INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF BASIC MEDICAL SCIENCES

BACHELOR OF SCIENCE IN MEDICALBIOCHEMISTRY (B.Sc. MB)

SYLLABUS

YEAR/ SEMESTER: III/V

Integral University, Lucknow
Department of Basic Medical Sciences
Study and Evaluation Scheme

Program: B.Sc. Medical Biochemistry Semester-V

S. N.	Course code	Course Title	Type of Paper	Period Per hr/week/sem			Evaluation Scheme				Sub. Total	Credit	Total Credits
				L	T	P	CT	TA	Total	ESE			
THEORIES													
1	MB301	Endocrinology and Toxicology	Core	2	1	0	40	20	60	40	100	2:1:0	3
2	MB302	Research Methodology	Core	2	1	0	40	20	60	40	100	2:1:0	3
3	MB303	Cytogenetics and Molecular Diagnostic	Core	2	1	0	40	20	60	40	100	2:1:0	3
4	MB304	Recombinant DNA Technology	Core	2	1	0	40	20	60	40	100	2:1:0	3
5	MB305	Cancer Biology	Core	2	1	0	40	20	60	40	100	2:1:0	3
PRACTICAL													
1	MB306	Recombinant DNA Technology-Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
2	MB307	Endocrinology and Toxicology-Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
3	MB308	Clinical Posting	Core	0	0	12	40	20	60	40	100	0:0:6	6
Total				**10**	**05**	**20**	**400**	**200**	**600**	**400**	**1000**	**25**	**25**

S. N.	Course code	Course Title	Type ofPaper	Attributes							United Nation Sustainable Development Goal (SDGs)
				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
THEORIES											
1	MB301	Endocrinology and Toxicology	Core	√	√	√	√		√	√	3,4
2	MB302	Research Methodology	Core	√	√	√	√		√	√	3,4
3	MB303	Cytogenetics and Molecular Diagnostic	Core	√	√	√	√		√	√	3,4
4	MB304	Recombinant DNA Technology	Core	√	√	√	√		√	√	3,4
5	MB305	Cancer Biology	Core	√	√	√	√		√	√	3,4
PRACTICAL											
1	MB306	Recombinant DNA Technology-Lab	Core	√	√	√	√		√	√	3,4
2	MB307	Endocrinology and Toxicology-Lab	Core	√	√	√	√		√	√	3,4
3	MB308	Clinical Posting	Core	√	√	√	√		√	√	3,4

L: Lecture **T:** Tutorials **P:** Practical **CT:** Class Test **TA:** Teacher Assessment **ESE:** End Semester Examination,
AE= Ability enhancement, DSE- Discipline Specific Elective, **Sessional Total:** Class Test + Teacher Assessment **Subject Total:** Sessional Total + End Semester Examination (ESE)

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**MB301**	**Title of the Course**	**ENDOCRINOLOGY AND TOXICOLOGY**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course objectives	This subject gives a general insight into the history, and basics of endocrinology and toxicology andimparts knowledge about equipment used in enzymology.						

Course outcomes	
CO1	To Understand the basic concepts and mechanisms of hormone action.
CO2	To Describe the structure, function, and disorders of major endocrine glands.
CO3	To Explain reproductive endocrinology and clinical diagnostic techniques.
CO4	To Understand the principles of toxicology and effects of chemical poisons.
CO5	To Evaluate the impact of environmental and industrial toxins on health.

