INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF BASIC MEDICAL SCIENCES

BACHELOR OF SCIENCE IN MEDICAL MICROBIOLOGY (BSc.MM)

SYLLABUS

YEAR/ SEMESTER: II/III

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

Program: BSc. Medical Microbiology — 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	MM201	Clinical Hematology - I	Core	2	1	0	40	20	60	40	100	2:1:0	3
2	MM202	General pathology	Core	2	1	0	40	20	60	40	100	2:1:0	3
3	MM203	Medical Biochemistry -II	Core	2	1	0	40	20	60	40	100	2:1:0	3
4	MM204	Fundamentals of Microbiology	Core	2	1	0	40	20	60	40	100	2:1:0	3
5	MM205	Immunology & Serology - I	Core	2	1	0	40	20	60	40	100	2:1:0	3
6	MM101	Environmental Science	Core	2	1	0	40	20	60	40	100	2:1:0	3
PRACTICAL													
1	MM206	Clinical Hematology - I Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
2	MM207	Fundamentals of Microbiology Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
3	MM208	Medical Biochemistry -II Lab	Core	0	0	4	40	20	60	40	100	0:0:2	2
4	MM209	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	MM201	Clinical Hematology – I	Core	√	√	√	√		√	√	3,4
2	MM202	General Pathology	Core	√	√	√	√		√	√	3,4
3	MM203	Medical Biochemistry -II	Core	√	√	√	√		√	√	3,4
4	MM204	Fundamentals of Microbiology - I	Core	√	√	√	√		√	√	3,4
5	MM205	Immunology & Serology - I	Core	√	√	√	√		√	√	3,4
6	MM101	Environmental Science	Core			√		√			3,4
PRACTICAL											
1	MM206	Clinical Hematology - I Lab	Core	√	√	√	√		√	√	3,4
2	MM207	Fundamental of Microbiology	Core	√	√	√	√		√	√	3,4
3	MM208	Medical Biochemistry -II Lab	Core	√	√	√	√		√	√	3,4
4	MM209	Immunology & Serology -Lab		√	√	√	√		√	√	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	**MM201**	**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)** 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 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 Hemolytic anemia.

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.**
	CLINICAL	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics

MM201	HAEMATOLOGY- I	√	√	√			√	√	3,4

Effective from Session: 2024-25							
Course Code	**MM202**	**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 practical histopathology 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 histopathological techniques including laboratory organization, histopathology 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 PATHOLOGY**	1. Introduction of pathology, 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, Processing of 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	
MM202	GENERAL PATHOLOGY	√	√	√	√		√	√	3,4

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MM203**	**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 photometry, 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.
MM203	MEDICAL BIOCHEMISTRY-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	**MM204**	**Title of the Course**	**FUNDAMENTAL OF MICROBIOLOGY**	**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, basics of microbiology and imparts knowledge about equipment used in microbiology.						

Course Outcomes	
CO1	This course makes the students to know handling of instruments and sterilization techniques.
CO2	This course makes the students to know general insight into the history, basics of microbiology.
CO3	This course makes the students to know imparts knowledge about equipment used in microbiology.
CO4	This course makes the students to know Structure, function and chemical composition of bacterial cell membranes.
CO5	This course makes the students to know Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION ANDHISTORY OF MICROBIOLOGY**	• Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner. • Introduction to bacterial taxonomy, Classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pili, ribosomes.	6	CO1
2	**MICROSCOPY**	• Microscopy: Study of compound microscope– magnification, numerical aperture resolution and components of microscope. • Dark ground illumination, care of microscope and common difficulties micrometry. • Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope, Confocal Microscope.	6	CO2
3	**STRUCTURE OF BACTERIA**	• Cell size, shape and arrangement, cell-wall, composition and detailed structure of Gram- positive and Gram-negative cell walls, Cell Membrane. • Structure, function and chemical composition of bacterial cell membranes. • Cytoplasm: Ribosome, mesosomes, inclusion bodies, nucleoid, chromosome and plasmidsEndospore: Structure, formation, Bacterial Genetics.	6	CO3
4	**STERILIZATION AND DISINFECTION**	• General safety measures used in Microbiology laboratory. • Sterilization and disinfection: Various physical methods of sterilization heat. • UV radiation, ionizing radiation, filtration, characters affecting sterilization, auto clave control and sterilization indicators. • Biomedical waste management in a Medical Microbiology laboratory: Types of thewaste generated, Segregation, Treatment, Disposal, PPE & infection prevention Control.	6	CO4
5	**ANTISEPTICS AND DISINFECTANTS**	• Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants. • Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound use and abuse of disinfectants. precautions while using the disinfectants, Testing of disinfectants.	6	CO5

Reference Books:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
2. BrooksG.F.,CarrollK.C.,ButelJ.S.,MorseS.A.andMietzner,T.A.(2013).
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.
5. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, NewYork.

