



**PSGR
Krishnammal College for Women**



DEPARTMENT OF BIOTECHNOLOGY (UG)

**CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING
OUTCOMES-BASED CURRICULAR FRAMEWORK (LOCF)**

(Semester – I & II)

BACHELOR OF SCIENCE - BIOTECHNOLOGY



B.Sc BIOTECHNOLOGY

PROGRAMME LEARNING OUTCOME (PLO):

After completion of this programme, the student will be able to

PLO1: Achieve successful technical and professional career which will turn the student into an effective researcher or as an entrepreneur.

PLO2: Acquire sound knowledge in basic sciences and applied sciences and thereby applying the principles in dealing problems in a scientific way.

PLO3: Acquire knowledge in the fields of molecular biology, genome biology, gene engineering, protein engineering, immuno technology, tissue engineering and bioinformatics.

PLO4: Have a life-long learning to follow novel developments in the field which will inspire high ethical values and technical standards.

PLO5: Be equipped to transfer this knowledge to the consumer by applying biotechnological principles in producing a research oriented product.

PROGRAMME SPECIFIC OUTCOME:

At the end of the programme the student will

PSO1: Ability to understand the structure and function of cells.

PSO2: Skill to make biosafe cloning host cells, design new proteins, develop new diagnostic tools, drug discovery through virtual analysis.

PSO3: Acquire skills to higher levels of learning and/or for the development of new products.

PSO4: Initiate new start ups in areas of biotechnology.

PSO5: Comprehend current trends to meet the future challenges in biotech industry.



DEPARTMENT OF BIOTECHNOLOGY-UG
CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION
BACHELOR OF SCIENCE (B.Sc.) – 2022-2025 BATCH
SYLLABUS & SCHEME OF EXAMINATION

Applicable to students admitted during the academic year 2022-2023 onwards (I & II Sem)

SEM	Part	Subject Code	Title of the Paper		Instruction hours/week	Contact hours	Tutorial	Duration of Examination	Examination Marks			Credits
									CA	ESE	TOTAL	
I	I	TAM2201/ HIN2201/ FRE2201	Language Tamil I/ Hindi I/ French Paper I	Language	6	86	4	3	50	50	100	3
	II	ENG2101	English paper I	English	6	86	4	3	50	50	100	3
	III A	BT22C01	Core Paper I – Cell and Molecular biology	CC	5	71	4	3	50	50	100	4
		BT22CP1	Core Practical I – Lab in Cell and Molecular biology	CC	3	45	-	-	-	-	-	-
	III A	BT22A01/ CE22A01/ PS22A01	Allied I –Paper I Biochemistry/ Allied Chemistry for Biologist Paper I/ Allied Physics Paper –I	GE	5	71	4	3	30	45	75	4
	III A	BT22AP1/ CE21AP1/ PS21AP1	Allied Practical I Lab in Biochemistry/ Allied Chemistry Practical for Biologist / Allied Physics practical	GE	3	45	-	-	-	-	-	-
	IV	NME22B1/ NME22A1/ NME21ES	Basic Tamil I/ Advanced Tamil I/WS/AS/GS/ Introduction to Entrepreneurship	AEC	2	28	2	2	50	50	100	2
II	I	TAM2202/ HIN2202/ FRE2202	Language Tamil II/ Hindi II/ French II	Language	6	86	4	3	50	50	100	3
	II	ENG2102	English paper II	English	5	86	4	3	50	50	100	3
	III A	BT22C02	Core Paper II – Microbiology	CC	5	71	4	3	50	50	100	4
		BT22CP1	Core Practical I- (Lab in Cell and Molecular biology & Microbiology)	CC	3	45	-	3	50	50	100	4
	III A	BT22A02/ CE22A02/ PS22A02	Allied Paper II- Instrumentation and Analysis/ Allied Chemistry for Biologist Paper- II/ Allied Physics Paper-II	GE	5	71	4	3	30	45	75	4