Unit No.	Title of the Unit	Content of Unit	ContactHrs.	MappedCO
1	**Fundamentals of Endocrinology**	• **Introduction to Endocrinology**: Endocrine vs. Exocrine glands, Hormone classification (Peptide, Steroid, Amine hormones),Mechanism of hormone action (Receptors & Signal Transduction) • **Hypothalamic-Pituitary Axis**: Role of Hypothalamus in Hormone Regulation, Pituitary Gland (Anterior & Posterior) and its Hormones Disorders: Growth Hormone Deficiency, Gigantism, Acromegaly	6	CO1
2	**Endocrine Glands & Their Functions**	• **Thyroid & Parathyroid Glands**: Thyroid Hormones (T3, T4, Calcitonin) – Functions & Regulation, Parathyroid Hormone (PTH) – Role in Calcium Homeostasis, Disorders: Hypothyroidism, Hyperthyroidism, Goiter, Hypoparathyroidism • **Adrenal Glands**: Hormones of the Adrenal Cortex (Cortisol, Aldosterone), Hormones of the Adrenal Medulla (Epinephrine, Norepinephrine), Disorders: Addison's Disease, Cushing's Syndrome • **Pancreas & Glucose Regulation**: Role of Insulin & Glucagon, Diabetes Mellitus (Type 1 & Type 2)	6	CO2
3	**Reproductive & Clinical Endocrinology**	• **Reproductive Hormones & Regulation**: Male Hormones (Testosterone) & Female Hormones (Estrogen, Progesterone), Menstrual Cycle Hormonal Control, Disorders: PCOS, Infertility, Menopause • **Endocrine Disorders & Clinical Applications**: Hormonal Imbalance & Associated Diseases, Diagnostic Techniques in Endocrinology (Blood Hormone Assays, Radioimmunoassay, ELISA), Hormone Replacement Therapy & Applications in Medicine	6	CO3
4	**Introduction to Toxicology & Chemical Poisons**	• **Introduction to Toxicology** Definition & Scope, Types of Toxic Agents (Chemical, Biological, Physical) Dose-Response Relationship & Toxic Effects on Human Health • **Corrosive & Irritant Poisons** Strong Acids & Alkalis (Sulfuric Acid, Hydrochloric Acid) • Organic Irritant Poisons (Plant & Animal Origin) • **Neurotoxins & Heavy Metal Poisons**; Neurotoxins: How they affect the nervous system, Heavy Metal Toxicity: **Lead** (Sources, Effects & Treatment), **Mercury** (Types of Mercury Poisoning), **Aluminum & Arsenic** (Effects & Detoxification Methods	6	CO4
5	**Environmental & Industrial Toxicology**	• **Pesticides & Insecticides** Organophosphorus Compounds & Their Toxic Effects • **Industrial & Environmental Hazards**; Air Pollutants: **Nitrogen Dioxide, Sulfur Dioxide,** Indoor Exposure & Health Risks • **Toxic Substances in Food** Contaminants & Additives, **Lathyrism**: Causes & Effects of Toxic Amino Acids in Diet	6	CO5

Reference Books:

1.Fundamentals of Enzymology : Nicholas Price & Lewis Stevens Enzymes :

2.Biochemistry, Biotechnology and Clinical Chemistry- Trevor Palmer

3.Biochemistry text books by Stryer, Voet and Lehninger (Relevant Chapters)

e-Learning Source:

1. https://www.babcock.edu.ng/oer/lecture_notes/mlsc/MLSC%20417%20HISTORY%20OF%20MICROBIOLOGY.ppt
2. https://www.tru.ca/_shared/assets/Microbiology_Lab_Safety39696.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	-	-	-	1	2	-	-	2	3	1	2	3	-
CO2	1	3	1	3	-	-	-	2	3	-	-	3	3	-	1	2	-
CO3	1	3	1	2	-	-	-	1	2	-	-	2	2	2	1	2	2
CO4	1	3	1	2	-	-	-	1	3	1	-	3	2	3	1	3	2
CO5	1	3	1	2	-	-	-	1	2	2	-	2	3	1	2	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
MB301	Endocrinology and Toxicology	✓	✓	✓	✓		✓	✓	3,4

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**MB302**	**Title of the Course**	**Research Methodology**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course introduces students to fundamental principles of research methodology, including study design, data collection, statistical analysis, and ethical considerations in scientific research. On completion of this course,students will be able to apply statistical tools in various fields in their practical life.						

