

Km. Mayawati Govt. Girls P.G. College

Badalpur, G.B. Nagar-203207

<http://kmgcbadalpur.org/>



**Accredited
Grade-B (CGPA-2.16) by NAAC**

CURRICULUM FOR

UGC - B.Voc.

Under National Skills Qualification Framework (NSQF)

Bachelor of Vocational

in

Medical Laboratory and Molecular Diagnostics Technology

(3 years – Six Semester Full Time Course)

(B. Voc.- MLMDT)

(Sanctioned by UGC vide letter no. 5-1/2018 Dt. 11-08-2018)

***Examination Module: As per UGC/NSQF guideline in 60 (By SDC/Industry)
and 40 Ratio (By University/College)***

**B. Voc. –
Medical Laboratory and Molecular Diagnostics Technology
(Semester – I)**

PAPER - I

MMDT 1.1: Fundamentals of Anatomy and physiology				
No.	Topics	Details	Marks	Min. Lec.
1.	Body as a whole and its constituents	A. The cells, tissues and organization of the body B. Tissues- epithelial, connective, muscle, nervous C. Cell regeneration, membranes, glands D. Organization of the body E. Cavities of the body F. Cranial, thoracic, abdominal, pelvic		4
2.	Blood	A. Composition of blood B. Erythrocytes-Structure and functions C. Leucocytes-Types, Structure and functions D. Platelets- Structure and functions, Hemostasis		5
3.	Cardiovascular system	A. Heart-Functional anatomy B. Properties of heart muscle C. Heart as a pump D. Cardiac output and venous return E. Vascular system F. Systemic arterial blood pressure		7
4.	Respiratory system	A. Functional anatomy B. Ventilation and its control C. Exchange of gases D. Applied and environmental physiology		6
5.	Digestive system	A. Elementary functional anatomy B. Salivary glands C. Stomach and its secretion D. Liver, pancreas and their role in digestion, Bile E. Small and large intestine F. Movement of alimentary tract G. Gastrointestinal hormones and their functions		7
6.	Excretory system	A. Functional anatomy of kidney B. Mechanism of formation of urine C. Water, electrolyte and acid-base balance D. Skin and its functions		6
7.	Nervous system	A. Elementary neuroanatomy B. Properties of neurons C. Nerve impulse, Types of nerves		7

		D. Synapse and chemical transmitters E. Central nervous system-Neuroglia, membranes of brain and spinal cord, Ventricles of brain and cerebrospinal fluid F. Brain- cerebrum, cerebellum G. Spinal cord- structure H. Peripheral nervous system-Spinal nerves and cranial nerves I. Autonomic nervous system-Sympathetic NS Parasympathetic NS J. Functions of ANS		
8.	Special senses and overview of endocrine system	A. Ear and hearing B. Structure and physiology of hearing C. Eyes and sight D. Structure and physiology of sight E. Sense of smell and taste F. Overview of important endocrine glands and their functions		6
9.	Muscular system	A. Muscles characteristics B. Properties of skeletal muscles C. Properties of smooth muscles		4
10.	Reproductive system	A. Female reproductive system B. Anatomy- External and internal parts C. Puberty, menstrual cycle, Fertilization D. Male reproductive system E. Elementary anatomy F. Functions of male reproductive system		8
Total			100	60
<ul style="list-style-type: none"> • Student Seminar- 5 Lectures • Expert Talk-5 Lectures • Student Test-5 Lectures • Total Lectures 60+15=75 				

PRACTICAL:

A. ANATOMY

1. Identification and description of all anatomical structures.
2. The learning of Anatomy by demonstration only through dissected parts, slides, models, charts etc.

B. PHYSIOLOGY

1. Measurement of pulse, blood pressure.
2. Elicitation of Reflexes and jerks.
3. Identification of blood cells by study of peripheral blood smear.

