the knowledge about basic technical skills in microbiology lab.
- To enable the students in the culturing, identification and maintenance of microbes.

Course Outcomes:

1. Perform safe practices in a microbiology laboratory.
2. Understand the use of culture media.
3. Identify unknown bacteria using biochemical testing.
4. Perform proper streaking for isolation using the quadrant method.
5. Perform appropriate staining technique.
6. Interpret biochemical test results properly to determine species identification.

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

Reference Books:

1. Ronald M. Atlas *et al.*, “Experimental Microbiology”, Benjamin and Cummings Publication, 1997.
2. J.G. Cappuccino and N. Sherman, “Microbiology: A Laboratory Manual”, Addison-Wesley, 2002.
3. Kannan.N., “Lab manual in Microbiology” , Panima publishers, New Delhi, 1995.
4. J.G.Holt, N.R.Krieg, “Bergey’s Manual of Determinative Bacteriology”, Ninth edition, 2000.

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UG Programme - B.Sc

Semester - III

(2018-2021)

Allied Course – III: Biological Science (18UBTA31)

(For those who join from June 2018 and afterwards)

Credits : 3

Int. Marks : 25

Hours/Week : 4

Ext. Marks : 75

Duration : 60 hrs

Max.Marks : 100

Course Objectives:

- To provide familiarity with basic topics about classification, nomenclature and herbarium preparation.
- To provide the knowledge about the general aspects of algae, fungi and bryophyte.
- To help the students acquaint with details of Invertebrate and Chordates.

Course Outcomes:

1. Knowledge about the modern system of classification of plants.
2. Analyze the Economic importance and Life history of Algae, Fungi and Bryophytes.
3. Understand the Classification and Life history of Pteridophytes, Gymnosperms.
4. Salient features of Monocot and Dicot plants.
5. Characteristic features of invertebrates and Chordates and their Importance.

UNIT I

(12 hrs)

Basics of Classification-Units of Classification-Nomenclature-Binomial System-Systems of Classification- Artificial, Natural and Phylogenetic- Natural system of classification- Bentham and Hooker system of classification of plants- Herbarium and their importance.

UNIT II

(12 hrs)

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

UNIT III

(12 hrs)

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

UNIT IV

(12 hrs)

Classification of Invertibrata (Upto class level). Phylum Protoza-General Characters-Life Cycle of Malarial Parasite- Phylum - Coelenterata-General Characters-Coral formation and Types. Phylum Helminthes – Life cycle of *Taenia solium* and *Ascaris*. Phylum Anaelida- General Characters - Vermi technology.Phylum Arthropoda and Phylum Mollusca – General characters.

UNIT V

(12 hrs)

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

Text Books:

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

Unit	Text Book No.	Chapter	Section	Page No.
I	3	1	3 – 6	23-35
		2	4 – 7	37-40
		3	5 – 8	43- 45
II	4	2	7-10	1-6, 219-232, 33
		3	11-13	288-298, 2-5
		4	15-17	288-298, 2-5
III	4	7	19-21	177- 178
		8	22- 23	183, 185-186
		9	25-27	228- 261, 180- 187
		10	28-29	305-311
IV	1	11	11.1 - 11.9	101 - 102,
		18	18.7 - 18.9	177 – 183
		30	30.2 - 30.6	335 - 336, 426 – 429
		36	36.2 - 36.13	441 – 442
V	2	2	2.1 - 2. 11.1, 17.6, 18.6	17-48
		4	4.2 - 4.3	88
		6	6.3 - 6.7	149
		7	47.1 - 7.3	234
		11	11.5, 14.1	340-341
		14	14.2	410-416
		16	16.9	240-249
		17	17.2 -17.9	249-359
		18	18.2 -18.4	359-537

References Books:

1. Dutta A.C, “Botany for Degree students”, Oxford University press, New Delhi, 2004.
2. Smith G.M, “Cryptogamic botany”, Volume I and II, Tata Mc Graw Hill, India, 2009.
3. Subramanyam, “Modern plant Taxonomy”, Vikas Publishing House, New Delhi,2003.

Sri Kaliswari College (Autonomous), Sivakasi
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Semester III
(2018 – 2021)

Allied Course - III: Lab in Biological Sciences (18UBTA3P)
(For those who join from June 2018 and afterwards)

Credits	: 2	Int.Marks	: 40
Hours / Week	: 2	Ext.Marks	: 60
Duration	: 30 hrs	Max.Marks	: 100

Course Objectives:

- To practice the students in handling of plants, animals and lower plants and their identification.
- To impart the practical knowledge on Plant Diversity.

Course outcomes:

- Handling and identification of plants, animals and lower plants.
- Practical knowledge on ecological techniques.
- Basic techniques of cell biology.

Botany:

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

Zoology:

1. Cockroach- external, digestive and reproductive system.
2. Pigeon- external, digestive and reproductive system.
3. Morphology of following spotters only: Amoeba, Euglena, Hydra, Liver fluke,
4. *Taenia*, Ascaris, Earth worm, Prawn, Pila, Star fish, Calotes, Pigeon and Rat.

Reference Books:

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

Sri Kaliswari College (Autonomous), Sivakasi
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UG Programme - B.Sc
Semester III
(2018 - 2021)

Skill Based Course - I: Basic Concepts of Biotechnology (18UBTS31)
(For those who join from June 2018 and afterwards)

Credit	: 2	Int. Marks	: 25
Hours/Week	: 2	Ext. Marks	: 75
Duration	: 30 hrs	Max. Marks:	100

Course Objectives:

- To enable the students to comprehend about the basic concepts of modern biotechnology.
- To educate knowledge to students about the branch tree of biotechnology in the field.
- To learn the students about the fundamental of biotechnological techniques.

Course Outcomes:

1. Understand the structure, composition and function of various biomolecules.
2. Understand the fundamentals of biotechnology.
3. Role of biotechnology in *Spirulina* cultivation and its applications.
4. Novel methods for production of antibiotic.
5. Importance of mushroom and Vermicompost and its cultivation technique.
6. Application of biotechnology in pollution control.

UNIT I **(6 hrs)**

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

UNIT II **(6 hrs)**

Basic concepts- Central dogma of Molecular biology-Nucleic acids- Structure and function of DNA and RNA- mRNA, tRNA, rRNA, miRNA and siRNA. Gene, Codon and Anticodon. Basic concept of Protein synthesis.

UNIT III **(6 hrs)**

Genetic engineering- Enzymes involved in genetic engineering and their function -Steps in Gene Cloning- Tools- Gel Electrophoresis- Agarose, SDS PAGE, Pulse field Gel Electrophoresis (PFGE)-Molecular taxonomy-Gene library-Metagenomics.

UNIT IV **(6 hrs)**

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

UNIT V **(6 hrs)**

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

Text Books:

1. Dubey, R.C., "Advanced Biotechnology," S. Chand and Co. Pvt. Ltd, New Delhi, 2014.
2. Jordening, H.J. and Winter, J. "Environmental Biotechnology- Concepts and Applications," WILEY-VCH Verlag GmbH and Co. KGaA, Weinheim, 2005.

Unit	Text Book No.	Chapter	Page No.
I	1	1	3 - 24
II	1	2	27 - 51
III	1	3	52 - 61
		4	71 - 84
		6	114 - 125
IV	1	18	412 - 441
		17	386 - 411
V	1	25	569 - 598
	2	1	35-36
		3	79-85

Reference Books:

1. Satharayana, U. "Biotechnology", Books and Allied Pvt. Ltd., Kolkata, India, Ninth Edition, 2006.
2. Primrose, S.B. and Twyman, R.M. "Principles of Gene Manipulation and Genomics", Blackwell Publishing, USA, Seventh Edition, 2006.
3. Primrose, S.B., Twyman, R.M. and Old, R. K. "Principles of Gene Manipulation", Black Well Science. Inc, UK, Sixth Edition, 2004.
4. Walker, J. M. and Rapley, R. "Molecular Biology and Biotechnology", Royal Society of Chemistry, UK, 2009.
5. Kumar, H.D. "Modern Concepts of Biotechnology", Vikas Publishing House Pvt. Ltd., India, 1998.
6. Ravi, P. "Introduction to Biotechnology", Atlantic Publishers, India, 2007.

Sri Kaliswari College (Autonomous), Sivakasi
Department Of Biotechnology
UG Programme - B.Sc
Semester III
(2018-2021)

Value Based Course - I: Medicinal Plants (18BTV31)
(For those who join from June 2018 and afterwards)

Credit	: 1	Int. Marks	: 25
Hours/Week	: 2	Ext. Marks	: 75
Duration	: 30 hrs	Max. Marks	: 100

Course Objectives:

- To provide information about medicinal plants and their importance
- To provide the knowledge about the general aspects of nursery techniques and organic farming
- To acquaint the students with details of active constituents of medicinal plants

Course Outcomes:

1. Identify medicinal plant taxa and habitats threatened by non-sustainable harvest.
2. Understand the present and future prospectus of the medicinal plants.
3. High levels of trade, environmental degradation, and other factors contributing to loss of species and genetic diversity.
4. Work with local, regional, national, and global partners to design and implement conservation action plans for priority medicinal plant taxa and habitats.
5. Opportunities for consumers, industry, and other beneficiaries to understand and participate more directly in conservation.
6. Marketing of Medicinal plants in India and World level.

UNIT I **(6 hrs)**

Introduction – History- Importance of Medicinal Plants-Present Status and Future Prospectus of Medicinal Crops-Opportunities.

UNIT II **(6 hrs)**

Processing of Medicinal Plants- Decoction –Extraction, Infusion, Maceration. Parts of Medicinal Plant to Be Used –Active Constituents of Medicinal Plants- Preparation of Herbal Remedies.

UNIT III **(6 hrs)**

Morphology, Traditional Knowledge and Utility of Some Medicinal Plants: Adhatoda, Nilavembu, Garlic, Turmeric, Rauwolfia and Aswagandha.

UNIT IV **(6 hrs)**

Cultivation of Medicinal Plant- *Aloe Vera*; Processing and Products Recovery from *Aloe Vera* and its Applications.

UNIT V**(6 hrs)**

Conservation of Medicinal Plants- *In Situ* and *Ex Situ* Conservation. Centre of Medicinal Plant Conservation in India- IBPGRCOL, CIMAP, CDRI, NBGRI, KFRI, TAMPCOL, TKDL and FRLHT.

Text Books:

1. Farooqi, A.A. and Sreeramu, B.S., "Cultivation of medicinal and Aromatic crops", Universities Press India private limited, 2004.
2. Ravindra Sharma. "Agro techniques of medicinal plants", Daya Publishing House, Delhi, 2004.
3. Joshi, S.G. "Medicinal plants". Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2013.

Unit	Text Book No.	Chapter	Section	Page. No.
I	1	1	1.1	1- 18
II	2	6	6.7	192 – 200
III	3	1	1.1-1.2	1 – 3
		2	2.2	12
		10	10.8	47
IV	1	2	2.1	19 – 26
V	2	11	11.1	218 – 226

Reference Books:

1. Purohit, S.S. and S.P. Vyas, "Medicinal Plant Cultivation-Scientific Approach", Agrobios, India, 2006.
2. Singh, Pande and Jain, "Economic Botany", Rastogi Publications, Meerut, 2015.
3. Pal, D.C. and S.K. Jain. "Tribal medicinal plants", Naya Prokash, Calcutta, 1998.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester IV
(2018 – 2021)

Core Course-VII: Immunology and Immunotechnology (18UBTC41)
(For those who join from June 2018 and afterwards)

Credits	: 4	Int. Marks	: 25
Hours/Week	: 4	Ext. Marks	: 75
Duration	: 60 hrs	Max. Marks	: 100

Course Objectives:

- To explore the students in natural mechanism of body defense and scope of immunology.
- To impart the knowledge on immune response, cells and organs of the immune system.
- To learn the immunodiagnostic techniques of infectious diseases.

Course Outcomes:

1. Understand the cells and organs involved in the immune system of the body.
2. Familiar with the body's natural defense (immunity), its mechanism and active immunity by vaccination.
3. Understand the mechanisms of humoral and cell mediated immune response.
4. Handling skills of different immunotechniques for disease diagnosis and identification.
5. Theoretical understanding of transplantation immunology and immunosuppressive agents.
6. Understand how to combat the disease and immunotherapies available.
7. Highlight the current applications of immunological research in practice.