Course Outcomes	
CO1	Understand the basics of research, types of research, and their significance.
CO2	Formulate research questions, hypotheses, and study designs.
CO3	learning how to gather and analyze data and creating effective graphs, charts, and tables to visually communicate data insights.
CO4	Course aims to equip students with the skills to critically analyze existing research within their field and writing a comprehensive literature review
CO5	Course typically aims to equip students with the ability to develop a well-structured research proposal, including a thorough literature review, appropriate methodology, and a compelling presentation to effectively communicate

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION OF RESEARCH METHODOLOGY**	• Meaning, objectives, characteristics & significance. • Types of research: qualitative & quantitative. • Basic elements of research: variables – types- independent, dependent, active, attribute, continuous and categorical, characteristic and relationships	6	CO1
2	**RESEARCH DESIGN AND SAMPLING METHODS**	• Research design: meaning, features, types: Observational vs. Experimental research • Types of sampling: Probability and Non-probability sampling • Sample size calculation and statistical power • Sample test**:** use of distribution, test for single mean, equality of mean paired- t test, test for equality of variance, chi- square test	6	CO2
3	**DATA COLLECTION AND ANALYSIS**	• Data collection: classification, tabulation and methods of collecting data. • Types of data: Primary vs. Secondary data • Methods of data collection: Surveys, Questionnaires, Interviews, and Observations. • Statistics: definition, aim, scope, importance and limitation of statistics	6	CO3
4	**SCIENTIFIC WRITING AND LITERATURE REVIEW**	• Review of related literature: Importance of literature review and referencing. • Identification of the related literature. • Organizing the related literature.	6	CO4
5	**RESEARCH PROPOSAL AND PRESENTATION SKILL**	• Preparing a research proposal – Title, Objectives, Methodology, Budgeting • Research proposal: research proposal or synopsis, introduction, procedure for collecting and treating data, bibliography, time and budget schedule. • Writing a thesis/dissertation – Structure and formatting guidelines • How to prepare poster and oral presentations for conferences	6	CO5

Reference Books:

1. C.R. Kothari & Gaurav Garg Research Methodology: Methods and Techniques, 4th Edition New Age International Publishers
2. Ranjit Kumar Research Methodology: A Step-by-Step Guide for Beginners, 5th Edition SAGE Publications
3. Uma Sekaran & Roger Bougie Research Methods for Business: A Skill-Building Approach, 8th Edition Wiley India

e-Learning Source:

1. https://www.slideshare.net/DJASMINEPRIYA/histopathology-introduction
2. https://www.ijohsjournal.org/article.asp?issn=2231-6027;year=2018;volume=8;issue=2;spage=63;epage=67;aulast=Theresa
3. HTTPS://WWW.SLIDESHARE.NET/VARUGHESEGEORGE/HEMATOXYLIN-AND-EOSIN-STAINING-67250220

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3	1	2	-	-	-	1	2	-	-	2	1	-	1	-	1
CO2	1	3	1	3	-	-	-	1	3	-	-	3	2	-	2	-	1
CO3	1	3	1	2	-	-	-	1	2	-	-	3	1	-	1	-	1
CO4	1	3	1	2	-	-	-	1	3	-	-	2	1	-	1	-	1
CO5	1	3	1	2	-	-	-	1	2	-	-	2	1	-	1	-	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
MB302	**Research Methodology**	✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**MB303**	**Title of the Course**	**Cytogenetics and Molecular Diagnostic**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course deals with fundamentals of metabolism, metabolic disorders, laboratory test and instruments of Clinical Biochemistry.						

Course Outcomes: After the successful course completion, learners will develop following attributes:

CO1	Students will be able to learn the structure and function of nucleic acids in biological systems
CO2	Students will be able to Explain chromosome structure, genetic abnormalities, and cytogenetic techniques
CO3	Students will be able to learn about molecular biology techniques like PCR, blotting, and genetic diagnosis.
CO4	Students will be able to learn about the importance of body fluids, stem cell therapies, and bone marrow analysi
CO5	Apply knowledge of nucleic acid purification, genetic engineering, and gene therapy in medical research

