VIDYASAGAR UNIVERSITY

Midnapore, West Bengal

PROPOSED CURRICULUM & SYLLABUS (DRAFT) OF

BACHELOR OF MEDICAL LABORATORY TECHNOLOGY -BMLT (HONOURS)

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.)	2nd	III	**SEMESTER-III**							
			Major-3	**BMLTHMJ03**	T: **Histology and Cytology**; P: Practical	**4**	**3-0-1**	**15**	**60**	**75**
			Major-4	**BMLTHMJ04**	T: **Clinical Biochemistry**; P: Practical	**4**	**3-0-1**	**15**	**60**	**75**
			SEC	**BMLTSEC03**	P: **Blood bank and Blood Transfusion**	**3**	**0-0-3**	**10**	**40**	**50**
			AEC	**BMLTAEC03**	**Community orientation and Clinical visit (*only for BMLT prog.*)**	**2**	**2-0-0**	**10**	**40**	**50**
			MDC	**BMLTMDC03**	**Parasitology (*only for BMLT programmes*)**	**3**	**2-0-1**	**10**	**40**	**50**
			Minor-3	**BMLTMIN03**	T: **Endocrinology**; P: Practical	**4**	**3-0-1**	**15**	**60**	**75**
					Semester-III Total	**20**				**375**
		IV	**SEMESTER-IV**							
			Major-5	**BMLTHMJ05**	T: **Immunology and Serology**; P: Practical	**4**	**3-0-1**	**15**	**60**	**75**
			Major-6	**BMLTHMJ06**	T: **Bacteriology**; P: Practical	**4**	**3-0-1**	**15**	**60**	**75**
			Major-7	**BMLTHMJ07**	T: **Clinical Pathology-1** (**pathology of body fluids**); P: Practical	**4**	**3-0-1**	**15**	**60**	**75**
			AEC	**BMLTAEC04**	**Epidemiology (*only for BMLT programmes*)**	**2**	**2-0-0**	**10**	**40**	**50**
			Minor-4	**BMLTMIN02**	T: **Diagnostic Laboratory Quality Control**;	**4**	**3-1-0**	**15**	**60**	**75**
			Summer Intern.	**IA**	**Internship / Apprenticeship** *(to be decided by the College)*	**4**	**0-0-4**	**-**	**-**	**50**
					Semester-IV Total	**22**				**400**
					TOTAL of YEAR-2	**42**				**775**

MJ = Major, MI = Minor Course, SEC = Skill Enhancement Course, AEC = Ability Enhancement Course, MDC = Multidisciplinary Course, CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical, MIL = Modern Indian Language

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SEMESTER-III

MAJOR (MJ)

MJ-3: Histology and Cytology **Credits 04(FM: 75)**

Course objective: To develop the concept of human cellular architecture from tissue sample of different pathological condition.

Course outcome: Students will develop the ability to prepare, analyze and interpret histological and cytological samples for clinical diagnostics and research applications.

MJ-3T: Histology and Cytology (Theory) **Credits 03**

Course content:

1. Introduction to histopathological techniques
2. Specimens' types, collection, and handling
3. Equipment used in histology and cytology laboratory: types of microtomes, embedding bath, tissue processor and stainer- Cytospin, Cell block techniques and use.
4. Fixative types and uses with Merits and demerits, clearing agents, technique of section cutting etc.
5. Different type of stains and its application in histology and cytology.
6. Step of tissue processing and embedding, Section cutting, Decalcification
7. Manual and automated method of staining- Principle, procedure and clinical significance of Haematoxylin & Eosin staining, PAS stain, Van Gieson's stain, Giemsa stain, Trichrome stain
8. Mounting, observation and interpretation of tissue sample.
9. Reticulin stain & its uses
10. Frozen section
11. IHC basic principles & utility
12. Preparation of smear in fine needle aspiration cytology
13. Principle of exfoliative cytology,
14. Preparation of smear from fluid, Fluid cytology, Imprint cytology, scrape& brush cytology
15. Fixation of cytological smears
16. MGG stain, Leishman-Giemsa staining, Papanicolaou staining- principles & uses
17. Liquid Based Cytology

MJ-3P: Histology and Cytology (Practical) **Credits 01**

Practical contents:

1. Tissue collection and fixation.
2. Dehydration of collected tissue sample in the graded alcohol.
3. Embedding & preparation of blocks, Section cutting, use & care of microtome

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4. Stain preparation – Haematoxylin, eosin, PAS, Trichrome, iron haematoxylin, and Giemsa stain
5. Staining techniques using above stains.
6. Preparation of specimen for cytological evaluation by Papanicolaou (PAP) stain, crystal violet staining.
7. Characterization of benign and malignant cells.

