Maulana Abul Kalam Azad University of Technology, WB
(Formerly known as West Bengal University of Technology)
Syllabus of B.Sc. (Medical Lab Technology)
Effective from academic session 2023-24
Semester V
Detailed Syllabus

Course: Immunohematology and Blood Banking **Immunohematology and Blood Banking Lab**	
Course Code: BMLC501+BMLC591	**Semester: V**
	Maximum Marks: 100+100
Teaching Scheme	**Examination Scheme**
Lecture: 3	End semester Exam: 70
Tutorial: 0	Attendance: 5
Practical: 2	Continuous Assessment: 25
Credit: 5	Practical/Seasonal internal continuous evaluation: 40
	Practical/Seasonal external examination: 60

SL No.	**Course Objective**
1.	Gain foundational knowledge of blood banking, including the roles of antigens, antibodies (including naturally occurring antibodies), and the complement system.
2.	Study the ABO and Rh blood group systems in detail along with other significant systems like Lewis, MNS, Cell, and Duffy. Understand methods of blood grouping including forward and reverse typing using slide, tube, and gel methods.
3.	Understand criteria for donor selection, types of anticoagulants and preservatives, and procedures for blood collection and processing.
4.	Learn about screening for transfusion-transmissible infections, Coombs' tests, crossmatching, compatibility testing, and antibody screening and identification, including grading of agglutination reactions.
5.	Understand the preparation, storage, and transportation of various blood components and their specific indications for transfusion. Understand the quality control of reagents, equipment, and blood components, and recognize the roles of national bodies like NACO, Indian Red Cross Society, and DGHS in transfusion medicine.

	Course Outcomes	**Mapped module/Unit**
CO 1	Demonstrate the basic knowledge of Immunohematology and blood banking	U1
CO 2	Understand the different blood grouping system and donor selection criteria	U1,U2
CO 3	Explain the knowledge of transfusion transmissible disease and antigen antibody reaction	U1,U2,U3
CO 4	Organise the knowledge and skill of preparation of blood components.	U3,U4
CO 5	Outline the Apheresis procedure and role of different administrative bodies.	U4
CO 6	Examine and Evaluate to perform different activities related to transfusion medicines	U4,U5

Learning Outcome/Skills:

By the end of this course, students will be able to understand the fundamental principles of blood banking, including antigen-antibody interactions and major blood group systems such as ABO, Rh, and others like Lewis, Kell, MNS, and Duffy. They will gain practical knowledge of blood grouping techniques, donor selection, blood collection, processing, and component preparation. Students will also be equipped to perform compatibility testing, antibody screening, and transfusion-transmissible infection screening. They will understand the indications for different blood component transfusions, recognize various transfusion reactions including HDN, and learn advanced procedures such as apheresis and stem cell banking. Additionally, students will appreciate the importance of quality control and the regulatory roles of NACO, Indian Red Cross Society, and DGHS in ensuring safe transfusion practices.

Unit	**Total Hours**	**% of Questions**	**Bloom's Taxonomy**	**Remarks, if any**
THEORY				
U1	**10**	**20**	**1,2**	**NA**
U2	**10**	**20**	**1,2,3**	**NA**
U3	**5**	**20**	**1,2**	**NA**
U4	**10**	**20**	**1,2,3**	**NA**
U5	**10**	**20**	**1,2**	**NA**
	45	**100**		

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Course Code:	**BMLC501**	
Course:	**Immunohematology and Blood Banking**	**Credits: 3.0**
Contents		
Chapter	**Name of the Topic**	**Hours**
Unit-I	Principles of Blood Banking; Antigen, Antibody, naturally occurring antibody, Complement, ABO & Rh blood group system, Methods of blood group determination, Forward and Reverse grouping, Slide & Tube method, Gel method.	10
Unit-II	Other blood group system such as Lewis, MNS, Kell Duffy etc. Anticoagulants and preservative used in blood bank, Donor selection criteria, Blood collection and processing	10
Unit-III	Transfusion transmissible infectious disease screen, Coomb'test, Cross matching, Compatibility testing, Antibody Screening & Identification, Grading of Reaction/Agglutination	5
Unit-IV	Blood components and its preparation, preservation, storage and transportation Indications for different blood component transfusion, Blood transfusion reaction and its type, HDN Introduction of stem cell banking and bone marrow transplantation.	10
Unit-V	Apheresis, indications of hemapheresis, plasmapheresis, plateletspheresis, plasmapheresis Quality control of reagents, equipment's, blood components used in transfusion medicine. Role of NACO, Indian Red Cross Society and DGHS.	10
	Total:	45