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Structure & Function of Nucleic Acids**	• **Introduction to Nucleic Acids** Components of DNA & RNA Nucleosides & Nucleotides (Structure & Bonding) • **DNA Structure** Watson-Crick Double Helix Model Different Forms of DNA (A, B, Z-DNA) • **RNA Structure & Functions** Types of RNA (mRNA, tRNA, rRNA, snRNA, miRNA) • **Basic Concepts of Gene Expression** DNA Replication, Transcription (RNA Synthesis), Translation (Protein Synthesis)	6	CO1
2	**Chromosomes & Genetic Disorders**	• **Chromosome Structure & Morphology** • **Chromosomal Abnormalities** Numerical Abnormalities (Aneuploidy, Down Syndrome, Turner Syndrome), Structural Abnormalities (Deletions, Translocations, Duplications) • **Cytogenetic Techniques** Karyotyping & Spectral Karyotyping,	6	CO2
3	**Molecular Diagnostics & PCR**	• **Blotting Techniques** Southern Blot (DNA Detection), Northern Blot (RNA Detection),Western Blot (Protein Detection) • **Polymerase Chain Reaction (PCR) & Its Variants** Basic PCR, Real-Time PCR (qPCR), Multiplex PCR, Fluorescent In Situ Hybridization (FISH) & In Situ Hybridization (ISH) • **Molecular Diagnosis of Genetic Disorders** Sickle Cell Anemia Chronic Myeloid Leukemia (CML), Thalassemia	6	CO3
4	**Body Fluids & Stem Cell Applications**	• **Types & Examination of Body Fluids** Cerebrospinal Fluid (CSF),Pleural, Pericardial, Peritoneal, and Synovial Fluids, Common Cells in Body Fluids & Their Clinical Significance • **Bone Marrow Studies & Stem Cell Therapy** Bone Marrow Transplantation & Harvesting, Stem Cell Banking & Its Applications, HLA Typing & Crossmatching for Transplant Compatibility, Bone Marrow Collection & Staining Techniques	6	CO4
5	**Nucleic Acid Analysis**	• **Nucleic Acid Extraction & Purification** • **Detection & Quantitation of DNA & RNA** Gel Electrophoresis, Nucleic Acid Hybridization & DNA Probes • **Applications of Molecular Biology in Medicine** Gene Therapy & Its Role in Disease Treatment, Microarrays & Tumor Markers in Cancer Detection, Growth Factors & Their Role in Cell	6	CO5

Reference Books:

1. D M Vasudevan, Text book of Medical Biochemistry,JaypeePublishers.
2. M N Chatterjee&RanaShinde, Text book of Medical Biochemistry, Jayppe Publications.
3. Michael Cox, David L. Nelson, Lehninger Principles of Biochemistry, 7th edition,W.H. Freeman.
4. RanjanaChawla, Practical Clinical Biochemistry: Methods andInterpretations.

e-Learning Source:

1. https://youtu.be/t5DvF5OVr1Y
2. https://youtu.be/gggC9vctvBQ
3. https://youtu.be/ufvZ8bYtyO8

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	-	-	-	1	2	1	-	2	2	1	-	1	-
CO2	1	3	1	3	-	-	-	2	3	-	-	3	3	2	-	2	-
CO3	1	3	1	2	-	-	-	1	2	2	-	2	3	1	-	1	-
CO4	1	3	1	2	-	-	-	1	3	-	-	3	2	1	-	1	-
CO5	1	3	1	2	-	-	-	1	2	1	-	2	2	1	-	1	-

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation **Attributes & SDGs**

Course Code	**Course Title**	**Attributes**						**SDGs No.**
MB303	**Cytogenetics and Molecular Diagnostic**	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics
		✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**MB304**	**Title of the Course**	**RECOMBINANT DNA TECHNOLOGY**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	V	**2**	**1**	**0**	**3**
Pre-Requisite		**Co-requisite**	Nil				
Course Objectives	The objective of this course is to introduce students to the principles and applications of recombinant DNA technology, including gene cloning, DNA manipulation, molecular biology techniques, and their applications in medicine and biotechnology.						