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.
MM204	FUNDAMENTAL OF MICROBIOLOGY	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MM205**	**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	-

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

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
MM205	IMMUNOLOGY & SEROLOGY - I	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	3,4

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Effective from Session: 2024-25							
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	**MM206**	**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							

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**

	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
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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.**
MM206	CLINICAL HAEMATOLOGY- I 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	**MM207**	**Title of the Course**	**FUNDAMENTAL OF MICROBIOLOGY-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 Glasswares used in histopathology lab, alcohol preparation, formalin preparation
CO2	Students will be able to learn about honing and stopping technique, grossing of tissue, tissue processing
CO3	Students will be able to learn about section cutting techniques, smear fixation techniques
CO4	Students will be able to learn about H & E staining techniques
CO5	Students will be able to learn about mounting and preservation of slides

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.		CO2
4	**HOT AIR OVEN**	4. Demonstration of Hot air oven and sterilization of glasswares.		CO2
5	**GRAM STAINING**	5. Toperform Gram staining.		CO3
6	**STAINING METHODS**	6. Toperform Acid fast staining (Zeihl- Neelsen staining).		CO3
7	**STAINING METHODS**	7. Toperform Indian ink staining.		CO4
8	**MOTILITY TESTING**	8. Toperform Hanging drop method.		CO4
9	**CAPSULE DETECTION**	9. Demonstration of capsule.		CO5
10	**SPORE STAINING**	10. Staining of bacterial spores.		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.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.**
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
MM207	HISTOPATHOLOGY & HISTOTECHNIQUES-II LAB	✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MM208**	**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.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
MM208	MEDICAL BIOCHEMISTRY- II LAB	✓	✓	✓	✓		✓	✓	**3,4**

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	**MM209**	**Title of the Course**	**IMMUNOLOGY & SEROLOGY- I 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. To perform Gram staining.		CO2
6	**STAINING METHODS**	6. To perform Acid fast staining (Zeihl- Neelsen staining).		CO2
7	**STAINING METHODS**	7. To perform Indian ink staining.		CO3
8	**MOTILITY TESTING**	8. To perform 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. To perform RA test.		CO4
13	**SEROLOGY TEST**	13. To perform WIDAL test.		CO5
14	**SEROLOGY TEST**	14. To perform RPR test.		CO5
15	**SEROLOGY TEST**	15. To perform 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.
MM209	FUNDAMENTALS OF MICROBIOLOGY- I LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF BASIC MEDICAL SCIENCES

BACHELOR OF SCIENCE IN MEDICAL MICROBIOLOGY (BSc.MM)

SYLLABUS

YEAR/ SEMESTER: II/IV

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

Program: BSc. Medical Microbiology 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	MM210	Clinical Hematology-II	Core	2	1	0	40	20	60	40	100	2:1:0	3
2	MM211	Systemic Pathology	Core	2	1	0	40	20	60	40	100	2:1:0	3
3	MM212	Parasitology	Core	2	1	0	40	20	60	40	100	2:1:0	3
4	MM213	Systemic Bacteriology	Core	2	1	0	40	20	60	40	100	2:1:0	3
5	MM214	Principles of Laboratory Management	Core	2	1	0	40	20	60	40	100	2:1:0	3
PRACTICAL													
1	MM215	Clinical Hematology-II Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1
2	MM216	Systemic Bacteriology Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1
3	MM217	Parasitology - Lab	Core	0	0	2	40	20	60	40	100	0:0:1	1
4	MM218	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	MM210	Clinical Hematology-II	Core	√	√	√	√		√	√	3,4
2	MM211	Systemic Pathology	Core	√	√	√	√		√	√	3,4
3	MM212	Parasitology	Core	√	√	√	√		√	√	3,4
4	MM213	Systemic Bacteriology	Core	√	√	√	√		√	√	3,4
5	MM214	Principles of Laboratory Management	Core	√	√	√	√		√	√	3,4
PRACTICAL											
1	MM215	Clinical Hematology-II Lab	Core	√	√	√	√		√	√	3,4
2	MM216		Core	√	√	√	√		√	√	3,4
3	MM217	Clinical Biochemistry - Lab	Core	√	√	√	√		√	√	3,4
4	MM218	Hospital 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	**MM210**	**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
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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.**
MM210	CLINICAL HAEMATOLOGY - II	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