UNIT I **(12 hrs)**

History and Scope of immunology-Overview of the immune system-Immunity-Types of immunity-Cells of the immune system-Memory Cells-Lymphoid organs-Primary and Secondary organs-B and T cell maturation, activation and differentiation-Antigen processing and presentation.

UNIT II **(12 hrs)**

Antigens-Types and Characteristics-Haptens and Adjuvants-Structure, properties, types and functions of Immunoglobulins (Antibodies)-Immune response-Cell mediated immune response and humoral immune response-Complement systems-Activation and Biological role-Cytokine: properties, functions, Cytokine-related diseases-Interleukins: Structure, properties, types and functions.

UNIT III **(12 hrs)**

B cell and T cell receptor-Antigen-Antibody interactions-Precipitation, Agglutination-Immunotechniques-Radial and Double immunodiffusion-Immuno electrophoresis-Immunoprecipitation-Immunofluorescence-ELISA and its types-Flow cytometry-Western blotting.

UNIT IV **(12 hrs)**

Tumor immunology-Immunity to infectious disease and infectious agents-Bacteria, virus and parasites-Immunodeficiency diseases-Autoimmunity-Hypersensitivity-Types, mechanism and disorders of hypersensitivity-Vaccines-Subunit, Attenuated and Recombinant vaccines.

UNIT V

(12 hrs)

Structure and functions of Class I and Class II MHC-HLA tissue typing and transplantation-Hybridoma technology-Principles, construction and purification of monoclonal antibodies and their applications-Immunohistochemistry.

Text Books:

1. Goldsby, R.A., Kindt, T.J., Osborne, B.A. and Kuby, J. "Immunology", W.H. Freeman and Company, New York, Fifth Edition, 2000.
2. Tizard, I.R., "Immunology – An introduction", Cengage learning Pvt. Ltd, India, Fourth Edition, 2010.
3. Roitt, I. "Essentials of Immunology", Blackwell Sci., New York, Fourth Edition, 2006.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1 - 1.4	1 – 17
		2	2.1 - 2.5	24 – 53
		8	8.1 - 8.6	185 – 196
		10	10.1 - 10.6	221 – 242
		11	11.1 - 11.7	247 – 272
II	1	3	3.1 - 3.4	57 – 68
		4	4.1 - 4.9	76 – 100
		12	12.1 - 12.7	276 – 293
		13	13.1 - 13.6	299 – 316
III	1	6	6.1 - 6.12	137 – 156
		9	9.1 - 9.7	200 – 218
IV	1	17	17.1 - 17.5	389 – 408
		18	18.1 - 18.8	413 – 425
		20	20.1 - 20.6	460 – 474
		21	22.1 - 22.7	499 – 518
		20	20.1 - 20.7	306 – 317
		23	23.1 - 23.2	347 – 358
		24	24.1 - 24.6	359 – 373
		25	25.1 - 25.5	377 -396
		29	29.1 - 29.9	396-454
		30	30.1 - 30.10	454-465
		31	31.1-31.5	468-483
V	1	7	7.1 - 7.7	161 – 179
	2	21	21.1 - 21.6	479-496
		8	8.1 - 8.11	91-106

		19	19.1 - 19.6	288 – 302
	3	16	16.1 - 16.8	364 – 380

Reference Books:

1. Motick, E.J., “A Historical Perspective on Evidence-Based Immunology”, Elsevier, 2015.
2. Parija, S.C., “Textbook of Microbiology and Immunology, Elsevier India, Second Edition, 2013.
3. Zabriskie, J.B., “Essential Clinical Immunology”, Cambridge University Press, UK, 2009.
4. Delves, P.J., Martin, S.J. Burton, D.R. and Roitt, I.M., “Essential Immunology”, Blackwell publishing, Eleventh Edition, 2006.
5. Rao, C.V., “An Introduction to Immunology”, Narosa Publishing House, Chennai, 2002.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester IV
(2018 – 2021)

Core Course- VIII: Lab in Immunology and Immunotechnology (18UBTC4P)
(For those who join from June 2018 and afterwards)

Credits : 4

Int. Marks : 40

Hours/Week : 4

Ext. Marks : 60

Duration : 60 hrs

Max. Marks : 100

Course Objectives:

- To practice the students in handling of animals, antigen preparation and bleeding techniques.
- To impart the practical knowledge on antigen-antibody techniques.
- To learn the immunodiagnostic techniques of infectious diseases.

Course Outcomes:

1. Identify the blood groups using antibody specific to each blood group antigens and to study the principle of transfusion.
2. Knowledge on different types of antigen, Hapten, adjuvants and immunization methods to elicit polyclonal antibody production in animals.
3. Expose to the different immunotechniques for disease diagnosis and identification.
4. Isolate and separate B and T lymphocytes from total human blood using nylon wool column. Enumerate WBCs and RBCs from human blood using haemocytometer.
5. Detect the specific protein (antigen) present in the unknown protein sample using western blotting.
6. Detect the presence or absence of antigen/antibody present in the unknown sample using ELISA.

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1. ABO blood group typing, Blood staining.
 2. Enumeration of RBC and WBC count using haemocytometer.
 3. Preparation of Antigen from Bacteria.
 4. Immunization and Bleeding techniques, Serum and plasma preparation.
 5. Isolation, separation and enumeration of B and T lymphocytes and Rosette assay.
 6. Antigen- Antibody interactions:
 - a. Haemagglutination.
 - b. Immunodiffusion- Single, Double and Radial immunodiffusion.
 - c. Electrophoresis – Classical, Counter Current and Rocket immunoelectrophoresis.
 7. Isolation and purification of immunoglobulin G (IgG).
 8. Enzyme linked immunosorbent assay (ELISA).
 9. Western Blotting.
 10. Observation of Histology slides.
 11. Cell viability assay.

Reference Books:

1. Reddy, P.H. and Govil, S. "Life sciences protocol manual", DBT Star college scheme, DBT, New Delhi, 2018.
2. Sittampalam, G.S., *et al.*, "Assay Guidance Manual", Eli Lilly and Company and the National Center for Advancing Translational Sciences, Bethesda, MD, 2017.
3. Hay, F.C., Westwood, O.M.R. "Practical Immunology", Blackwell Publishers, USA, Fourth Edition, 2002.
4. Bhatia, A. "Manual of Practical Immunology", Palani Paramount Publication, India, First Edition, 2000.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester IV
(2018 -2021)

Allied Course - IV: Food Biotechnology (18UBTA41)

(For those who join from June 2018 and afterwards)

Credits	: 3	Int.Marks : 25
Hours / Week	: 4	Ext.Marks :75
Duration	: 60 hrs	Max.Marks: 100

Course Objectives:

- To enable the students understand importance of food Biotechnology.
- It creates awareness on Microorganisms involved in food Contamination.
- It creates awareness on hazard analysis of food and quality of the food substances.

Course Outcomes:

1. Awareness about the food contamination by microorganisms.
2. Understand the production of cheese, bread, wine.
3. Production of single cell protein and their economic importance.
4. Understanding of food preservation techniques.
5. Awareness on food hazardous and food analysis.
6. Importance of Dairy products and its types.

UNIT I **(12 hrs)**

Introduction: Importance of food biotechnology - Scope of food biotechnology – Biotechnology and dairy industry - Biotechnology and baking industries – Prebiotics and Probiotics and their application - Future prospects of biotechnology and food industry.

UNIT II **(12 hrs)**

Preparation of Cheese – Bread – Wine - Fermented Vegetables – Methods and Organisms Used - Food and enzymes from microorganisms – Single Cell Protein - Production of Enzymes.

UNIT III **(12 hrs)**

General Principles Underlying Spoilage: Contamination - Spoilage and Preservation of different kinds of foods - Vegetable and Fruits – Meat and Meat Products – Fish and Other Sea Foods – Eggs and Poultry –Milk and Milk Products .

UNIT IV **(12 hrs)**

Food Poisoning: Food Borne Infections (A) **Bacterial:** Staphylococcal – Brucella – Bacillus – Clostridium – Escherichia - Salmonella (B) **Fungal :** Mycotoxins Including Aflatoxins, (C) **Viral:** Hepatitis (D) **Protozoa :** Amoebiasis.

UNIT V **(12 hrs)**

Principles of Food Preservation: Methods of preservation - Physical (Irradiation, Drying, Heat Processing, Chilling And Freezing, High Pressure and Modification of Atmosphere, Canning, Smoking) - Chemical (Sodium Benzoate Class I and II) - Food sanitation - Good manufacturing

practices - Hazard analysis - Critical control points - Personnel hygiene -The Food Safety and Standards Authority of India (FSSAI), FDA, BIS.

Text Books:

1. Rita singh, "Food Biotechnology", Volume I, Global vision Publishing house, 2004.
2. Frazier, W.C. and Westhoff, D.C, "Food Microbiology", TATA McGraw Hill Publishing company Ltd., New Delhi, 2002.
3. Adams, M.R. and Moss, M.O. "Food Microbiology", New age international Publishers, 2005.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	2	-	37 - 42, 61 - 80, 50 - 57, 81- 91
II	2	22	-	330 - 334, 339 - 345, 352 - 369
		23	-	390 - 396
III	2	13	-	196 - 210
		14	-	218 - 225
		15	-	243 - 254
		16	-	255 - 260
		17	-	268 - 272
		18	-	276 - 289
IV	3	7	7.2 -7.3, 7.6 - 7.7, 7.10 , 7.12	158 - 162, 177 - 182, 192 - 196, 205 - 210
		8	8.2.2, 8.4.1 - 8.4.5, 8.5.2	226, 228 - 241, 246 - 247
V	2	5	-	83 - 90
		6	-	91 - 95
		7	-	121 - 129
		8	-	134 - 142
		10	-	159 - 169
	3	11	11.5	349 - 355

Reference Books:

1. Jay, J.M, "Modern Food Microbiology", CBS Publishers and distributors, New Delhi, 2001.
2. Atlas, R.M, "Microbiology, A Fundamentals and Applications", Macmillian Publishing company, 2000.
3. Tripathy SN, "Food Biotechnology", Dominant Publishers and Distributors, New Delhi, 2006.

Sri Kaliswari College (Autonomous), Sivakasi
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Semester IV
(2018 - 2021)

Allied Course - IV: Lab in Food Biotechnology (18UBTA4P)
(For those who join from June 2018 and afterwards)

Credits	: 2	Int.Marks	: 40
Hours / Week	: 2	Ext.Marks	: 60
Duration	: 30 hrs	Max.Marks	: 100

Course Objectives:

- To enable the students acquire the knowledge about basic technical skills in food Biotechnology.
- To enable the students in the isolation and identification of microbes in food samples.
- To create awareness on hazard analysis of food and quality of the food substances.

Course Outcomes:

1. Knowledge about the basic food biotechnology techniques.
2. Knowledge about the isolation and identification of food contaminants.
3. Identify the quality of milk.
4. Identify the water quality analysis.
5. Awareness on microbiological examination of soft drinks.

-
1. Analysis of Bacterial Counts in Food samples.
 2. Isolation of Lipolytic Organisms from Butter.
 3. Milk reduction test using Resazurin
 4. Microbiological examination of Soft Drinks.
 5. Detection of Coliform Bacteria in Water – MPN test
 6. Food adulteration analysis.
 - 7s. Isolation of Lactobacillus from curd

Reference Books:

1. Kannan N, “Laboratory manual in General Microbiology”, Palani Paramount Publications, Palani,1996.
2. Collins, C. H, Lyne, P. M, Grange, J. M, Collin’s and Lyne’s “Microbiological methods”, Oxford University Press, INC., New York, 2001.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

UG Programme - B.Sc

Semester IV

(2018-2021)

Major Elective Course – I: Biostatistics (18UBTO41)

(For those who join from June 2018 and afterwards)

Credits : 3

Hours / week : 4

Duration : 60 hrs

Int. Marks : 25

Ext. Marks : 75

Max. Marks : 100

Course Objectives:

- To make the students to understand the basic concept of biostatistics.
- To provide the knowledge about the general aspects of collection of data, classification of data and tabulation of data.
- To acquaint the students with details of various statistical tools for the storage, retrieval and analysis of biological data.
- To expose students to various bio statistical tools used in biotechnology research.