Reference Books:

S.No.	Title	Author	Publisher
1.	Anatomy and physiology in health and illness	Wilson Katheen, Anne Waugh	Churchill livingstone
2.	Concise medical physiology	Sujit Chaudhari	Central
3.	Central Textbook of medical physiology	Arthur Guyton and Hall	W.B. Saunders
4.	Understanding medical physiology	R.L. Bijlani	Jaypee

SEMESTER - I**PAPER - II****MMDT 1.2: General Pathology and Microbiology**

No.	Topics	Details	Marks	Min. Lec.
1.	Cell Injury and Cellular Adaptations	A. Normal Cell B. Cell Injury- types of cell injury, Etiology of cell injury, morphology of cell injury, Cellular swelling C. Cell death: types- autolysis, necrosis, apoptosis & gangrene D. Cellular adaptations-atrophy, hypertrophy, hyperplasia & dysplasia		8
2.	Haemodynamic disorders	A. Internal environment B. Normal water and electrolyte balance C. Disturbances of body fluids and electrolytes D. Oedema, overhydration, dehydration E. Disturbances in volume of circulating blood Hyperaemia and congestion F. Haemorrhage and shock G. Thrombosis, Ischaemia, Infarction		7
3.	Inflammation and healing	A. Acute inflammation B. Vascular events, cellular events C. Inflammatory cells D. Morphology of acute inflammation, Chronic inflammation E. General features F. Granulomatous inflammation, Tuberculoma G. Healing, Regeneration, repairs, wound healing		7
4.	Neoplasia	A. Nomenclature and classification B. Characteristics of tumours C. Local invasion and metastasis D. Grading and staging of cancer E. Epidemiology and predisposition to neoplasia		7

		F. Carcinogenesis G. Etiology and pathogenesis of cancer H. Molecular pathogenesis of cancer I. Chemical, physical, biologic carcinogens J. Clinical aspects of neoplasia K. Diagnosis of cancer		
5.	Genetic and paediatric diseases system	A. Introduction to Genetic diseases B. Developmental defects C. Cytogenetic abnormalities and Mutation		4
6.	Environmental and nutritional diseases	A. Environmental pollution B. Air pollution, tobacco smoking C. Chemical and drug injury D. Alcohol, lead and carbon monoxide poisoning, drug abuse E. Environmental chemicals F. Injury by physical agents G. Thermal and electrical injury H. Injury by radiation I. Nutritional diseases Obesity, Starvation J. Protein energy malnutrition K. Disorders of vitamins L. Trace elements		6
7.	General characters and classification of Bacteria	A. Characteristics of Bacteria: Morphology - Shape, Capsule, Flagella, Inclusion, Granule, Spore B. Growth and Maintenance of Microbes: Bacterial division, Batch Culture, Continuous culture C. Bacterial growth- total count, viable count, bacterial nutrition, oxygen requirement, CO ₂ requirement, temperature, pH, light. D. Sterilization and Disinfection: Physical agents- Sunlight, Temperature less than 100°C, Temperature at 100°C, steam at atmospheric pressure and steam under pressure, irradiation, filtration. E. Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide		8
8.	Culture and Staining	A. Culture Media: Definition, uses, basic requirements, classification, Agar, Peptone, Transport Media, Sugar Media, Anaerobic Media, Containers of Media, Forms of Media B. Staining Methods: Simple, Grams staining, Ziehl-Neelsen staining or AFB staining, Negative Impregnation		7
9.	Collection of Specimen and Disposal of Waste	A. General Principles, Containers, Rejection B. Samples- Urine, Faeces, Sputum, Pus, Body fluids, Swab, Blood. C. Disposal of Laboratory/Hospital Waste: Non-infectious waste, infected sharp waste disposal, infected non-sharp waste disposal.		6
Total			100	60
<ul style="list-style-type: none"> • Student Seminar- 5 Lectures • Expert Talk- 5 Lectures • Student Test- 5 Lectures • Total Lectures 60+15=75 				

PRACTICAL:

A. GENERAL PATHOLOGY

1. Components & setting of the Compound microscope.
2. Focusing of object.
3. Use of low & high-power objectives of microscope.
4. Use of oil immersion lens.
5. Care and Maintenance of the microscope.
6. Different types microscopy
 - a) Working of Digital Microscope
 - b) Dark field microscopy
 - c) Fluorescence Microscopy
7. Electronic Microscopy in brief.

B. GENERAL MICROBIOLOGY

1. Preparation of swabs/sterile tubes & bottles.
2. Preparation of smear.
3. Staining.: Gram & Ziehl -Neelsen staining.
4. Preparation of Culture media.
5. Identification and study of instruments.
6. Identification of common microbes.