Course Outcomes	
CO1	Students will be able to receive process and preserve the design and construct recombinant vectors for gene transfer.
CO2	Students will be able to Understand gene cloning and expression in prokaryotic and eukaryotic systems.
CO3	Students will be able to understand gene library and various screening method
CO4	Students will be able to receive process and preserve the Apply PCR for DNA amplification and use gel electrophoresis for analysis.
CO5	Students will be able to Evaluate the ethical, social, and environmental issues in recombinant DNA technology

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**DNA Restriction Enzyme**	• Restriction Enzymes: Types (Class I, II, III) functions, Nomenclature and Units of restriction enzymes, • Restriction Digestion: Partial vs. complete digestion., Star Activity: Effects and precautions., DNA Modifying Enzymes: DNA Ligase Alkaline Phosphatase, T4 DNA Polymerase, Reverse Transcriptase	6	CO1
2	**Cloning Vectors & Host Systems**	• Plasmids as Cloning Vectors: Features, incompatibility, host range. • Bacteriophage Lambda Vectors: Advantages, genome map, insertional and replacement vectors. • Other Cloning Vectors: Cosmids, M13 Phage, Artificial Chromosomes: YACs (Yeast), BACs (Bacterial).	6	CO2
3	**Gene Library & Screening Methods**	• Genomic DNA Library vs. cDNA Library: Differences & construction. • Screening Techniques: Colony Hybridization, Immunological Screening • DNA Sequencing Techniques: Sanger's Method, Maxam-Gilbert Method	6	CO3
4	**Techniques**	• PCR: Steps and working principle. Types of PCR: Conventional \PCR, Real-Time PCR, Multiplex PCR (Amplifying multiple genes at once) Applications of PCR in Cloning: DNA amplification, mutation detection, gene expression studies. • Electrophoresis techniques (Agarose gel electrophoresis, SDS-PAGE)	6	CO4
5	**Applications of Recombinant DNA Technology**	• Production of human insulin. • Recombinant vaccines (Hepatitis B). • Production of human growth hormone. • Application of recombinant DNA in medicine, agriculture, and industry. • Contributions of scientists: Arber & Smith, Boyer, Temin & Baltimore, Jackson & Berg, Southern, Mullis.	6	CO5

Reference Books:

- Principles of Gene Manipulation and Genomics - Primrose & Twyman.
- Molecular Cloning: A Laboratory Manual - Sambrook & Russell.
- Recombinant DNA: Genes and Genomes - Watson et al.
- Molecular Biology of the Gene - James D. Watson.

e-Learning Source:

- NCBI: Recombinant DNA Technology
- MIT OpenCourseWare: Molecular Biology
- YouTube: Recombinant DNA Techniques

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO																	
CO1	1	3	1	2	-	-	-	1	2	-	-	-	1	-	1	-	1
CO2	1	3	1	3	-	-	-	1	3	-	-	-	2	-	2	-	1
CO3	1	3	1	2	-	-	-	1	2	-	-	-	1	-	1	-	1
CO4	1	3	1	2	-	-	-	1	3	-	-	-	1	-	1	-	1
CO5	1	3	1	2	-	-	-	1	2	-	-	-	1	-	1	-	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
MB304	**RECOMBINANT DNA TECHNOLOGY**	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**MB305**	**Title of the Course**	**Cancer Biology**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course has been formulated to impart basic aspects of free radicals, oxidative sress, antioxidantsmolecular basis of cancer,.						

Course Outcomes: After the successful course completion, learners will develop following attributes:	
CO1	Understand the **molecular basis of cancer and its causes**.
CO2	Learn about **free radicals, their effects, and their role in diseases**.
CO3	Learn about **oxidative stress mechanisms and their link to chronic diseases**.
CO4	Learn about **antioxidants and their role in preventing free radical damage**.
CO5	Learn about the **body's defense mechanisms against oxidative stress**