		BT22AP1/ CE21AP1/ PS21AP1	Allied Practical I Lab in Biochemistry & Instrumentation and Analysis/ Allied Chemistry Practical for Biologists Allied Physics practical	GE	3	45	-	3	20	30	50	2
	IV	21PELS1	Professional English for Life Sciences		3	26	4	2	50	50	100	2
		NME22B2/ NME22A2/ OPS1808	Basic Tamil II / Advanced Tamil II**/ Open Course Self study online courses	AEC	-	-	-	-	-	-	-	-
		NME12GA W	Foundation Course I (General Awareness)	AEC	Self-Study Online			100	-	100	Grade	

CC – Core Courses
GE – Generic Elective
AEC – Ability Enhancing Course

CA – Continuous Assessment
ESE - End Semester Examination

#Allied theory papers with practicals will be evaluated for 50/50 and converted into 30/45; Theory and practical converted to 20/30

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
BT22C01	Core paper I-Cell and Molecular Biology	CORE	71	4	-	4

Preamble

To facilitate the students to

- Familiarize various aspects of cellular organization and their role in DNA replication, transcription and translation.
- Develop comprehensive understanding on the complete cellular and molecular function of cell organelles in terms of cell to cell interaction, gene regulation, cellular signaling.
- Impart the skills of molecular biology and their applications in various disciplines

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO 1	Classify the cells based on their structural and genetic makeup of the organism.	K1
CLO 2	Examining the basic concepts of cell cycle and regulators involved in it.	K2
CLO 3	Implementing the concepts of cell signalling and communication in research fields.	K3
CLO 4	Exploration of the genetic mechanisms involved in studying the cellular activity of an organism.	K4

Mapping with Programme Outcomes

CLOS	PLO1	PLO2	PLO3	PLO4	PLO 5
CLO 1	S	S	S	S	S
CLO 2	S	M	S	M	M
CLO 3	S	S	M	S	S
CLO 4	S	M	S	S	M

S- Strong; M-Medium

Syllabus

UNIT I: Basics of Cells

14 hrs

Cell as a basic unit: discovery of the cells, classification of cell types, development of cell theory, early chemical investigation in cell biology. Prokaryotic and Eukaryotic cell organization. Cytoplasmic compartments of the cell. Structure and Functions of organelles.

UNIT II: Mechanisms of Cell Transport

14 hrs

Chemical composition and fluidity of membranes; dynamic nature of membranes; transportation across cell membrane; membrane potentials; extracellular matrices– structure and function; cytoskeleton– structure and function

UNIT III: Cell Division, Cell cycle Regulation and Cell Signaling

14 hrs

Eukaryotic cell cycle, Cyclin, CDKs, Check points, Cell cycle inhibitors, DNA content, FACS, Regulation of cell cycle- factors and genes regulating cell cycle. Mitosis and Meiosis; Cell signaling – types of cell signaling - G protein mediated, Tyrosine kinase mediated signaling. Transposable elements-prokaryotes.

UNIT IV: Organization and functions of DNA

14 hrs

Chromosomes-structure, function and specialized structure. DNA-Structure, types, DNA replication in prokaryotes and eukaryotes. DNA damage-types of DNA damage and factors affecting, Mutation, types and DNA Repair mechanism-types, Base Excision repair, SOS repair, NHEJ.

UNIT V: Gene Regulation and Expression

15 hrs

Transcription, Prokaryotes and Eukaryotes. mRNA processing Translation –Prokaryotes and Eukaryotes. Gene regulation: prokaryotic gene regulation- Operon concept; Lac operon and Trp operon. Post translational modifications- phosphorylation, glycosylation, ubiquitination and methylation.

TEXT BOOKS

S.No	Authors	Year	Title of the book	Publishers
1.	S C Rastogi	2020	Cell and Molecular Biology	New age International Publishers
2.	Samantha Granger	2018	Textbook of Cell Biology	Callisto reference
3.	Thomas D.Pollard, William C.Earnshaw, Jennifer Lippincott-Schwartz, Graham Johnson	2016	Cell Biology	Elsevier; 3rd edition
4.	Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter	2014	Molecular Biology of Cell 6 th Edition	W. W. Norton & Company
5.	Harvey Lodish; Arnold Berk; Chris A. Kaiser; Monty Krieger; Anthony Bretscher; Hidde Ploegh; Kelsey C. Martin; Michael Yaffe; Angelika Amon	2021	Molecular Cell Biology Ninth Edition	Macmillan's Publishers

