INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF BASIC MEDICAL SCIENCES

BACHELOR OF SCIENCE IN MEDICAL BIOCHEMISTRY (BSc. MB)

SYLLABUS

YEAR/ SEMESTER: II/III

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

Program: BSc. Medical Biochemistry Semester-III

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	MB201	Clinical Hematology-I	Core	2	1	0	40	20	60	40	100	2:1:0	3
2	MB202	General Pathology	Core	2	1	0	40	20	60	40	100	2:1:0	3
3	MB203	Medical Biochemistry-II	Core	2	1	0	40	20	60	40	100	2:1:0	3
4	MB204	Enzymology	Core	2	1	0	40	20	60	40	100	2:1:0	3
5	MB205	Immunology & Serology	Core	2	1	0	40	20	60	40	100	2:1:0	3
6.	ES101	Environmental Studies	Core	2	1	0	40	20	60	40	100	2:1:0	3
PRACTICAL													
1	MB206	Clinical Hematology-I Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
2	MB207	Enzymology Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
3	MB208	Medical Biochemistry-II Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
4	MB209	Immunology & Serology Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
Total				**12**	**06**	**16**	**400**	**200**	**600**	**400**	**1000**	**26**	**26**

S. N.	Course code	Course Title	Type of Paper	Attributes							United Nation Sustainable Development Goal (SDGs)
				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
THEORIES											
1	MB201	Clinical Hematology-I	Core	√	√	√	√		√	√	3,4
2	MB202	General Pathology	Core	√	√	√	√		√	√	3,4
3	MB203	Medical Biochemistry-II	Core	√	√	√	√		√	√	3,4
4	MB204	Enzymology	Core	√	√	√	√		√	√	3,4
5	MB205	Immunology & Serology	Core	√	√	√	√		√	√	3,4
6	ES101	Environmental Science	Core			√		√			3,4
PRACTICAL											
1	MB206	Clinical Hematology-I Lab	Core	√	√	√	√		√	√	3,4
2	MB207	Enzymology Lab	Core	√	√	√	√		√	√	3,4
3	MB208	Medical Biochemistry-II Lab	Core	√	√	√	√		√	√	3,4
4	MB209	Immunology & Serology Lab	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: 2024-25							
Course Code	**MB201**	**Title of the Course**	**CLINICAL HAEMATOLOGY- I**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**2**	**1**	**0**	**3**
Pre-Requisite	10+2 with Biology	**Co-requisite**	Nil				
Course Objectives	**1)** Thehematologycurriculumaimstopreparestudentsinbasicunderstandingofcomposition of blood. Students would also be introduced to laboratory waste management protocols, instrumentation, techniques and methods of estimating different parameters of blood. **2)** The academic emphasis of this module is that students would learn basic hematological techniques including blood coagulation tests, blood banking and automation.						

Course Outcomes	
CO1	Students will be able to receive process and preserve the tissue samples and can efficiently about the RBCs. Structure and function
CO2	Students will be able to receive process and about the Anemia.
CO3	Students will be able to receive process of the Anemic Disease.
CO4	Students will be able to receive process and preserve the tissue samples and can efficiently perform Anemia of Diminished Erythropoiesis.
CO5	Students will be able to receive process and preserve the Hemolyticanemia.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**BLOOD**	Structure and metabolism of RBCs. Structure of normal hemoglobin and its metabolism. Variation of size and shape.	6	CO1
2	**ANEMIA**	Definition of Anemia and its classification (Morphological and etiological) pathogenesis, laboratory investigations in a case of anemia.	6	CO2
3	**ANEMIC DISEASE**	Anemia of blood loss - acute and chronic.	6	CO3
4	**ANEMIA OF DIMINISHED ERYTHROPOIESIS**	**Anemia of Diminished erythropoiesis:** Iron deficiency anemia - pathogenesis, and laboratory investigations. Principle and procedure of special tests - Estimation of iron, TIBC, Transferrin, Ferritin, Plasma hemoglobin, Perls Prussian blue staining. Macrocytic anemia - pathogenesis, and laboratory investigations of Megaloblastic anemia, pernicious anemia, pathogenesis, clinical features, laboratory investigations, test for Vit.B12, Folic acid, FIGLU test and Schilling test.	6	CO4
5	**HEMOLYTIC ANEMIA**	Features of Hemolytic anemia (extra vascular and intra vascular hemolysis). Hemolytic anemia of non-immune origin Sickle cell anemia, sickle cell trait, pathogenesis, clinical features, laboratory investigations. Principle and procedure of special test, Sickling test. Briefly about G-6-PD deficiency disease, tests for diagnosis, Hereditary spherocytosis and test for diagnosis (Osmotic fragility test, Heinz bodies). Immune-hemolytic anemia.	6	CO5

Reference Books:

1. Mukherjee .L. K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mc-graw Hill..
2. SoodRamnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications.
3. Wintrobe's Clinical Haematology,(2014),13th edition, Lippincott Williams &Wilkins.
4. De Gruchy's Clinical Haematology in Medical Practice,(2012),Sixth edition,Wiley Publications.
5. Dacie& Lewis Practical Haematology, (2011),11thedition, Elsevier Publications.

e-Learning Source:

1. https://www.slideshare.net/peddanasunilkumar/introduction-to-pathology-ppt
2. https://www.ucsfhealth.org/medical-tests/semen-analysis#:~:text=Semen%20analysis%20is%20one%20of,have%20a%20male%20infertility%20problem.
3. **https://www.youtube.com/watch?v=wZCKrseSIOE**

	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	PSO4	PSO5	PSO6	PSO7
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	-	-	2	-	1	-	1	-	1
CO4	1	3	1	2	-	-	-	1	3	-	-	3	-	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.**
MB201	CLINICAL HAEMATOLOGY- I	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√			√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB202**	**Title of the Course**	**GENERAL PATHOLOGY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	**(1)** The curriculum of Pathology and its techniques aims to prepare the students to understand to learn about handling and tissue processing and prepare to aid in proper diagnosis. **(2)** The unique preposition of this paper is that the students should learn the basic Pathological techniques including laboratory organization, Pathology techniques.						

Course Outcomes	
CO1	Students will be able to gain knowledge on safety measures in histopathology lab, Fixation techniques
CO2	Students will be able to gain knowledge on Grossing of tissues, processing and decalcification techniques
CO3	Students will be able to gain knowledge on Microtome, its working and types.
CO4	Students will be able to gain knowledge on Staining techniques

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION TO HISTOPATHOLOGY**	1. Introduction of histopathology, laboratory organization, care & maintenance of equipment used in histotechnology lab. 2. Safety measures in histotechnology lab reception, recording, labeling and transportation of tissue specimens. 3. Basic concepts of fixation and various types of fixative used in histopathology and cytopathology.	7	CO1
2	**GROSSING OF TISSUE**	1. Grossing of tissues, whole mount, sections, tissue processing and its steps, manual and automated method, components & principle of automatic tissue processor. 2. Decalcification, decalcification methods, types of decalcifying fluid, Processingof bones and teeth, Embedding media, its type and properties.	8	CO2
3	**MICROTOME**	Microtome, its type and working, various type of microtome, Microtome knives, its type and knife sharpening, Section cutting, fault and remedies, Section adhesive.	7	CO3
4	**STAIN**	Progressive, regressive, vital, supravital staining, types of hematoxylins, hematoxylin and eosin staining, use of control sections in tissue staining, mounting and mounting media, advantages & disadvantages, refractive index.	8	CO4

Reference Books:

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, ElsevierPublications
2. Harshmohan (2017), Textbook of Pathology,7th edition, JaypeePublications.
3. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,BhalaniPublications.
4. CFA Culling, (1974), Handbook of Histopathological and Histochemical techniques: Including Museum Techniques, 3rd edition, Butter worth publishers.

