VIDYASAGAR UNIVERSITY

Midnapore, West Bengal

PROPOSED CURRICULUM & SYLLABUS (DRAFT) OF

BACHELOR OF MEDICAL LABORATORY TECHNOLOGY -BMLT (HONOURS)

DRAFT

4-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)

Based on

Curriculum & Credit Framework for Undergraduate Programmes (CCFUP), 2023& NEP, 2020

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VIDYASAGAR UNIVERSITY
BACHELOR OF MEDICAL LABORATORY TECHNOLOGY -BMLT (HONOURS)
(under CCFUP, 2023)

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
								CA	ESE	TOTAL
BMLT (Hons.)	4th	VII	SEMESTER-VII							
			Major-14	BMLTHMJ14	T: Immuno-pathological techniques; P: Practical	4	3-0-1	15	60	75
			Major-15	BMLTHMJ15	T: Medical Biotechnology; P: Practical	4	3-0-1	15	60	75
			Major-16	BMLTHMJ16	T: Clinical Research and Ethics; ; P: Practical	4	3-0-1	15	60	75
			Major Elective-03	BMTHDSE03	Genetics and Health/ Basic Emergency care and First aid.	4	3-0-1	15	60	75
			Minor-07	BMLTMIN07	T: Laboratory Management; P: Practical	4	3-0-1	15	60	75
			Minor-08	BMLTMIN08	T: Human Resource management; P: Practical	4	3-0-1	15	60	75
			Semester-VII Total			24				450
		VIII	SEMESTER-VIII							
			Internship/ Apprentice	BMLTIA02	P: Apprenticeship (6 Months)	16	0-0-16	-	-	300
			Semester-VIII Total			16				300
			YEAR-4			40				750
			To be awarded *Bachelor of Medical Technology-BMLT (Honours)*			166	Marks (Year: I+II+III+IV)			3075

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SEMESTER-VII

MAJOR (MJ)

MJ-14: Immuno-pathological techniques **Credits 04 (FM: 75)**

Course Objective:

- To understand the students to the disease related with immune system failure and learn diagnostic methodologies.
- To demonstrate the knowledge of basic aspects of the immune system organization, as well as to understand the diseases resulting from its malfunction.
- To demonstrate theoretical and practical knowledge of the experimental methodology used in immunology.

Course outcome: The students will understand the diseases resulting from its malfunction and its detection through theoretical and practical knowledge of the experimental methodology used in immunopathology.

MJ-14T: Immuno-pathological techniques (Theory) **Credits 03**

Course content:

1. Immune cell separation, analysis, selection of immune cells by Density gradient centrifugation (DGC), Fluorescence-Activated Cell Sorting (FACS)
2. Inflammatory responses: Cell adhesion molecules-types and Neutrophil extravasation.
3. Techniques and principles of histocompatibility testing – mixed lymphocyte reactions (MLR), GVH Reaction, HLA typing.
4. Hypersensitivity- Systemic and localized anaphylaxis- asthmatic attack, atopic dermatitis, food allergies. Drug-induced hypersensitivity reactions, Allergen test: Skin Prick Test, allergy panel test, Blood Test (IgE), Patch Test.
5. Immune tolerance - Organ specific and systemic autoimmune diseases/disorder (basic concept) – thyroiditis, autoimmune haemolytic anemia, Goodpasture's syndrome, IDDM, Graves' Disease, myasthenia gravis.
6. Detection of some autoimmune disorders: Antinuclear Antibodies (ANA), Inflammation Markers, Autoantibody Panels Rheumatoid Factor (RF) and anti-cyclic citrullinated peptide (CCP), Anti-dsDNA and Anti-Smith for SLE, Anti-TPO, Extractable Nuclear Antigen (ENA) Panel.

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MJ-14P: Immunopathology (Practical) **Credits 01**

Practical contents:

1. Immune cell separation and identification.
2. Haemagglutination test.
3. Allergy test: Skin Prick Test, Patch Test, DTH reaction.

