

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
Syllabus of B. Sc. In Medical Lab Technology
(Effective for 2021-2022 Admission Session)
Choice Based Credit System
140 Credit (3-Year UG)

6th Semester

Subject Type	Course Name	Course Code	Credit Distribution			Credit Points	Mode of Delivery			Proposed MOOCs
			Theory	Practical	Tutorial		Offline	Online	Blended	
CC 13	Clinical Endocrinology & Toxicology	BML(T) 601	4	0	0	6				As per MAKAUT Notification
		BML691	0	2	0				✓	
CC 14	Diagnostic MolecularBiology	BML(T) 602	4	0	0	6				
		BML692	0	2	0				✓	
DSE 3(Any one)	Advanced Diagnostic Techniques	BML 603 (A)	4	0	0	6				
		BML 693 (A)	0	2	0				✓	
	Basic Laboratory Management	BML 603 (B)	4	0	0					
		BML 693 (B)	0	2	0					
DSE 4 (Any One)	Major Project	BML 681(B)	1	5	0	6				
	Internship	BML 681(B)	1	5	0				✓	
Semester Credits						24				

Note:

Major Project/Internship- (Students have to engage in a full length/capstone project with a pre-specified Internal Guide (faculty member) throughout the semester). Industry collaboration is highly encouraged in case of Internship.

(At least two-three times progress needs to be checked and evaluation needs to be done through PCA.) It will be followed by a report submission and viva as part of University examination.

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Paper: Clinical Endocrinology & Toxicology

Code: BML-601/691

Credits: 4L+2P.

Course objective- 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.

Sl	Course Outcome
1	Build the basic knowledge of endocrine system.
2	Distinguish the different types of thyroid hormones and their measurement.
3	Interpret the knowledge of infertility profile.
4	Make use the knowledge of growth hormones and its abnormality.
5	Explain the drug abuse and their measurement.
6	Able to plan and perform the measurement of different hormones.

THEORY- BML (T) 601

CO	Blooms Level	Module	%age of questions
CO1	1,2,3	M1	20
CO2	1,2,3	M2	20
CO3	1,2,3	M3	20
CO4	2,3,4	M4	20
CO5	2,3,4	M5	20
			100

PRACTICAL- BML 691

CO	Blooms Level	Module	%age of questions
CO6	2,3,4,5	M6	100

Module –I (10 hours)

Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion.

Module –II (10 hours)

Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T₃, T₄, TSH, FT₃, FT₄, TBG, Disorder associated with thyroid dysfunction.

Module-III (10 hours)

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

Module –IV (10 hours)

Growth hormone, ACTH, Aldosterone, Cortisol clinical significance, reference range, hypo and hyper secretion

Module –V (10 hours)

Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Immunoassay for drugs.

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Module VI- Practical Clinical Endocrinology & Toxicology (26 hours)

Code: BML-691

Credits : 2

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

Suggested readings:

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),22nd edition,Elsevier
4. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition JaypeePublishers
5. M N Chatterjea & Rana Shinde,(2012),Text book of MedicalBiochemistry,8th edition,Jayppe Publications
6. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
7. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman

Paper: Diagnostic Molecular Biology

Code: BML-602/692

Credits: 4L+2P.

Course objective: Students will be able to adapt to rendered to take up future molecular biology challenges and efficiently work in diagnostic molecular setup.

Sl	Course Outcome
1	Explain the knowledge of chromosome.
2	Able to examine the transcription apparatus.
3	Organise the Nucleic acid amplification testing .
4	Apply the knowledge of blotting technique.
5	Illustrate the knowledge about Radioisotopes and its application.
6	Able to conduct different test related to PCR.

THEORY- BML (T) 602

CO	Blooms Level	Module	%age of questions
CO1	1,2,3	M1	20
CO2	1,2,3	M2	20
CO3	1,2,3	M3	15
CO4	1,2,3	M4	20
CO5	1,2,3	M5	25
			100

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PRACTICAL- BML 692

CO	Blooms Level	Module	%age of questions
CO6	2,3,4	M6	100

Module-I (10 hours)

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.

Module- II (10 hours)

Basic transcription apparatus, Initiation, elongation and termination of transcription, Eukaryotic Transcription of mRNA, tRNA and rRNA, types of RNA polymerases.

Module –III (10 hours)

Nucleic acid amplification testing, PCR, Principle, Types, applications, Thermal cycler, RT PCR, reverse transcriptase PCR, Nested PCR

Module –IV (10 hours)

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

Module –V (10 hours)

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.

Module VI-Practical Diagnostic Molecular Biology- 26 hours

Code: BML-692

Contacts Hours / Week: 2PCredits : 2

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.

Suggested Readings:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications
2. Henry's Clinical Diagnosis and Management by Laboratory Methods (2011),22nd edition,Elsevier
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4. Lehninger, (2013),Principles of Biochemistry,6th edition, W H Freeman.

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DSE 3: Advanced Diagnostic Techniques

Code- BML 603(A)/693(A)

Credits : 4L+2P

COURSE OBJECTIVE.

To understand the basic concepts of Chromatography

To demonstrate Planning and Objectives of electrophoresis in clinical diagnosis.