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	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3	1	2	-	-	-	1	2	-	-	2	2	1	-	1	-	1
CO2	1	3	1	3	-	-	-	1	3	-	-	3	3	2	-	2	-	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	
MB202	HISTOPATHOLOGY & HISTOTECHNIQUES - I	✓	✓	✓	✓		✓	✓	3,4

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB203**	**Title of the Course**	**MEDICAL BIOCHEMISTRY-II**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**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 about metabolism of carbohydrates, HMP pathway & ETC
CO2	Students will be able to learn about blood glucose regulation mechanism and its disorder, ex- Diabetes Mellitus
CO3	Students will be able to learn about Proteins and their metabolism.
CO4	Students will be able to learn about Lipids, their structure, metabolic pathways and cholesterol metabolism
CO5	Students will be able to learn about Acid-Base balance mechanism, Blood chemistry profile, various techniques to monitor blood chemistry.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**METABOLISM OF CARBOHYDRATES**	Introduction of Metabolism, Metabolism of Carbohydrates: Glycolysis, TCA cycle, Gluconeogenesis, Glycogenesis, Glycogenolysis, Hexose monophosphate Pathway. Biological Oxidation and Electron Transport Chain.	6	CO1
2	**DIABETES MELLITUS**	Blood glucose homeostasis and its regulation, Insulin, glucagon, C- peptide. Diabetes mellitus, types, clinical features, diabetic profile test, HbA1C, Fructosamine, GTT, Glycosuria, Hyperglycemia and Hypoglycemia.	6	CO2
3	**PROTEINS**	Metabolism of Proteins: Formation of ammonia, Transamination, Deamination, Urea, Cycle, Significance of Urea cycle, metabolism of Aromatic and Branched chain amino acids, Aminoaciduria.	6	CO3
4	**LIPID**	Metabolism of Lipids: Fatty acid synthesis, Beta oxidation of fatty acids, Ketone bodies and ketosis, Cholesterol metabolism, metabolism of Lipoproteins, Lipid profile, Hyperlipidemia, Dyslipidemia and Atherosclerosis.	6	CO4
5	**ACID & BASE BALANCE**	1. Acid- Base balance and pH: pH and its Regulation, Metabolic and Respiratory Disorders. 2. Principle, application, calibration and maintenance of colorimeter, Blood Chemistry analyzer, ABG analyzer, Flame photometer, Turbidimetry, Nephelometry.	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
4. https://youtu.be/Q6R4o-oECxs

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.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
MB203	MEDICAL BIOCHEMISTRY-II	✓	✓	✓	✓		✓	✓	3,4

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB204**	**Title of the Course**	**ENZYMOLOGY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	THIS SUBJECT GIVES A GENERAL INSIGHT INTO THE HISTORY, AND BASICS OF ENZYMOLOGY AND IMPARTS KNOWLEDGE ABOUT EQUIPMENT USED IN ENZYMOLOGY.						

Course Outcomes	
CO1	This course makes the students to know introduction of enzymes.
CO2	This course makes the students to know inhibition and catalysis of enzyme.
CO3	This course makes the students to know imparts of regulation of enzymes..
CO4	This course makes the students to know enzyme kinetics.
CO5	This course makes the students to know industrial and clinical uses of enzymes.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION TO ENZYMES**	General introduction and historic background- General Terminology, Nomenclature and Classification of Enzymes. Criteria of purity of enzymes- Specific activity. Enzyme units-Katal and IU. Enzyme activity- chemical nature of enzymes. Protein nature of enzymes and Non protein enzymes- Ribozymes and DNAzymes. Metalloenzymes and metal activated enzymes. Coenzymes and CofactorsProsthetic group, coenzymes involved in different metabolic pathways. Classification of coenzymes. Isozymes, Abzymes, Synzyme	6	CO1
2	**ENZYME CATALYSIS AND INHIBITION**	• Lock and key, Induced fit and Transition state Hypotheses. Mechanism of enzyme catalysis- Acid-base catalysis, covalent catalysis, Metal ion catalysis, Proximity and orientation effects etc. Mechanism of Serine proteases-Chymotryspin, Lysozyme Carboxypeptidase A and Ribonuclease., Proenzymes (Zymogens). Reversible Inhibition- Competitive, Non Competitive, Uncompetitive, Mixed, Substrate, Allosteric and Product Inhibition. Irreversible Inhibition- Suicide inhibition. Examples and Mechanism of various Inhibitions like Penicillin, Iodoacetamide and DIPF.	6	CO2
3	**ENZYME REGULATION**	• Feedback Regulation, Allosteric Regulation, Reversible Covalent Modification and Proteolytic Activation. Organisation of enzymes in the cell. Enzymes in the cell, localization, compartmentation of metabolic pathways, enzymes in membranes, concentrations. Mechanisms of enzyme degradation, lysosomal and nonlysosomal pathways, examples.	6	CO3
4	**ENZYME KINETICS**	• Factors affecting the enzyme activity- Concentration, pH and temperature. Kinetics of a single-substrate enzyme catalysed reaction, Michealis-Menten Equation, Km, Vmax, L.B Plot, Turnover number, Kcat. Kinetics of Enzyme Inhibition. Kinetics Allosteric enzymes.	6	CO4
5	**INDUSTRIAL AND CLINICAL USES OF ENZYMES (Applied Enzymology)**	• Industrial Enzymes- Thermophilic enzymes, amylases, lipases, proteolytic enzymes in meat and leather industry, enzymes used in various fermentation processes, cellulose degrading enzymes, Metal degrading enzymes. Clinical enzymes- Enzymes as thrombolytic agents, Anti-inflamatory agents, strptokinasae, asparaginase, Isoenzymes like CK and LDH, Transaminases (AST, ALT), Amylases, Cholinesterases, Phosphatases. Immobilization of enzymes, ELIZA. Biosensors. Enzyme Engineering and site directed mutagenesis, Designer enzymes.	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)

4.Proteins by Gary Walsh

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
3. https://www.healthline.com/health/what-is-antiseptic

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	
MB204	ENZYMOLOGY	✓	✓	✓	✓		✓	✓	3,4

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB205**	**Title of the Course**	**IMMUNOLOGY & SEROLOGY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course has been formulated to impart basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases.						