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4. Complement fixation test.
5. Quantification of cytokines by ELISA.
6. Autoimmune disease detection: Antinuclear Antibodies (ANA), Rheumatoid Factor, Anti-dsDNA

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MJ-15: Medical Biotechnology **Credits 04(FM: 75)**

Course Objective:

- To demonstrate knowledge of the fundamental concepts, principles, and applications of medical biotechnology in the diagnosis, prevention, and treatment of human diseases.
- To demonstrate theoretical and practical knowledge of the laboratory techniques, molecular tools, and experimental methodologies used in medical biotechnology for research, diagnostics, and therapeutic development.

Course outcome:

- Students can apply the principles and techniques of medical biotechnology for the diagnosis, prevention, and treatment of human diseases.
- Students can analyze biomedical data and evaluate the ethical, regulatory, and biosafety considerations associated with medical biotechnology applications.

MJ-15T: Medical Biotechnology (Theory) **Credits 03**

Course content:

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1. Medical biotechnology – definition and application. Molecular tools and applications restriction enzymes, ligases, polymerases, alkaline phosphatase. Gene Recombination and Gene transfer: Transformation, Episomes, Plasmids and other cloning vectors (Bacteriophage derived vectors, artificial chromosomes).
2. Gene transfer methods– microinjection, embryonic stem cell, gene transfer, Retrovirus & Gene transfer.
3. Introduction to transgenesis. Transgenic Animals.
4. Animal propagation – Artificial insemination, Animal Clones. Conservation Biology – Embryo transfer techniques. Introduction to Stem Cell Technology and its applications.
5. Genetic modification in Medicine – Basics of gene therapy and types, vectors in gene therapy. Therapeutic products produced by genetic engineering-blood proteins, human hormones, immune modulators and vaccines.

MJ-15P: Medical Biotechnology (Practical) **Credits 01**

Practical contents:

1. Isolation of plasmid DNA from bacteria
2. Restriction digestion of DNA using restriction enzymes
3. Quantification of DNA and RNA using UV-Visible NanoDrop.
4. SDS-PAGE for separation and analysis of proteins.
5. Polymerase Chain Reaction (PCR) for amplification of target DNA.

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6. Demonstration of transformation and transduction process.
7. Induction of β −galactosidase in *E. coli*.
8. Demonstration of animal cell cultures, Media, sterilization, demonstration of cell line.

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MJ-16: Clinical Research and Ethics **Credits 04(FM: 75)**

Course Objective:
To teach students research design, data analysis and the application of statistical methods in scientific studies.
Course outcome: The Research Methodology and Statistics course equips students with the ability to design research studies, analyze data using statistical techniques, and effectively communicate their findings.

MJ-16T: Clinical Research and Ethics **Credits 03**

Course content:

1. Definition, objectives, and significance of research
2. Types of research: basic vs applied, qualitative vs quantitative
3. Research process: steps involved in conducting research
4. Defining a research problem
5. Hypotheses and objectives
6. Meaning and types of research design (experimental, descriptive, exploratory)
7. Components of a research report: introduction, methodology, results, discussion.
8. Sampling techniques: random, stratified, cluster sampling
9. Sample size determination
10. Qualitative vs quantitative data analysis
11. Measures of central tendency (mean, median, mode)
12. Measures of dispersion (standard deviation and standard error mean)
13. Parametric tests (t-tests, ANOVA) and non-parametric tests (chi-square)

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MJ-16P: Clinical Research and Ethics (Practical) **Credits 01**

Course content:

1. Assignment of research proposal writing (including all sections: abstract, introduction, methods, results, discussion).
2. Analysis of mean, median, mode, variance, and standard deviation.
3. Hypothesis testing: T-tests, chi-square tests, and ANOVA using sample datasets. Interpret the results and draw conclusions.

