Master of Science in Medical Laboratory Techniques : Biochemistry (M.Sc. MLT) - Biochemistry

Second Semester

Era University, Lucknow

Department of Medical Laboratory Techniques
Course Outline: Master of Science in Medical Laboratory Techniques : Biochemistry
(M.Sc. MLT) - Biochemistry

Curriculum Outline

Second Semester

Course Code	Course Title	Hours			Marks		Total Marks	Credits
		L	T	P	Internal	External		
MLT- B 201	Principles of Biochemistry	4	1	_	30	70	100	5
MLT- B 202	Enzymes and Metabolism-Il	4	1	_	30	70	100	5
MLT- B 203	Vitamin, Hormones, General Physiology & Nutrition	4	_	_	30	70	100	4
MLT- B 204	Molecular Biology and Bioinformatics	4	_	_	30	70	100	4
MLP- B 201	Principles of Biochemistry (Practical)	_	_	5	30	70	100	3
MLP- B 202	Enzymes & Metabolism Il (Practical)	_	_	5	30	70	100	3
MLP- B 203	Vitamins, Hormones, General Physiology & Nutrition Practical	_	_	2	30	70	100	1
MLP- B 204	Molecular Biology and Bioinformatics (Practical)	_	_	_	30	70	100	1
Total		16	2	14	240	560	800	26
Total Hours in Semester		512						

NOTE:

1. Abbreviations: L - Lecture, T - Tutorials and P -Practical
2. Teaching resources should be made available at every institute for all basic subjects
3. Considering four months per semester as working months, total contact hour hours per semester shall be 512 (Five hundred and twelve)

Era University, Lucknow

Department of Medical Laboratory Techniques

Course Outline: Master of Science in Medical Laboratory Techniques : Biochemistry

Effective From: 2024-2025

Name of the Program	**Master of Science in Medical Laboratory Techniques : Biochemistry**			**Year/ Semester:**	**1ST /2nd semester**
Course Name	**Principles of Biochemistry**	**Course Code:**	**MLT-B-201**	**Type:**	**THEORY**
Credits	**L:4 T:1 P:0**			**Total Sessions Hours:**	**75**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	This course will provide knowledge of Principles of biochemistry based techniques, Electrophoresis, spectrophotometry, Radioisotopes, Fluorimeter, Reflectance Photometry.				

Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*

Course Outcome (CO)	To learn about the techniques used in protein purification ELISA, Application of isotopes in clinical biochemistry, Fluoresecence and applications of Flame photometry		
CO1	To learn about the Electrophoresis.		
CO2	To learn about the Spectrophotometry		
CO3	To learn about the Radio isotopes		
CO4	To learn about the Fluorimeter		
CO5	To learn about the Reflectance Photometry		
Pedagogy	Classroom teaching, PPT, Videos, Seminar, Whiteboard, Assessments		
Internal Evaluation Mode	Continuous internal assessment and written exam		
Session Details	**Topic**	**Hours**	**MappedCO**
Unit 1	**Electrophoresis: -Definition, General Methodology** Factors affecting migration of charged particles Proteins separation by gel Electrophoresis, Isoelectric Focusing. Protein purification and Evaluation — total protein, total activity , specific activity , yield , purification level ,Blot Techniques- Southern & Northern Techniques Ultracentrifugation , valuable for separating Biomolecules and Determining their masses	20	CO1
Unit 2	Spectrophotometry:- Protein Mass Determination by Mass Spectrometry, Protein Purification, Immunological techniques For Protein Investigation , Antibodies to Specific Proteins , Enzyme Linked Immune sorbent assay	20	CO2
Unit 3	Radio Isotopes: Detection and measurement of radioactive isotopes, application of isotopes in research and clinical bio-chemistry, Radioactive emissions, radiation-matter interaction, radiation dose.	15	CO3
Unit 4	**Fluorimeter:** Principles, Factors Affecting Fluorescence Fluorescent Markers — Visualiz	10	CO4

Unit 5	Reflectance Photometry Introduction & Applications Flame Photometry, immunochemical Techniques	10	CO5