Course Outcomes: After the successful course completion, learners will develop following attributes:	
CO1	The students will learn scientific approaches/techniques that are used to investigate various diseases, historical background, general concepts of the immune system
CO2	The students will learn scientific approaches/techniques that are used to investigate Antigens and haptens: Properties, foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens.
CO3	The students will learn scientific approaches/techniques that are used to investigate Mechanism of humoral and cell mediated immune response…
CO4	The students will learn scientific approaches/techniques that are used to investigate Laboratory tests for demonstration of antigen antibody reaction such as agglutination, precipitation, ELISA, RIA, Immune of fluorescence.
CO5	The students will learn scientific approaches/techniques that are used to investigate Rheumatologic diseases, etiology and pathogenesis and lab investigations.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION AND HISTORY OF IMMUNOLOGY**	• Historical background, general concepts of the immune system, innate and adaptiveimmunity; active and passive immunity; primary and secondary immune response. • Cell and organs of immune system, Phagocytosis.	6	CO1
2	**ANTIGENS ANDANTIBODY**	• Antigens and haptens: Properties, foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens. • Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies; different classes, subclasses and biological activities of antibodies; concepts of antibody diversity. • Introduction & mechanism of hybridoma technology, monoclonal antibodies, polyclonal antibody.	6	CO2
3	**IMMUNE RESPONSE, MHC AND COMPLEMENT**	• Mechanism of humoral and cell mediated immune response • Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans; Antigen presenting cells, antigen processing and presentation. • Complement system and complement fixation test.	6	CO3
4	**ANTIGEN-ANTIBODY REACTION**	• Laboratory tests for demonstration of antigen antibody reaction such as agglutination, precipitation, ELISA, RIA, immune of fluorescence, PCR	6	CO4
5	**RHEUMATOLOGICAL DISORDERS**	• Rheumatological diseases, etiology and pathogenesis and lab investigations, vaccine production and vaccination schedule.	6	CO5

Reference Books:

1. Abbas AK ,LichtmanAH,PillaiS.(2007).CellularandMolecularImmunology.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.
4. Delves P,Martins,BurtonD,RoittIM.(2006).Roitt'sEssential Immunology.11thedition Wiley- Blackwell Scientific Publication, Oxford.

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	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.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
MB205	IMMUNOLOGY & SEROLOGY - I	✓	✓	✓	✓		✓	✓	3,4

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	**ES101**	**Title of the Course**	**ENVIRONMENTAL STUDIES**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**2**	**1**	**0**	**3**
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	To study about the Environment and the ECO system.
CO2	To study about the Natural Resources.
CO3	To study about Biodiversity and Conservation
CO4	To study Environmental pollution, its policies and practices
CO5	To study Human Population and Environmental Ethics.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION TO ENVIRONMENT AND ECOSYSTEMS**	Environment, its components and segments, Multidisciplinary nature of Environmental studies, Concept of Sustainability and sustainable development, Environmental movements, Ecosystem, Structure & Function, Energy flow in the Ecosystem, Ecological Pyramids and Ecological Succession.	6	CO1
2	**NATURAL RESOURCES**	Energy Resources: Renewable and nonrenewable, Soil erosion and desertification, Deforestation, Water: Use and over exploitation, Impacts of large Dams, Case studies.	6	CO2
3	**BIODIVERSITY AND CONSERVATION**	Levels of biological diversity, Hot spots of biodiversity, India as a Mega Diversity Nation, Endangered and endemic species of India, Threats to Biodiversity, Conservation of Biodiversity, Ecosystem and biodiversity services.	6	CO3
4	**ENVIRONMENTAL POLLUTION, POLICIES AND PRACTICES**	Environmental pollution, Solid waste management, Ill effects of fireworks, Climate change, Ozone layer depletion, acid rain and impacts on human communities and Environment. Environmental Laws: Environment Protection Act, Wildlife protection Act, Forest conservation Act, Convention on Biological Diversity (CBD), Tribal rights, Human wildlife conflicts.	6	CO4
5	**HUMAN POPULATION AND THE ENVIRONMENT**	Human population growth: Impacts on environment, human health and welfare, Resettlement and rehabilitation of project affected persons, Environmental ethics, Environmental communication and public awareness, case studies.	6	CO5

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.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
ES101	ENVIRONMENTAL STUDIES	√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB206**	**Title of the Course**	**CLINICAL HAEMATOLOGY- I LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	1) The hematologycurriculumaimstopreparestudentsinbasicunderstandingofcomposition of blood. Students would also be introduced to laboratory waste management protocols, instrumentation, techniques and methods of estimating different parameters of blood. 2)The academic emphasis of this module is that students would learn basic hematological techniques including blood coagulation tests, blood banking and automation						

Course Outcomes	
CO1	Students will be able to learn about Hemoglobin Detection Technique, Total RBC counting technique, PCV
CO2	Students will be able to learn about Red cell Indices, Blood smear, GBP
CO3	Students will be able to learn about G-6PD, Leucocyte count, ALC techniques
CO4	Students will be able to learn about toxic granulation of neutrophil, PT & NR, APTT
CO5	Students will be able to learn about SICKLE TEST, Plasma HB, Reticulocyte count techniques.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**HEMOGLOBIN DETECTION TECHNIQUE**	1. Determination of hemoglobin by various methods.	60	CO1
2	**TOTAL RBCCOUNTING TECHNIQUE**	2. Determination of Total RBC count.		CO1
3	**PCV**	3. Determination of PCV.		CO1
4	**RED CELL INDICES**	4. Determination of red cell indices.		CO2
5	**BLOOD SMEAR**	5. Demonstration of hypochromic microcytic slide.		CO2
6	**GBP**	6. General blood picture.		CO2
7	**G-6PD**	7. Determination ofG-6-PD.		CO3
8	**LEUCOCYTE COUNT**	8. Differential Leucocyte Count.		CO3
9	**ALC**	9. Absolute leucocyte count.		CO3
10	**NEUTROPHIL**	10. Demonstration of toxic granulation of neutrophil.		CO4
11	**PT & NR**	11. Toperform PT and Calculate INR.		CO4
12	**APTT**	12. Toperform APTT.		CO4
13	**SICKLE TEST**	13. Toperform sickling test.		CO5
14	**PLASMA HB**	14. Determination of Plasma Hemoglobin.		CO5
15	**RETICULOCYTE COUNT**	15. Toperform reticulocyte count.		CO5

Reference Books:

1. Praful B. Godkar: Textbook of Medical Laboratory Technology
2. Dr.RamnikSood: Textbook of Medical Laboratory Technology

e-Learning Source:

1. https://www.slideshare.net/peddanasunilkumar/introduction-to-pathology-ppt
2. https://www.ucsfhealth.org/medical-tests/semen-analysis#:~:text=Semen%20analysis%20is%20one%20of,have%20a%20male%20infertility%20problem.
3. **https://www.youtube.com/watch?v=wZCKrseSIOE**

PO-PSO CO	**Course Articulation Matrix: (Mapping of COs with POs and PSOs)**																
	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	-	1	-	1	-
CO2	1	3	1	3	-	-	-	1	3	-	-	3	-	2	-	2	-
CO3	1	3	1	2	-	-	-	1	2	-	-	2	-	1	-	1	-
CO4	1	3	1	2	-	-	-	1	3	-	-	3	-	1	-	1	-
CO5	1	3	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.**
MB206	CLINICAL HAEMATOLOGY- I LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Integral Un[illegible], Lucknow

Effective from Session: 2024-25							
Course Code	**MB207**	**Title of the Course**	**ENZYMOLOGY LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	• To demonstrate the chemical nature of the enzyme. • To investigate the substrate specificity of the enzyme • To investigate the effects of various temperatures on the activity of the enzyme.						