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Effective from Session: 2024-25							
Course Code	**MM211**	**Title of the Course**	**SYSTEMIC PATHOLOGY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	2	1	0	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	Acquire the knowledge of concepts of cell injury & changes produced thereby in different tissues & organs-; capacity of the body in healing process. Recall the etiopathogenesis, the pathological effects & the clinico-pathological correlation of common infections & noninfectious diseases						

Course Outcomes	
CO1	Students able to understand the structure & functions of Cell, Cardinal sign of inflammation and neoplasm
CO2	Students able to understand the Vascular & Cardiorespiratory System
CO3	Students able to understand the bones and joints diseases
CO4	Students able to understand the Patho-physiology and associated problems
CO5	Students able to learn the disease related to nervous system including Myopathies, Myasthenia gravis, Muscular dystrophy

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**CELL INJURY, INFLAMMATION & NEOPLASMS**	Cells: Brief out line of cell injury, hypertrophy, atrophy, degeneration, necrosis and gangrene. Inflammation: Definition, vascular and cellular phenomena, difference between transudate and exudates, granuloma. Neoplasm: Definition, characteristic features, benign and malignant tumor, spread of tumor, cancer pain syndrome	6	CO1
2	**VASCULAR & CARDIORESPIRATORY SYSTEM**	Circulatory Disturbance: Odema, Hemorrhage, Embolism, Thrombosis, Infraction, Shock, Volkmann's ischemic contracture. Blood Disorder: Concepts of Anemia, Bleeding disorder- Hemophilia. Cardio Vascular System (CVS): Etiopathogenesis and Gross pathology of Atherosclerosis, coronary heart disease, Rheumatic heart disease. Respiratory System: Chronic Bronchitis, Asthma, Bronchiectasis, Emphysema	6	CO2
3	**BONES, JOINTS & MUSCULAR SYSTEM:**	Bones: Etiopathogenesis and gross pathology of fallowing conditions: Rickets/Osteomalacia, Osteoporosis, Osteomyelitis, Hyper parathyroidism Joint: Osteoarthritis, Rheumatoid Arthritis, Gout, Spondyloarthopathy (including Ankylosing Spondylitis), Osteonecrosis, Paget's disease. Muscles: Myositis ossificans, Myofascial Pain syndrome, Septic arthritis	6	CO3
4	**HEPATO-BILIARY, ENDOCRINE & INTEGUMENTARY SYSTEM**	Hepato-Biliary System: Jaundice Types, Etiopathogenesis and diagnosis. Endocrine: Diabetes Mellitus, Non-Neoplastic lesion of thyroid-Thyrotoxicosis, Myxedema. Skin: Brief outline of Scleroderma, Psoriasis, Pressure Ulcer, and Burn.	6	CO4
5	**CENTRAL NERVOUS SYSTEM & UROLOGY**	CNS: Etiopathogenesis and gross pathology of fallowing conditions- Meningitis, Encephalitis, Parkinson's, Amyotrophic lateral sclerosis, Ataxias, Multiple sclerosis, Neuropathies (Carcoat Marie Tooth disease, Compression and Entrapments, diabetics G.B. Syndrome), malformation, CVA, Extredural and Intra Dural Hematoma. Muscle Neuropathies: Poliomyelitis, Myopathies, Myasthenia gravis, Muscular dystrophy. Renal Function Tests, Nephrotic Syndrome, Nephritic Syndrome, Urolithiasis, Pap Smear.	6	CO5

Reference Books:

1. Text book of Pathology - by Harsh Mohan
2. Textbook of Pathology By Boyd
3. General Pathology – by Bhende
4. Pathologic basis of diseases by Cotran, Kumar, Robbins

e-Learning Source:

1.https://youtu.be/WFm9j1rNkQs
2.https://youtu.be/vLCg_kyuyw4
3. https://youtu.be/xLEw7ceog8M
4.https://youtu.be/80bzLTdAN4w
5. https://youtu.be/dHURMD4v8Kk

	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

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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.
MM211	SYSTEMIC PATHOLOGY	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Effective from Session: 2024-25							
Course Code	**MM212**	**Title of the Course**	**PARASITOLOGY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The student will be taught about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important parasites.						