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Fundamentals of Cancer Biology**	**Introduction to Cancer**: Definition and Characteristics of Cancer Cells, Differences Between Normal & Cancer Cells **Causes of Cancer** Chemical Carcinogens (Tobacco, Pollution, Radiation), Genetic Mutations (Oncogenes & Tumor Suppressor Genes) Hormonal Imbalances & Cancer Progression **Mechanism of Cancer Development** Uncontrolled Cell Growth & Tumor Formation, Role of Apoptosis (Programmed Cell Death) in Cancer Prevention	6	CO1
2	**Free Radicals & Their Role in Diseases**	**Introduction to Free Radicals** Definition & Types of Free Radicals, Physical & Chemical Properties **Generation of Free Radicals** Environmental Factors (Pollution, UV Radiation, Smoking), Biological Factors (Metabolism, Inflammation, Mitochondria) **Diseases Associated with Free Radicals** Cardiovascular Diseases (Atherosclerosis), Respiratory Disorders (Asthma, COPD), Skin Aging & Damage (Wrinkles, UV-Induced Damage)	6	CO2
3	**Oxidative Stress & Its Impact on Health**	**Mechanism of Oxidative Damage** Oxidation of Proteins, Lipids, and DNA, Role in Inflammation & Chronic Diseases **Lipid Peroxidation & Its Stages** Initiation, Propagation, and Termination Phases **Oxidative Stress in Disease Progression** Retrolental Fibroplasia (Eye Damage in Premature Infants) Reperfusion Injury (Tissue Damage After Blood Flow Returns	6	CO3
4	**Antioxidants& Their Protective Role**	**Definition & Classification of Antioxidants** Endogenous (Produced in the Body), Exogenous (Dietary Antioxidants) **Sources of Antioxidants** Nutritional Antioxidants: Vitamin C, Vitamin E, Carotenoids Flavonoids & Polyphenols (Found in Fruits, Vegetables, Green Tea) **Role of Antioxidants in Disease Prevention**	6	CO4
5	**Antioxidant Defense Mechanisms**	**First Line of Defense: Enzymatic Antioxidants** Superoxide Dismutase (SOD), Catalase, Glutathione Peroxidase & Reductase **Second Line of Defense: Non-Enzymatic Antioxidants** Glutathione (GSH), Uric Acid, Albumin, Bilirubin, Coenzyme Q10 (Ubiquinol) & Flavonoids **Antioxidants in Cancer Prevention & Therapy**; Their Role in Reducing Oxidative Stress & DNA Damage Use in Cancer Treatment & Chemoprevention	6	CO5

Reference Books:

1. Abbas AK, Lichtman A H, PillaiS. (2007).Cellular and MolecularImmunology.6thedition Saunders Publication, Philadelphia.
2. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
3. Murphy K, Travers P, Walport M. (2008).Janeway's Immunobiology.7th edition Garland Science Publishers, New York.

e-Learning Source:

1. https://en.wikipedia.org/wiki/Immune_system
2. https://www.creative-diagnostics.com/blog/index.php/immunogen-antigen-hapten-epitope-and-adjuvant/
3. https://www.webmd.com/rheumatoid-arthritis/an-overview-of-rheumatic-diseases

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	-	-	-	1	2	1	2	2	1	-	1	-
CO2	1	3	1	3	-	-	-	2	3	-	3	3	2	-	2	-
CO3	1	3	1	2	2	-	-	1	2	2	2	3	1	-	1	-
CO4	1	3	1	2	-	-	-	1	3	-	3	2	1	-	1	-
CO5	1	3	1	2	1	-	-	1	2	1	2	2	1	-	1	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
MB305	**Cancer Biology**	✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**MB306**	**Title of the Course**	**Recombinant DNA Technology- Lab**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The student will be made aware of our environment in general, natural resources, ecosystems, environmental pollution and social issues related to environment.						