Course Outcomes:

1. Understand about basic knowledge on biostatistics and their important in applied biology.
2. Understand about history of biostatistics and their role.
3. Knowledge in mean, median and mode and the difference in tabulation.
4. Understand about diagrams and tabulations and their role in experimental studies.
5. Knowledge about ANNOVA and their application in research studies.

UNIT I (12 hrs)

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

UNIT II (12 hrs)

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

UNIT III (12 hrs)

Mean-Simple Arithmetic Mean, Median, Mode, Range , Standard deviation and Variance, Standard Error.

UNIT IV (12 hrs)

Test of Significance: Students t Test, Chi square test, Analysis of variance, one way and Two way, SPSS.

UNIT V (12 hrs)

Types of correlation- Positive, Negative, Simple, Partial, And Multiple, Linear and Non Linear Correlation, Regression Analysis.

Text Books:

1. Ramakrishnan. P, “Biostatistics”, Saras publications, India, 2010.
2. Veer Bala Rastogi, “Fundamentals of Biostatistics”, Ane books New Delhi, India, 2004.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1	1 - 3, 10 - 18, 20 – 25
	2	1	1.2	3, 2, 7, 11 -12
II	1	2	2.1	6 – 8
		3	3.2	10 – 17
		4	4.1	39 – 42
		5	5.1	71 - 80, 81 – 113
III	1	6	6.3 - 6.15	116 - 149, 162 – 178
IV	1	10	10.6 - 10.8	325, 326-331, 334 - 337, 346 - 361
V	1	8	8.1	185 – 200
		9	9.1	223 – 235

Reference Books:

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

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme-B.Sc
Semester IV
(2018 - 2021)

Major Elective Course- I: Fundamentals of Drug Designing (18UBTO42)
(For those who join from June 2018 and afterwards)

Credits	: 3	Int. Marks: 25
Hours/Week	: 4	Ext. Marks: 75
Duration	: 60 hrs	Max.Marks:100

Course Objectives:

- To provide students with an understanding of the process of drug discovery.
- To make them to understand the development from the identification of novel drug targets to the introduction of new drugs into clinical practice.

Course Outcomes:

1. Understand the development and discovery of Drugs.
2. Innovative approaches of drug discovery.
3. Understand the role of enzymes and receptors during drug design.
4. Role of Pro drug and their applications.

UNIT I **(12 hrs)**

Introduction to The Drug Discovery/Development: General Principles of Drug Discovery and Drug Development- Source of Drugs- Microbial- Plant and Animal- Chemical Synthesis of Penicillin and Tetracycline- Patenting the Drugs- Molecular Dissection and Metabolic Stabilization of Drugs.

UNIT II **(12 hrs)**

Approaches to New Drug Discovery: Drugs Derived from Natural Products- Existing Drugs as a Source for New Drug Discovery-Using Disease Models as Screens for New Drug Leads (for cancer) -Physiological Mechanisms- the Modern “Rational Approach” to Drug Design.

UNIT III **(12 hrs)**

Enzymes as Targets of Drug Design: Enzyme kinetics - Enzyme inhibition and Activation - Approaches to the Rational Design of Enzyme Inhibitors-Receptors as Targets of Drug Design-Receptor Theory-Receptor Complexes and Allosteric Modulators-Molecular Biology of Receptors-Lead Compound- Discovery of Receptor agonists and antagonists.

UNIT IV **(12 hrs)**

Prodrug Design and Applications: Definition – Applications -Prodrug Design Considerations-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.

UNIT V**(12 hrs)**

Drug release and activation mechanisms - Prodrugs and intellectual property rights- Two court Cases-Docking and virtual screening-Molecular Dynamics and binding free energy methods- Combinatorial Chemistry and Microwave Chemistry- Solid-phase and Solution Phase Strategies- Role of Microwave Chemistry in drug designing.

Text Books:

1. Kerns, "Drug-Like Properties Concepts, Structure Design and Methods from ADME to Toxicity Optimization", Academic Press, Third Edition, Oxford, 2008.
2. M. E. Wolff, "Burger's Medicinal Chemistry and Drug Discovery", Academic Press, New York, Sixth Edition, 2005.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1, 3 - 1.9	6-13
		2	2.7-2.9	31-49
		3	3.1-3.9	62-96
II	2	3	3.1-3.9,	314-409
III	1	8	8.1-8.2, 11.3-11.8, 28.2-28.9	86-98, 185-199, 312-359
IV	2	2	2.1-2.7	275-312
		4	4.21-4.29	557-569
V	2	5	5.3-11.8	928-1021

Reference Books:

1. A.W. Czarnik and S. H. DeWitt A, "Practical Guide to Combinatorial Chemistry," American Chemical Society, Washington DC, 2007.
2. E.Blass, "Basic Principles of Drug discovery and Development"- Academic Press Publication, New York, 2015.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme – Biotechnology
Semester IV
(2018 – 2021)

Major Elective Course I: Consumer Affairs (18UBTO43)
(For those who join from June 2018 and afterwards)

Credits	: 3	Int. Marks	: 25
Hours/Week	: 4	Ext. Marks	: 75
Duration	: 60 hrs	Max. Marks	: 100

Course Objectives:

- To familiarize the learners with their rights and responsibilities as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights.
- To provide an understanding of the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards.
- To enable the learners to comprehend the business firms' interface with consumers and the consumer related regulatory and business environment.

Course Outcomes:

1. The learners know about the need for consumer protection and the areas covered by consumer protection law
2. Learners will have a clear idea on legislative controls on unconscionable conduct, misleading or deceptive conduct, false or misleading representations and other unfair practices
3. The learners know the legal obligations of a supplier of goods or services
4. The learners know the obligations of manufacturers and the rights of consumers to compensation
5. The learners know the bodies available to protect the rights of the consumer and discuss their operations.

UNIT I **(12 hrs)**

Consumer – meaning, Consumer and markets – Whole sale, Retail and Online markets concept of price – Retail price including Maximum Retail Price (MRP) with Goods and Service Tax (GST) - Consumer problems – Consumer Complaints – defect in goods, spurious goods, deficiency service – unfair trade practices – Restrictive trade practices.

UNIT II **(12 hrs)**

Consumer Rights and UN Guidelines on Consumer Protection – Consumer Protection Act, 1996, Consumer Protection Bill 2018. Consumer Protection Council – Objectives – Dispute Redressal forums – Central, State and District lands – Composition, Powers and Jurisdiction.

UNIT III **(12 hrs)**

Grievance Redressal Mechanism under the Indian Consumer Protection Law: Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of

order, Appeal, frivolous and vexatious complaints; Offences and penalties. Recent Cases decided under Consumer Protection law by Supreme Court/National Commission.

UNIT IV

(12 hrs)

Role of Industry Regulators in Consumer Protection : Banking: RBI and Banking Ombudsman - Insurance: IRDA and Insurance Ombudsman - Telecommunication: TRAI - Food Products: FSSAI - Electricity Supply: Electricity Regulatory Commission - Real Estate Regulatory Authority

UNIT V

(12 hrs)

Contemporary Issues in Consumer Affairs: Consumer Movement in India: Evolution of Consumer Movement in India. Interest of consumer and Misleading Advertisements, National Consumer Helpline and Product testing. Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance.

Text Books:

1. "The Consumer Protection Act, 1986", Universal Law Publishing, New Delhi, 2017.
2. Dr. Francis Cherunilam, "Business Environment: Text and Cases", Himalaya Publishing House, Mumbai, Twenty Sixth Revised Edition, 2017.
3. Swarup C. Sahoo and Suresh C. Das, "Insurance Management: Text and Cases", Himalaya Publishing House, Mumbai, Second Revised Edition, 2017.

Unit	Text Book No.	Chapter	Page No.
I	1	1	3 - 14
		2	3 - 14
II	2	10	188 - 206
III	1	3	14 - 36
IV	3	25	220 - 229
		27	244 - 249
V	1	4	40 - 54

Reference Books:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi, "Consumer Affairs", Universities Press, 2007.
2. Choudhary, Ram Naresh Prasad, "Consumer Protection Law Provisions and Procedure", Deep Publications Pvt. Ltd., 2005.
3. G. Ganesan and M.Sumat, "Globalisation and Consumerism", Regal Publications, 2012.
4. Rajyalaxmi Rao, "Consumer is King", Universal Law Publishing Company, 2012.

Sri Kaliswari College (Autonomous), Sivakasi.

Department of Biotechnology

UG Programme-B. Sc

Semester – V

(2018-2021)

Core Course - IX: Plant Biotechnology (18UBTC51)

(For those who join from June 2018 and afterwards)

Credits : 5

Int. Marks : 25

Hours / Week : 5

Ex. Marks : 75

Duration : 75 hrs

Max. Marks : 100

Course Objectives:

- To gain knowledge of Plant Genome Organization organelles organization.
- To study the perception of Plant Tissue Culture and the techniques involved.
- To learn Plant Genetic engineering and their application Such as Plantibodies, Improved Nutritional Content.

Course Outcomes:

1. Knowledge of Plant Genome Organization organelles organization.
2. Perception of Plant Tissue Culture and the techniques involved.
3. Knowledge on the regulation of gene expression in plant development.
4. Basic concepts of plant genetic engineering and its application such as edible vaccines, plantibodies, improved nutritional content resistance to bacterial, fungal and viral infections
5. Influence of plant hormones in plant tissue culture.
6. Understand the molecular mechanism of Agrobacterium mediated gene transfer and to study the plant-pathogen interaction.
7. Basic knowledge on gene silencing using RNAi technology.

UNIT I

(15 hrs)

Structural features of a higher plant gene-Gene families-Chloroplast organization-Photosystem I and Photosystem II -Mitochondrial genome organization-Cytoplasmic male sterility

UNIT II

(15 hrs)

Planthormones-CultureMedia-Sterilization-Totipotency-Pluripotency-Dedifferentiation-redifferentiation-Micropropagation-Somatic embryogenesis-Somoclonal variation-Somatic hybridization-Types of culture-Callus, Suspension, Protoplast and anther culture.

UNIT III

(15 hrs)

Natural genetic Engineers and their use in the development of transgenic plants (*Agrobacterium tumefaciens*) -Ti plasmid vector- plant viral vector- Direct transformation by physical methods –Molecular Symbiotic nitrogen fixation in legumes by Rhizobia.

UNIT IV

(15 hrs)

Selectable markers-reporter genes-promoters. Transgenic plants engineering for resistance to Bacteria, fungi, pest, Herbicide. Delay of fruit ripening. Golden rice.

UNIT V

(15 hrs)

Gene silencing -Terminator gene technology -Plantibodies-edible vaccines-Plant as a bioreactor- -Modification of improved nutritional content. GMO-Merits and Demerits.

Text Books:

1. Adrian slater, Nigel W, Scott and Mark R. Flower, “Plant Biotechnology”, Oxford university press, US, 2014.
2. R.C Dubey, “Advanced Biotechnology”, S.Chand and company Pvt. Ltd, 2014.
3. U.Sathyanarayana, “Biotechnology”, Books and allied Pvt. Ltd. India, 2010.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1	1 – 33
II	2	18	18.1	829, 836 – 842
			18.3	845, 849 – 876
III	3	49	49.2	572-576
			49.3	577-581
			49.4	581-583
			49.5	583-587
		52	52.5	639-644
IV	3	49	49.2	588-592
		50	50.4	596-609
			50.5	612- 615
			50.6	618-619
V	3	49	49.8	593
		50	50.7	617-621
		50	50.7	622-631
		51	51.2	643-638

Reference Books:

1. A.Slater., N.Scott and M.Flower, “Plant Molecular Biology and Biotechnology”, Oxford university press. Oxford,2003.
2. H.S. Chawla, “Introduction to plant biotechnology”, Oxford and IBH pulishing Co.Pvt. Ltd, New Delhi, 2012.
3. C.B.Nirmala, G.Rajalakshmi, Chandra karthick, “Plant Biotechnology”, MJP Publishers Chennai, 2010.