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Course Code:BML591	**Course:** Immunohaematology and Blood Banking Lab
Credit: 2	**Practical**
1	Forward blood grouping (Tube and slide method)
2	Reverse blood grouping..
3	Rh typing.
4	Rh negative or Du conformation.
5	Direct and indirect Coomb's test.
6	Major Cross matching.
7	Minor cross matching.
8	Blood donor selection.
9	Demonstration of blood collection procedure. 10- Blood group screening by finger pricking. 11- Demonstration of blood component separation. 12- Demonstration of storage of blood component
10	Blood group screening by finger pricking.
11	Demonstration of blood component separation.
12	Demonstration of storage of blood component

List of Books

Sr. No.	**Name of Author**	**Title of the BOOK**	**Edition/Publication**
1	Godkar.B. Praful,(2016)	Textbook of MLT	3rd edition,Bhalani Publications
2	Ochei J & Kolhatkar A(2000)	Medical Laboratory Science: Theory & Practice	3rd edition,Mcgraw Hill Education
3	Mukherjee .L.K(2017)	Medical Laboratory Technology	Vol.1-3,3rd edition, Tata Mcgraw Hill
4	Sood Ramnik,(2015)	Text book of Medical Laboratory Technology	2nd edition, Jaypee Publications
5	Wintrobe's	Clinical Hematology,(2014)	13th edition, Lippincott Williams & Wilkins
6	R.N Makroo	Principle & practice of Transfusion Medicine	Kongposh Publications.

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Course: Clinical Pathology **Clinical Pathology Lab**	
Course Code: BMLC502+BMLC592	**Semester: V**
	Maximum Marks: 100+100
Teaching Scheme	**Examination Scheme**
Lecture: 3	End semester Exam: 70
Tutorial: 0	Attendance: 5
Practical: 2	Continuous Assessment: 25
Credit:5	Practical/Seasonal internal continuous evaluation: 40
	Practical/Seasonal external examination: 60

Sl No.	**Course Objective**
1	To understand the correct methods for collection and preservation of urine samples, including 24-hour collections, and to perform physical, chemical, and microscopic examinations for diagnostic purposes.
2	To learn techniques for proper collection, preservation, and examination of stool samples, including the identification of parasites, occult blood, and other pathological contents using both direct and concentration methods.
3	To gain knowledge of the various methods of sputum collection for detecting infections such as tuberculosis, fungal diseases, and malignancy, along with microscopic examination and AFB staining.
4	To acquire skills in semen collection and comprehensive examination including liquefaction time, sperm count, motility, morphology, biochemical markers, and detection of antisperm antibodies.
5	To understand the proper collection, transportation, and examination of cerebrospinal fluid (CSF), as well as ascitic, pleural, pericardial, and synovial fluids, with emphasis on physical, cellular, microbial, and biochemical evaluation for diagnosis of conditions like meningitis, encephalitis, and effusions.
6	To explore the different methods used for pregnancy detection, particularly the urinary hCG assay, and understand their clinical applications and limitations.