Course Outcomes	
CO1	Describe structure, functions and mechanism of action of enzymes
CO2	Classify enzymes based on the reactions catalysed.
CO3	Understand kinetics, inhibition and regulation of enzyme catalysed reactions.
CO4	Determine the various ways of calculating enzyme activity of alkaline phosphatase, alpha and beta amylase etc
CO5	Explain the effect of different concentration of substrates on the enzyme activity of various enzymes

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Enzyme Kinetics**	Investigate the kinetics of an enzyme-catalyzed reaction	60	CO1
2	**Effect of pH on Enzyme Activity**	Study how varying pH affects enzyme activity		CO1
3	**Temperature Dependence**	Explore how temperature influences enzyme activity		CO2
4	**Inhibition Studies**	Investigate enzyme inhibition		CO2
5	**Enzyme Immobilization**	Learn about immobilizing enzymes on solid supports		CO3
6	**Determination of alkalinity in the given sample**	Determine the Alkalinity in a Given sample		CO3
7	**Identification of enzymes in different sources**	Identify the enzymes present in different solutions		CO4
8	**Isolation of œ Amylase from different sources**	To isolate œ Amylase from different sources		CO4
9	**Determination of œ Amylase Enzyme activity**	To determine the enzyme activity of œ Amylase		CO5
10	**Specific activity of œ Amylase**	To determine Specific activity of œ Amylase from different source		CO5

Reference Books:

1. Enzyme technology and Biokinetics lab Prepared By LS and KRS
2. CFA Culling, (1974), Handbook of Histopathological and Histochemical techniques: Including Museum Techniques, 3rd edition, Butter worth publishers.

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	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	-	-	-	1	2	1	-	2	-	2	2	1	-
CO2	1	3	1	3	-	-	-	2	3	-	-	3	-	1	1	1	-
CO3	1	3	1	2	-	-	-	1	2	2	-	2	-	1	1	1	-
CO4	1	3	1	2	-	-	-	1	3	-	-	3	-	1	2	1	-
CO5	1	3	1	2	-	-	-	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.
MB207	ENZYMOLOGY LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	3,4

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB208**	**Title of the Course**	**MEDICAL BIOCHEMISTRY- II LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives							

Course Outcomes	
CO1	Students will be able to learn about Picratemethod, Benedict's/ Uristixmethod
CO2	Students will be able to learn about Rothera Nitroprussidetest, Serum Amylase, Serum Lipase estimation
CO3	Students will be able to learn about Malloy–Evelyn method, BCG method
CO4	Students will be able to learn about Uricase/ PAP method
CO5	Students will be able to learn aboutSemi Autoanalyzer, Flame Photometer

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**PICRATE METHOD.**	1. Estimation of Serum Creatinine by Alkaline Picrate method.	60	CO1
2	**BENEDICT'S/ URISTIX METHOD**	2. Toperform urine sugar by Benedict's/ Uristix method.		CO1
3	**ROTHERA NITROPRUSSIDE TEST**	3. Toperform urine Ketone body analysis by Rothera Nitroprusside test.		CO2
4	**SERUM AMYLASE**	4. Estimation of Serum Amylase.		CO2
5	**SERUM LIPASE**	5. Estimation of Serum Lipase.		CO3
6	**MALLOY–EVELYN METHOD**	6. Estimation of Serum Total Bilirubin by Malloy–Evelyn method.		CO3
7	**BCG METHOD**	7. Estimation of Serum Albumin by BCG method and calculation of Globulin & A/Gratio.		CO4
8	**URICASE/ PAP METHOD**	8. Estimation of Serum uric acid by Uricase/ PAP method.		CO4
9	**SEMI AUTOANALYZER**	9. Demonstration of Semi Autoanalyzer.		CO5
10	**FLAME PHOTOMETER**	10. Demonstration of Flame Photometer.		CO5

Reference Books:

1. Ranjna Chawla, Practical Clinical Biochemistry: Methods and Interpretations.
2. Praful B. Godkar,DarshanP.Godkar, Textbook of Medical Laboratory Technology.
3. DrRamnikSood, Medical Laboratory Technology: Methods and Interpretations.
4. Bishop,FodyandSchoeff,ClinicalChemistry,techniques,principlesandcorrelations.
5. Singh &Sahni, Introductory Practical Bio chemistry.

e-Learning Source:

1. https://youtu.be/t5DvF5OVr1Y
2. https://youtu.be/gggC9vctvBQ
3. https://youtu.be/ufvZ8bYtyO8
4. https://youtu.be/Q6R4o-oECxs

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	2	1	-
CO2	1	3	1	3	-	-	-	2	3	-	-	3	-	1	1	1	-
CO3	1	3	1	2	-	-	-	1	2	2	-	2	-	1	1	1	-
CO4	1	3	1	2	-	-	-	1	3	-	-	3	-	1	2	1	-
CO5	1	3	1	2	-	-	-	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.**
MB208	MEDICAL BIOCHEMISTRY- II LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Integral Un[illegible], Lucknow

Effective from Session: 2024-25							
Course Code	**MB209**	**Title of the Course**	**IMMUNOLOGY AND SEROLOGY LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives							

Course Outcomes	
CO1	Student will be able to gain knowledge about Microscopy, glassware, Sterilization and Disinfection
CO2	Student will be able to learn about staining methods used in Bacteriology
CO3	Student will be able to learn about capsule and Spore detection testing
CO4	Student will be able to gain knowledge about antigen -antibody reaction
CO5	Student will be able to learn about serology testing techniques

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**MICROSCOPY**	1. Demonstration of Microscope and its parts.	60	CO1
2	**GLASSWARES**	**2.** Demonstration of glassware used in microbiology.		CO1
3	**AUTOCLAVES**	3. Demonstration of autoclave and sterilization of glasswares.		CO1
4	**HOT AIR OVEN**	4. Demonstration of Hot air oven and sterilization of glasswares.		CO2
5	**GRAM STAINING**	5. Toperform Gram staining.		CO2
6	**STAINING METHODS**	6. Toperform Acid fast staining (Zeihl- Neelsen staining).		CO2
7	**STAINING METHODS**	7. Toperform Indian ink staining.		CO3
8	**MOTILITY TESTING**	8. Toperform Hanging drop method.		CO3
9	**CAPSULE DETECTION**	9. Demonstration of capsule.		CO3
10	**SPORE STAINING**	10. Staining of bacterial spores.		CO4
11	**ANTIGEN ANTIBODY REACTION**	11. To demonstrate agglutination reaction.		CO4
12	**SEROLOGY TEST**	12. Toperform RA test.		CO4
13	**SEROLOGY TEST**	13. Toperform WIDAL test.		CO5
14	**SEROLOGY TEST**	14. Toperform RPR test.		CO5
15	**SEROLOGY TEST**	15. Toperform CRP test.		CO5

Reference Books:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
2. Brooks G.F., Carroll K.C., ButelJ. S., MorseS . A. and Mietzner, T.A.(2013).