4. K.G. Ramawat, "Plant Biotechnology", S.Chand and company Ltd, New Delhi, 2004.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme-B. Sc
Semester V
(2018-2021)

Core Course - X: Industrial Biotechnology (18UBTC52)
(For those who join from June 2018 and afterwards)

Credits : 5

Int. Marks : 25

Hours / Week : 5

Ex. Marks : 75

Duration : 75 hrs

Max. Marks: 100

Course Objectives:

- To make the students to understand the scope and applications of Industrial Biotechnology.
- To obtain knowledge about the basic fermentor and its types.
- To learn the innovative microbial food products through Industrial biotechnological techniques.

Course Outcomes:

1. Understand the scope and applications of Industrial Biotechnology.
2. Basic knowledge about fermentor and its types for the production of recombinant bio molecules.
3. Knowledge about the innovative microbial food products.
4. Explore the methods of potential improvement of efficient strains to increase the yield of microbial products.
5. Knowledge on immobilization of enzymes and cells and downstream processing of biological Products.
6. Knowledge of mechanism for the production of primary and secondary metabolites.
7. Understand the importance of single cell protein and single cell oils.
8. Know about separation techniques using in industrial biotechnology.

UNIT I

(15 hrs)

Scope and Applications of Industrial Biotechnology- Commercially available Biotech products and their uses. Bioremediation - Waste management using *Pseudomonas*. Microbial Based Environmental Applications Of Biotechnology.

UNIT II

(15 hrs)

Bioreactor Design, Parts, Types and Functions. Bioprocess Control and Monitoring variables such as Temperature, Agitation, Pressure and pH. Introduction to Large Scale Production of Recombinant Proteins (Insulin, Biopolymer) Using Bioreactors.

UNIT III

(15 hrs)

Isolation and Screening of Industrially Important Microbes, Strain Improvement, Fermentation and its types, Media Formulation and Sterilization. Fermented Foods-Yoghurt, Cheese. Microbial Foods-Single Cell Protein (SCP), Single Cell Oils (SCO) –Biofuels.

UNIT IV

(15 hrs)

Downstream Processing, Production of Primary and Secondary Metabolites including Vitamins (Riboflavin production), Amino Acids (Glutamate production) Commercial Products (Citric acid, Lactate, Vinegar), Antibiotic Production (Penicillin & Bacterial Toxoids).

UNIT V

(15 hrs)

Product Recovery and Purification - Microbial Cell Removal, Foam Separation, Precipitation, Coagulation and Flocculation, Filtration, Centrifugation, Cell Disruption, Chromatography, Ultrafiltration, Crystallization. Application of Industrial Enzymes: Proteases, Amylases, Pectinases, Cellulases, β - galactosidase.

Text Books:

1. Wulf Crueger and Anneliese Crueger, “A Textbook of Industrial Microbiology”, Punima Publishing Corporation, India, 2000.
2. Sathyanarayana. U, “Biotechnology”, Books and allied (P) ltd. India, 2010.
3. Stanbury. P.F, A.Whitaker and S.J.Hall, “Principles of Fermentation Technology”, Second Edition Elsevier publication, 2012.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	57	57.5	703 – 705
		59	59.1	718 – 729
II	1	19	19.1	239 - 246,267 – 268
		15	15.1	189 – 192
		30	30.1	382 – 385
III	1	19	19.1	252 - 254, 258 – 262
			19.28	244 246, 362 – 365
			19.29	373 – 374
			19.30	391
IV	2	27	27.1	357 – 358
		26	26.1	346 – 348
		24	24.1	318 – 326
		25	25.3	331 – 336
		20	20.1	270 – 280
V	3	10	10	277- 285, 286- 300, 301-307

Reference Books:

1. A. H Patel, “Industrial Microbiology” Second Edition, Laxmi publications, New Delhi, 2016.
2. Abhilashas. Mathuriya, “Industrial Biotechnology”, Ane Books Pvt. Ltd, 2009.

3. P.Ponmurugan, Nithya ramasubramanian, M.Fredimoses, “Bioprocess technology and downstream processing”, Anjanaa Book house, 2012.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

UG Programme-B. Sc

Semester V

(2018-2021)

Core Course - XI: Animal Biotechnology (18UBTC53)

(For those who join from June 2018 afterwards)

Credits : 4

Int. Marks : 25

Hours / Week : 5

Ext. Marks : 75

Duration : 75 hrs

Max. Marks : 100

Course Objectives:

- To help students to explore diagnostic method and therapy for mortal diseases
- To expose the students in animal genomics.
- To give knowledge to the students brain with innovative tools of animal transfer methods.

Course Outcomes:

1. Explore diagnostic method and therapy for mortal diseases.
2. Expose to genetic engineering for the production of regulatory proteins, vaccines and hormones.
3. Understand the basic principles of animal tissue culture and handling procedures
4. Knowledge on the concept of transgenesis and methods of transferring genes using various vectors into the host.
5. Understand the fundamentals of animal genomics.
6. Basic understanding about genetically modified organisms.
7. Understand the ethical issues related to animal biotechnology and to introduce the concepts and importance of intellectual property rights- patents, copyright, tradeseecrets and trademark.
8. Understand human genome project and gene therapy.

UNIT I

(15 hrs)

Introduction about animal tissue culture-washing, sterilization of animal tissue culture glassware -Types of media - primary culture-Dissaggregation of cells- subculture-Transformation of animal cells.

UNIT II

(15 hrs)

Basic tools for animal tissue culture: Cultivation & Maintenance of Fibroblast cell lines, HeLa cell lines, A549, MCF 7, ZR751, Hep G2, -Significance of animal tissue culture.

UNIT III

(15 hrs)

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

UNIT IV**(15 hrs)**

Genetic Engineering for the production of regulatory proteins, blood products, vaccines and hormones, CPCSEA, IAEC, IBSC, IEC.

UNIT V**(15 hrs)**

Production of transgenic animals. Transgenics in animal biotechnology research. Gene knockout and mice model for human genetic disorder. Gene therapy-Ex vivo and in vivo. Live experimental animal models-Zebra fish, C.elegans and Mice.

Text Books:

1. Yadav, PR, "Cell culture", Discovery Publishing House, 2005.
2. Sathyanarayana, U, "Biotechnology", Books and allied Pvt. Ltd, 2010.
3. Glick and Pasternak, "Molecular Biotechnology," ASM Press, Fourth edition, 2010.
4. Dubey, R.C., A "Text of Biotechnology" S.Chand, and company Ltd 2006.
5. Sasidhara.R, "Animal Biotechnology", MJP Publisher, 2006.

Unit	Text Book No.	Chapter	Page No.
I	1	1	1-19
		3	44-65
		4	66-79
	2	86-89	
II	1	2	20-43
III	3	9	218-220
		17	409-413
IV	4	10	243-250
V	5	5	136-161

Reference Books:

1. DonMurray C. and Walter, E.Wlest, "Gene transfer and expression protocols", Methods in Molecular Biology, Humana Press, 1991.
2. James D.Watson, Michael Gilman, Jan Witkowski;Mark Zoller, Gilman Witkowski, "Recombinant DNA", Second Edition, WH Freeman and Co., 1993.
3. Bernard R Glick and Jack.J.Pasternack, "Molecular Biotechnology", American Society for Microbiology, 2003.

Sri Kaliswari College (Autonomous), Sivakasi
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UG Programme – B.Sc
Semester V
(2018 – 2021)

Core Course - XII: Lab in Plant, Animal and Industrial Biotechnology (18UBTC5P)
(For those who join from June 2018 and afterwards)

Credits	: 5	Int.Marks	: 40
Hours / Week	: 5	Ext.Marks	: 60
Duration	: 75 hrs	Max.Marks	: 100

Course Objectives:

- To give practical knowledge of plant tissue culture.
- To provide the students knowledge on the techniques involved in plant tissue culture.
- To give training on generation of *in vitro* propagated plants.

Course outcomes:

1. Basic knowledge of plant tissue culture such as surface sterilization, media preparation, contamination and other handling procedures.
2. Understand the techniques involved in plant tissue culture and to generate *in vitro* propagated plants.
3. Knowledge on hardening techniques.
4. Handling skills for agrobacterium mediated gene transfer and host–plant pathogen interactions.
5. Isolation and purification of protoplasts.
6. Hands on experience to all students.

-
1. Preparation of plant tissue culture media(MS,B5 and Nitch and Nitch medium) Stock and Hormone preparation (2,4-D,NAA,BAP) and Surface Sterilization.
 2. Micropropagation and Hardening.
 3. Callus induction.
 4. Isolation and purification of protoplasts.
 5. Immobilisation of callus/ plant tissues.
 6. Preparation of Animal tissue culture Media, Equipments and sterilization.
 7. Preparation of Chick embryo Cell lines.
 8. Cell toxicity and Viability assay.
 9. Cryopreservation.
 10. Isolation of industrially important strains from environment – Enzyme producers and Antibiotic producers.
 11. Strain improvement – UV treatment.
 12. Fermentation process – Batch and Fed batch fermentation.
 13. Small scale production of Grape wine.

Reference Books:

1. Robert H. Smith, "Plant tissue culture, Techniques and Experiments", Elsevier Science and technology Books, 2000.
2. Pal Maliga, Daniel F K Lessug Anthony R, Loil helm Gruissm and Joseph E varner, "Methods in plant Molecular Biology, A Laboratory Course Manual", Cold Spring Harbour Laboratory press, 1994.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester V
(2018-2021)

Major Elective Course - II: Bioinformatics (18UBTO51)
(For those who join from June 2018 and afterwards)

Credits : 3

Hours/week : 4

Duration : 60 hrs

Int. Marks : 25

Ext. Marks : 75

Max.Marks: 100

Course Objectives:

- To provide students with a practical and the theoretical knowledge of DNA sequences, genomes, protein sequences and protein structure information that will prepare them for careers in bioinformatics, academia, industry and research.
- To understand the vast quantities of data generated in the fields of Molecular and Biological Sciences.
- To help students to acquire problem-solving skills and gain experience in understanding, handling and developing important software used in pharmaceutical, chemical and biotechnology industries.

Course Outcomes:

1. Practical and the theoretical knowledge of DNA sequences, genomes, protein sequences and protein structure information that will prepare them for careers in bioinformatics, academia, industry and research.
2. Understand the vast quantities of data generated in the fields of Molecular and Biological Sciences (databases available for different organisms).
3. Problem-solving skills and gain experience in understanding, handling and developing important software used in pharmaceutical, chemical and biotechnology industries.
4. Understand the basic algorithms of bioinformatics and to learn with the fundamentals of sequence retrieval and alignment and to study the phylogenetic relationship between the different organisms.
5. Understand with application of structural biology and molecular docking and to impart knowledge on drug designing.

UNIT I

(12 hrs)

Introduction to Bioinformatics: Definitions- Basic Concepts-Scope and Applications of Bioinformatics- Genome Project- Human Genome Project and its Current Status.

UNIT II

(12 hrs)

Biological Databases: Nucleic Acid Sequence Databases – EMBL- GenBank and DDBJ- Protein Sequence Databases – PIR, Swiss-PROT- Structural Databases–PDB- PubChem- File Formats– GenBank- FASTA file formats.

UNIT III

(12 hrs)

Sequence Alignment: Pair wise Alignment- Local alignment – BLAST- Global Alignment – FASTA- Multiple Sequence Alignment- Clustal W.

UNIT IV

(12 hrs)

Phylogenic Tree: PHYLIP- Tree constructing Methods- Distance Based Method-Neighbour Joining Method- Structure based Drug Designing- Molecular docking.

UNIT V

(12 hrs)

Protein Primary Structure Analysis: Structure Analysis using EXPASY Tools-Amino acid composition analysis- Molecular weight- Hydrophobicity and Hydrophathy profiles- Helical Wheel- Protein Secondary structure Prediction - GOR method.