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	Course Outcomes	**Mapped module/Unit**
CO 1	Explain the principles and procedures for the collection, preservation, and physical, chemical, and microscopic examination of urine samples.	U1
CO 2	Perform and interpret stool examinations for parasitic infections, occult blood, and other pathological conditions using proper collection and diagnostic techniques.	U1,U2
CO 3	Demonstrate the collection and laboratory analysis of sputum for bacterial, fungal, tubercular, and malignant findings.	U1,U2,U3
CO 4	Conduct semen analysis including physical, chemical, and microscopic examination, sperm morphology, motility, and advanced diagnostic tests.	U1,U2,U3,U4
CO 5	Collect, transport, and analyze cerebrospinal fluid samples to diagnose meningitis, encephalitis, and other neurological conditions.	U4,U5
CO 6	Identify and interpret findings in serous fluids (ascitic, pleural, pericardial, and synovial) and perform pregnancy testing using various methods.	U5,U6

Learning Outcome/Skills:

By the end of this course, students will be able to properly collect, preserve, and examine various clinical specimens including urine, feces, sputum, semen, cerebrospinal fluid (CSF), and other body fluids such as ascitic, pleural, pericardial, and synovial fluids. They will gain practical skills in performing physical, chemical, and microscopic analyses to detect abnormalities, infections, and other pathological conditions. Students will understand diagnostic techniques for detecting ova, cysts, parasites, occult blood, and acid-fast bacilli, and will be proficient in semen analysis including sperm morphology, motility, and biochemical testing. Additionally, they will be able to interpret CSF findings for diagnosing neurological infections and perform various pregnancy detection methods using urine samples. This training prepares students for effective diagnostic work in clinical laboratories.

Unit	**Total Hours**	**% of Questions**	**Bloom's Taxonomy**	**Remarks, if any**
THEORY				
U1	**10**	**25**	**1**	**NA**
U2	**5**	**10**	**1, 2**	**NA**
U3	**5**	**10**	**1, 2, 3**	**NA**
U4	**10**	**25**	**1, 2, 3**	**NA**
U5	**10**	**20**	**1, 2, 3**	**NA**
U6	**5**	**10**	**1,2,3**	**NA**
	45	**100%**		

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Course Code:	**BMLC502**	
Course:	**Clinical Pathology**	**Credits: 3.0**
Contents		
Chapter	**Name of the Topic**	**Hours**
Unit-I	Urine: Collection of urine and its preservation, 24 hour urine collection for protein. Physical examination of urine – examination of urine for colors, cloudiness, specific gravity, reaction and ph. Chemical examination of urine.Microscopical examination of urine Urine sediment preparation, types of sediments and its examination.	10
Unit-II	Faeces: Collection and preservation, examination of motion for color, mucus, consistency, ova, ameba, cysts, parasites, puscells, RBC and crystals. Detection of occult blood in stool, concentration techniques	5
Unit-III	Sputum Method of collection for various purposes including AFB fugal, malignant cells and others. Microscopic examination of sputum, sputum for AFB.	5
Unit-IV	Semen: method of collection examination of semen for time for liquefaction, volume,colour,reaction pH, motility of spam, sperm count and other findings staining and morphological study of spermatozoa, semen fructose determination, Antisperm antibodies	10
Unit-V	General introduction method of CSF collection, Transport of CSF, examination of CSF,colour, turbidity and fibrin clot (Cob web), total and differential leukocyte count. CSF examination by gram's staing and acid fast staining, biochemical tests, clinical significance of CSF analysis in various meningitis and 7ncephalitis and interpretations	10
Unit-VI	Methods of collection, transport and macroscopic and microscopic examination of ascetic fluid, pleural fluid, pericardial fluid and synovial fluid. Pregnancy tests: Different methods of testing and chronic gonadotropin assay with urine	5
	Total:	45

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Course Code: BMLC592	**Course: Clinical Pathology Lab**
Credit: 2	**List of practical**
1	Leishman staining for malarial parasites
2	Saline wet mount for observing ova and eggs of parasites.
3	Iodine wet mount for observing ova and eggs of parasites.
4	Concentration of stool samples byfloatation method
5	Zinc sulphate conc. Method for stool sample
6	Urine-collection, processing, physical, chemical and microscopic examination
7	Collection, preservation and examination of stool
8	Sputum collection and microscopy. exmination of sputum for AFB.
9	Aldehyde Chopra test for Kala Azar
10	To perform HIV by ELISA
11	To perform Dengue IgG/IgM.