Course Outcomes	
CO1	Understand and perform plasmid DNA isolation from *E. coli*.
CO2	Carry out restriction enzyme digestion and analyze DNA fragments using gel electrophoresis.
CO3	Prepare competent bacterial cells for genetic transformation.
CO4	Perform transformation of plasmid DNA into host cells and evaluate efficiency.
CO5	Interpret experimental results in recombinant DNA technology applications.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Introduction to** Recombinant DNA Technology	• Isolation of plasmid DNA from E. coli cells. • Digestion of plasmid DNA with restriction enzymes and size estimation of fragments by gel electrophoresis. • Preparation of competent cells, transformation and estimation of transformation efficiency.	6	CO1

1. Agarwal, K.C. 2001 Environmental; Biology, Nidi Pub. Ltd .Bikaner.
2. Glick, H.P.1993 water in crisis, Pacific Institute for studies in dev, Environment &security, Stockholm Env, Institute, Oxford Univ, Press 473p.
3. Cunningham W.P.2001.Cooper, T.H. Gorhani, E & Hepworth, Environmental encyclopedia, Jaicob Publication House, Mumbai
4. Clark R.S. Marine Pollution, Clanderon Press Oxford(TB).
5. Brunner R.C. 1989. Hazardous waste incineration, Mc Graw Hill.
6. BharuchaErach, The Biodiversity of India, Mapin Pub. Pvt. Ltd., Ahemdabad-380, India.
7. De. A.K. Environmental chemistry Willey EasternLimited.

e-Learning Source:

1. https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/UNIT-I_15.pdf
2. https://juniperpublishers.com/rapsci/pdf/RAPSCI.MS.ID.555586.pdf
3. **https://ourworldindata.org/world-population-growth**

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	1	2	-	-	-	1	2	1	-	2	-	1	2	-	3
CO2	2	3	2	2	-	-	-	1	3	1	-	3	-	2	1	-	2
CO3	1	3	1	2	-	-	-	1	2	-	-	2	-	1	2	-	3
CO4	2	3	1	2	-	-	-	1	3	-	-	3	-	2	3	-	3
CO5	1	3	1	2	-	-	-	1	2	1	-	2	-	1	2	-	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Attributes & SDGs

Course Code	**Course Title**	**Attributes**							**SDGs No.**
MB306	Recombinant DNA Technology- Lab	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	**3,4**
		✓	✓	✓	✓		✓	✓	

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**MB307**	**Title of the Course**	**Endocrinology and Toxicology- Lab**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The objective of this module is to help the students understand about Determination of various Hormones.						

Course Outcomes	
CO1	The student will study about determine T3, T4, TSH hormones conc. in serum sample.
CO2	The student will study about determine LH, PRL, FSH hormones conc. in serum sample.
CO3	The student will study about perform TRIPLE test.
CO4	The student will study about of Male & Female infertility test.
CO5	The student will study about determine BHCG hormones.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Determination of T3 CONC**	• To determine T3 conc. in serum sample.		CO1
2	**Determination of T4 CONC**	• To determine T4 conc. in serum sample		CO1
3	**Determination of TSH CONC**	• To determine TSH conc. in serum sample		CO2
4	**Determination of LH CONC**	• To determine LH conc. in serum sample		CO2
5	**Determination of FSH CONC**	• To determine FSH conc. in serum sample	30	CO3
6	**Determination of PRL CONC**	• To determine prolactin conc. in serum sample		CO3
7	**Determination of TRIPLE TEST**	• To perform TRIPLE test.		CO4
8	**Determination of Male and Female Infertility Hormone**	• Demonstration of male and female infertility test		CO4
9	**Determination of BHCG**	• Beta HCG		CO5

Reference Books:

1. Teitz (2007), fundamental of clinical chemistry,6th edition Elsevier Publications.
2. Bison (2013), Clinical chemistry, 7th edition, wiley Publication.
3. Henry's clinical diagnosis and management by laboratory methods (2011), 22nd edition, Elsevier.
4. D M Vasudevan (2011), text book of medical biochemistry, 8th edition Jaypee Brothers.
5. M N Chatterjee & Rana Shinde (2012), textbook of medical biochemistry, 8th edition Jaypee Publications.
6. Singh & Sahni (2008), Introductory Practical Biochemistry, 2nd edition, alpha Science.

e-Learning Source:

1. https://byjus.com/biology/hormones/
2. https://docs.google.com/presentation/d/11DhZilsAs_n_hte5NqSQ30TV1RnMQOk5/edit?usp=share_link&ouid
3. https://www.slideshare.net/TSOLEMAN/1-introduction-15583147

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	1	2	-	-	-	1	2	-	-	2	**2**	1	-	1	**1**
CO2	1	3	1	3	-	-	-	1	3	-	-	3	**3**	2	-	1	**1**
CO3	1	3	1	2	-	-	-	1	2	-	-	2	**3**	1	-	1	**1**
CO4	1	3	1	2	-	-	-	1	3	-	-	3	**2**	1	-	1	**1**
CO5	1	3	1	2	-	-	-	1	2	-	-	2	**2**	1	-	1	**1**

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
MB307	**Endocrinology and Toxicology- Lab**	✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**MB308**	**Title of the Course**	**CLINICAL POSTING**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	0	0	12	6
Pre-Requisite	Nil	**Co-requisite**	Nil				
Course Objectives	Students will engage in clinical practice in biochemistry department to enhance their clinical skills and apply contemporary knowledge gained during teaching sessions.						

Course Outcomes	
CO1	To learn the punctuality and interaction with colleague and supporting staff during clinical training.
CO2	To develop assessment skills.
CO3	To develop appropriate treatment protocol.
CO4	To understand the importance of documentation of the case record and case presentation.
CO5	To develop discipline and improve overall quality of clinical work.

CLINICAL POSTING ASSESSMENT FORM

Name of Student:		**Session:**	
Enrolment Number:		**Date:**	
Name of Subject:		**Subject code:**	
Topics:			

S. No.	Point to be Considered	Max. Marks	Marks Obtained
1.	Punctuality	4	
2.	Interaction with colleagues and supporting staff	2	
3.	Maintenance of case records	3	
4.	Presentation of case during rounds	2	
5.	Maintained OT records	2	
6.	OT Manners	2	
7.	Rapport with patients	2	
8.	Assistance during operative procedures	3	
9.	Discipline	2	
10.	Overall quality of clinical work	3	
	TOTAL SCORE	**25**	

(Name and signature of In-charge) **(Head, Basic medical)**

GUIDELINES FOR CLINICAL TRAINING PROGRAM

The students of Post Graduate B.Sc.MB program must spend above mentioned allotted time period in the hospital based clinical training for specified clinical experiences to meet the objectives of the training program. This period of practical and theoretical experience will enable the students to acquire competency and experience to perform as an independent practice and will enable to adjust to the real practical life in different units in the hospital settings.

S.No.	Program Name	Year/Semester	Duration of Training
1.	B.Sc. MB	II Year/ V Semester	4 Months
2.		II Year/ V Semester	4 Months
3.		III Year/ V Semester	4 Months
4.		IIIYear/ V Semester	4 Months

By the successful completion of this clinical training period, the student is expected to fulfil the objectives of the program and will be examination as given below:

S.No.	Program Name	Year/Semester	Case file	Practical on Case	Voice/Viva	Attendance
1.	B.Sc. MB	II Year/ V Semester	10 Marks	10 Marks (1 Long Case and 2 Short Case)	25 Marks	5 Marks
2.		II Year/ V Semester				
3.		III Year/ V Semester				
4.		III Year/ V Semester				

EVALUATION OF CLINICAL POSTING

BMB- Students has to prepare 1 long case and 2 short cases during their clinical posting. The evaluation for internal clinical examination of 50 marks will be distributed:

Cases during clinical posting=**25 marks**. Viva voce =**20 marks** Attendance=**5 marks**

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)															
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	3	2	3	1	2	1	-	3	2	3	3	2
CO2	3	3	3	3	2	2	3	2	1	3	-	2	2	3	2	3
CO3	3	3	3	3	2	2	3	2	1	3	-	3	2	2	2	3
CO4	3	3	3	3	2	2	3	2	1	3	-	2	3	2	2	3
CO5	3	3	3	3	2	2	3	2	1	3	-	3	2	3	3	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
MB308	Clinical Posting	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√			√	√	**3,4,11**