Text Books:

1. Paul G and Teresa K. Attood, “Bioinformatics and molecular Evolution,” Blackwell Publishing, 2012.
2. David M. Mount, “Bioinformatics sequence and genome analysis”, Gold Spring Harbor Press Publishers, England, 2009.
3. Irfan A KhanumAtiya, “Recent Advance in Bioinformatics,” Ukaaz Publication,2003.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1-1.4	1-42
II	2	2	2.1-2.9,	31 – 382
		4	7.2-7.9	492-499
III	2	4	4.9-4.11	281- 298
		6	6.1-6.9	381-467
		7	7.3-7.9	443- 450
		9	9.1-9.3, 9.2-9.4	941- 949
		10	10.3-10.9	949-952
IV	3	6	6.1-6.4	42 – 60
V	3	42	7.1-7.5	341 – 389

Reference Books:

1. Andrew Leach, “Molecular Modeling”, Blackwell Publishing, Second Edition, USA, 2003.
2. T.K. Westhead, “Instant notes on Bioinformatics”, VIVA Publishers, New Delhi, 2012.

Sri Kaliswari College (Autonomous), Sivakasi
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Semester V
(2018-2021)

Major Elective Course-II: Genetically Modified Crops (18UBTO52)
(For those who join from June 2018 and afterwards)

Credits	: 3	Int. Marks	: 25
Hours / Week	: 4	Ex. Marks	: 75
Duration	: 60 hrs	Max. Marks	: 100

Course Objectives:

- To gain knowledge of Plant Genome Organization.
- To study the perception of transformation techniques involved.
- To learn Plant genetic engineering and their application.

Course Outcomes:

1. Knowledge on Transgenic Plant.
2. Knowledge on the pharmaceutically useful proteins from plants.
3. Basic concepts of plant genetic engineering and its application such as improved nutritional content, resistance to bacterial, fungal and viral infections, plantibodies.
4. Ensuring the biosafety concerns of genetically modified crops.
5. Understand the molecular mechanism of Agrobacterium mediated gene transfer and cultivation.

UNIT I **(12 hrs)**

Structure of plant nuclear gene-Totipotency and plant genetic engineering.

UNIT II **(12 hrs)**

Direct transformation-Protoplast transformation using PEG and by electroporation, transformation by particle gun.

UNIT III **(12 hrs)**

Agrobacterium and Crown gall-Ti plasmid vectors for plant transformation-Cultivation of genetically modified crops-Global and Indian status-Biosafety concerns of genetically modified crops.

UNIT IV **(12 hrs)**

Transgenic crops-Herbicide resistance, male sterility and heterosis, pest resistance, virus, fungal and bacterial disease resistance, drought and salinity resistance.

UNIT V **(12 hrs)**

Genetic engineering for the delay of fruit ripening, plant oil quality, antibody production, Golden rice, pharmaceutically useful proteins from plants.

Text Books:

1. Dubey, R.C. “Advanced Biotechnology”, S.Chand and company Pvt. Ltd, 2000.
2. Purohit, A Laboratory manual of Plant Biotechnology, Agrobios (India), Second Edition, 2004.
3. Slater A. and Scott, N.W. “Plant Biotechnology-The genetic manipulation of plants, Oxford University press, Second Edition, 2008.

Unit	Text Book No.	Chapter	Page No.
I	1	18	828-884
		19	887
II	1	8	376,374
		3	72
III	2	12	299
IV	3	12	324
V	3	10	251
	1	21	1036

Reference Books:

1. Balasubramanian D. et al., “Concepts in Biotechnology”, Costed-Ibn-University Press, Hyderabad, 1996.
2. H.K. Das., “Text Book of Biotechnology”, Wiley Dream Tech India Pvt. Ltd., New Delhi, 2004.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester V
(2018 - 2021)

Major Elective Course-II: Natural Products (Secondary Metabolites) (18UBTO53)

Credits	: 3	Int. Marks	: 25
Hours/Week	: 4	Ext. Marks	: 75
Duration	: 60 hrs	Max. Marks	: 100

Course Objectives:

- To make the students to understand the scope and applications of Plant Biotechnology.
- To obtain knowledge about the metabolites and its synthesis process of natural crops.
- To learn the innovative metabolic engineering of plant species and its products through biotechnological techniques.

Course Outcomes:

1. Understand the scope and applications of metabolites produced by various plants.
2. Explore the methods of potential improvement of efficient plant species to increase the yield of plant products.
3. Knowledge on biotechnological applications of metabolites in various industries.
4. Knowledge on mechanism for the production of primary and secondary metabolites.
5. Know about metabolic engineering for the production of plant products.

UNIT I	(12 hrs)
Primary and secondary metabolites-terpenoids-Synthesis of IPP-Prenyltransferase and terpene synthase reactions-Modification of terpenoid skeletons-Transgenic terpenoid production.	
UNIT II	(12 hrs)
Alkaloids, alkaloid biosynthesis-biotechnological applications of alkaloid biosynthesis research.	
UNIT III	(12 hrs)
Phenylpropanoid and phenylpropanoid pathway- metabolites and biosynthesis.	
UNIT IV	(12 hrs)
Biosynthesis of lignans, lignins, and suberization-Flavonoids, coumarines, stilbenes, styrylpyrones and arylpyrones.	
UNIT V	(12 hrs)
Metabolic engineering of phenylpropanoid production-Enhanced fibres, pigments, pharmaceuticals and flavouring agents.	

Text Books:

1. Jain J.L, Fundamentals of Biochemistry, S.Chand company Ltd.,
2. Sathyanarayana,U., “ Biotechnology”, Books and allied Pvt. Ltd,
3. Staunton west E., Biochemistry, Oxford and IBF Publishing Co. Pvt. Ltd, Fourth Edition,

Unit	Text Book No.	Chapter	Page No.
I	1	13	263
	2	19	254
II	1	3	41
III	3	10	433
IV	3	20	926-928
V	3	20	926-928

Reference Books:

1. Andrew Leach, “Molecular Modeling”, Blackwell Publishing, Second Edition, USA, 2003.
2. T.K.Westhead, “Instant notes on Bioinformatics”, VIVA Publishers, New Delhi, 2012.

Sri Kaliswari College (Autonomous), Sivakasi
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UG Programme - B.Sc
Semester V
(2018 - 2021)

Skill Based Course-II: IPR, Bioethics and Biosafety (18UBTS51)
(For those who join from June 2018 and afterwards)

Credit	: 1	Int. Marks	: 25
Hours/ Week	: 2	Ex. Marks	: 75
Duration	: 30 hrs	Max. Marks	: 100

Course Objectives:

- To learn Intellectual property rights and productions.
- To learn about patenting, Bioethics and its importance.
- To learn the application Biosafety and hazards of environmental management.

Course Outcomes:

1. Importance of Intellectual Property Rights and productions.
2. Awareness on Patenting, Bioethics and its importance.
3. Operation of Biosafety and hazards of environmental management.
4. Understand about the ethics of Cloning and Stem cell research.
5. Knowledge on guidelines of DBT.

UNIT I **(6 hrs)**

Introduction to Intellectual Property Rights and WIPO- Concept of IPR- Trade Secret- Trade Mark- Copyright. Evolution of patent laws- History of Indian patent system- Patent law in other countries-International conventions-Treaties.

UNIT II **(6 hrs)**

Guidelines of Patenting-Biological Material-Product patents- Importance to inventors- Conditions for Patenting- Patenting of live forms- Significance of patenting in India.

UNIT III **(6 hrs)**

Introduction to ethics- Definitions- Scope of Bioethics- Ethics of cloning and ethics of stem cell research- Ethical guidelines of transgenic plant, animal and recombinant microbes- DBT.

UNIT IV **(6 hrs)**

Bioethics and its Scope- Different approaches to ethics- Social and ethical implications- Public and Private sector organizations for Biosafety and Bioethics-Biosafety on GMO-Importance of Good Laboratory Practices and Good Manufacturing Practice (GMP).

UNIT V **(6 hrs)**

Biosafety guidelines in India evolved by DBT- Rules for the manufacture- Storage and disposal of medical waste, hazardous microorganisms and Electronic waste.

Text Books:

1. Dubey, R.C., "A text Book of Advanced Biotechnology", S. Chand and Co. Pvt. Ltd, New Delhi, 2014.
2. Deepa G., Shomini P. "IPR, Biosafety and Bioethics", Dorling Kindersley Pvt. Ltd. New Delhi, 2013.

Unit	Text Book No.	Chapter	Page No.
I	1	9	601 - 612
II	1	9	612 - 614
	2	3	47 - 54
		4	55-87
III	2	8	129 - 137
		10	150 - 165
IV	2	11	167 - 174
V	2	13	182 - 196
		14	197-201
		15	202-205
		16	206-212

References Books:

1. Beier, F.K., Crespi R.S. and Straus, T. "Biotechnology and Patent protection", Oxford and IBH Publishing Co. New Delhi, 2007.
2. Krishna, S. V. "Bioethics and Biosafety in Biotechnology", New Age International Pvt. Ltd., New Delhi, 2007.
3. "Biosafety issues related to transgenic crops", DBT guidelines, Biotech Consortium India Limited, New Delhi, 2010.
4. Sing, K. "IPR on Biotech", BCIL, New Delhi, 2010.

Sri Kaliswari College (Autonomous) Sivakasi.

Department of Biotechnology

UG Programme - B.Sc Biotechnology

Semester V

(2018 -2021)

Skill Based Course - III: Cancer Biology (18UBTS52)

(For those who join from June 2018 and afterwards)

Credit	: 1	Int.Marks	: 25
Hours / Week	: 2	Ext.Marks	: 75
Duration	: 30 hrs	Max.Marks	: 100

Course Objectives:

- To make the students understand the basic properties of Cancer.
- To give idea about Cancer diagnosis and treatment.
- To understand the basic characteristic features of Stem cells.

Course Outcomes:

1. Mechanisms of transformation of normal cell into cancerous cell.
2. Understand the physical, chemical and biological agents that causes cancer.
3. Understand the genes (oncogenes and tumor suppressor genes) involved in cancer progression and termination.
4. Knowledge on the classical and advance methods of diagnosis of cancer.
5. Explore the current trends of cancer research such as nanomedicine and therapies available.
6. Understand the gene silencing process using RNAi technology of cancerous cells.

UNIT I

(6 hrs)

Introduction: Cancer Cells and its Properties - Classification of Cancer - Carcinoma-Sarcoma-Leukemia- Lymphoma - Myeloma - Cell Cycle - Phases of Cell Cycle - Carcinogenic Agents-Physical - Chemical agents.

UNIT II

(6 hrs)

Mechanisms: Chemical carcinogenesis - Initiation, Promotion, Progression - Radiation-genetic effects of ionizing radiation - Oncogenes and Antioncogenes - Risk factors.

UNIT III

(6 hrs)

Cancer epidemiology - Inherited susceptibility to cancer - Tumor suppressors - P53 and Retinoblastoma – Genetic instability – Aneuploidy - Telomere attrition - Tumor metastasis.

UNIT IV

(6 hrs)

Diagnosis and Treatment of Cancer : Chemotherapy - Classification of Cytotoxic Drugs - Alkylating Agents - Platinum Drugs – Radiotherapy, Immunotherapy.

UNIT V

(6 hrs)

Current Scenario of Cancer Treatment: Nanomedicine – Ormosil – Gold –Silver and Palladium Nanoparticle - Induction of gene silencing in cancer cells - RNAi Technology.

Text Books:

1. Mohan.P.Arora, “ Molecular biology”,Himalaya Publishing house, 2000.
2. Rana S.V.S, “ Biotechniques Theorys and Practice”, Rastogi Publications, Meerut, 2016.
3. Das H.K,” Text book of biotechnology”,Wiley dreamtech india Pvt.Ltd., 2004.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	38	-	439 – 448
		24	-	288 – 304
II	3	9	9.8	585 – 590
III	3	9	9.8.4	586 -590
IV	2	2	-	28 – 29
		5	-	56 – 60
		6	-	72 – 96
		8	-	132 – 133
		9	-	141 – 147
		14	-	191
		15		218
V	3	9	9.9.1	591 – 592
			9.4.8	578 – 579

Reference Books:

1. Rudson R.W, “Cancer biology”, Second Edition, oxford University press, 1987.
2. Stella, Pelengaries and Michael khan,”The molecular biology of cancer”, Blackwell publishers, 2006.
3. Old and Primrose,”Principles of Gene Manipulations”, Sixth Edition, Blackwell Science Publication, 2006.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester VI
(2018 – 2021)

Core Course- XIII: Recombinant DNA Technology (18UBTC61)
(For those who join from June 2018 and afterwards)

Credits	: 5	Int. Marks	: 25
Hours/Week	: 5	Ext. Marks	: 75
Duration	: 75 hrs	Max. Marks	: 100

Course Objectives:

- To provide knowledge on the construction of recombinant molecule.
- To help students understand how to transform the recombinant molecule into the desire host.
- To learn the application such as PCR, Genomic library, DNA Fingerprinting.