List of Books

Sl. No.	**Name of Author**	**Title of the Book**	**Edition & Publisher**
1	Harsh Mohan	Practical Pathology (5th Edition)	Jaypee Brothers Medical Publishers
2	Shirish M Kawthalkar	Essentials of Clinical Pathology (3rd Edition)	Jaypee Brothers Medical Publishers
3	Tapeshwar Yadav & Asheshwar Yadav	Essential Textbook of Clinical Pathology	Samiksha Publication Pvt. Ltd., Kathmandu, Nepal

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Semester VI

Course:Clinical Endocrinology and Toxicology **Clinical Endocrinology and Toxicology Lab**	
Course Code: BMLC601+BMLC691	**Semester: VI**
	Maximum Marks: 100+100
Teaching Scheme	**Examination Scheme**
Lecture: 3	End semester Exam: 70
Tutorial: 0	Attendance: 5
Practical: 2	Continuous Assessment: 25
Credit:5	Practical/Seasonal internal continuous evaluation: 40
	Practical/Seasonal external examination: 60

Sl. No.	**Course Objective**
1	After the exposure of the current paper students would be able to detect hormones and toxic substances in blood samples and also will be able to outline the basis of endocrine disorders.

	Course Outcomes	**Mapped module/Unit**
CO 1	Build the basic knowledge of endocrine system	U1
CO 2	Distinguish the different types of thyroid hormones and their measurement.	U1,U2
CO 3	Interpret the knowledge of infertility profile.	U1,U2,U3
CO 4	Make use the knowledge of growth hormones and its abnormality.	U3,U4
CO 5	Explain the drug abuse and their measurement.	U5

Learning Outcome/Skills:

The candidate will be in a position to understand the fundamentals of the history of Pathology, general features, the concepts of tissue and its respective characteristics. The importance of protein molecule in eliminating the various deficiencies, the role of minerals and vitamins to maintain a good health and a detailed overview of cancer, its features, possibility of cure, the various stages and the malignant texture of this deadly disease. All these will be extremely necessary and helpful for the candidate invest the best in the career chosen and by them.

Unit	Total Hours	% of Questions	Bloom's Taxonomy	Remarks, if any
THEORY				
U1	**5**	**10**	**1**	**NA**
U2	**10**	**25**	**1, 2**	**NA**
U3	**10**	**25**	**1, 2**	**NA**
U4	**10**	**20**	**1, 2, 3**	**NA**
U5	**10**	**20**	**1, 2, 3**	**NA**
	45	**100%**		

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Course Code:	**BMLC601**	
Course:	**Clinical Endocrinology and Toxicology**	**Credits: 3.0**
Chapter	**Name of the Topic**	**Hours**
Unit-I	Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion.	**5**
Unit-II	Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T3, T4, TSH, FT3, FT4, TBG, Disorder associated with thyroid dysfunction.	**10**
Unit-III	Infertility profile: LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone, DHEA-S, 17- Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test	**10**
Unit-IV	Growth hormone, ACTH, Aldosterone, Cortisol clinical significance, reference range, hypo and hyper secretion	**10**
Unit-V	Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Immunoassay for drugs.	**10**
	Total:	**45**

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Course Code: BMLC691	**Course: Clinical Endocrinology & Toxicology Lab**
Credit: 2	**List of practical**

1	To determine T3 conc. in serum sample.
2	To determine T4 conc. in serum sample.
3	To determine TSH conc. in serum sample.
4	To determine LH conc. in serum sample
5	To determine FSH conc. in serum sample.
6	To determine Prolactin conc. in serum sample
7	To determine TSH conc. in serum sample.
8	To perform TRIPLE test.
9	Demonstration of male and female infertility test.
10	Beta HCG

List of Books

Sr. No.	**Name of Author**	**Title of the BOOK**	**Publication**
1	Teitz,(2007	Fundamentals of Clinical Chemistry	6th edition,Elsevier Publications
2	Bishop(2013)	Clinical Chemistry	7th edition, WileyPublications
3	Henry's	Clinical Diagnosis and Management by Laboratory Methods,(2011)	22ndedition, Elsevier
4.	D M Vasudevan, (2011)	Text book of Medical Biochemistry	6th edition Jaypee Publishers
5.	M N Chatterjea & Rana Shinde,(2012)	Text book of Medical Biochemistry	8th edition,Jayppe Publications
6.	Singh & Sahni,(2008)	Introductory Practical Biochemistry	2nd edition, Alpha science