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	1	-	-	1	3		2	2	1	2	2	2
CO2	1	1	1	-	-	1	3		2	2	1	2	2	2
CO3	1	1	1	-	-	1	3		2	2	1	2	2	2
CO4	1	1	1	-	-	1	3		2	2	1	2	2	2
CO5	1	1	1	-	-	1	3		2	2	1	2	2	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books

1. Principles and Techniques of Biochemistry and Molecular Biology by Wilson/Walker
2. Basic Techniques in Biochemistry and Molecular Biology by Ahmad Sarafaraz
3. Analytical Techniques in Biochemistry and Molecular Biology by by RajanKatoch
4. Basic Techniques in Biochemistry, Microbiology and Molecular Biology byAakanchha Jain
5. Total quality management by Dough Hutchinson

Para Text

Unit 1: Electrophoresis:
Unit 2: Spectrophotometry
Unit 3: Radio Isotopes:
Unit4: Fluorimeter:
Unit 5: Reflectance Photometry

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01
Class Test	6	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Online Test/ Objective Test	4	MCQ: 4
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	**30**	

Era University, Lucknow

Department of Medical Laboratory Techniques

Course Outline: Master of Science in Medical Laboratory Techniques : Biochemistry

Effective From: 2024-2025

Name of the Program	**Master of Science in Medical Laboratory techniques**			**Year/ Semester:**	**1st/2nd sem**
Course Name	**Enzyme & Metabolism**	**Course Code:**	**MLT-B-202**	**Type:**	**THEORY**
Credits	L:4 T:1 P:0			**Total Sessions Hours:**	**75**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	This course will provide knowledge of Metabolic interrelationship, Electron Transport and Oxydative phosphorylation, Glycogen storage disease and Galactosuria, Intrinsic disorders of red cells, Haemoglobin and Porphyrins Sphingolipidase, Gout and Genetic defects in Urate Metabolism				
Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome(CO)	To learn about the Metabolic interrelationship between adipose tissue, liver, & extra hepatic tissues Electron Transport & Oxidative phosphorylation, Different types of disease and the defects in Urate Metabolism				
CO1	To learn about the Metabolic interrelationship between adipose tissue				
CO2	To learn about the components of electron transport & oxidative phosphorylation				
CO3	To learn about the Glycogen storage diseases & Galactosuria				
CO4	To learn about the Intrinsic disorders of red cells, Haemoglobin and Porphyrins Sphingolipidase				
CO5	To learn about the Gout and Genetic defects in Urate Metabolism, X-ray linked disorders				
Pedagogy	Classroom teaching, PPT, Videos, Seminar, Whiteboard, Assessments				
Internal EvaluationMode	Continuous internal assessment and written exam				
Session Details	**Topic**			**Hours**	**Mapped CO**
Unit 1	**Interrelationship in Metabolism** Metabolic interrelationship between adipose tissue, liver & extra hepatic tissues, Clinical Importance, Key Junction Glucose — 6 — Phosphate, Pyruvate & Acetyl-Co-A, Unique metabolic profile of various organs			15	CO1
Unit 2	**Electron Transport & Oxidative Phosphorylation** Components of Electron Transport Chain, Respiratory Chain Energy Coupling hypothesis, Proton- Gradient generation, Mechanism of ATP synthesis, Uncoupling of Oxidative Phosphorylation				

Unit 3	**Glycogen Storage Diseases & Galactosuria:** Introduction, Different types of Diseases, Pompe's Disease, Cori's Disease, McArdle's Disease, Andersen's Disease, Hers' Disease Taruis Disease ,Galactosuria	15	CO3
Unit 4	**Intrinsic Disorders of Red Cells, Haemoglobin and Porphyrins Sphingolipidases:** A) Disorders of Red Cells, HaemolyticAnemia, Sickle Cell Anemia, Thalassaemia B) Disorders of Hemoglobin, Haemogloblnuria, Other Haemoglobinuriapathies C) Disorders of Porphyrins, Introduction, Porphyria: Definition and types, Acute Intermittent Porphyria	20	CO4
Unit 5	**Gout & Genetic Defects in Urate Metabolism:** Introduction, Types of Gout,Primary,Secondary Treatment , X-Linked Disorder	10	CO5