Course Outcomes:

1. Basic principles of recombinant DNA technology and its pros and cons.
2. Knowledge on the bacterial vectors, viral vectors for the construction of recombinant molecule.
3. Knowledge on the construction of recombinant molecule and how to transform the recombinant molecule into the desire host.
4. Knowledge on methods of gene transfer into bacteria, plant, animal.
5. Knowledge on molecular techniques such as PCR, genomic library and to highlight the methods of gene sequencing.
6. Detect DNA, RNA and Protein by blotting techniques.
7. Understand the application of rDNA in industrial enzyme production.

UNIT I

(15 hrs)

Introduction to Genetic Engineering-Restriction enzymes-Discovery-Types and uses-Methylase, Alkaline phosphatase, Topoisomerase, Reverse transcriptase, Ligases and Polymerases-Polymerase Chain Reaction- Mechanism and applications- Types of PCR- RT-PCR, Reverse transcriptase PCR, Inverse PCR, *in situ* PCR-Probes- Radiolabelled and non-Radiolabelled probes-Primers, Reporter/Marker genes.

UNIT II

(15 hrs)

Cloning vectors-Properties and their applications-Plasmids-Construction of pBR322, pUC18, Phagemids, M13 phage vector, Shuttle vectors-Expression vectors in *E. Coli* and yeast, Cosmids, Artificial chromosomes-BAC and YAC, Ti plasmid.

UNIT III

(15 hrs)

Gene Cloning-Sticky and Blunt end Ligation-Adaptors-Linkers-Homopolymer tailing-Expression host: Bacillus, Yeast, Baculovirus-Insect cell and mammalian Expression system-Genomic DNA, cDNA and Metagenomic libraries-Construction and applications-Fusion tag for protein expression and purification.

UNIT IV**(15 hrs)**

Methods of gene transfer into Bacteria, Plant and Animal-physical, chemical and biological methods-Screening-Alpha complementation-Blue white Selection-Blotting techniques-Northern, Southern and Western-Microarray-DNA sequencing and its methods-Site directed mutagenesis and Protein engineering.

UNIT V**(15 hrs)**

Large scale production and purification of recombinant proteins-Human growth hormone, Insulin, antibodies, Biopolymers, antibiotics, industrially important proteins-amylase, protease-Engineering of *B. thuringiensis* toxin genes-Baculovirus as biocontrol agents-Engineering plants to overcome biotic and abiotic stress.

Text Books:

1. Glick, B.R., Pasternak, J.J. and Patten, C.L. "Molecular Biotechnology: Principles and Applications of Recombinant DNA", ASM Press, Washington, USA, Fourth Edition, 2010.
2. Rastogi, V.B. "Fundamentals of Molecular Biology", Ane Books Pvt. Ltd., New Delhi, 2010.
3. Brown, T.A. "Gene Cloning and DNA Analysis-An Introduction", Blackwell Scientific Publications, 2006.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1 - 1.4	3 - 12
		4	4.1-4.2	108-113
		9	9.1-9.2	345-375
	3	4	4.1 - 4.3	49 - 83
II	1	3	3.1 - 3.7	47 - 95
		6	6.1-6.9	195-235
		7	7.1-7.6	240-286
	2	17	17.1 - 17.4	387 - 425
III	1	3	3.1 - 3.7	47 - 95
		6	6.1-6.9	195-235
		7	7.1-7.6	240-286
	2	17	17.1 - 17.4	387 - 425
IV	1	4	4.1 - 4.5	98 - 142
		8	8.1-8.3	290-327
	2	17	17.1 - 17.4	387 - 425
V	1	10	10.1-10.6	379-422
		13	13.1-13.6	501-547
		16	16.1-16.4	652-681
		17	17.1-17.8	685-720
		19	19.1-19.8	759-800

Reference Books:

1. Primrose, S.B. and Twyman, R.M. "Principles of Gene Manipulation and Genomics", Blackwell Scientific Publications, 2006.
2. Sathyanarayana, U. "Text of Biotechnology", Books and Allied Pvt. Ltd, 2005.

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Semester VI
(2018 - 2021)

Core course-XIV: Molecular Biology and Molecular Genetics (18UBTC62)
(For those who join from June 2018 and afterwards)

Credits	: 5	Int. Marks	: 25
Hours/Week	: 5	Ext. Marks	: 75
Duration	: 75 hrs	Max. Marks	: 100

Course Objectives:

- To enable the students to understand about the basics of Molecular biology.
- To impart knowledge to the students about the concepts of Molecular Genetics.
- To explain the concept of gene regulation and gene transfer methods.

Course Outcomes:

1. Knowledge about the bacterial and eukaryotic DNA replication, transcription, translation and post translational modification.
2. Regulation of gene expression in prokaryotes and eukaryotes.
3. Knowledge about genetic diseases and causes of genetic diseases.
4. Knowledge on mutation and various aspects of DNA repair mechanism.
5. Knowledge about the types of mutation and its causative agents.
6. To ensure the students understand about transposable elements and transposition mechanism.

UNIT I

(15 hrs)

Genome Organisation in Prokaryotes and Eukaryotes-Structure of Nucleic Acids-DNA and RNA (mRNA, tRNA, rRNA). DNA Replication- Mechanism of Prokaryotic and Eukaryotic DNA replication. Transcription-Prokaryotic and Eukaryotic transcription-Post transcriptional Modification.

UNIT II

(15 hrs)

Translation-Post translational Modification-Gene regulation in Prokaryotes-Lactose operon, Arabinose operon and Tryptophan operon-Gene regulation in Eukaryotes- Chromatin remodelling, Enhancers and repressors, gene rearrangement, gene amplification, alternative splicing-Genetic diseases-Molecular basis of genetic diseases.

UNIT III

(15 hrs)

Plasmids-Types-Conjugation-Principle, types- F-mediated and Hfr mediated mechanism- Transformation- Process and mechanism-Transduction-Generalised and specialized transduction- Transfection of phage DNA.

UNIT IV**(15 hrs)**

Models of recombination-Mutation-Types-Mutagenesis-Physical and Chemical agents-Site directed mutagenesis-DNA damage and Repair mechanism-Photoreactivation, direct repair of nicks, excision repair, mismatch repair, recombination repair, SOS repair mechanisms.

UNIT V**(15 hrs)**

Transposable genetic elements in Maize and Drosophila-Identification of Transposition-IS elements-Composite transposons-Tn3, Tn5, Tn9, Tn10. Transposition mechanism.

Text Books:

1. Rastogi, V.B. "Fundamentals of Molecular Biology", Ane Books Pvt. Ltd., New Delhi, 2010.
2. Freifelder, D. "Molecular Biology", Jones and Barlett Publishers, USA, 2004.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	7	7.1-7.10	167-187
		8	8.1-8.18	188-229
		10	10.1-10.9	240-258
		11	11.1-11.9	260-283
II	1	12	12.1 - 12.6	289 - 299
		13	13.1-13.13	301-327
		15	15.1-15.10	350-361
		16	16.1-16.7	367-327
III	1	14	14.1 - 14.14	328 - 349
	2	17	17.1 - 27.8	551 - 590
		19	19.1-19.5	619-639
IV	1	9	9.1 - 9.7	230 - 239
V	2	21	21. 1 - 21.9	679 - 704

Reference Books:

1. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. and Cummings, B. "Molecular Biology of the Gene", Pearson Benjamin Cummings, seventh Edition, 2017.
2. Malacinski, G.M. "Essentials of Molecular Biology", Jones and Bartlett Publishers, Fourth Edition, 2002.
3. Russel, P. J. "Genetics – A Molecular Approach", Pearson Publishers, Second Edition, 2006.
4. Cullis, T., Burton, Guhman, S., Griffiths, A. and Suzuk, D. "Genetics: A Beginner's guide", One world publication limited, 2003.

Sri Kaliswari College (Autonomous), Sivakasi
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(2018 – 2021)

Core course- XV: Lab in Recombinant DNA technology (18UBTC6P)
(For those who join from June 2018 and afterwards)

Credits	: 5	Int. Marks	: 40
Hours/Week	: 5	Ext. Marks	: 60
Duration	: 75 hrs	Max. Marks	: 100

Course Objectives:

- To perform DNA and RNA isolation from different organisms.
- To possess hands on experience at PCR, plasmid isolation techniques.
- To learn the techniques in Recombinant DNA technology.

Course Outcomes:

1. To perform DNA/RNA isolation from different organisms such as plant, bacteria and human blood.
2. To study the transformation of recombinant DNA into Bacteria.
3. To amplify the gene of interest by Polymerase Chain Reaction (PCR).
4. To perform the cloning of the gene of interest in vector and screening of the recombinants and non recombinants.
5. To identify the gene of interest by Southern hybridization.
6. To identify the protein of interest by Western blotting.
7. To provide hands on experience on molecular techniques to every students.

-
1. Agarose Gel Electrophoresis.
 2. Isolation of DNA and RNA from Bacteria, Plant and blood and quantification.
 3. Polymerase Chain Reaction (PCR).
 4. Isolation of Plasmid DNA from Bacteria.
 5. Restriction digestion and ligation.
 6. Transformation and Blue-White screening using IPTG and X-Gal in *E. coli*.
 7. Southern hybridization.
 8. Sodium dodecyl sulphate-Polyacrylamide gel electrophoresis (SDS-PAGE).
 9. Purification of recombinant protein.

Reference Books:

1. Reddy, P.H. and Govil, S. "Life sciences protocol manual", DBT Star college scheme, DBT, New Delhi, 2018.
2. Sambrook, J., Green, M.R. "Molecular Cloning: A Laboratory Manual", Cold Spring Harbor Laboratory Press, Fourth Edition, 2012.
3. Ausbel, F.M., Rogerbrent, Kingston, R.E., Moore, D.D., Seidman, J.G. and Kevinsgruhl, J.A.S. "Current Protocols in Molecular Biology", John Wiley and Sons. Inc., 2002.
4. Cappuccino, J. G. and Sherman, N. "Microbiology: A Laboratory Manual", Addison-Wesley, 2002.

Sri Kaliswari College (Autonomous), Sivakasi
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Core Course-XVI: Lab in Molecular Biology and Molecular Genetics (18UBTC6Q)
(For those who join from June 2018 and afterwards)

Credits	: 5	Int. Marks	: 40
Hours/Week	: 5	Ext. Marks	: 60
Duration	: 75 hrs	Max. Marks	: 100

Course Objectives:

- To enable the students acquire the knowledge about basic technical skills in Molecular Biology.
- To enable the students for the better understanding of Molecular Genetics.

Course Outcomes:

1. Understand the principle of bacterial conjugation and transformation.
2. Isolation of bacteriophage and their titration.
3. Understanding the mechanism of mutation.
4. Knowledge about the differentiation of auxotrophic and prototrophic mutants.
5. Isolate the genomic DNA and plasmid DNA from plants, animals and bacteria.

-
1. Growth curve of Bacteria.
 2. Isolation of genomic DNA and RNA from plants, animals, bacteria and quantification.
 3. Isolation of Plasmid DNA from bacteria.
 4. Elution of DNA from gel.
 5. Bacterial Conjugation.
 6. Bacterial Transformation.
 7. Isolation of Bacteriophage and Phage titration.
 8. Isolation of Auxotrophic mutants.
 9. Mutation analysis of Bacteria using Physical agent (UV).
 10. Bacterial gene induction and β -galactosidase assay.