Reference Books:

S.No.	Title	Author	Publisher
1.	Textbook of Pathology	Harsh Mohan	Jaypee
2.	Basic Pathology	V.Kumar, S.Robbins	Harcourt
3.	Textbook of Microbiology	Anantha Narayan and Paniker's	Universities Press
4.	Text Book of Microbiology vol-I and II	Powar and Daginawala	Himalayan Books

SEMESTER - I

PAPER - III

MMDT 1.3: Functional English and Communication Skills

No.	Topics	Details	Marks	Min. Lec.
1.	Grammar	A. Determiners B. Tenses i. Defining a Verb ii. Chief forms of a Verb iii. Tense and Time iv. Further Division of Tenses a. The Present Tense b. The Past Tense c. The Future Tense C. Active – Passive Voice i. Introduction ii. Defining the Voice iii. Some General rules regarding the change of voice D. Modals & Auxiliaries i. Introduction to Auxiliaries ii. The Primary Auxiliaries iii. Introduction to Modals iv. The Most Commonly Used Modals v. Important points about the Modals vi. Modals and Their Uses E. Prepositions / Prepositional Phrases		15
2.	Writing Comprehension	A. Business Letters: i. Introduction ii. Functions of a Business Letter iii. Inward Structure / Layout of a Business Letter iv. Other Important Parts of Business Letter v. Outward appearance of a business letter vi. Arrangement Styles vii. Salient Features of a Business Letter viii. Legal Aspects of a business Letters ix. Kinds of Business Letter, Inquiry & Reply Order & Reply Cancellation of order Complaint / Adjustment Sales Letter B. Report Writing: i. Introduction ii. The Nature of a Report iii. The P's of an Effective Report iv. Functions of a Report v. Preparing a Report vi. Types of Reports		15

		vii. Business report viii. Press report C. Job Application / Resume Writing. i. Introduction ii. A Cover Letter iii. Curriculum Vitae / Resume D. Letters of Appointment & Resignation.		
3.	Conversation Skills	A. Conversations based on everyday situation / Dialogue B. Writing. i. Introduction ii. Nature of Conversations iii. Purpose of conversation iv. Guidelines for Effective Conversation Skills v. Proverbs used in Everyday Conversation with their Meanings / Explanations vi. Comparisons used in Everyday Conversation vii. Practical Conversations		15
4.	Communication Skills	A. Communication – Meaning, Features & Process B. Verbal & Non – Verbal comm. i. Verbal a. Oral Communication b. Written Communication ii. Non – Verbal a. Body language b. Space c. Para language d. Others iii. Group discussion skills a. Meaning b. Characteristic c. Do's & Don'ts d. Relevance e. Moderating a group discussion iv. Presentation skills a. Meaning b. Planning a presentation skill c. Preparing a presentation skill d. Delivering a presentation skill e. Presentation skills v. Public Speaking a. Meaning b. Essential of effective public speaking vi. Facing Interviews a. Importance b. Do's & Don'ts		15

Total		100	60
<ul style="list-style-type: none"> • Student Seminar- 5 Lectures • Expert Talk- 5 Lectures • Student Test- 5 Lectures • Total Lectures 60+15=75 			

Reference Books:

S.No.	Title	Author	Publisher
1.	High School English Grammar and Composition	Wren & Martin	Churchill Livingstone
2.	Anthology of English language and communication skills	Sharma S R, Jacob John	Mark
3.	Handbook of practical communication skills		Jaico
4.	Language and communication skills	Shastri, Rameshchandra	ABD

B.Voc.-
Medical Laboratory and Molecular Diagnostics Technology
(Semester – II)

PAPER – I

MMDT 2.1: Basics Of Biochemistry, Instruments And Reagents

No.	Topics	Details	Marks	Min. Lec.
1.	Chemistry of carbohydrates & their related metabolism	A. Introduction-Definition B. Classification C. Biomedical importance & properties D. Metabolism: E. Glycogenesis & glycogenolysis. F. Glycolysis, Citric acid cycle & its significance G. HMP shunt & Gluconeogenesis H. Regulation of blood glucose level I. Hyperglycaemia & hypoglycaemia J. Diabetes mellitus – definition, types, features K. Gestation diabetes mellitus L. Glucose Tolerance test, glycosuria		10
2.	Chemistry of Proteins & their related metabolism	A. Introduction-Definition B. Classification C. Biomedical importance D. Metabolism: Catabolism of amino acids E. Removal of NH ₂ group F. Transamination, Deamination G. Decarboxylation- Ammonia formation & transport H. Urea cycle, Metabolic disorders in urea cycle I. Fate of some important amino acids- Phenylalanine, Tyrosine & Tryptophan J. Creatine, Creatinine		10
3.	Chemistry of Lipids & their related metabolism	A. Introduction-Definition B. Classification C. Biomedical importance, essential fatty acids D. Metabolism: Beta oxidation of fatty acids E. Fatty liver F. Ketosis G. Cholesterol & its clinical significance H. Lipoproteins in the blood & their functions I. Atherosclerosis		8
4.	Chemistry of Nucleic acid and	A. Introduction-Definition B. Elementary chemistry of DNA and RNA C. Structure of nucleotide		8