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Course: Diagnostic Molecular Biology **Diagnostic Molecular Biology Lab**	
Course Code: BMLC602+ BMLC692	**Semester: VI**
	Maximum Marks: 100+100
Teaching Scheme	**Examination Scheme**
Lecture: 3	End semester Exam: 70
Tutorial: 0	Attendance: 5
Practical: 2	Continuous Assessment: 25
Credit: 5	Practical/Seasonal internal continuous evaluation: 40
	Practical/Seasonal external examination: 60

Sl. No.	**Course Objective**
1.	Students will be able to adopt the rendered to take up future molecular biology challenges and efficiently work in diagnostic molecular setup.

	Course Outcomes	**Mapped module/Unit**
CO 1	Explain the knowledge of chromosome.	U1
CO 2	Able to examine the transcription apparatus	U2
CO 3	Organize the Nucleic acid amplification testing .	U3
CO 4	Apply the knowledge of blotting technique.	U4
CO 5	Illustrate the knowledge about Radioisotopes and its application.	U5
CO 6	Able to conduct different test related to PCR.	U1, U2, U3, U5

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Learning Outcome/Skills:

By the end of this course, students will gain a comprehensive understanding of the molecular biology of nucleic acids, including the structure, function, and replication of DNA and RNA. They will be able to explain transcription mechanisms, distinguish between different types of RNA, and understand the roles of polymerases. Students will also learn about nucleic acid amplification techniques such as PCR and its various forms, along with their diagnostic applications. The course equips students with knowledge of blotting techniques, chromosome structure and abnormalities, karyotyping, and FISH, particularly in the context of hematological disorders. Finally, students will understand the use of radioisotopes in blood analysis, radiation safety, and modern diagnostic tools like flow cytometry, stem cell banking, and prenatal diagnostics, preparing them for both clinical and research roles in molecular biology and diagnostics

Unit	Total Hours	% of Questions	Bloom's Taxonomy	Remarks, if any
THEORY				
U1	**15**	**30**	**1, 2**	**NA**
U2	**5**	**10**	**1, 2,**	**NA**
U3	**5**	**10**	**1, 2,3**	**NA**
U4	**10**	**25**	**1, 2,3**	**NA**
U5	**10**	**25**	**1, 2,3**	**NA**
	45	**100%**		

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Course Code:	**BMLC602**	
Course:	**Diagnostic Molecular Biology**	**Credits:3.0**
Chapter	**Name of the Topic**	**Hours**
Unit-I	Nucleic Acids, DNA, RNA, composition, structure, types, denaturation and renaturation of DNA, chemistry of DNA synthesis, general principles of replication, enzyme involved in DNA replication – DNA polymerases, DNA ligase, primase, telomerase and other accessory proteins.	**15**
Unit-II	Basic transcription apparatus, Initiation, elongation and termination of transcription, Eukaryotic Transcription of mRNA, tRNA and rRNA, types of RNA polymerases.	**5**
Unit-III	Nucleic acid amplification testing, PCR, Principle, Types, applications, Thermal cycler, RT PCR, reverse transcriptase PCR, Nested PCR	**5**
Unit-IV	Blotting techniques, southern blotting and Western blotting Introduction to chromosomes, its structure and disorder, Karyotyping, Chromosomal studies in hematological disorders (PBLC and Bone marrow), FISH	**10**
Unit-V	Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell life span, platelet life span, radiation hazards and its prevention disposal of radioactive material Introduction and applications of Flow cytometry, Stem cell banking, Prenatal Diagnosis.	**10**
	Total:	**45**

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Course Code: BMLC692	**Course: Diagnostic Molecular Biology Lab**
Credit: 2	**List of practical**

1	Isolation of DNA
2	Separation of DNA by Agarose gel electrophoresis
3	Demonstration of thermal cycler and PCR.
4	Demonstration of PCR HLA B-27
5	Demonstration of PCR HIV
6	Demonstration of PCR MTB
7	Demonstration of triple test

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List of Books

Sr. No.	Name of Author	Title of the BOOK	Publication
1	Teitz,(2007),	Fundamentals of Clinical Chemistry	6th edition,Elsevier Publications
2	Henry's	Clinical Diagnosis and Management by Laboratory Methods (2011)	22ndedition, Elsevier
3	Singh & Sahni (2008)	Introductory Practical Biochemistry	2nd edition, Alpha science
4	Lehninger, (2013)	Principles of Biochemistry	6th edition, W H Freeman.