REFERENCE BOOKS

S.No	Authors	Year	Title of the book	Publishers
1	Bruce Alberts, Karen Hopkin, Alexander D. Johnson, David Morgan; Martin Raff, Keith Roberts; Peter Walter	2018	Essential Cell Biology 5 th Edition	W.W.Norton & Company
2	D.Freifelder	2015	Freifelders Essentials of Molecular Biology	Jones & Bartlett Publishers
3	Harvey Lodish; Arnold Berk; Chris A. Kaiser; Monty Krieger; Anthony Bretscher; Hidde Ploegh; Kelsey C. Martin; Michael Yaffe; Angelika Amon	2021	Molecular Cell Biology 9 th Edition	Macmillan's Publishers

Course Designer:

Dr.R.Nirmal Kumar

Dr.A.Dhivya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
BT22CP1	Core Practical I (Lab in Cell and Molecular Biology & Microbiology)	CORE	-	-	90	4

Objectives

- To develop the knowledge on different microbiological techniques and isolate microorganisms from the various sources and to establish pure cultures
- To isolate and differentiate different cell organelles and utilize staining techniques to visualize them
- To understand molecular techniques in separating the genetic material from the organism
- To analyze the methodology of isolating proteins from the organisms.

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand and identify techniques in isolating different microorganisms.	K1
CLO2	Acquire the skills in interpreting the specimens and inferring the results.	K2
CLO3	Demonstrate basic molecular techniques in isolating the genetic material from both prokaryotic and eukaryotic organisms	K3
CLO4	Will be capable of determining the isolation and separation of proteins from the samples given.	K3

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO 5
CLO1	S	S	M	M	S
CLO2	S	M	S	S	M
CLO3	S	S	M	M	S
CLO4	S	M	S	S	M

S- Strong; M-Medium

Lab in Cell and molecular biology (Semester I Practicals)

1. Use of simple compound microscope and Micrometry
2. Different types of cells–parenchyma, collenchymas, sclerenchyma, epithelium
3. Permanent slide preparation
4. Osmosis and tonicity
5. Cell division –Mitotic stages –Preparation of Onion Root Tip
6. Cell division –Meiotic stages –Preparation of *Tradescantia* Flower bud
7. Isolation of Genomic DNA from bacterial cells
8. Isolation of RNA
9. Quantification of DNA

Lab in Microbiology: (Semester II Practicals)

1. Microbiological techniques–Sterilization techniques, Media preparation
2. Isolation and enumeration of microbes (bacteria & fungi) from soil.
3. Pure culture method - streak plate method
4. Identification of Bacteria: Staining methods–simple, Grams and Spore Staining
5. Biochemical Identification –IMViC–test, Oxidase and Catalase
6. Growth curve of bacteria.
7. Anti-microbial sensitivity test – Disk diffusion test.
8. Fungal identification: lactophenol cotton blue staining and KOH moulding (morphology)

Course Designer:

Dr. R. Nirmal Kumar

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
BT22A01	Allied paper I-Biochemistry	Allied	71	4	-	4

Objectives

- To facilitate the students to
- To understand the structure of simple sugars
 - To elucidate the role played by different Biomolecules
 - To analyze the structure of different sugars, lipids, amino acids and proteins.
 - To analyze the various pathways involved in sugar utilization

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO 1	Classify the biomolecules based on structure and function	K1
CLO 2	Comprehend the basics of enzymes and their role in different metabolic processes.	K2
CLO 3	Acquire knowledge about the Importance of lipids and their biosynthesis	K3
CLO 4	Analyze the significance of metabolic pathways and their role in cellular function	K3

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO 5
CLO 1	S	S	M	S	S
CLO 2	S	M	S	M	M
CLO 3	S	S	M	S	S
CLO 4	S	M	S	M	S

S- Strong; M-Medium

SYLLABUS

UNIT I: Structure and Function of Carbohydrates

14 hrs

Carbohydrates: Definition, classification, structure and biological functions of mono, di, oligo and polysaccharides (starch, glycogen, cellulose, dextrin, hyaluronic acid, keratin sulphate, heparin and chondroitin sulphate).