MJ-4: Clinical Biochemistry **Credits 04(FM: 75)**

Course objective: To provide students with an understanding of biochemical principles and their applications in diagnosing and monitoring diseases.

Course Outcome: Students will acquire both theoretical knowledge and practical skills in clinical biochemistry, enabling them to perform and interpret diagnostic tests while ensuring laboratory quality and safety.

MJ-4T: Clinical Biochemistry (Theory) **Credits 03**

Course content:

1. Specimen collection and processing of blood, separation of serum and plasma, deproteinization of sample.
2. Determination of glucose, Glucose tolerance test, HbA1c
3. Lipid profile and Cardiac Function test: Triglyceride, cholesterol and LDL, VLDL, HDL, LDH, CK-MB, Troponin T test in blood.
4. Liver function tests-Total protein, Albumin, Globulin ratio, ACP, ALP, ALT, AST, gamma GT, conjugated and unconjugated bilirubin
5. Kidney function test- urea, creatinine, uric acid, Na+, K+, Ca^{++}
6. Gastric function tests: Free acidity, Total acidity, total acidity, gastric pH, gastric enzyme analysis.
7. Pancreatic function test: Lipase and amylase

MJ-4P: Clinical Biochemistry (Practical) **Credits 01**

1. Preparations of plasma, serum, and protein free filtrate from blood.
2. Determination of Blood glucose, glucose tolerance test, HbA1c
3. KFT: urea, uric acid and creatinine in blood, determination of Na +, K , Ca++
4. LFT: total bilirubin, direct-indirect, ACP, ALT, AST, gamma-GT, ALP, total protein in serum, albumin-globulin ratio
5. Lipid profile: serum TG, blood cholesterol, HDL,LDL, VLDL, Troponin T, Troponin I
6. Amylase, lipase

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MINOR (MI)

MI – 3: Endocrinology **Credits 04(FM: 75)**

Course Objective:
To provide students with an understanding of endocrine system functions, hormone regulation and their role in maintaining homeostasis.

Course Outcome: Students will gain the ability to analyze and interpret endocrine disorders and apply knowledge to diagnose and manage related conditions.

MI – 3T: Endocrinology **Credits 03**

Course contents:

1. Concept on pituitary-gonadal axis, pituitary–thyroid axis, pituitary– Adrenocortical axis, feedback system. Information on pancreatic hormones.
2. Hormonal disorders in Diabetes mellitus and insipidus, hypertension, goiter, obesity and infertility.
3. Endocrinology of aging, transition care (from adolescent to young adult)
4. Techniques followed in hormone assay– ELISA cross reaction, inter assay, intra assay variation.
5. Hypothalamus and pituitary- General functional disorders
6. Thyroid: Thyrotoxicosis (including Graves' disease, Toxic multinodular goiter, hypothyroidism and thyroiditis)
7. Adrenal cortex and medulla: a) Cushing syndrome, b) Adrenal insufficiency, c) Congenital adrenal hyperplasia,
8. Pancreas: Basics of Pancreatic endocrine disorders and pancreatitis
9. Gonads: a) Delayed or early puberty, b) Chronic anovulatory disorders menopause, e) Male hypogonadism -primary and secondary
10. Parathyroid:
    a) Hyperparathyroidism,
    b) Hypoparathyroidism.

MI – 3P: Endocrinology (Practical) **Credits 01**

Practical contents:

1. ELISA program for hormone assay
2. Hormone assay by ELISA reader– Estrogen, Testosterone, thyroid profile (T3,T4,TSH), LH, FSH, PRL, Insulin, Glucagon, Glucocorticoids, GH.
3. Quality control of hormone assay- Intra assay, Inter assay, Cross reaction

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SKILL ENHANCEMENT COURSE (SEC)

SEC 3: Blood Bank and Blood Transfusion **Credits 03(FM: 50)**

SEC 3P: Blood Bank and Blood Transfusion **Credits 03**

Course Objective:

To provide students with knowledge and skills related to blood bank operations, blood donation and transfusion practices.

Course outcome:

The students will be benefited by learning the idea about blood group and transfusion of blood along with its separation and storage technique.

Course Outline:

1. Donor selection and blood collection,
2. Forward grouping, reverse grouping, Coomb's test: direct and indirect, cross matching of blood, compatibility test, Rho typing.
3. Demonstration of apheresis technique.
4. Preparation of reagents and preservatives in blood bank.
5. Preparation of packed red cells.
6. HIV-testing, hepatitis B and C testing, Syphilis testing.
7. Pooled cell preparation, Weak-D test
8. Blood group subtypes determination

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ABILITY ENHANCEMENT COURSE (AEC)

AEC 3T: Community orientation and Clinical visit **Credits 02 (FM: 50)**

Course Objective:

To equip students with knowledge of community health, healthcare roles, health screening and the application of medical technology in public health.