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Course: Clinical Nutrition	
Course Code: BMLC603	**Semester: VI**
	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Lecture: 3	End semester Exam: 70
Tutorial: 1	Attendance: 5
Practical: 0	Continuous Assessment: 25
Credit: 4	Practical/Seasonal internal continuous evaluation: 0
	Practical/Seasonal external examination: 0

Sl. No.	**Course Objective**
1.	Gain in-depth knowledge of the types, functions, and dietary sources of macronutrients and micronutrients. Understand the concept of a balanced diet and its significance in maintaining health and preventing disease.
2.	Describe the biochemical pathways involved in digestion, absorption, and metabolism of carbohydrates, proteins, and fats. Identify the role of vitamins and minerals in metabolic functions and the effects of their deficiencies and toxicities.
3	Understand the role of diet in the prevention and management of various clinical conditions such as diabetes, cardiovascular diseases, renal disorders, gastrointestinal diseases, and obesity.
4.	Analyze the impact of malnutrition on community health and explore national nutrition programs in India. Learn the theoretical foundation of dietary assessment and planning in clinical settings. Appreciate the importance of nutrition education and counselling in patient care.

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	Course Outcomes	**Mapped module/Unit**
CO 1	**Describe** the fundamental concepts of nutrition, including types and functions of macro- and micronutrients, energy metabolism, and dietary guidelines.	U1,
CO 2	**Explain** the biochemical processes of digestion, absorption, and metabolism of nutrients, and relate these to common clinical and nutritional disorders.	U1,U2
CO 3	**Analyze** the nutritional requirements and appropriate dietary modifications in various clinical conditions such as diabetes, cardiovascular disease, renal disorders, and gastrointestinal diseases.	U2,U3
CO4	**Evaluate** the nutritional needs at different stages of the life cycle (infancy, adolescence, pregnancy, aging), and identify potential nutritional challenges and preventive strategies	U3,U4
CO5	**Discuss** the impact of malnutrition and overnutrition on public health and describe the theoretical basis of national nutrition programs and clinical dietary planning.	U4,U5
CO6	**Interpret** basic dietary assessment methods and nutritional counseling strategies used in public health and clinical nutrition practice.	U4,U5

Learning Outcome/Skills:

Upon successful completion of this course, students will have a thorough understanding of the fundamental principles of human nutrition, including the roles, sources, and functions of macronutrients and micronutrients, as well as energy metabolism and dietary requirements. They will be able to explain the physiological and biochemical processes involved in the digestion, absorption, and metabolism of nutrients, and relate these concepts to various nutritional deficiencies and imbalances observed in clinical practice. Students will develop the ability to analyze and apply dietary modifications for managing common diseases such as diabetes, cardiovascular disorders, renal disease, and gastrointestinal conditions. They will also gain insight into the changing nutritional needs across the human life cycle—from infancy and adolescence to adulthood and old age—and be able to identify appropriate dietary strategies for each stage. Furthermore, students will understand the broader role of nutrition in public health, evaluate the theoretical basis of national nutrition programs, and appreciate the importance of nutrition education and counseling in improving patient outcomes and promoting community health.