Reference Books:

1. Reddy, P.H. and Govil, S. "Life sciences protocol manual", DBT Star college scheme, DBT, New Delhi, 2018.
2. Sambrook, J. and Green, M.R. "Molecular Cloning: A Laboratory Manual", Cold Spring Harbor Laboratory Press, Fourth Edition, 2012.
3. Cappuccino J.G. and Sherman, N. "Microbiology: A Laboratory Manual", Addison-Wesley, 2002.
4. Holt, J.G. and Krieg, N.R. "Bergey's Manual of Determinative Bacteriology", Lippincott Williams and Wilkins Publishers, Ninth Edition, 2000.

Sri Kaliswari College (Autonomous), Sivakasi
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Semester VI
(2018 - 2021)

Major Elective Course-III: Stem Cell Biology (18UBTO61)

Credits	: 3	Int. Marks	: 25
Hours/Week	: 4	Ext. Marks	: 75
Duration	: 60 hrs	Max. Marks	: 100

Course Objectives:

- To make the students understand the basic properties of Stem Cells.
- To enrich the students in characterization and differentiation of Stem cells.

Course Outcomes:

1. Understand the properties and types of stem cell.
 2. Knowledge about the techniques used for studying stem cell.
 3. Application of stem cell biology in medicine.
 4. Justify the ethical consideration of stem cell research.
-

UNIT I **(12 hrs)**

Stem cell concept-Properties of stem cell-Types of stem cell-Embryonic stem cell-Adult stem cells-Problem of differentiation.

UNIT II **(12 hrs)**

Differentiation status of cells-Primordial germ cell-Skin cell-Gastrointestinal cells-Embryonic stem cell differentiation as a model to study haematopoietic and endothelial cell development.

UNIT III **(12 hrs)**

Stem cell location and Classification-Neural stem cells-Stem cell niches-Germ line Epithelial and Epidermal and neural niches.

UNIT IV **(12 hrs)**

Uses of Stem cells-Human stem cells-Renewal of stem cells-Stem cells and Tissue Engineering-Embryonic stem cells and Gene therapy-Therapeutic cloning.

UNIT V **(12 hrs)**

Single-Cell PCR methods for studying stem cells-Ethical and Social consideration of Stem cell Research.

Text Books:

1. Munsie, M. "The Australian Stem cell Handbook", National Stem Cell Foundation of Australia, 2015.
2. Turksen, K. "Embryonic Stem Cells-Methods and Protocols", Vol.185, Humana press, 2012.
3. Dockendorff, B. "Stem Cell Century: Law and Policy for a Breakthrough Technology", Vol.5, Journal of Health and Biomedical Law, 2009.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1 - 1.10	1 – 19
II	2	1	1.1-1.5	1 – 19
		2	2.1-2.5	1 - 19
		3	3.1-3.7	1 - 19
		4	4.1-4.8	1 - 19
		5	5.1 - 5.5	1 - 54
III	1	1	1.1 - 1.10	1 - 19
IV	2	8	8.1 – 8.10	64 - 71
V	3	1	3.1 - 3.5	131 - 149

Reference Books:

1. Lanza, R. “Essential of Stem cell Biology”, Elsevier press, 2005.
2. Lanza, R. “Hand Book of Stem Cells”, Volume 1 and 2, Elsevier press, 2007.

Sri Kaliswari College (Autonomous), Sivakasi
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Semester-VI
(2018-2021)

Major Elective Course- III: Biochemical Techniques (18UBTO62)
(For those who join from June 2018 and afterwards)

Credits	: 3	Int. Marks	: 25
Hours/Week	: 4	Ext. Marks	: 75
Duration	: 60 hrs	Max.Marks	: 100

Course Objectives:

- To understand principles of instruments.
- To learn the techniques of collecting biological signals using basic sensors.
- To provide complete information on instruments of biological research.

Course Outcomes:

1. Basic principles of biological instruments such as microscopy, flow cytometry.
2. Knowledge on chromatographic, electrophoretic, spectroscopic and radioisotopic techniques for analysis of biological compounds.
3. Application of instruments for the biological research.
4. Techniques of two dimensional gel electrophoresis and MALDI-TOF.
5. Information on immunotechniques for disease diagnosis and identification.

UNIT I **(12 hrs)**

Microscopic Techniques: Principles and Applications of Light, Phase Contrast, Fluorescence Microscopy-Scanning and Transmission Electron Microscopy- Confocal Microscopy- Cytophotometry and Flow Cytometry-Patch Clamping, Advances of Microscopy-Centrifugation-Preparative and Analytical Centrifuges-Sedimentation Analysis RCF-Density Gradient Centrifugation.

UNIT II **(12 hrs)**

Chromatography Techniques: Principles and Application of Paper Chromatography-TLC- Gel Filtration Chromatography- Ion Exchange Chromatography-Affinity Chromatography- GLC and HPLC.

UNIT III **(12 hrs)**

Electrophoretic Techniques: Principles and Application of Gel Electrophoresis- 2DE:Iso-electric Focusing- PAGE-Immuno diffusion-Immuno Electrophoresis- ELISA - Southern -Northern and Western Blotting.

UNIT IV **(12 hrs)**

Spectroscopic Techniques: Principles and Application of UV and Visible Spectroscopy- Fluorescence Spectroscopy- MS- NMR- ESR-Atomic Absorption Spectroscopy- X- ray Spectroscopy-Raman Spectroscopy-MALDI TOF.

UNIT V**(12 hrs)**

Radio-isotopic Techniques: Introduction to Radioisotopes and their Biological Applications, Radioactive Decay – Types and Measurement, Principles and Applications of GM Counter, Solid and Liquid Scintillation Counter, Autoradiography, RIA.

Text Books:

1. Wilson K. and Amp J. Walker, “Principles and Techniques of Biochemistry and Molecular Biology”, Cambridge University Press, 2005.
2. P.Palanivelu, Analytical Biochemistry and Separation Techniques,” Kalaimani Publishers, 2001.
3. Kuby, “Immunology”, Wiley services and publishers, Third edition, 2002.
4. Prescott, Harley and Klen, “Microbiology,” Harvard publishers, Fifth Edition, 2002.

Unit	Text Book No.	Chapter	Section	Page No
I	1	1	1.1-1.5	107-110
II	2	17	17.1-17.5	142-170
III	2	14	14.1-14.5	114-140
IV	3	3	3.1,3.1.3	23-32
V	4	6	6.1-6.5	147-150

References Books:

1. AvinashUpadhyay, KakoliUpadhyay,NirmalenduNath, “Biophysical Chemistry HimalayaPublishers, India, 2005.
2. John F. Robyt, Bernard J. White, “Biochemical techniques: Theory and practice,” Wave land press, Inc, 1990.
3. Dauglas A Skoog, “Principles of instrumental analysis”, Saunders college publishers,1985.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
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Semester VI
(2018 - 2021)

Major Elective Course-III: DNA Fingerprinting (18UBTO63)

Credits	: 3	Int. Marks	: 25
Hours/Week	: 4	Ext. Marks	: 75
Duration	: 60 hrs	Max. Marks	: 100

Course Objectives:

- To provide knowledge on DNA fingerprinting.
- To help the students understand how to use the molecular techniques in the analysis of disputes.
- To learn the application in various disciplines of Biotechnology.

Course Outcomes:

1. Basic principles of DNA Fingerprinting and its pros and cons.
2. Knowledge on the identification of paternity, criminals and ancestors.
3. Knowledge on the molecular analysis tools such as RFLP, AFLP and PCR.
4. Knowledge on its role in agricultural genetics and plant breeding.
5. Understand the case studies.

UNIT I **(12 hrs)**

History of Fingerprinting - Patterns - Classification - Uses of fingerprints in crime investigation- Direct and latent prints - Developments of powders - Chemistry of powders - Other methods of development, transfer of fingerprints.

UNIT II **(12 hrs)**

Fundamentals principles - Computerized prints, blood stains, grouping and identification, disputed paternity and DNA tests.

UNIT III **(12 hrs)**

Genetic fingerprinting, DNA typing, DNA profiling, DNA fingerprinting methods-RFLP analysis, PCR analysis, AFLP.

UNIT IV **(12 hrs)**

DNA structure - Process of DNA fingerprinting-DNA fingerprinting in agricultural genetics programs - Plant DNA fingerprinting.

UNIT V **(12 hrs)**

Application of DNA fingerprinting, Fake DNA evidences and Case studies.

Text Books:

1. Jain, M., Recombinant DNA technique-A textbook, N.K.Mehra for Narosa publishing house, 2012.
2. Kleinsmith, L.J., Cell and Molecular Biology, Harper Collins college publisher, Second Edition, 1995.
3. Kreuzer,H., Recombinant DNA and Biotechnology, ASM Press Washington DC, Second Edition, 2001.
4. Nicholl, D.S.T., An introduction to Genetic Engineering, Cambridge university press, Third Edition, 2002.
5. Glick B. R. and Pasternak J. J., “Molecular Biotechnology, Principles and application of recombinant DNA”, Panima Publishing Corporation, New Delhi, Fourth Edition, 2010.

Unit	Text Book No.	Chapter	Page No.
I	1	9	333-375
II	5	9	333-375
III	1	4	41-51
	2	8	108
		3	110
IV	2	3	107-111
	3	6	120-139
V	4	12	248-252

Reference Books:

1. Parik, C.K., Parik’s “Text Book of Medical Jurisprudence, Forensic Medicine and Toxicology”, Sixth Edition, CBS Publishing, India, 1999.
2. Saferstein. R., “Criminalistics, An introduction to Forensic Science”, Pretice Hall of India, 1978.

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Semester VI
(2018-2021)

Skill Based Course- IV: Functional Genomics (18UBTS61)

(For those who join from June 2018 and afterwards)

Credits	: 2	Int. Marks	: 25
Hours/Week	: 2	Ext. Marks	: 75
Duration	: 30 hrs	Max.Marks	: 100

Course Objectives:

- To provide students with a theoretical knowledge of Proteome and genomes.
- To help the students to understand the various proteomic and genomic analysis techniques.
- To enable students to acquire problem-solving skills and gainon techniques used in biotechnology, pharmaceutical, chemical and industries.

Course Outcomes:

1. Theoretical knowledge of Proteome and genomes.
2. Understand the various proteomic and genomic analysis techniques.
3. Understand the principle of DNA sequencing and mapping of the genome.
4. Acquire problem-solving skills and gain experience used in biotechnology, pharmaceutical, chemical and industries.
5. Applications of DNA array and protein array.
6. Basic concepts of Pharmacogenomics in the identification of drug targets.

UNIT I	(6 hrs)
Genomics: Definition-Construction of Genetic Maps-Physical Maps-RFLP-FISH to Identify Chromosome Landmarks- Human Genome Project.	
UNIT II	(6 hrs)
DNA sequencing: Chemical- Enzymatic and Automated DNA sequencing-SAGE and Sequence Assembly- Sequence Annotation.	
UNIT III	(6 hrs)
DNA Micro array: Basic principles and Design- Applications- cDNA Oligonucleotide Micro array- Genotyping/SNP detection- Detection technology- Computational analysis of micro array data.	
UNIT IV	(6 hrs)
Overview of protein structure: Primary-secondary-Tertiary and Quaternary structure- Identification and Analysis of Proteins by 2D analysis-Yeast two hybrid system- Phage Display-Protein Interaction Maps- Protein Arrays-Definition- Applications- Diagnostics- Expression profiling.	
UNIT V	(6 hrs)

Proteomics and drug discovery: High throughput Screening For Drug Discovery- Identification of Drug Targets-Phylogenetics-Metabolomics- Mass Spectrometry-MALDI TOF and HPLC Principle- Instrumentation and Application.

Text Books:

1. SB Primrose S and TwymanR, "Principles of Genome Analysis and Genomics," Blackwell, Washington, 2008.
2. TA Brown, "Genomes"-Oxford Academic Publication, 2011.
3. Lehninger, "Principles of Biochemistry," -Palgrave Publication, 2009.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	2	2.1 - 2.7,	16 – 22
II	2	3	3.1 - 3.9	71-81
		4	4.1.1 -4.2.3	104-119
III	2	3	3.2.2 - 3.9.7	96-109
		6	6.1-6.4	183-189
IV	3	6	6.1- 6.7 , 6.8- 7.3	116 -158 ,183,
V	3	6	6.2.1 -6..8	175-186

References Books:

1. Glick B.R and Pasternak J.J, "Molecular Biotechnology," ASM Press, Third Edition, Washington, 1998.
2. David Bowell and Joseph Sambrook, "DNA Microarrays", Cold Spring Harbor Laboratory Press Publication, New York, 2009.