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO6
CO1	2	1	3	-	-	3	2	1	2	3	-	2	2	2
CO2	2	1	3	-	-	3	2	1	2	3	-	2	2	2
CO3	2	1	3	-	-	3	2	1	2	3	-	2	2	2
CO4	2	1	3	-	-	3	2	1	2	3	-	2	2	2
CO5	2	1	3	-	-	3	2	1	2	3	-	2	2	2

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	1. Kuby Inmmology 8Ed (Pb 2019) by PUNT J, 2. FREEMAN 3. Cellular and Molecular Immunology by Abbas 4. Clinical Immunology & Serology: A Laboratory Perspective by Linda E. Miller
Para Text	**Unit 1**: Interrelationship in Metabolism **Unit 2**: Electron Transport & Oxidative Phosphorylation **Unit 3**: Glycogen Storage Diseases & Galactosuria: **Unit4**: Intrinsic Disorders of Red Cells, Haemoglobin and Porphyrins Sphingolipidases: **Unit 5**: Gout & Genetic Defects in Urate Metabolism:

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01
Class Test	6	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Online Test/ Objective Test	4	MCQ: 4
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	**30**	

Era University, Lucknow

Department of Medical Laboratory Techniques

Course Outline: Master of Science in Medical Laboratory Techniques : Biochemistry

Effective From: 2024-2025

Name of theProgram	**Master of Science in Medical Laboratory Techniques : Biochemistry**			**Year/ Semester:**	**1st /2nd**
CourseName	**Vitamins, Hormones, General Physiology & Nutrition**	**Course Code:**	**MLT-B-203**	**Type:**	**THEORY**
Credits	**L:4 T:0 P:0**			**Total Sessions Hours:**	**60**
EvaluationSpread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type ofCourse	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	This course will provide knowledge of Chemistry and Function of Vitamin and Hormones, Respiration and Muscle contraction, Nutrition in Health and Disease, Minerals and their role in Nutrition, Classification of Hormones and the detoxification pathways of metabolism.				

Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*

Course Outcome (CO)	To learn about the structure and functions of Vitamins and Hormones and the role of minerals in the nutrition.
CO1	To learn about the Chemistry and Function of Vitamin and Hormones
CO2	To learn about the Respiration and Muscle contraction,
CO3	To learn about the Nutrition in Health and Disease,
CO4	To learn about the Minerals, source, function and their role in Nutrition
CO5	To learn about the Classification of Hormones and the detoxification pathways of metabolism.
Pedagogy	Classroom teaching, PPT, Videos, Seminar, Whiteboard, Assessments
Internal Evaluation Mode	Continuous internal assessment and written exam

SessionDetails	**Topic**	**Hours**	**Mapped CO**
Unit 1	**Chemistry and functions of Vitamins and Hormones.** Digestion and Absorption of food. Digestion of Carbohydrates, Proteins, Lipids, Nucleic Acid. Absorption of Monosaccharide, amino acid, dipeptide and tripe tides, electrolyte Vitamins and Water.	15	CO1
Unit 2	**Respiration,** Lung volume and capacities, Internal and extremely respiration, Transport of oxygen and carbon dioxide **Muscle contraction** , Sliding filament contractions , The contraction c le , Excitation-contraction coupling	15	CO2
Unit 3	**Nutrition in Health and Disease:** Balanced Diet Regulations of food intake and energy storage. Disorder of nutrition-Malnutrition, malabsorption, obesity, starvation, deficiency diseases,	10	CO3
Unit 4	**Minerals & Their Role in Nutrition:** Common mineral salts — Source, function and importance, Trace mineral salts - Source, function and importance	10	CO4
Unit 5	**Hormones:** Classification and their mode of action. Detoxification: Pathways of metabolism. Drug Biotransformation.	10	CO5

CO-PO and PSO Mapping														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO 1**	**PSO 2**	**PSO3**	**PSO 4**	**PSO 5**	**PSO6**
CO1	1	2	-	3	1	-	1	2	-	3	3	3	3	3
CO2	1	2	-	3	1	-	1	2	-	3	3	3	3	3
CO3	1	2	-	3	1	-	1	2	-	3	3	3	3	3
CO4	1	2	-	3	1	-	1	2	-	3	3	3	3	3
CO5	1	2	-	3	1	-	1	2	-	3	3	3	3	3