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
3. https://www.healthline.com/health/what-is-antiseptic

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	2	1	-
CO2	1	3	1	3	-	-	-	2	3	-	-	3	-	1	1	1	-
CO3	1	3	1	2	-	-	-	1	2	2	-	2	-	1	1	1	-
CO4	1	3	1	2	-	-	-	1	3	-	-	3	-	1	2	1	-
CO5	1	3	1	2	-	-	-	1	2	1	-	2	-	1	1	1	-

2- **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	
MB209	FUNDAMENTALS OF MICROBIOLOGY- I LAB	✓	✓	✓	✓		✓	✓	3,4

INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF BASIC MEDICAL SCIENCES

BACHELOR OF SCIENCE IN MEDICAL BIOCHEMISTRY

(BSc. MB)

SYLLABUS

YEAR/ SEMESTER: II/IV

Integral University, Lucknow
Department of Paramedical Sciences
Study and Evaluation Scheme

Program: BSc MB Semester-IV

S. N.	Course code	Course Title	Type of Paper	Period Per			Evaluation Scheme				Sub. Total	Credit	Total Credits
				L	T	P	CT	TA	Total	ESE			
THEORIES													
1	MB210	Clinical Hematology-II	Core	2	1	0	40	20	60	40	100	2:1:0	3
2	MB211	Systemic Pathology	Core	2	1	0	40	20	60	40	100	2:1:0	3
3	MB212	Clinical Biochemistry	Core	2	1	0	40	20	60	40	100	2:1:0	3
4	MB213	Molecular Biology	Core	2	1	0	40	20	60	40	100	2:1:0	3
5	MB214	Principles of Laboratory Management	Core	2	1	0	40	20	60	40	100	2:1:0	3
PRACTICAL													
1	MB215	Clinical Hematology-II Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1
2	MB216	Molecular Biology - Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1
3	MB217	Clinical Biochemistry - Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1
4	MB218	Clinical Posting	Core	0	0	14	40	20	60	40	100	0:0:1	7
Total				**10**	**05**	**20**	**360**	**180**	**540**	**360**	**900**	**25**	**25**

S. N.	Course code	Course Title	Type of Paper	Attributes							United Nation Sustainable Development Goal (SDGs)
				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
THEORIES											
1	MB210	Clinical Hematology-II	Core	√	√	√	√		√	√	3,4
2	MB211	Systemic Pathology	Core	√	√	√	√		√	√	3,4
3	MB212	Clinical Biochemistry	Core	√	√	√	√		√	√	3,4
4	MB213	Molecular Biology	Core	√	√	√	√		√	√	3,4
5	MB214	Principles of Laboratory Management	Core	√	√	√	√		√	√	3,4
PRACTICAL											
1	MB215	Clinical Hematology-II Lab	Core	√	√	√	√		√	√	3,4
2	MB216	Molecular Biology - Lab	Core	√	√	√	√		√	√	3,4
3	MB217	Clinical Biochemistry - Lab	Core	√	√	√	√		√	√	3,4
4	MB218	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: 2024-25							
Course Code	**MB210**	**Title of the Course**	**CLINICAL HAEMATOLOGY - II**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	2	1	0	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	• The hematology curriculum aims to prepare students in basic understanding of Hematological disorders and their laboratory diagnosis and basics of blood banking. Students would also be introduced to laboratory instrumentation, techniques and methods of estimating different parameters of blood and their clinical significance. • The academic emphasis of this module is that students would learn basic, special and advanced hematological techniques and basics of blood banking.						

Course Outcomes	
CO1	Student will be able to gain knowledge about Anemia, its types, investigation techniques, bone marrow examination
CO2	Student will be able to gain knowledge about ABO grouping system, its determination, blood collection and donation techniques
CO3	Student will be able to gain knowledge about leukemia, its cytochemistry
CO4	Student will be able to gain knowledge about disorder of platelets, Hemophilia, Von-Willebrand disease and Lab diagnosis
CO5	Student will be able to gain knowledge about LE cell, its testing and demonstration of Blood parasites

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**ANEMIA AND DIAGNOSIS**	Anemia of chronic disorders, Sideroblastic anemia, Aplastic anemia, Thalassemia - classification, etiopathogenesis, clinical features and laboratory investigations, Hemoglobin electrophoresis. Bone marrow examination (Bone marrow needle, aspiration technique, processing and staining).	6	CO1
2	**ABO BLOOD GROUPING SYSTEM AND TECHNIQUES**	Genetics of ABO blood group system. Red cell reagents and preparation of red cell suspension. Method of determination of ABO and Rh blood group. Other blood group system. Importance of blood grouping. Donor selection. Blood collection, ant additive systems.	6	CO2
3	**LEUKEMIA & CYTOCHEMISTRY TECHNIQUES**	Leukemia, Cytochemistry - Detail of cytochemical stains, its preparation, Role ofcytochemistry in diagnosis of various types of leukemia	6	CO3
4	**PLATELET DISORDERSAND ITS DIAGNOSIS**	Disorders of platelets - Qualitative and quantitative. Disorders of primary and secondary hemostasis, approach to patient with bleeding and coagulation disorders. Hemophilia and Von-Willebrand disease and their lab diagnosis, Disseminated intravascular coagulation, Disorder of fibrinogen, quantitative factor assay.	6	CO4
5	**LE CELL TEST, BLOODPARASITE DEMONSTRATION TECHNIQUES**	LE cell, its demonstration, procedure of LE cell test and its clinical significance,Demonstration of Blood parasites - Malaria, Filariasis, Leishmania.	6	CO5

Reference Books:

1. Godkar B' Praful (2016): Textbook of Medical laboratory Technology (3rd edition) Bhalani Publications.
2. Singh Tejinder(2014): Atlas &Textbook of Hematology (3rd edition), Avichal Publications
3. SoodRamnik (2015): Medical Laboratory Technology: Methods and Interpretations (vol - 1 &2).
4. Lewis, Mitchell S: Dacie and Lewis PracticalHematology.
5. Kawthalkar, Shrish M: Essential of ClinicalPathology.

e-Learning Source:

1 https://www.slideshare.net/peddanasunilkumar/introduction-to-pathology-ppt

2 https://www.ucsfhealth.org/medical-tests/semen-analysis#:~:text=Semen%20analysis%20is%20one%20of,have%20a%20male%20infertility%20problem.