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MAJOR ELECTIVE (DSE)

Major Elective (MJ DSE) -3
(Genetics and Health/ Basic Emergency care and First aid.)
Credits 04 (Full Marks: 75)

MJ DSE -3T: Genetics and Health (Theory) **Credits 04 (FM: 75)**

Objective: To provide students with fundamental knowledge of human genetics and inheritance and the principles of inheritance as well as the principles and applications of genetic testing and molecular diagnostic techniques used in clinical laboratories.

Course Outcome: The broad goal of teaching Genetics and Health is to identify common genetic and chromosomal disorders and gain knowledge about disease prevention, diagnosis, and personalised healthcare. The course also covers the principles and clinical applications of genetic testing, pharmacogenomics, and gene therapy, which will help students understand the concept of genetic counselling and emerging developments in genomic medicine while evaluating their ethical, legal, and social implications.

Course contents:

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1. Genetics and Heredity, Cell Cycle, Mitosis and Meiosis, Mendel's Laws of Inheritance, Non-Mendelian Inheritance, Incomplete Dominance, Codominance, Multiple Alleles, Polygenic Inheritance, Pedigree Analysis
2. Human Chromosomes and Karyotyping, Sex-linked Inheritance, Chromosomal Disorders- Down Syndrome, Turner Syndrome, Klinefelter Syndrome, Multifactorial Disorders, Congenital Disorders
3. Genetic Testing, Prenatal and Neonatal Screening, Cytogenetic and Molecular Diagnostic Approaches, Microarray Technology
4. Pharmacogenomics, Gene Therapy, Genetic Counseling, Ethical, Legal and Social Issues in Genetics, Future Perspectives of Genomic Medicine

OR

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MJ DSE -3T: Basic Emergency care and First aid (Theory) Credits 04(FM: 75)

Objective:

- Assess emergencies quickly and accurately to ensure personal and victim safety.
- Demonstrate basic life-saving techniques, including CPR (Cardiopulmonary Resuscitation) and the recovery position.
- Provide appropriate first aid for common injuries such as wounds, burns, fractures, sprains, and poisoning.

Course Outcome:

- Students will be able to perform basic emergency procedures and provide first aid in everyday medical situations.

Course contents:

1. First Aid-Introduction, Aims & objectives of first aid, Priorities of first aid, Golden rules of first aid, Qualities & responsibilities of first aider, Simple first aid measures in selected conditions like Food poisoning, Snake bite, Scorpion bite, Dog bite, foreign bodies in various organs, Burns, Haemorrhage.
2. Shock- Definition, Types of shock, General Features of shock, Investigations of shock, Initial management & first aid of shock.
3. Poisoning- Definition, Causes of poisoning, Sources of Poisoning, Symptoms of poisoning, First aid & Management, Antidotes, Common drugs poisoning, Carbon monoxide poisoning.
4. Introduction: Chain of survival, team dynamics & multi-rescuer resuscitation. Vital signs of patients- Body temperature, Pulse, Blood Pressure, Respiration.
5. Basic Life Support (BLS) in adults: Flowchart approach, approach to victim, techniques of CPR, BLS in paediatric Victims: checking pulse in children, chest compressions techniques, Bag mask ventilation technique.

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MINOR (MI)

MI – 7: Laboratory Management **Credits 04(FM: 75)**

Course objective:

- Understand principles of laboratory management.
- Understand organization, leadership and communication.
- Learn HR, inventory and financial management.
- Understand quality management, accreditation and documentation.
- Practice laboratory safety, ethics and LIS.

Course outcome:

Students can apply the principles of laboratory management to ensure safe, efficient, and quality laboratory operations.

Students can maintain laboratory records, manage equipment and inventory, and implement quality assurance and biosafety practices in accordance with standard guidelines.

MI – 7T: Laboratory Management (Theory) **Credits 03**

Course contents:

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1. **Principles of Laboratory Management:** Introduction to laboratory management, Importance and objectives of laboratory management, Basic functions of management: Planning, Organizing, Staffing, Directing and Controlling, Roles and responsibilities of the laboratory manager. Effective management of laboratory services.