Course outcome:

Students will develop an understanding of community health concepts and develop proficiency in clinical laboratory practices, including disease screening and data analysis.

Course content:

1. Concept of community and health, awareness among different types of community
2. Role of health care providers and societal involvement.
3. COPC (community oriented primary care).
4. Screening of disorders and diseases (obesity, diabetes, undernutrition, anaemia, thalassemia, thyroidal dysfunction etc).
5. Transition from point of care testing (POCT) towards clinical laboratory with a translational approach
6. Role of medical technologist in public health assessment
7. Data analysis of the results from community awareness programme, health screening, surveillance and evaluation.

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MULTIDISCIPLINARY COURSE (MDC)

MDC 3T: Parasitology **Credits 03(FM: 50)**

Course Objective: To provide students with knowledge of parasitic organisms and methods for diagnosis, treatment and prevention of parasitic infections.

Course outcome: Students will gain a comprehensive understanding of parasitic organisms, including their classification, life cycles, and pathogenic mechanisms, as well as practical skills in diagnosing and managing parasitic infections.

MDC 3T: Parasitology (Theory) **Credits 02 (Marks-25)**

Course content:

1. Basic concept of Parasitology.
2. Collection, Transport, processing and preservation of samples for routine parasitological investigations
3. Introduction of parasites, host, zoonosis, host parasites relationship, sources of infection, mode of infection, pathogenesis, immunity in parasitic infection.
4. Morphology, life cycle, pathogenesis, clinical features and lab diagnosis of *Entamoeba histolytica, Giardia lamblia*, Malarial Parasites, Leishmania, Trypanosomes.
5. Role in disease transmission and controlling measures Houseflies, Sand flies and mosquito.
6. Role in disease transmission and controlling measure flea, itch mite and typhus.
7. Filariasis– Cause, symptoms and controlling measures.
8. Taeniasis– Causes, Symptoms and controlling measures.
9. Ascariasis- Causes, Symptoms and controlling measures
10. Ancylostomiasis- Causes, Symptoms and controlling measures
11. Parasite egg counting technique.

MDC 3P: Parasitology (Practical) **Credits 01 (Marks-15)**

1. Identification of different disease-causing Helminth and Protozoan parasites.
2. Identification of different phases of life cycle of arthropods protozoa, helminth, having medical importance for causing disease.
3. Identification of microfilaria, *Taenia solium*, ascaris, ancylostoma and deferent stages of malaria.
4. Examination of stool for OPV (Ova parasite Cyst).
5. Laboratory Diagnosis of Various Parasites: Rapid Diagnostic Tests (RDTs), Malaria Rapid diagnostic test (MRDT), Leishmanin test.

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SEMESTER-IV

MAJOR (MJ)

MJ-5: Immunology and Serology **Credits 04(FM: 75)**

Course Objective:
To equip students with knowledge of immunology and serology for understanding immune responses and performing diagnostic tests for infectious and autoimmune diseases.

Course outcome: Students will gain a comprehensive understanding of immunology and serology, covering immune system principles, immunization, autoimmune diseases, and proficiency in serological and hypersensitivity testing.

MJ-5T: Immunology and Serology **Credits 03**

Course content:

1. Basic concept regarding Immune system
2. Brief study regarding types of immunity and immunological organs.
3. Types, structures and basic functions of Immunoglobulins
4. Basic concept of Hypersensitivity and allergy
5. Concept on Immunization. Bodily responses against immunization. Vaccination and Booster does.
6. Basic concept of Human Immunodeficiency diseases- HIV
7. Concept of immunosuppresion, HLA typing and role in organ transplantation.
8. Important Autoimmune diseases, SLE, type I diabetes, rheumatoid arthritis, Multiple sclerosis
9. Concept of Ag-Ab reaction and types. Principle and example of sero-diagnostic tests: Agglutination, precipitation, Flocculation, Neutralization, Coagulation
10. Serological tests against various human diseases –Screening for syphilis (VDRL, RPR), WIDAL, ASO, Dengue (IgM, IgG and NS1), AIDS, SARS-CoV2 (Ab), TORCH panel test, CRP and RA test.
11. Intradermal hypersensitivity test – Mantoux test.

MJ-5P: Immunology and Serology (Practical) **Credits 01**

Practical contents:

1. Basic principles of Collection and preparation of specimen used in immunology and serological lab.

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2. Study on precipitation, Agglutination, Coagulation test
3. Antibody measurement by Radial Immunodiffusion (RID) technique, Ouchterlony test
4. Quantitative assay of Immunoglobulins in plasma (IgG, IgM)
5. Rapid test regarding VDRL test, WIDAL test, RPR, ASO test, SARS-Cov2.
6. CRP test, RA test, HIV test
7. POCT for pregnancy
8. Mantoux test.