3 https://www.youtube.com/watch?v=wZCKrseSIOE

	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	1	1	-	3	2	2	1	1	1
CO2	1	3	2	2	-	-	-	1	1	1	-	3	2	2	1	1	1
CO3	1	3	1	2	-	-	-	1	1	1	-	3	2	1	1	1	1
CO4	2	3	1	2	-	-	-	1	1	1	-	3	2	2	1	1	1
CO5	1	3	1	2	-	-	-	1	1	1	-	3	2	1	1	1	1

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

Attributes & SDGs

Course Code	**Course Title**	**Attributes**							**SDGs No.**
MB210	CLINICAL HAEMATOLOGY - II	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB211**	**Title of the Course**	**HISTOPATHOLOGY & HISTOTECHNIQUES- II**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	2	1	0	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	1. The curriculum of histopathology and its techniques aims to prepare the students to understand and learn about handling and processing of biopsies and procedure of special staining techniques. 2. Students would learn the basic histopathological (routine and special).						

Course Outcomes	
CO1	Student will be able to gain knowledge about Staining Techniques of carbohydrates and connective tissue
CO2	Student will be able to gain knowledge about AFB, Fungal demonstration techniques
CO3	Student will be able to gain knowledge about Nucleic acid, BMD testing, Neuropathology testing
CO4	Student will be able to gain knowledge about Museum Testing techniques, Electron and Fluorescence microscopy
CO5	Student will be able to gain knowledge about Immunohistochemistry Techniques, Quality control in histopathology

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**STAINING TECHNIQUES OF CARBOHYDRATES AND CONNECTIVE TISSUE**	**A) Staining of carbohydrates:** 1. **PAS STAIN -** preparation of periodic acid and Schiff reagent, procedure of staining, and control section clinical usefulness of PASstain. 2. **ALCIAN BLUE STAIN-** Preparation, staining and procedure. 3. Other staining method of carbohydrates **B) Connective tissue & its staining:** Preparation and procedure of Trichrome staining, Verhöeff stain, Gordon and Sweet's stain, Gomori's method, van Gieson stain, PTAH stain.	6	CO1
2	**AFB, FUNGAL DEMONSTRATION TECHNIQUES**	Demonstration of AFB, Demonstration of minerals and pigments in tissue sample, Actinomyces,fungi	6	CO2
3	**NUCLEIC ACID, BMD TESTING, NEUROPATHOLOGY TESTING**	Demonstration of nucleic acid, processing and staining of bone marrow sample. Fixation, Processing and section cutting of bones, Techniques in neuro pathology: Specimen handling in Neuropathology lab, Staining of Neurons, Myelin and eyeball.	6	CO3
4	**MUSEUM TESTING TECHNIQUES, ELECTRON AND FLUORESCENCE MICROSCOPY**	Museum techniques - composition and preparation of keiserling fluid. Electron microscopy: Principle,procedure of fixation ,processing and staining of tissue. Fluorescence Microscope: Principle and role in histopathology.	6	CO4
5	**IMMUNOHISTOCHEMISTRY TECHNIQUES**	Immunohistochemistry: principle, types, applications, antigen retrieval, APAAP, PAP Stainingmethod. Quality control in histopathology.	6	CO5

Reference Books:

Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications

Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications.

Godkar.B. Praful,(2016) Textbook of MLT,3rd edition, Bhalani Publications.

CFA Culling, (1974), Handbook of Histopathological and Histochemical techniques: Including Museum Techniques, 3rd edition, Butter worth publishers.

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	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.**
MB211	HISTOPATHOLOGY & HISTOTECHNIQUES- II	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB212**	**Title of the Course**	**CLINICAL BIOCHEMISTRY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This paper gives brief understanding about various types of function test, acid base balance and associated disorders.						

Course Outcomes	
CO1	Student will be able to gain knowledge aboutLiver function tests
CO2	Student will be able to gain knowledge about Renal Function Test
CO3	Student will be able to gain knowledge about Cardiac Function test
CO4	Student will be able to gain knowledge about Gastric function Test
CO5	Student will be able to gain knowledge about Acid base balance, arterial blood gas analysis

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**LFT**	**Liver function tests:** Introduction, bile pigment metabolism, jaundice and its types, Estimation of Bilirubin, Bile salt, Bile pigments, urobilinogen, SGPT/ALT, SGOT/AST, ALP, GGT, Viral Hepatitis.	6	CO1
2	**RFT/KFT**	Renal Function Test: Introduction, Glomerular filtration rate, renal threshold, Urea, Creatinine, Uric Acid, Sodium, Potassium, Creatinine Clearance test, Urea clearance test, examination of renal calculi.	6	CO2
3	**CARDIAC FUNCTION TEST**	**Cardiac Function test:** Introduction, myocardial infarction, CHD, Biochemical markers of Heart diseases, Role of laboratory in monitoring heart diseases.	6	CO3
4	**GASTRIC FUNCTION TESTS**	**Gastric function Test:** Introduction, gastric secretions, total and free acid, stimulation test, physical & chemical examination of gastric secretions. Tumor markers: Introduction, types, applications.	6	CO4
5	**ACID-BASE BALANCE AND ANALYSIS**	Acid base balance, action of buffer system, Hb buffers, respiratory and metabolic acidosis, respiratory and metabolic alkalosis, arterial blood gas analysis, blood gas analyzer.	6	CO5

Reference Books:

1. DMVasudevan,(2011),TextbookofMedicalBiochemistry,6th editionJaypeePublishers.
2. MNChatterjea&RanaShinde,(2012),TextbookofMedicalBiochemistry,8th ed ition, Jayppe Publication
3. Singh &Sahni,(2008),Introductory Practical Biochemistry,2nd edition,Alphascience.
4. Lehninger,(2013),Principles of Biochemistry,6th edition, WH Freeman.
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers.
6. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,ElsevierPublications.

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	2	3	-	2	1	-	-	-	1	1	-	1	2	1	3	2	1
CO2	1	3	-	2	-	-	-	-	1	-	-	1	2	1	3	2	1
CO3	2	3	-	2	-	-	-	-	1	1	-	1	2	1	3	2	1
CO4	1	3	-	1	-	-	-	-	1	-	-	1	2	1	3	2	1
CO5	2	3	-	1	-	-	-	-	1	-	-	1	2	1	3	2	1

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
MB212	CLINICAL BIOCHEMISTRY	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	3,4

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB213**	**Title of the Course**	**MOLECULAR BIOLOGY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This paper gives brief understanding about various types of Bacteria, and associated disorders.						