Course Outcomes	
CO1	Students are able known about characteristics, habitat, morphology & life cycle of different types of parasites
CO2	Students are able to known about characteristics, habitat, morphology & life cycle of different types of Helminthes
CO3	Students are study about stool examinations like- collection, preservation, physical chemical & microscopic examination.
CO4	Students are able to make a thin or thick smear for parasitic examination and also about various types of stains
CO5	Students are able known about collection, handling, transport and preservation of samples for parasitological investigations.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**PARASITOLOGY**	Introduction to Medical Parasitology with respect to terms used in Parasitology. Protozoology/ Protozoal parasites: General characteristics of protozoa classification, Geographical distribution, Habitat, Morphology, lifecycle, Mode of infection and laboratory diagnosis of Entamoeba sp. E. Histolytica, Free-living Entamoeba sp. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Intestinal and vaginal flagellates i.e., Giardia, Trichomonas sp. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of blood and tissue flagellates i.e., Plasmodium, Leishmania and Toxoplasma sp.	6	CO1
2	**HELMINTHOLOGY**	Helminthology/ Helminthic parasites: General characteristics of Cestodes, Trematodes and Nematodes. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of -Taeniasolium and saginata, Echinococcusgranulos, Hymenolepis nana, Schistosoma haematobium and mansoni, Fasciola hepaticabuski, Trichuristrichura, Trichinellaspirales,Strongyloidesstercoralis,Ancylostomaduodenale Enterobiusvermicularis Ascaris lumbricoides, Wuchereriabancrofti , Dracunculusmedinensis	6	CO2
3	**DIAGNOSTIC PROCEDURE**	Diagnostic procedures: Collection of stool samples, Preparation of material for unstained and stained preparations Staining methods i.e., Iodine staining and permanent staining. Concentration techniques i.e., Flotation and sedimentation techniques, egg counting techniques. General rules for microscopic examination of stool samples, Examination of Stool for parasites for intestinal protozoal infections, For Helminthic infections. Examination of blood for parasite, preparation of thin and thick blood film, leishman staining, examination of thick and thin smear, field's stain, JSB stain.	6	CO3
4	**SLIDE PREPARATION**	Smear preparation, procedure and precaution, fixation methods and observation	6	CO4
5	**SAMPLES**	Clinical case studies of various protozoal and helminthic infections with special focus on identification strategies of above mentioned parasites.	6	CO5

Reference Books:

Parasitology in relation to Clinical Medicine by K D Chatterjee.

Medical Entomology by A.K. Hati, Pub. Allied Book Agency

Medical Parasitology by D.R.Arora

Clinical Parasitology by Paul Chester Beaver.

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)

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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.
MM212	PARASITOLOGY	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

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Effective from Session: 2024-25							
Course Code	**MM213**	**Title of the Course**	**SYSTEMIC BACTERIOLOGY**	**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 learn about Gram positive cocci and Gram-negative cocci
CO2	To learn about Gram positive bacilli
CO3	To Learn about Gram negative bacilli
CO4	To learn about Gram negative bacilli
CO5	To learn about Miscellaneous Bacteria

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**GRAM POSITIVE AND NEGATIVE COCCI**	Identification of Bacteria – Colony morphology, Culture media and methods, AST methods, Biochemical Reactions.	6	CO1
2	**GRAM POSITIVE BACILLI**	Bacteria, with reference to their- Morphology, Cultural Characteristics, Biomedical reactions, Pathogenesis/ Disease caused & lab diagnosis of - Gram positive cocci –Staphylococcus, Streptococcus, Enterococccus and Pneumococcus. Gram Negative cocci – Neisseira & Moraxella, Gram positive Bacilli, Corynebacterium, Bacillus, Clostridium.	6	CO2
3	**GRAM NEGATIVE BACILLI**	Bacteria, with reference to their- Morphology, Cultural Characteristics, Biomedical reactions, Pathogenesis/ Disease caused & lab diagnosis of Gram-Negative Bacilli Enterobacteriaceae family, Mycobacteria, and Vibrio.	6	CO3
4	**GRAM NEGATIVE BACILLI**	Bacteria, with reference to their- Morphology, Cultural Characteristics, Biomedical reactions, Pathogenesis/ Disease caused & lab diagnosis of Pseudomonas, Haemophilus, Spirochaetes.	6	CO4
5	**MISCELLANEOUS BACTERIA**	Antimicrobial Resistance, AMR Surveillance, Bacteriology of food, air and water, Hospital acquired infections.	6	CO5

Reference Books:

Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.