MJ-6: Bacteriology **Credits 04(FM: 75)**

Course Objective:
To provide students with knowledge of bacterial structure, classification, physiology, and pathogenesis, along with techniques for bacterial identification and control of infections.

Course outcome: Students will develop expertise in bacteriology, encompassing bacterial classification, infection management, and practical skills in microbial identification and laboratory techniques.

MJ-6T: Bacteriology **Credits 03**

Course content:

1. Introduction to clinical bacteriology
2. Normal microbial flora of human body
3. Human microbiome, host defences, biofilms, infections, intoxications, virulence factors.
4. Bacterial nutrition and effects of environmental factors over it.
5. Growth and survival of pathological bacteria.
6. Bacteriological culture techniques and media, biochemical identification of pathogenic bacteria (E. coli, Staphylococcus, Streptococcus, Mycobacteria, Salmonella Typhi, S. Paratyphi, Klebsiella pneumoniae, Pseudomonas aeruginosa and Vibrio cholerae), infection, prevention and control measures.
7. Antibiotics- classification, mode of action, resistance, and antimicrobial susceptibility testing.

MJ-6P: Bacteriology (Practical) **Credits 01**

Practical contents:

1. Dry and moist heat methods of sterilization, fumigation, aseptic techniques, biosafety.

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2. Collection, process, and transport of urine, stool, blood, pus, and sputum samples for bacteriological analysis.
3. Different culture media and techniques for isolation of bacteria.
4. Staining techniques: Gram staining, AFB stain, Albert stain, endospore stain.
5. Biochemical identification of pathogenic bacteria (E. coli, Staphylococcus, Streptococcus, Mycobacteria, Salmonella typhi, Paratyphi and Vibrio cholerae).
6. Bacterial culture preservation and transport.
7. Antimicrobial susceptibility testing by disc diffusion and MIC determination.

MJ-7: Clinical Pathology-1 (pathology of body fluids) Credits 04(FM: 75)

Course Objective:
To train students in analyzing and interpreting body fluids for disease diagnosis.

Course outcome: The students will be well exposed about an outline of disease in connection with assessment of the different urine, stool and body fluid samples.

MJ-7T: Clinical Pathology-1 (pathology of body fluids) Credits 03

Course content:

1. Pathogenesis and different pathological condition of body fluid- transudate, exudate.
2. Plural effusion
3. Pericardial fluid
4. CSF
5. Serous fluid
6. Ascites
7. Synovial fluid
8. Peritoneal fluid—
9. Pus and swab
10. Collection, processing and transport of above body fluids
11. Routine examination of above body fluids-physical-chemical and microscopic test and evaluation.

MJ-7P: Practical Credits 01

1. Collection and storage of transudate and exudate type of samples.
2. Physical, biochemical and microscopic examination of CSF, Serous fluid, Ascitic fluid, Synovial fluid, peritoneal fluid.

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MINOR (MI)

MI – 4T: Diagnostic Laboratory Quality Control **Credits 04(FM: 75)**

Course objective:
To provide students with an understanding of quality control principles and practices in diagnostic laboratories, ensuring accurate and reliable test results.

Course outcome: Learners would be equipped with the knowledge of accuracy of test reports along with its assessment by TQM (total quality management).

Course contents:

1. Definition of quality, elements of quality assurance, quality assessment, qualitative and quantitative quality control.
2. Idea about control, standard, reproducibility, technical competence, accuracy, intra-assay and inter-assay variation.
3. Calibration of instruments, small devices, proper techniques of using centrifuge, water bath, incubator, laminar air flow, Bio-safety cabinet.
4. Levy Jenning chart and its application. Different types of laboratory errors,
5. Reference value, External quality control; role of reference laboratories.
6. Good laboratory practice.

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ABILITY ENHANCEMENT COURSE (AEC)

AEC 2T: Epidemiology **Credits 02 (FM: 50)**

Course Objective:
To introduce students to the principles and methods of epidemiology, focusing on disease patterns, risk factors and strategies for controlling health issues in populations.

Course outcome: Student will learn about epidemiology and its importance in the promotion of health in a community.

Course contents:

1. Definition of epidemiology.
2. Descriptive, analytical and experimental aspects of epidemiology.
3. Communicable and non-communicable diseases.
4. Environmental aspects of health, community diagnosis, prevalence rate, incidence, vaccination ratio, herd immunity, relative risk, epidemiological surveillance, community screening for disease.

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Internship/ Apprenticeship

Credit-04 Marks: 50 **(120 hours)**

Internship/ Apprentice Service to the Hospital

(to be arrange by the College)

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