Course Outcomes	
CO1	To Understand genetic material organization and elements affecting gene function.
CO2	To Learn DNA replication processes and key enzymes in prokaryotes and eukaryotes.
CO3	To Explore transcription mechanisms and modifications in prokaryotes and eukaryotes
CO4	To Comprehend the genetic code, translation mechanisms, and protein modifications.
CO5	To Examine gene expression regulation in prokaryotes and eukaryotes.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Central Dogma of Molecular Biology**	Fine structure of gene Organization of Genetic Material: split genes, overlapping genes; pseudogenes, cryptic genes, Insertion elements and transposons. Gene	6	CO1
2	**DNA Replication**	Enzymes and proteins involved in replication (prokaryotic and eukaryotic), Mutation & DNA damage & repair, Inhibitors of Replication.	6	CO2
3	**Transcription**	Transcription in prokaryotes and Eukaryotes: Mechanism, Promoters and RNA polymerase, transcription factors, Post-transcriptional modifications of eukaryotic, Inhibitors of Transcription.	6	CO3
4	**Genetic code**	Properties and Wobble hypothesis. Translation: Mechanism of translation in Prokaryotes and Eukaryotes, Post-translational modifications of protein,. Inhibitors of Translation	6	CO4
5	**Regulation of Gene expression**	Regulation of Gene expression in Prokaryotes: Operon concept (Lac), Regulation of Gene expression in Eukaryotes	6	CO5

Reference Books:

1. Howe.C. (1995) Gene Cloning and manioulation, Cambridge University Press, USA
2. Lewin, B., Gene VI New York, Oxford University Press.
3. Sambrooket al (2000) Molecular cloning Volumes I, II, & III Cold spring Harbor
4. Walker J.M. and Gingold, E.B. (1983) Molecular Biology & Biotechnogy (Indian Edition) Royal Society of Cemistry U.K
5. Karp.G (2002) Cell & Molecular Biology, 3rd Edition, John Wiley & Sons; INC.

e-Learning Source:

1. https://slideplayer.com/slide/9041398/
2. https://www.webmd.com/a-to-z-guides/difference-between-gram-positive-bacillus-gram-negative-bacillus
3. **https://www.ncbi.nlm.nih.gov/books/NBK7885/**

	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	2	-	-	1	-	3	3	2	2	-	2	2	-	-	-	-	1
CO2	2	-	-	2	-	3	2	2	1	-	2	3	-	-	-	-	2
CO3	2	-	-	1	-	3	3	1	2	-	1	2	-	-	-	-	1
CO4	2	-	-	1	-	3	3	2	1	-	2	3	-	-	-	-	1
CO5	2	-	-	2	-	3	2	2	1	-	2	2	-	-	-	-	1

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
MB213	MOLECULAR BIOLOGY	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB214**	**Title of the Course**	**PRINCIPLES OF LABORATORY MANAGEMENT**	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	**IV**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The students will be made aware of the basic ethics, good lab practices including awareness/ safety in a clinical lab.						

Course Outcomes	
CO1	Student will be able to gain knowledge about Ethical Principles, Good Laboratory Practice (GLP)
CO2	Student will be able to gain knowledge about Awareness / Safety in a clinical laboratory and General safety precautions
CO3	Student will be able to gain knowledge about Sample analysis, reporting results, basic format of a test report, reported reference range
CO4	Student will be able to gain knowledge about Quality Management system, Quality assurance, Quality control system, Inventory Control
CO5	Student will be able to gain knowledge about Audit in a Medical Laboratory, NABL & CAP

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**GLP**	Ethical Principles and standards for a clinical laboratory professional duty to the patient, duty to colleagues and other professionals, Good Laboratory Practice (GLP), Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation.	6	CO1
2	**AWARENESS / SAFETY INA CLINICAL LABORATORY**	Awareness / Safety in a clinical laboratory, General safety precautions. HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post-exposure guidelines, Drug Resistant Tuberculosis Patient management for clinical samples collection, transportation and preservation, Sample accountability, Purpose of accountability, Methods of accountability	6	CO2
3	**SAMPLE ANALYSIS**	Sample analysis: Introduction, factors affecting sample analysis, reporting results, basic format of a test report, reported reference range, clinical alerts, abnormal results, results from refer all laboratories, release of examination results, alteration in reports	6	CO3
4	**QUALITY MANAGEMEN TSYSTEM**	Quality Management system: Introduction, Quality assurance, Quality control system, Internal and External quality control, quality control chart Biomedical Introduction and importance of calibration and Validation of Clinical Laboratory instrument Ethics in Medical laboratory Practice, Ethics in relation to Pre- Examination procedures, Examination procedures, reporting of results, preserving medical records Procurement of equipment and Inventory Control,	6	CO4
5	**AUDIT IN A MEDICAL LABORATORY**	Audit in a Medical Laboratory, Introduction and Importance, NABL & CAP, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation.	6	CO5

Reference Books:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,ElsevierPublications
2. Bishop(2013),Clinical Chemistry,7th edition,WileyPublications
3. Henry's Clinical diagnosis and management by Laboratory Methods (2011), 22nd edition, Elsevier.

e-Learning Source:

1. https://nata.com.au/accreditation/oecd-principles-of-good-laboratory-practice/
2. https://www.icao.int/NACC/Documents/Meetings/2016/AIMQMS/QMSFPLAIMP04.pdf
3. http://virology-online.com/general/QualityControl4.htm

	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	-	-	-	-	-	2	-	2	-	-	-	2	-	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-
CO3	-	-	-	-	-	2	-	1	-	1	-	2	-	-	-	-	-
CO4	-	-	-	-	-	2	2	-	-	-	-	2	-	-	-	-	-
CO5	-	-	-	-	-	2	1	1	-	-	1	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	
MB214	PRINCIPLES OF LABORATORY MANAGEMENT			√					3,4, 11

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB215**	**Title of the Course**	**CLINICAL HAEMATOLOGY- II LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	0	0	2	1
Pre-Requisite	**NIL**	**Co-requisite**	**Nil**				
Course Objectives							

Course Outcomes	
CO1	Student will be able to gain knowledge about Platelet count, GBP
CO2	Student will be able to gain knowledge about Routine Romanowsky staining, Leukemia
CO3	Student will be able to gain knowledge about LAP scoring, Total platelet count, Thrombin time
CO4	Student will be able to gain knowledge about D-dimer test, Fibrinogen assay
CO5	Student will be able to gain knowledge about Hemoparasite, Electrophoresis

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**PLATELET COUNT**	1. Platelet count - manual and automated.	30	CO1
2	**GBP**	2. General blood Picture and its clinical significance.		CO1
3	**ROUTINE ROMANOWSKY STAINING**	3. Staining of bone marrow (routine romanowsky staining and pearl Prussian blue staining).		CO2
4	**LEUKEMIA**	4. Demonstration of leukemic slides.		CO2
5	**LAP SCORING**	5. LAP scoring - procedure and clinical significance.		CO3
6	**TOTAL PLATELET COUNT**	6. To determine total platelet count.		CO3
7	**THROMBIN TIME**	7. Procedure of thrombin time.		CO4
8	**D-DIMER TEST**	8. Procedure of D-dimer test and its clinical significance.		CO4
9	**FIBRINOGEN ASSAY**	9. Fibrinogen assay.		CO5
10	**HEMOPARASITE**	10.Demonstration of hemoparasite - malaria and filaria.		CO5
11	**ELECTROPHORESIS**	11.Hemoglobin electrophoresis.		CO5

Reference Books:

Godkar B' Praful (2016): Textbook of Medical laboratory Technology (3rd edition) Bhalani Publications.