2. **Laboratory Planning & Financial Management:** Organization of a clinical laboratory, Laboratory layout and workflow, Basic laboratory planning, Laboratory budget (basic concept), Laboratory expenses (equipment, reagents and consumables), Proper use of laboratory resources, Cost-effective laboratory management, Inventory Management and Equipment Maintenance, Purchase of laboratory reagents and consumables, Storage of laboratory chemicals and reagents , Stock register and inventory maintenance, Checking reagent expiry dates, Maintenance of equipment records and log books.

3. **Modern Quality Management System (QMS):** A brief outline of modern quality management system, Good laboratory practice and good clinical practice.

4. **Laboratory Accreditation & Quality Improvement:** Introduction to laboratory accreditation, NABL and ISO 15189: Basic concepts, Importance of accreditation in clinical laboratories, Internal quality audit (basic concept), Documentation and record maintenance,

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Corrective and Preventive Action (CAPA): Basic concept, Continuous quality improvement in laboratory services, Role of laboratory personnel in maintaining quality.

5. **SOPs, Documentation & Recent Advances:** Structure and formatting of Standard Operating Procedures (SOPs); preparation of Quality Manuals and safety manuals; document control practices; overview of clinical laboratory regulations, automated workflow management, and modern trends in laboratory leadership.

MI – 7P: Laboratory Management (Practical) **Credits 01**

1. Preparation of Standard Operating Procedures (SOPs).
2. Laboratory Safety and PPE Demonstration: Identification of Laboratory Hazards and Proper Use of Personal Protective Equipment (PPE)
3. Biomedical Waste Management: Segregation, Collection, Handling, and Disposal of Biomedical Waste
4. Preparation and Interpretation of Internal Quality Control (IQC) Documentation Using Levey–Jennings Charts and Westgard Rules
5. Specimen Collection and Sample Management: Collection, Labeling, Storage, and Handling of Clinical Specimens
6. Laboratory Audit and Accreditation Checklist: Preparation and Use of Internal Audit Checklists for Quality Assessment and Accreditation Compliance
7. Laboratory Information System (LIS) Demonstration: Patient Registration, Sample Accession, Test Processing, Result Entry, and Report Generation

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MINOR (MI)

MI – 8: Human Resource Management for Laboratory **Credits 04(FM: 75)**

Course Outcome: Human Resources Management is a vital part of any large business organization, handling a vast array of tasks from recruiting new employees, conducting interviews, dealing with conflict resolution, and managing the holiday allowance, benefits and payroll for existing employees.

Course Content:

1. **Introduction to Human Resource Management (HRM)**
   - Definition and objectives
   - Importance of HRM in medical laboratories
   - Roles and responsibilities of HR managers

   Human Resource Planning
   - Workforce planning
   - Staff requirement analysis
   - Recruitment forecasting
2. **Performance Management**
   - Performance appraisal methods
   - Key Performance Indicators (KPIs)
   - Feedback and performance improvement
3. **Staff Scheduling**
   - Duty roster preparation
   - Shift management
   - Leave management
   - Overtime management
4. **Motivation and Employee Engagement**
   - Motivation theories
   - Employee recognition
   - Team building
   - Job satisfaction
5. **Leadership and Supervision**
   - Leadership styles
   - Supervisory skills
   - Decision-making
   - Delegation of responsibilities
6. **Occupational Health and Safety**
   - Laboratory safety policies

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- Infection prevention
- Personal Protective Equipment (PPE)

7. **Quality Management and Human Resources**
   - Staff competency assessment
   - Documentation
   - Internal audits
   - Quality improvement through HR
8. **Accreditation Requirements**
   - Human resource requirements under laboratory quality standards
   - Staff qualifications
   - Competency records
   - Continuing education
   - Personnel documentation

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