Sri Kaliswari College (Autonomous), Sivakasi
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Semester VI
(2018 – 2021)

Value based course-II: Nano Biotechnology (18UBTV61)
(For those who join from June 2018 and afterwards)

Credit	: 1	Int. Marks	: 25
Hours/Week	: 2	Ext. Marks	: 75
Duration	: 30 hrs	Max. Marks	: 100

Course Objectives:

- To understand the different approaches of nanoparticle synthesis.
- To make the students familiar with biological synthesis of nanoparticles.
- To make the students understand the methods of characterizing nanoparticles.

Course Outcomes:

1. Understand the basic concepts and historical aspects of nanotechnology.
2. Understand the different physical, chemical and biological methods of synthesis of nanoparticles.
3. Characteristic analysis of nanoparticles using UV spectrophotometry, microscopic techniques such as SEM, TEM and X-ray diffraction.
4. Applications of nanoparticles in anticancer, antiangiogenic, drug delivery and imaging.
5. Understand the scope of nanomedicine in near future.

UNIT I **(6 hrs)**

History and Scope-Background and definition of Nanotechnology-Scientific revolutions-Properties of Nanoparticles-Nanosized particles-Crystal structure-Nanoscalar- Molecular and atomic size.

UNIT II **(6 hrs)**

Synthesis of Nanoparticles using Bottom up and Top Down approaches-Chemical Precipitation and reduction methods-Sol gel method-Sonochemical synthesis-Physical methods-Ball Mining-Physical Vapour deposition-Chemical Vapour deposition-Sputter deposition.

UNIT III **(6 hrs)**

Synthesis of Nanoparticles using Biological Sources-Plant, Microorganism, Bacteria, Mushrooms and Fungi.

UNIT IV **(6 hrs)**

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

UNIT V**(6 hrs)**

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

Text Books:

1. Poole Jr. C.P. and Owens F.J. "Introduction to Nanotechnology", Wiley Inter Science, USA, 2003.
2. Kulakarni S.K. "Nanotechnology Principles and Practices", Springer, Third Edition, 2014.
3. Balaji, S. "Nanobiotechnology", MJP Publishers, Chennai, 2010.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1	1 – 7
		3	3.1-3.4	35-71
		3	4.1-4.6	72-101
	3	1	1.1-1.13	1-19
		2	2.1-2.12	23-50
II	2	3	3.1 - 3.8	55 - 76
		4	4.1-4.12	77-109
	3	3	3.1 - 3.13	53 - 89
III	2	5	5.1 - 5.5	111 - 123
IV	2	7	7.1 - 7.8	135 - 197
	3	3	3.1 - 3.13	53 - 89
V	2	12	12.7-13.1	399-344
		13	13.1-13.3	349-354
	3	4	4.1-4.15	93-147
		5	5.1-5.11	151-178

Reference Books:

1. Boisseau, P. and Lahamani, M. "Nanoscience, Nanobiotechnology and Nanobiology", Springer Heidelberg Dordrecht London, New York, 2010.
2. Niemeyer, C.M and Mirkin, C.A. "Nanobiotechnology: Concepts, Applications and Perspectives, Wiley-VCH publisher, 2004.

Sri Kaliswari College (Autonomous), Sivakasi
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(2018-2021)
Semester VI

Part IV: Environmental Studies (18UESR61)
(For those who join from June 2018 and afterwards)

Credit : 1

Int. Marks : 25

Hours/Week : 2

Ext. Marks : 75

Duration : 60 hrs

Max.Marks : 100

Course Objectives:

- To understand that living and non living things are interlinked from Micro to macro level as an unbroken chain from sun to soil.
- To provide the knowledge about the general aspects of eco system and their structure.
- To acquaint the students with details of diversity of animals and plants and their conservation.

Course Outcomes:

1. Understand that living and non living things are interlinked from micro to macro level as an unbroken chain from sun to soil
2. Knowledge about the general aspects of eco system and their structure
3. Details of diversity of animals and plants and their conservation
4. Core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
5. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
6. Address the lethal impact of global warming and control measures.

UNIT I

(6 hrs)

Structure of earth and its components: Atmosphere, Lithosphere, Hydrosphere and Biosphere. Renewable and nonrenewable resources- Forest, water, energy resources. Population explosion- family welfare programme.

UNIT II

(6 hrs)

Concept of an ecosystem-Terrestrial and aquatic. Structure and function-Energy flow in the ecosystem-Food chain and food web, Ecological pyramids-types. Bio geo chemical cycle-carbon, water and nitrogen and Phosphorous cycle.

UNIT III

(6 hrs)

Introduction, definition- genetic, species, and ecosystem diversity-Threats to bio diversity-Conservation of Bio diversity-Insitu, Exsitu conservation. IUCN,WWF. India as mega diversity nation- Hot spots of bio diversity-bio geo graphical distribution-Endangered and endemic species of India.Bioinvasion.

UNIT IV**(6 hrs)**

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

UNIT V**(6 hrs)**

Road safety rules-Traffic signals. Awareness program on “Road Safety measures”. Contribution of students and teachers in adoption of villages and steps taken for green villages. Personal health hygiene-HIV/AIDS.

Text Books:

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

Unit	Text Book No.	Chapter	Section	Page No.
I	1	2	2.1-2.6	6-37
	2	1	1.1-1.5	4-7
II	1	3	3.1-3.4	42-52
III	1	4	4.1-4.5	62-77
IV	1	5	5.1-5.7	81-118
V	1	6	6.1-6.9	127-174

Reference Books:

1. Agarwal, K.C., “Environmental Biology”, Nidi publication Ltd, Bikaner, 2001.
2. Odum, E.P, “Fundamentals of ecology”, W.B. Saunders Co. USA, 1971.
3. Miller, T.G., “Environmental sciences”, Wadsworth Publishing Co, New Delhi. 2004.
4. <http://www.adcidl.com/pdf/India-Road, Traffic-Signs.pdf>.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology, Botany, Chemistry and Physics
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Semester I
(2018 - 2021)

Extra Credit Course (ECC): Nanotechnology (18USC EX1)
(For those who join from 2018 and afterwards)

Credit	: 1	Int. Marks	: 25
Hours/Week	: 4	Ext. Marks	: 75
Duration	: 60 hrs	Max. Marks	: 100

Course Objectives:

- To understand the different approaches of nanoparticle synthesis.
- To make the students familiar with biological synthesis of nanoparticles.
- To make the students understand the methods of characterizing nanoparticles.

Course Outcomes:

6. Understand the basic concepts and historical aspects of nanotechnology.
7. Understand the different physical, chemical and biological methods of synthesis of nanoparticles.
8. Characteristic analysis of nanoparticles using UV spectrophotometry, microscopic techniques such as SEM, TEM and X-ray diffraction.
9. Applications of nanoparticles in anticancer, antiangiogenic, drug delivery and imaging.
10. Understand the scope of nanomedicine in near future.

UNIT I **(12 hrs)**

Introduction: Introduction to nanomaterials and evolution of nanotechnology-Concepts and Fundamentals- Historical aspects - Recent development and scope.

UNIT II **(12 hrs)**

Growth Techniques of Nanomaterials: Introduction – Top-Down Vs Bottom-Up Technique – Lithographic process and its limitations – Nonlithographic techniques – Evaporation – Thermal Evaporation – E-Beam evaporation – Chemical Vapour Deposition - Types of CVD process.

UNIT III **(12 hrs)**

Synthesis of nano materials: General approaches – Chemical methods – Sol- gel techniques – Co – precipitation – Hydrolysis – Sonochemical method – Colloidal precipitation- Microwave plasma processing – Catalytic methods- Preparation of gold, silver nano particles- Bottom up and down approaches – Characterization of nano particles.

UNIT IV **(12 hrs)**

Characterization: Application of Scanning electron microscope (SEM), Transmission electron microscope (TEM), Confocal microscope-Spectroscopic techniques- X-ray spectroscopy and mass spectrometry in characterization of nanoparticles.

UNIT V**(12 hrs)**

Applications: Applications of Nanobiotechnology: Anticancerous, antioxidant and anti-angiogenic activities of nanoparticles – Diagnosis of different types of cancer – Biocompatibility and biodegradability of engineered nanoparticles for drug delivery.

Text Books:

4. Poole Jr. C.P. and Owens F.J. "Introduction to Nanotechnology", Wiley Inter Science, USA, 2003.
5. Kulkarni S.K. "Nanotechnology Principles and Practices", Springer, Third Edition, 2014.
6. Balaji, S. "Nanobiotechnology", MJP Publishers, Chennai, 2010.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1	1 - 7
		3	3.1-3.4	35-71
		3	4.1-4.6	72-101
	3	1	1.1-1.13	1-19
		2	2.1-2.12	23-50
II	2	3	3.1 - 3.8	55 - 76
		4	4.1-4.12	77-109
	3	3	3.1 - 3.13	53 - 89
III	2	5	5.1 - 5.5	111 - 123
IV	2	7	7.1 - 7.8	135 - 197
	3	3	3.1 - 3.13	53 - 89
V	2	12	12.7-13.1	399-344
		13	13.1-13.3	349-354
	3	4	4.1-4.15	93-147
		5	5.1-5.11	151-178

Reference Books:

1. Boisseau, P. and Lahamani, M. "Nanoscience, Nanobiotechnology and Nanobiology", Springer Heidelberg Dordrecht London, New York, 2010.
2. Niemeyer, C.M and Mirkin, C.A. "Nanobiotechnology: Concepts, Applications and Perspectives, Wiley-VCH publisher, 2004.

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Semester II
(2018 - 2021)

Extra Credit Course (ECC): Nanotechnology Practicals (18USC EXP)
(For those who join from 2018 and afterwards)

Credit	: 1	Int. Marks	: 40
Hours/Week	: 4	Ext. Marks	: 60
Duration	: 60 hrs	Max. Marks	: 100

Course Objectives:

- To understand the biological and chemical approaches of nanoparticle synthesis.
- To make the students familiar with characterization of nanoparticles.
- To make the students understand the application of nanoparticles.

Course Outcomes:

- Familiar with basic strategy of nanoparticle synthesis and its pros and cons.
- Understand the different physical, chemical and biological methods of synthesis of nanoparticles using various sources.
- Understand the Characterization of nanoparticles using UV spectrophotometry, microscopic techniques such as SEM, TEM and X-ray diffraction.
- Understand the scope of nanomedicine in near future.

Preparation of Nanoparticle

1. Citrate stabilized silver nanoparticle.
2. Sodium D-Gluconate stabilized silver nanoparticle.
3. Zinc oxide nanoparticle.
4. Copper oxide nanoparticle.
5. Preparation of silver nanoparticle by photochemical method.

Characterization technique of specific nanoparticle

1. Prediction of LSPR band for the given UV-Vis spectroscopic data.
2. Average size calculation using UV-Vis spectroscopic data.
3. XRD pattern prediction.
4. Morphology of nanoparticle using SEM images.
5. Size calculation of nanoparticle using given HRTEM images.

Application of Nanoparticle

1. Colorimetric sensing ability of Citrate stabilized silver nanoparticle.
2. Colorimetric sensing ability of Sodium D-Gluconate stabilized silver nanoparticle.

Reference Books:

1. Sulabha K. Kulkarni, “Nanotechnology Principles and Practices”, Capital Publishing Company and Springer, 2015.
2. T. Pradeep, “Understanding Nanoscience and Nanotechnology”, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
3. Vincent Rotello, “Nanoparticles: Building blocks of Nanotechnology”, Springer science plus Business media, 2004.
4. K.K. Chattopadhyay and A.N. Banerjee, “Introduction to Nanoscience and Nanotechnology”, PHI Learning Private Limited, New Delhi, 2009.
5. Charles P. Poole Jr. and Frank J. Owens, “Introduction to Nanotechnology”, Wiley Inter Science, 2004.
6. Jeremy Ramsden, Jeremy Ramsden and Ventus, “Essentials of Nanotechnology”, *Jeremy Ramsden and Ventus Publishing APS*, 2009.