	metabolism	D. DNA and RNA molecule and its structure E. Functions of nucleic acids F. Nucleotide metabolism- purines and pyrimidines		
5.	Enzymes	A. Introduction- definition B. Classification C. Coenzymes, isoenzymes, properties D. Mechanism of action of enzymes E. Factors affecting enzyme action F. Enzyme inhibition and regulation G. Diagnostic value of serum enzymes -Creatinine kinase, alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase		10
6.	Laboratory instruments	A. Principle and working of basic laboratory instruments Autoclave, Hot air oven, Incubator, pH meter, water bath, centrifuge, Refrigerator, colorimeter, Balance, Flame photometer, Microscope, Electrophoresis etc.		8
7.	Reagent Preparation	A. Concept of molarity and normality B. Molar, Normal and percent solution preparation, Dilution of the concentrated solution to desired concentration		6
Total			100	60
<ul style="list-style-type: none"> • Student Seminar- 5 Lectures • Expert Talk- 5 Lectures • Student Test- 5 Lectures • Total Lectures 60+15=75 				

PRACTICAL:

1. Introduction - Aim, basis, interpretation, safety in clinical biochemistry Laboratory
2. Laboratory organization- Instruments, glassware, sample collection & specimen labelling, routine tests, anticoagulants, reagents, cleaning of glassware, isotonic solution, standardization of methods, preparation of solution & interpretation of result, normal values.
3. Identification of Carbohydrates (qualitative tests).
4. Identification of Proteins (qualitative tests).
5. To study general properties of the enzyme (Urease).
6. Urine analysis - normal & abnormal constituents of urine.
7. Glucose tolerance test & Glycosylated haemoglobin.
8. Centrifugation: Principle, types & applications.
9. Chromatography: Definition, types, RF value, description of paper chromatography & applications.
10. Uses, Care and Maintenance of various instruments of the laboratory.

Reference Books:

S. No	Title	Author	Publisher
1.	Text book of biochemistry for medical students	D M Vasudevan	Jaypee
2.	Fundamentals of biochemistry	J L Jain	S.Chand
3.	Biochemistry	D Voet, J Voet	Wiley
4.	Text Book of biochemistry and human biology	G P Talwar	Prentice Hall
5.	Practical Clinical Biochemistry	Ranjana Chawla	Jaypee
6.	Biochemistry for Undergraduates	Rafi MD	Orient Black Swan
7.	Text book of medical laboratory technology	Praful Bhalani	Godkar; Bhalani Publishing House

SEMESTER - II**PAPER - II****MMDT 2.2: CLINICAL BIOCHEMISTRY & BASIC HEMATOLOGICAL TECHNIQUES**

No.	Topics	Details	Marks	Min. Lec.
1.	Bioinstrumentation/ Biophysical Application	A. Definition, laws of photometry, absorbance, transmittance, absorption maxima, instruments, parts of photometer B. Types of photometry–colorimetry, spectrophotometry, flame photometry, fluorometry C. Choice of appropriate filter D. Measurements of solution E. Calculation of formula, applications. F. Electrophoresis - Principle, Types &		15