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books	1. Kuby Inmmology 8Ed (Pb 2019) by PUNT J,FREEMAN 2. Cellular and Molecular Immunology by Abbas 3. Clinical Immunology & Serology: A Laboratory Perspective by Linda E. Miller
Para Text	**Unit 1: Interrelationship in Metabolism** **Unit 2: Electron Transport & Oxidative Phosphorylation** **Unit 3: Glycogen Storage Diseases & Galactosuria** **Unit4: Intrinsic Disorders of Red Cells, Haemoglobin and Porphyrins Sphingolipidases** **Unit 5: Gout & Genetic Defects in Urate Metabolism:**

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	**Marks**	**Pattern**
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01
Class Test	6	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Online Test/ Objective Test	4	MCQ: 4
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	**30**	

Era University, Lucknow

Department of Medical Laboratory Techniques

Course Outline: Master of Science in Medical Laboratory Techniques : Biochemistry

Effective From: 2024-2025

Name of theProgram	**Master of Science in Medical Laboratory Techniques : Biochemistry**			**Year/ Semester:**	**1st/2nd**
CourseName	**Molecular Biology And Bioinformatics**	**Course Code:**	**MLT-B-204**	**Type:**	**THEORY**
Credits	**L:4 T:0 P:0**			**Total Sessions Hours:**	**60**
EvaluationSpread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type ofCourse	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	This course will provide knowledge of Molecules structure, characteristics, techniques, the role of genetics in medicine and the Bioinformatics data processing by GenBank, EMBL, DDBJ, Uniprot and Protein Data Bank				

Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*

Course Outcome (CO)	To learn about the Nucleic acids -structure and their types, transcription and translation, role of genetics in medicine.
CO1	To learn about the Molecules structure, characteristics, techniques
CO2	To learn about the Transcription and Translation
CO3	To learn about the Recombinant DNA technology,
CO4	To learn about the Genetics used in Medicine
CO5	To learn about the tools and Techniques used in Bioinformatics databases.
Pedagogy	Classroom teaching, PPT, Videos, Seminar, Whiteboard, Assessments
Internal Evaluation Mode	Continuous internal assessment and written exam

SessionDetails	**Topic**	**Hours**	**Mapped CO**
Unit 1	**Nucleic acids: Nucleotides, Nucleosides, Nitrogen bases** DNA — structure, types, coiling and supercoiling, topoisomerases, replication, Satellite DNA. Organization of prokaryotic and eukaryotic genome, Chromosomes-structure, number, sex chromosomes, human karyotype, methods for chromosome analysis — chromosome banding, FISH, CGH, flow, cytometer , cell cycle, mitosis and meiosis.	10	CO1
Unit 2	**Transcription and Translation:** Factors involved, RNA processing, types of RNA, genetic code, regulation in eukaryotes and gene amplification Mutation: spontaneous, induced,	15	CO2
Unit 3	**Recombinant DNA Technology:** necessary elements — enzymes and their properties, DNA ligase, DNA ligase, DNA modifying enzymes, cloning vectors plasmids	15	CO3
Unit 4	**Genetics in Medicine:** Haemoglobin and haemoglobinopathies, phenylketonuria, alkaptonuria, homocystinuria, Lesch-Nyhan syndrome, genetics of cancer, Down's syndrome, Di- George sydrome, Klinefelter's	15	CO4

Unit 5	**Bioinformatics databases -** Nucleotide sequence databases, Primary nucleotide sequence databases-EMBL, GeneBank, DDBJ; Secondary nucleotide sequence databases; Protein databases- UniProt, Protein Data Bank.	20	CO5

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO4	PSO 5	PSO6
CO1	1	1	2	-	-	1	2	1	3	3	3	3	3	3
CO2	1	1	2	-	-	1	2	1	3	3	3	3	3	3
CO3	1	2	2	-	-	1	2	1	3	3	3	3	3	3
CO4	1	2	2	-	-	1	2	1	3	3	3	3	3	3
CO5	2	2	3	-	-	1	2	1	3	3	3	3	3	3

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Text- Books

1. Fowler, F,J. Survey Research Methods. New Delhi, Sage, 1993
2. Goode, W.J and Hatt, P.K. Methods in Social Science Research. New Delhi, McGraw Hill, 1986
3. Leddy, Pauli D Practical Research: Planning Design, London, Clive Bin le . 1980