UNIT II: Enzymes

14 hrs

Enzymes – properties, classes of enzymes, enzyme reaction, theories of enzyme reaction, MM equation, LB plot, factors affecting enzyme reaction, enzyme units, enzyme assay, coenzyme, Co-factors.

UNIT III: Lipids

14 hrs

Biological significance, nomenclature and classification. Simple lipids; Fatty acids and their properties, triglycerides, waxes, steroids and prostaglandins. Compound lipids: Phospholipids, sphingolipids and glycolipids. Lipoproteins. β -oxidation of lipids, Biosynthesis of lipids.

UNIT IV: Vitamins & Proteins

14 hrs

Vitamins – water soluble and fat soluble, importance of vitamins in life. Amino acids: structure, classification, physical and chemical properties. Proteins: Biological importance, classification, general properties. Primary structure- Human Insulin, Secondary structure - keratin tertiary structure- myoglobin and quaternary structure- Hemoglobin.

UNIT V: Metabolism of Biomolecules

15 hrs

Metabolism: Catabolism & Anabolism. Energy metabolic pathways – Glycolysis, Krebs's cycle, Oxidative phosphorylation. Substrate level phosphorylation, Gluconeogenesis, pentose phosphate pathway (HMP shunt).

TEXT BOOKS

S.No	Authors	Year	Title of the book	Publishers
1	Nelson,D.L.and Cox,.M. Lehninger	2021	Principles of Biochemistry 8 th Edition	Macmillan Higher Education
2	U. Satyanarayana, U.Chakrapani	2020	Biochemistry, Fifth edition revised	Elsevier
3.	Roger L. Miesfeld, Megan M. McEvoy	2016	Biochemistry	W.W. Norton
4.	Donald Voet, Charlotte W. Pratt, Judith G. Voet	2012	Principles of Biochemistry	Wiley; 4th Edition International Student Version
5	Jain, J.L, Sunjay Jain and Nitin Jain	2010	Biochemistry	Chand and Company, New Delhi

REFERENCE BOOKS

S.No	Authors	Year	Title of the book	Publishers
1	Victor Rodwell , David Bender , Kathleen Botham, Peter Kennelly, P.	2018	Harper's Biochemistry 31 st edition	McGraw Hill
2	Jeremy M.Berg, John L.Tymoczko and Lubertstryer	2002	Biochemistry	W H Freeman & Co. , Objectives

Course Designer:

Dr.R.Nirmal Kumar

Dr.A.Dhivya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
BT22AP1	Allied Practical–I (Lab in Biochemistry and Instrumentation and Analysis)	Allied	-	-	90	2

Objectives

To facilitate the students to

- Evaluate methods of biomolecule estimations, separation techniques and methods for biochemical analysis
- To enable the students to Learn to make standard solutions
- Gain knowledge in usage of separation techniques
- Apply the knowledge of understanding volumetric, colorimetric and spectrophotometric analysis

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Remember and differentiate the different techniques employed in estimating Biomolecules	K1
CLO2	Categorizing the method to quantify proteins and sugars	K2
CLO3	Examining the enzymatic assays and their calculations	K3
CLO4	Comprehend the basics of chromatography techniques	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO 5
CLO1	S	S	M	M	M
CLO2	S	S	M	M	S
CLO3	S	S	M	S	S
CLO4	S	M	S	M	M

S- Strong; M-Medium

Syllabus**45 Hrs****Lab in Biochemistry (Semester I Practicals)**

1. Preparation of standard solutions
2. Qualitative Analysis of Carbohydrates – Glucose, Fructose, Sucrose, Starch
3. Qualitative Analysis of Amino acid – Tyrosine, Cysteine, Tryptophan
4. Estimation of proteins-Lowry's methods
5. Estimation of total free amino acids – Ninhydrin Method
6. Estimation of Glucose (Dinitrosalicylic acid method)
7. Quantification of Vitamin C
8. Analysis of Oils- Saponification Value, Acid Number

Lab in Instrumentation and Analysis (Semester II Practicals)**Syllabus****45 hrs**