Singh Tejinder(2014): Atlas &Textbook of Hematology (3rd edition), Avichal Publications

SoodRamnik (2015): Medical Laboratory Technology: Methods and Interpretations (vol - 1 &2).

Lewis, Mitchell S: Dacie and Lewis Practical Hematology.

Kawthalkar, Shrish M: Essential of Clinical Pathology.

e-Learning Source:

1. https://www.slideshare.net/peddanasunilkumar/introduction-to-pathology-ppt
2. https://www.ucsfhealth.org/medical-tests/semen-analysis#:~:text=Semen%20analysis%20is%20one%20of,have%20a%20male%20infertility%20problem.
3. **https://www.youtube.com/watch?v=wZCKrseSIOE**

	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	1	1	-	3	2	2	1	1	1
CO2	1	3	2	2	-	-	-	1	1	1	-	3	2	2	1	1	1
CO3	1	3	1	2	-	-	-	1	1	1	-	3	2	1	1	1	1
CO4	2	3	1	2	-	-	-	1	1	1	-	3	2	2	1	1	1
CO5	1	3	1	2	-	-	-	1	1	1	-	3	2	1	1	1	1

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

Attributes & SDGs

Course Code	**Course Title**	**Attributes**							**SDGs No.**
MB215	CLINICAL HAEMATOLOGY- II LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB216**	**Title of the Course**	**HISTOPATHOLOGY & HISTOTECHNIQUES - II LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	0	0	2	**1**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives							

Course Outcomes	
CO1	Student will be able to gain knowledge about Grossing of tissue, tissue processing
CO2	Student will be able to gain knowledge about Section cutting
CO3	Student will be able to gain knowledge about Hematoxylin and Eosin staining
CO4	Student will be able to gain knowledge about PAS staining
CO5	Student will be able to gain knowledge about AFB staining

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**GROSSING OF TISSUE, TISSUE PROCESSING**	1. Grossing of tissue, tissue processing by manual method.	30	CO1
2	**SECTION CUTTING**	2. Section cutting of paraffin embedded tissue.		CO2
3	**HEMATOXYLIN AND EOSIN STAINING**	3. To fix the smear on glass slide, hematoxylin and eosin staining.		CO3
4	**PAS STAINING**	4. PAS staining.		CO4
5	**AFB STAINING**	5. AFB staining.		CO5

Reference Books:

1. Bancroft's Theory and Practice of Histological Techniques,7tEdition, Elsevier Publications.
2. Harshmohan (2017), Textbook of Pathology, 7thedition, Jaypee Publications.
3. Godkar B. Praful (2016) Textbook of MLT,3rdedition, Bhalani Publications.
4. CFA Culling, (1974), Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques, 3rd edition, ButterworthsPublishers.

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://en.wikipedia.org/wiki/Periodic_acid%E2%80%93Schiff_stain

	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	
MB216	HISTOPATHOLOGY & HISTOTECHNIQUES - II LAB	✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB217**	**Title of the Course**	**CLINICAL BIOCHEMISTRY- LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	0	0	2	**1**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives							

Course Outcomes: After the successful course completion, learners will develop following attributes:	
CO1	Student will be able to gain knowledge about Bilirubin, SGOT conc, SGPT conc
CO2	Student will be able to gain knowledge about ALP Conc, total and free acidity
CO3	Student will be able to gain knowledge about CPK test, CK-MB test
CO4	Student will be able to gain knowledge about serum sodium Conc, serum potassium conc
CO5	Student will be able to gain knowledge about uric acid conc, phosphorus conc

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**LFT, RFT/KFT, CARDIAC FUNCTION TEST, GASTRIC FUNCTIONTESTS, ACID-BASE BALANCE AND ANALYSIS**	1. To determine total, direct and indirect bilirubin	30	CO1
2		2. To determine SGOT conc		CO1
3		3. To determine SGPT conc		CO1
4		4. To determine ALP Conc		CO2
5		5. To determine total and free acidity.		CO2
6		6. To perform CPK test.		CO3
7		7. To perform CK-MB test.		CO3
8		8. To determine serum sodium conc.		CO4
9		9. To determine serum potassium conc.		CO4
10		10. To determine uric acid conc.		CO5
11		11. To determine phosphorus conc.		CO5

Reference Books:C

1. DMVasudevan,(2011),TextbookofMedicalBiochemistry,6thedition, Jaypee Publishers.
2. MNChatterjee&RanaShinde,(2012),TextbookofMedicalBiochemistry,8thedition,JayppePublications.
3. Singh &Sahni,(2008),Introductory Practical Biochemistry,2ndedition,Alphascience.
4. Lehninger,(2013),Principles of Biochemistry,6th edition, WH Freeman.
5. U SatyaNarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers.
6. Treitz,(2007),Fundamentals of Clinical Chemistry,6thedition,ElsevierPublications

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	2	3	-	2	1	-	-	-	1	1	-	1	2	1	3	2	1
CO2	1	3	-	2	-	-	-	-	1	-	-	1	2	1	3	2	1
CO3	2	3	-	2	-	-	-	-	1	1	-	1	2	1	3	2	1
CO4	1	3	-	1	-	-	-	-	1	-	-	1	2	1	3	2	1
CO5	2	3	-	1	-	-	-	-	1	-	-	1	2	1	3	2	1

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
MB217	CLINICAL BIOCHEMISTRY- LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	3,4

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MB218**	**Title of the Course**	**HOSPITAL POSTING**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	0	0	14	**7**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives							

Course Outcomes: After the successful course completion, learners will develop following attributes:	
CO1	Student will be able to learn and experience the practical handling of patients.
CO2	Student will be able to learn and experience collection and processing of blood, urine, sputum stool and body fluids samples
CO3	Student will be able to learn and experience identification of patient's particulars based on CR number, Lab Number
CO4	Student will be able to learn and experience transfer of samples from collection centers to different labs
CO5	Student will be able to learn and experience. process of performing various tests in different labs.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**HOSPITAL POSTING**	Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples. Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centers to different labs. Process of performingvarious tests in different labs. Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections. The faculty shall submit the assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.	180	CO1-5

e-Learning Source:

1.https://www.onepointesolutions.com/blog/how-to-design-a-pathology-lab/

2.http://www.naco.gov.in/sites/default/files/1Guideline%20doc%20design%20of%20BSL2%20labs(dist,hosp,chc&phc)%20level.pdf

3.file:///Users/rohitsrivastava/Downloads/9789241516938-eng.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	2	3	-	2	1	-	-	-	1	1	-	1	2	1	3	2	1
CO2	1	3	-	2	-	-	-	-	1	-	-	1	2	1	3	2	1
CO3	2	3	-	2	-	-	-	-	1	1	-	1	2	1	3	2	1
CO4	1	3	-	1	-	-	-	-	1	-	-	1	2	1	3	2	1
CO5	2	3	-	1	-	-	-	-	1	-	-	1	2	1	3	2	1

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

Attributes & SDGs

Course Code	**Course Title**	**Attributes**							**SDGs No.**
MB218	**HOSPITAL POSTING**	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**