Para Text

Unit 1: Nucleic acids: Nucleotides, Nucleosides, Nitrogen bases
Unit 2: Transcription and Translation
Unit 3: Recombinant DNA Technology
Unit4: Genetics in Medicine:
Unit 5: Bioinformatics databases

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01
Class Test	6	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Online Test/ Objective Test	4	MCQ: 4
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	**30**	

Era University, Lucknow

Department of Medical Laboratory Techniques

Course Outline: Master of Science in Medical Laboratory Techniques : Biochemistry

Effective From: 2024-2025

Name of the Program	**Masters of Science in Medical Laboratory techniques**			**Year/ Semester:**	**1st Year /II Semester**
Course Name	**PRINCIPLES OF BIOCHEMISTRY**	**CourseCode:**	**MLP-B -201**	**Type:**	**Practical**
Credits	**L-0,T-0,P-4.**			**Total Sessions Hours:**	**30**
Evaluation Spread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill

Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*

CO1	This course makes the student to learn about the cleaning of laboratory glassware
CO2	This course makes the student to learn about the preparation of distilled water
CO3	This course makes the student to learn about principle and working of pH meter
CO4	This course makes the student to learn about the preparation of molar solution
CO5	This course makes the student to learn about the osmosis and dialysis
Pedagogy	Hands-on experiment, demonstration
Internal Evaluation Mode	Continuous internal assessment

SessionDetails	**Topic**	**MappedCO**
Unit 1	Chromatography: paper, thin layer, gel, ion-exchange, demonstration of HPLC and GLC Photometry ,spectrophotometry Electrophoresis: slide gel, PAGE, Agarose gel, Native, SDS PAGE of Blood Sam le- Cell fractionation — methods Estimation of Inorganic phosphorous Estimation of Serum Calcium Estimation of Sodium Estimation of Potassium Estimation of Hemoglobin Identification of Sugars in fruit juices by using Thin layer Chromatogphy Interpretation and correlation of various biochemical parameters with different clinical conditions.	CO1

CO-PO and PSO Mapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO 1**	**PSO 2**	**PSO3**	**PSO 4**	**PSO 5**	**PS O6**
CO1	2	3	1	3	3	2	-	-	-	1	-	3	1	-

Strong contribution-3, Average contribution-2 , Low contribution-1,

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	**Marks**
Mid Semester	12
Internal continuous assessment	18
Total Marks	**30**

Era University, Lucknow

Department of Medical Laboratory Techniques

Course Outline: Master of Science in Medical Laboratory Techniques : Biochemistry

Effective From: 2024-2025

Name of the Program	**Master of Science in Medical Laboratory Techniques : Biochemistry**			**Year/ Semester:**	**1st/IInd sem**
CourseName	**Enzyme & Metabolism-II**	**Course Code:**	**MLP-B-202**	**Type:**	**Practical**
Credits	**L:0 T:0 P:5**			**Total Sessions Hours:**	**45**
EvaluationSpread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type ofCourse	○ Compulsory	◉ Core		○ Creative	○ Life Skill

Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*

Course Outcome(CO)	Students will know about knowledge of clinical aspects of different types of enzymes
CO1	To perform estimation and determination of the enzymes like ALT, ALP, Amylase, HDL-Cholestrol etc.

SessionDetails	**Topic**	**MappedCO**
Unit 1	To determine total serum iron To determine total protein bound iron To determine total serum folic acid To determine G-6-PD To perform Hb Electrophoresis To determine serum uric acid To determine RA factor To determine serum lipid profile	CO1

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO6
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Strong contribution-3, Average contribution-2 , Low contribution-1,

Suggested Readings:

Recapitulation & Examination Pattern

Internal Continuous Assessment:	
Component	**Marks**
Mid Semester	12
Internal continuous assessment	18
Total Marks	**30**

Era University, Lucknow

Department of Medical Laboratory Techniques

Course Outline: Master of Science in Medical Laboratory Techniques : Biochemistry