To explain Immunoassay particularly ELISA, RIA, FIA, FACS and their applications in clinical diagnosis.

To examine the Radioisotopes, Radioactivity, instruments for radioactivity measurement.

To make use of Centrifugation.

Course Outcomes (CO):

Sl. No.	Course Outcome
1.	Ability to examine and apply the concepts and knowledge of the Chromatography.
2.	Ability to evaluate and apply the Planning and Objectives of electrophoresis in clinical diagnosis.
3.	Make use of Centrifugation, fixed angle and swinging bucket rotors, RCF and sedimentation coefficient.
4.	Experiment with the Radioisotopes, Radioactivity, instruments for radioactivity measurement.
5.	Discuss Immunoassay particularly ELISA, RIA, FIA, FACS and their applications in clinical diagnosis.

THEORY- BML 603 (A)

CO	Blooms Level	Module	%age of questions
CO1	1,2,3	M1	20
CO2	1,2,3	M2	20
CO3	1,2,3	M3	15
CO4	2,3,4	M4	20
CO5	2,3,4	M5	25
			100

PRACTICAL- BML 693 (A)

CO	Blooms Level	Module	%age of questions
CO6	2,3,4,5	M6	100

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Detailed Syllabus:

MODULE-I: (10 hrs) Chromatography, its principle, types and applications. Paper Chromatography, Thin layer chromatography, HPLC, Gas liquid chromatography, Ion exchange chromatography and their application in diagnosis.

MODULE-II(10 hrs): Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE, Agarose gel electrophoresis, buffer systems in electrophoresis. Electrophoresis of proteins and nucleic acids, haemoglobin, immunoglobulin's, isoenzymes Applications of electrophoresis in clinical diagnosis.

MODULE-III(10 hrs): Centrifugation, fixed angle and swinging bucket rotors, RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and Ultracentrifugation

MODULE-IV(10 hrs): Radioisotopes, Radioactivity, instruments for radioactivity measurement, applications of radioisotopes in clinical biochemistry

MODULE V(10 hrs): Immunoassay: ELISA, RIA, FIA, FACS and their applications in clinical diagnosis.

Module VI-Practical Advanced Diagnostic Technique

Credits : 2(26 hrs)

1. To perform separation of amino acids by paper chromatography
2. To perform separation of amino acids by thin layer chromatography
3. To perform separation of DNA by Agarose gel electrophoresis.
4. Separation of protein by PAGE
5. Separation of protein by paper electrophoresis
6. Separation of haemoglobin

Suggested Readings:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications
2. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. Wilson & Walker, Practical Biochemistry,2nd edition

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DSE 3-Principles of Laboratory Management & Medical Ethics
BML-603(B)/ 693(B)
Credits : 4L+2P.

Objective:

To demonstrate the patient management system by good laboratory practice, quality control and accreditation

Course Outcomes (CO):

Sl. No.	Course Outcome
1.	Apply the concepts and knowledge of the Good Laboratory Practice
2.	Able to manage the patient's clinical samples collection.
3.	Ability to evaluate the Sample analysis.
4.	Explain the overview of Quality Management system.
5.	Organise Audit in a Medical Laboratory, Outline the Importance, Assess the NABL & CAP, Responsibilities.
6.	Make use of the knowledge about the laboratory work flow .

THEORY- BML 604(B)

CO	Blooms Level	Module	%age of questions
CO1	1,2,3	M1	25
CO2	1,2,3	M2	20
CO3	1,2,3	M3	20
CO4	2,3,4	M4	20
CO5	2,3,4	M5	15
			100

PRACTICAL- BML 694(B)

CO	Blooms Level	Module	%age of questions
CO6	2,3,4,5	M6	100

Detailed Syllabus:

MODULE I (10 hrs)- Principles and standards for a clinical laboratory professional and their role to the patient, colleagues and other professionals. Introduction to Basics of GLP and Accreditation. Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation

MODULE-II (10 hrs): General safety rule in laboratory. Pre- and post-exposure guidelines for HIV, Hepatitis B & C:. Patient management for clinical samples collection, transportation and preservation, Sample accountability, Purpose of accountability.

MODULE-III (10 hrs): Sample analysis: Introduction, factors affecting sample analysis, reporting results, basic format of a test report, reported reference range, clinical alerts, abnormal results, results from referral laboratories, release of examination results, alteration in reports

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MODULE-IV (10 hrs): Introduction to Quality assurance, Quality control system, Internal and External quality control and quality control chart. Importance of calibration and Validation of Clinical Laboratory instrument, Ethics in Medical laboratory Practice, reporting of results, preserving medical records Procurement of equipment and reagents.

MODULE V (10 hrs): Audit in a Medical Laboratory, Introduction and Importance, NABL & CAP, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation

Module VI-BML 693 (B) (26 hrs)

- 1- Estimation of blood glucose level and compare with QC sample.
- 2- Comparison of value of the unknown sample with QC data.
- 3- Preparation of LJ chart.
- 4- Preparation of work flow of a large category of laboratory from sample collection to report delivery.

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1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications
2. Bishop (2013), Clinical Chemistry,7th edition, Wiley Publications
3. Henry's Clinical Diagnosis and Management by Laboratory Methods, (2011),22nd edition, Elsevier