Unit	Total Hours	% of Questions	Bloom's Taxonomy	Remarks, if any
THEORY				
U1	**15**	**20**	**1,2**	**N/A**
U2	**15**	**20**	**1,2**	**N/A**
U3	**10**	**20**	**1,2,3**	**N/A**
U4	**10**	**20**	**1,2,3**	**N/A**
U5	**10**	**20**	**1,2,3**	**N/A**
	60	**100**		

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Course Code:	**BMLC603**	
Course:	**Clinical Nutrition**	**Credits:4**
Chapter	**Name of the Topic**	**Hours**
Unit-I	Introduction to Nutrition: Definition, scope, and importance in healthcare, Role of a nutritionist in clinical settings Macronutrients: Carbohydrates: types, functions, sources, dietary fiber,Proteins: essential amino acids, biological value, protein quality, Fats: types of fats, essential fatty acids, cholesterol, health implications Micronutrients: Vitamins: water-soluble (B-complex, C) and fat-soluble (A, D, E, K),Minerals: calcium, iron, iodine, zinc, sodium, potassium Energy Metabolism:BMR (Basal Metabolic Rate), physical activity level, total energy expenditure, Factors affecting energy requirements Balanced Diet: Food groups, food pyramids, My Plate model,RDA (Recommended Dietary Allowances) for different age groups	**15**
Unit-II	Digestive Physiology • Overview of digestion and absorption of carbohydrates, proteins, and fats Metabolism of Nutrients • Carbohydrate metabolism: glycolysis, glycogenolysis, gluconeogenesis • Lipid metabolism: β-oxidation, cholesterol synthesis • Protein metabolism: transamination, deamination, urea cycle Role of Vitamins and Minerals in Metabolism • Coenzymes and cofactors • Deficiency disorders and their metabolic implications Nutritional Deficiencies and Toxicities • Vitamin A, D, C, B12, iron, calcium, and iodine-related disorders Nutrient Interactions • Nutrient-nutrient and nutrient-drug interactions	**15**
Unit-III	Nutrition in Metabolic and Lifestyle Disorders • Diabetes Mellitus: carbohydrate control, glycaemic index • Cardiovascular diseases: cholesterol, fat intake, DASH diet • Obesity: energy balance, weight management approaches Renal and Hepatic Conditions • Renal diets: low sodium, potassium, protein • Liver diseases: protein modification, fat restriction Gastrointestinal Disorders • Peptic ulcers, inflammatory bowel disease, constipation, diarrhoea – dietary implications Special Diets in Clinical Practice • Clear, full liquid, soft diets • High-protein, low-fat, high-fibre diets Food-Drug Interactions • Impact of medications on nutrient absorption and metabolism	**10**

Unit-IV	Maternal Nutrition • Nutritional needs during pregnancy and lactation • Common deficiencies (iron, folic acid, calcium) Infant and Child Nutrition • Breastfeeding, weaning practices, growth stages • Childhood malnutrition: causes and prevention Adolescent Nutrition • Nutrient requirements during growth spurts • Eating disorders: anorexia nervosa, bulimia Adult and Elderly Nutrition • Age-related changes, dietary adjustments • Common deficiencies in elderly population Sports and Special Populations • Basics of sports nutrition • Nutrition for women (menstruation, menopause)	**10**
Unit-V	1. Malnutrition and Public Health Issues o PEM (Protein-Energy Malnutrition), obesity, anaemia o Determinants and consequences of malnutrition 2. National Nutrition Programs in India o Mid-Day Meal Scheme, ICDS, POSHAN Abhiyan, Anaemia Mukt Bharat 3. Dietary Assessment Methods (Theory) o 24-hour recall, food frequency questionnaire, diet history 4. Clinical Diet Planning (Conceptual) o Principles and steps in diet planning o Role of nutrition in hospital care and recovery 5. Nutrition Education and Counselling o Behaviour change models o Role of a clinical nutritionist in patient education	**10**
	Total:	**60**

List of Books

Sr. No.	Name of Author	Title of the BOOK	Publication
1	Mahtab S. Bamji, N. Pralhad Rao, Vinodini Reddy	Textbook of Human Nutrition	Oxford & IBH
2	F.P. Antia and Philip Abraham	Clinical Nutrition and Dietetics	Oxford University Press
3	Ashok Kumar J	Nutrition and Biochemistry for BSc Nursing and Allied Health Sciences	Jaypee Brothers
4	Davidson, Passmore, Brock, and Truswell	Human Nutrition and Dietetics	