1. Laboratory rules and regulations –Safety principles and Handling
2. pH measurement of samples using pH meter
3. Preparation of buffers-Phosphate and Tris Buffers
4. Centrifugation-Separation of organelles using Centrifugation
5. Paper Chromatography- Separation of plant pigments
6. Spectrophotometric method -Estimation of chlorophyll content
7. Thin Layer Chromatography for separation of amino acids
8. Analysis of Heavy metals from drinking water through AAS/ICP OES

Course Designer:**Dr.R. Nirmal Kumar**

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
BT22C02	Core Paper II- Microbiology	CORE	71	4	-	4

Preamble

To facilitate the students to

- To study the structure and function of microbial cells
- To enumerate different types of microbes
- To analyze the physiology of microbes
- To evaluate microbial growth
- To evaluate the use of microbes in different industries

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO 1	Acquire knowledge about the discovery of microbes and techniques utilized for their discovery	K1
CLO 2	Understand and gain knowledge about different types of Microorganism and their nutritive requirements for their growth	K2
CLO 3	Comprehend the ideology to culture and enumerate the microorganisms and its association with nature	K2
CLO 4	Inculcate knowledge on Industry 4.0, need for digital transformation	K2

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO 1	S	M	S	S	M
CLO 2	S	S	S	M	M
CLO 3	M	S	M	S	M
CLO 4	S	M	S	M	S

S- Strong; M-Medium

Syllabus

UNIT I: Introduction to Microscopy

14 hrs

Historical developments in microbiology, Definition and scope of microbiology, Microscopy: Light Microscope: Simple; Compound Microscopes–Dark field, light field, phase contrast, Fluorescent Microscopes, Electron microscope and Confocal Microscope.

UNIT II: Media and Culture Techniques

14 hrs

Microbiological Media: Types, preparation, methods of sterilization; enumeration of microorganisms in soil, water and air; isolation of microorganisms from Environment and infected tissue; Techniques of pure culture, maintenance and Preservation; Staining: stains and types of staining.

UNIT III: Microbial nutrition, growth and control

14 hrs

Structure of bacterial cell, Growth and reproduction of bacteria. Nutrients, nutritional types of microorganisms, Autotrophic microbes, Chemotrophic microbes, Photosynthetic microbes, aerobic microbes, anaerobic microbes, Bacterial Growth, Measurement –Direct and Indirect. Bacterial growth-bacterial growth curve asynchronous growth, synchronous growth, limitation of microbial growth, Fermentative microbes.

UNIT IV: Microbes and its association

14 hrs

Soil borne- *Azotobacter* sp, *Rhizobium* sp, *Azospirillum*, *Nostoc*, *Anabaena*, *Saccharomyces cerevisiae*, **Algae:** *Chlorella*, *Spirulina*, *Cyanobacteria Nannochloropsis* sp, Food borne- *Staphylococcus aureus*, *Salmonella* sp. *Clostridium* sp, *Escherichia coli*, *Bacillus subtilis*, *Pseudomonas* sp **Fungal Species:** *Aspergillus* sp, *Agaricus* sp , *Candida* sp, *Fusarium* sp, *Mycoplasma* sp **Viruses:** TMV, Baculovirus; Mammalian viruses: retroviruses, SARS-CoV-2 virus (COVID-19).Protozoa.

UNIT V: Introduction to Industrial Microbiology

15 hrs

Introduction to microbes based enzyme production. Need for Enzyme production. Reasons for adopting enzyme based Industries. Definition Goals, Design and Principles of Enzyme production. Technologies used to produce enzymes from microorganisms. Skills required for setting up an enzyme based industry. Advancements in enzyme production. Impact of microbes based enzyme production on Society, Business, Government and People - Introduction to 5.0.