		Applications. G. Autoanalysers - Principle & Applications		
2.	Water, electrolyte metabolism and Liver, Kidney function test	A. Distribution of fluids in the body, ECF & ICF, water metabolism, dehydration, mineral metabolism B. Macronutrients (principal mineral elements) & trace elements. C. Vitamins - Fat- & water-soluble vitamins, sources, requirement, deficiency disorders & biochemical functions. D. Liver Functions & their Assessment - Based on: Carbohydrate metabolism; Protein metabolism; Lipid metabolism. E. Measurements of serum enzyme levels F. Bile pigment metabolism, Jaundice, its types and their biochemical findings. G. Renal Function Tests - Various Tests, GFR & Clearance		15
3.	Cardiac Profile	A. In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases B. Different methods of Glucose Estimation - Principle advantage and disadvantage of different methods C. Different methods of Cholesterol Estimation - Principle, advantage and disadvantage of different methods		15
4.	Basic Haematological Techniques	A. Preparation of blood collection – Basic steps for drawing blood by vein, capillary and artery puncture. B. Complications during and after blood collection C. Specimen rejection criteria for blood D. Anticoagulants- types and concentration E. Transport of blood sample F. Effect of storage on blood cell morphology G. Universal precautions		15
Total			100	60
<ul style="list-style-type: none"> • Student Seminar- 5 Lectures • Expert Talk- 5 Lectures • Student Test- 5 Lectures • Total Lectures 60+15=75 				

PRACTICAL:

A. Clinical Biochemistry (By Colorimeter / Spectrophotometer)

1. Blood urea estimation
2. Serum creatinine estimation
3. Serum uric acid estimation
4. Serum total protein estimation
5. Serum albumin and Globulin estimation
6. Serum glucose estimation
7. Total cholesterol estimation
8. HDL and LDL cholesterol (direct) estimation.
9. Triglyceride estimation
10. Serum Bilirubin total and Bilirubin direct estimation
11. Serum amylase estimation
12. Serum SGOT (AST) and SGPT (ALT) estimation
13. Alkaline phosphatase estimation
14. Serum sodium estimation
15. Serum potassium estimation
16. Serum chloride estimation
17. CK-NAC estimation

B. Haematology Practical's

1. Basic requirements for haematology laboratory.
2. Glassware's and Equipment's for Haematology.
3. Anticoagulant vial preparation.
4. Determination of Blood group by ABO blood group system
5. Complete Blood Counts.
6. Determination of Haemoglobin.
7. TRBC Count by Haemocytometers.
8. TLC by Haemocytometer.
9. Differential Leukocyte count.
10. Determination of Platelet Count.
11. Determination of ESR by wintrobes.

Reference Books:

S. No	Title	Author	Publisher
1.	Biophysical Chemistry	Upadhyay, Upadhyay & Nath	Himalaya Publishing house
2.	Essential haematology	A.V.Hoffbrand	Black well
3.	Principles of haematology	Peter Haen	WCB
4.	Text book of medical laboratory technology	Praful Godkar; Bhalani	Bhalani Publishing House

MMDT 1.4: Practical	
Paper	Marks
MMDT 1.1 Course related practical's	100
MMDT 1.2 Course related practical's	100
MMDT 1.3 Related practical's/GD	50

SEMESTER – II

PAPER – I

MMDT 2.1: Basics Of Biochemistry, Instruments And Reagents				
No.	Topics	Details	Marks	Min. Lec.
1.	Chemistry of carbohydrates & their related metabolism	M. Introduction-Definition N. Classification O. Biomedical importance & properties P. Metabolism: Q. Glycogenesis & glycogenolysis. R. Glycolysis, Citric acid cycle & its significance S. HMP shunt & Gluconeogenesis T. Regulation of blood glucose level U. Hyperglycaemia & hypoglycaemia V. Diabetes mellitus – definition, types, features W. Gestation diabetes mellitus X. Glucose Tolerance test, glycosuria		10
2.	Chemistry of Proteins & their related metabolism	K. Introduction-Definition L. Classification M. Biomedical importance N. Metabolism: Catabolism of amino acids O. Removal of NH ₂ group P. Transamination, Deamination Q. Decarboxylation- Ammonia formation & transport R. Urea cycle, Metabolic disorders in urea cycle S. Fate of some important amino acids- Phenylalanine, Tyrosine & Tryptophan T. Creatine, Creatinine		10