Effective From: 2024-2025

Name of theProgram	**Masters of Science in Medical Laboratory techniques**			**Year/ Semester:**	**1st Year /II Semester**
CourseName	**VITAMINS, HORMONES, GENERAL PHYSIOLOGY AND NUTRITION (PRACTICAL)**	**CourseCode:**	**MLT-B 203**	**Type:**	**Practical**
Credits	**L-0,T-0,P-4.**			**Total Sessions Hours:**	**30**
EvaluationSpread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type ofCourse	○ Compulsory	◉ Core		○ Creative	○ Life Skill

Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*

CO1	This course makes the student to learn about the cleaning of laboratory glassware
CO2	This course makes the student to learn about the preparation of distilled water
CO3	This course makes the student to learn about principle and working of pH meter
CO4	This course makes the student to learn about the preparation of molar solution
CO5	This course makes the student to learn about the osmosis and dialysis
Pedagogy	Hands-on experiment, demonstration
Internal Evaluation Mode	Continuous internal assessment

SessionDetails	**Topic**	**MappedCO**
Unit 1	Determination of bicarbonate Estimation of total and differential proteins Estimation of Electrophoresis Estimation of hormones To determine Vitamin D3 To determine Vitamin B12 To determine serum Calcium	

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	1	3	3	2	-	-	-	1	-	3	1	-
CO2	2	3	1	2	3	2	-	-	-	1	-	3	1	-
CO3	2	3	1	3	3	2	-	-	-	1	-	3	1	-
CO4	2	3	2	3	2	2	-	-	-	1	-	3	1	-
CO5	2	3	1	2	3	2	-	-	-	1	-	2	1	-

Strong contribution-3, Average contribution-2 , Low contribution-1,

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	Marks	Pattern
Mid Semester	12	MCQ: 4 Short Answer Type Questions: 02 Long Answer Type Question: 01
Class Test	6	MCQ: 02 Short Answer Type Questions: 01 Long Answer Type Question: 01
Online Test/ Objective Test	4	MCQ: 4
Assignment/ Presentation	4	Hard copy/Softcopy
Attendance	4	
Total Marks	**30**	

Era University, Lucknow

Department of Medical Laboratory Techniques

Course Outline: Master of Science in Medical Laboratory Techniques : Biochemistry

Effective From: 2024-2025

Name of theProgram	**Masters of Science in Medical Laboratory techniques**			**Year/ Semester:**	**1st Year /II Semester**
CourseName	**MOLECULAR BIOLOGY AND BIOINFOMATICS(PRACTICAL)(PRACTICAL)**	**CourseCode:**	**MLP-B-204**	**Type:**	**Practical**
Credits	**L-0,T-0,P-4.**			**Total Sessions Hours:**	**30**
EvaluationSpread	**Internal Continuous Assessment:**	**30**		**End Term Exam:**	**70**
Type ofCourse	○ Compulsory	◉ Core		○ Creative	○ Life Skill

Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*

CO1	This course makes the student to learn about the cleaning of laboratory glassware
CO2	This course makes the student to learn about the preparation of distilled water
CO3	This course makes the student to learn about principle and working of pH meter
CO4	This course makes the student to learn about the preparation of molar solution
CO5	This course makes the student to learn about the osmosis and dialysis
Pedagogy	Hands-on experiment, demonstration
Internal Evaluation Mode	Continuous internal assessment

SessionDetails	**Topic**	**MappedCO**
Unit 1	Isolation of DNA Separation of DNA b A arose gel electrophoresis To perform of PCR. HIV test by Western Blotting To perform karyotyping To perform of PCR mycobacterium pathogen To perform PCR HIV Separation of Nucleic acid	

CO-PO and PSO Mapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	2	3	1	3	3	2	-	-	-	1	-	3	1	-
CO2	2	3	1	2	3	2	-	-	-	1	-	3	1	-
CO3	2	3	1	3	3	2	-	-	-	1	-	3	1	-
CO4	2	3	2	3	2	2	-	-	-	1	-	3	1	-
CO5	2	3	1	2	3	2	-	-	-	1	-	2	1	-

Strong contribution-3, Average contribution-2 , Low contribution-1,

Recapitulation & Examination Pattern

Internal Continuous Assessment:	
Component	**Marks**
Mid Semester	12
Internal continuous assessment	18
Total Marks	**30**