Brooks G.F., Carroll K.C.,ButelJ.S.,MorseS.A.andMietzner,T.A.(2013).

Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.

Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.

Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, NewYork.

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.
MM213	SYSTEMIC BACTERIOLOGY	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

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Effective from Session: 2024-25							
Course Code	**MM214**	**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	
MM214	PRINCIPLES OF LABORATORY MANAGEMENT			√					**3,4, 11**

Effective from Session: 2024-25							
Course Code	**MM215**	**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.**
MM215	CLINICAL HAEMATOLOGY- II LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	**3,4**
		✓	✓	✓	✓		✓	✓	

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Effective from Session: 2024-25							
Course Code	**MM216**	**Title of the Course**	**SYSTEMIC BACTERIOLOGY-LAB**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	0	0	2	**1**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	To understand the basic concept od lab equipments and media preparation						

Course Outcomes	
CO1	Student will be able to gain knowledge about the microscopic techniques
CO2	Student will be able to gain knowledge about different types of sterilization techniques
CO3	Student will be able to gain knowledge about staining and identification methods
CO4	Student will be able to gain knowledge about culture media preparation
CO5	Student will be able to gain knowledge about collection and transportation of different specimens

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Microscopy**	Handling and general maintenance. Care and operation of microscopes viz., Dark ground, Phase Contrast, Fluorescent microscope and Electron microscope	30	CO1
2	**Sterilization and disinfection**	Handling of main types of filters, preparation procedures for autoclaving, hot air oven, Operation and maintenance of autoclave		CO2
3	**Staning procedure**	Preparation of stains viz, Grams, Alberts, Capsules, Spores, Ziehl Neelsens etc. and performing of staining.		CO3
4	**Media preparation**	Quality control in media preparation		CO4
5	**Collection and transportation of specimens**	Blood, Urine, Throat swab, Rectal swab, Stool, Pus, OT specimens		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.**
MM216	SYSTEMIC BACTERIOLOGY-LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

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Effective from Session: 2024-25							
Course Code	**MM217**	**Title of the Course**	**PARASITOLOGY**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	0	0	2	**1**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	The student will be taught about laboratory diagnosis of various medically important parasites & microscopy.						

Course Outcomes: After the successful course completion, learners will develop following attributes:	
CO1	Students are study about medical Parasitology with respect to terms used in Parasitology
CO2	Students are study about General character, mode of infection lab diagnosis of many parasites.
CO3	Students are study about sample collection & identification of different parasites.
CO4	Students are study about slide preparation & staining of different parasitic infection
CO5	Students are study about Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**PARASITOLOGY HELMINTHOLOGI CAL DIAGNOSTIC PROCEDURE SLIDE PREPARATION SAMPLES**	1. Routine stool examination for detection of intestinal parasites with concentration methods.	30	CO1
2		2. Saline preparation, Iodine preparation, Floatation method Centrifugation method, Formal ether method, Zinc sulphate method.		CO2
3		3. Identification of adult worms from models/slides		CO3
4		4. Tapeworm, Tapeworm segments, Ascaris (Round worm), Hookworms, Pinworms.		CO4
5		5. Malarial parasite		CO5
6		6. Preparation of thin and thick smears, Staining of smear, Examination of smears for malarial parasites (P. vivax and P. falciparum).		CO6
7				
8				
9				
10				
11				

Reference Books:C

Parasitology in relation to Clinical Medicine by K D Chatterjee.
Medical Entomology by A.K. Hati, Pub. Allied Book Agency
Medical Parasitology by D.R. Arora.
Clinical Parasitology by Paul Chester Beaver

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.
MM217	PARASITOLOGY-LAB	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		✓	✓	✓	✓		✓	✓	**3,4**

Effective from Session: 2024-25							
Course Code	**MM218**	**Title of the Course**	**CLINICAL 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	**CLINICAL 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

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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

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Attributes & SDGs

Course Code	**Course Title**	**Attributes**							**SDGs No.**
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