TEXT BOOKS

S.No	Authors	Year	Title of the book	Publishers
1.	Michael J. Pelczar.Jr, E.C.S Chan, Noel R.Krieg	2020	Pelczar Microbiology 7th Edition	McGraw Hill
2.	Madigan Michael T. Martinko John M. Bender Kelly S.Buckley Daniel H. Stahl DavidA.	2017	Brock's Biology of Microorganisms 14th ed	Pearson
3.	Joanne Willey and Kathleen Sandman and Dorothy Wood	2020	Prescott's Microbiology , 11 th Edition	McGraw Hill
4.	Simon Baker, Jane Nicklin, Caroline Griffiths	2011	BIOS Instant Notes in Microbiology	Taylor & Francis
5.	P. Kaliraj and T. Devi . Higher Education for Industry 4.0 and Transformation to Education 5.0			
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]				
6.	Introduction to Industry 4.0 and Industrial Internet of Things by Prof.Sudip Misra, IIT Kharagpur.			
7.	A Complete Guide to Industry 4.0-Udemy			

REFERENCE BOOKS

S.No	Authors	Year	Title of the book	Publishers
1.	M.T. Madigan, J.M. Martinko,J.Parker.	2002	Brock's Biology of Microorganisms 10 th ed	Prentice Hall
2.	Moat Albert. G, Foster. John.W, Spector,Michel P	2002	Microbial Physiology 4 th ed	Wiley Liss Publishers.
3.	Das,H.K.	2004	Text Book of Biotechnology	Wiley Dream tech India Pvt. Ltd

Course Designer:
Dr.R.Nirmal Kumar
Dr.A.Dhivya

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
BT22A02	Allied paper II – Instrumentation and Analysis	Allied	71	4	-	4

Objectives

To facilitate the students to

- Acquire knowledge on design and application of instruments in biological field
- Become familiar with separation and purification techniques

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Discuss the principle and methodology of various instruments and their process	K1
CLO2	Understand the applications in various fields of bioscience	K2
CLO3	Demonstrate knowledge and practical skills using instruments in biology and medical field	K3
CLO4	Analyze and interpret the techniques and results involved in research	K3

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	M	S
CLO2	S	S	M	M	S
CLO3	S	S	M	M	M
CLO4	S	M	S	M	S

S- Strong; M-Medium

Syllabus

UNIT I: Basic Instrumentation

14 hrs

pH meter, Buffer of biological importance, Centrifuge- Preparative, Analytical and Ultra, Laminar Air Flow, Autoclave, Hot Air Oven and Incubator-General and BOD

UNIT II: Electrophoresis and Blotting

14 hrs

EC meter, Weighing Balance, UV Trans illuminator. Gel electrophoresis- Horizontal Agarose and Image analysis software. PAGE-Native and SDS. Blotting- Principles, types, Steps involved Southern Blotting, Western Blotting and Northern Blotting

UNIT III: Chromatography

14 hrs

Chromatographic Techniques: Principles, Types- Paper, Thin Layer, Column, HPLC, uHPLC, LC-MS, GC and GC MS.

UNIT IV: Colorimetric analysis and Spectroscopy

14 hrs

Colorimetric Analysis: Lambert's law, Beer's law, methods of color measurement or color comparison, basic principles and working of Colorimeter, Spectrophotometer, fluorescence, FT-IR, AAS, MS Applications.

UNIT V: Other methods of Analysis

15 hrs

Polarimetry, potentiometry, Thermo gravimetry -Introduction, basic principles, types, procedure & applications, Radio Immuno Assay, Scintillation counting (Solid, Liquid, gas), ELISA.

Text Books

S.No	Authors	Year of publication	Title of the book	Publishers
1	RS Khandpur	2015	Hand Book Of Analytical Instruments	McGraw Hill
2	Dinesh Kumar Chatanta, Prahlad Singh Mehra	2012	Instrumental Methods of Analysis in Biotechnology	I K International Publishing House Pvt. Ltd; First Edition
3.	Sabari Ghoshal, A. K. Srivastava	2010	Fundamentals of Bioanalytical Techniques and Instrumentation	Prentice-Hall Of India Pvt. Limited
4	Rana, S.V.S	2012	Bio Techniques. Theory and Practices	Rastogi Publications, Meerut

Reference Books:

S.No	Authors	Year of publication	Title of the book	Publishers
1	John G. Webster, Amit J. Nimunkar	2020	Medical Instrumentation: Application and Design, 5th Edition	Wiley

Course Designer:

Dr.R.Nirmal Kumar