3.	Chemistry of Lipids & their related metabolism	J. Introduction-Definition K. Classification L. Biomedical importance, essential fatty acids M. Metabolism: Beta oxidation of fatty acids N. Fatty liver O. Ketosis P. Cholesterol & its clinical significance Q. Lipoproteins in the blood & their functions R. Atherosclerosis		8
4.	Chemistry of Nucleic acid and metabolism	G. Introduction-Definition H. Elementary chemistry of DNA and RNA I. Structure of nucleotide J. DNA and RNA molecule and its structure K. Functions of nucleic acids L. Nucleotide metabolism- purines and pyrimidines		8
5.	Enzymes	H. Introduction- definition I. Classification J. Coenzymes, isoenzymes, properties K. Mechanism of action of enzymes L. Factors affecting enzyme action M. Enzyme inhibition and regulation N. Diagnostic value of serum enzymes -Creatinine kinase, alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase		10
6.	Laboratory instruments	B. Principle and working of basic laboratory instruments Autoclave, Hot air oven, Incubator, pH meter, water bath, centrifuge, Refrigerator, colorimeter, Balance, Flame photometer, Microscope, Electrophoresis etc.		8
7.	Reagent Preparation	C. Concept of molarity and normality D. Molar, Normal and percent solution preparation, Dilution of the concentrated solution to desired concentration		6
Total			100	60
<ul style="list-style-type: none"> • Student Seminar- 5 Lectures • Expert Talk- 5 Lectures • Student Test- 5 Lectures • Total Lectures 60+15=75 				

PRACTICAL:

11. Introduction - Aim, basis, interpretation, safety in clinical biochemistry Laboratory
12. Laboratory organization- Instruments, glassware, sample collection & specimen labelling, routine tests, anticoagulants, reagents, cleaning of glassware, isotonic solution, standardization of methods, preparation of solution & interpretation of result, normal values.
13. Identification of Carbohydrates (qualitative tests).
14. Identification of Proteins (qualitative tests).
15. To study general properties of the enzyme (Urease).
16. Urine analysis - normal & abnormal constituents of urine.
17. Glucose tolerance test & Glycosylated haemoglobin.
18. Centrifugation: Principle, types & applications.
19. Chromatography: Definition, types, RF value, description of paper chromatography & applications.
20. Uses, Care and Maintenance of various instruments of the laboratory.

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2.	Fundamentals of biochemistry	J L Jain	S.Chand
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6.	Biochemistry for Undergraduates	Rafi MD	Orient Black Swan
7.	Text book of medical laboratory technology	Praful Bhalani	Godkar; Bhalani Publishing House

SEMESTER - II

PAPER - II

MMDT 2.2: CLINICAL BIOCHEMISTRY & BASIC HEMATOLOGICAL TECHNIQUES

No.	Topics	Details	Marks	Min. Lec.
1.	Bioinstrumentation/ Biophysical Application	H. Definition, laws of photometry, absorbance, transmittance, absorption maxima, instruments, parts of photometer I. Types of photometry–colorimetry, spectrophotometry, flame photometry, fluorometry J. Choice of appropriate filter K. Measurements of solution L. Calculation of formula, applications. M. Electrophoresis - Principle, Types & Applications. N. Autoanalysers - Principle & Applications		15
2.	Water, electrolyte metabolism and Liver, Kidney function test	H. Distribution of fluids in the body, ECF & ICF, water metabolism, dehydration, mineral metabolism I. Macronutrients (principal mineral elements) & trace elements. J. Vitamins - Fat- & water-soluble vitamins, sources, requirement, deficiency disorders & biochemical functions. K. Liver Functions & their Assessment - Based on: Carbohydrate metabolism; Protein metabolism; Lipid metabolism. L. Measurements of serum enzyme levels M. Bile pigment metabolism, Jaundice, its types and their biochemical findings. N. Renal Function Tests - Various Tests, GFR & Clearance		15
3.	Cardiac Profile	D. In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases E. Different methods of Glucose Estimation - Principle advantage and disadvantage of different methods F. Different methods of Cholesterol Estimation - Principle, advantage and disadvantage of		15

		different methods		
4.	Basic Haematological Techniques	H. Preparation of blood collection – Basic steps for drawing blood by vein, capillary and artery puncture. I. Complications during and after blood collection J. Specimen rejection criteria for blood K. Anticoagulants- types and concentration L. Transport of blood sample M. Effect of storage on blood cell morphology N. Universal precautions		15
Total			100	60
<ul style="list-style-type: none"> • Student Seminar- 5 Lectures • Expert Talk- 5 Lectures • Student Test- 5 Lectures • Total Lectures 60+15=75 				

PRACTICAL:

C. Clinical Biochemistry (By Colorimeter / Spectrophotometer)

18. Blood urea estimation
19. Serum creatinine estimation
20. Serum uric acid estimation
21. Serum total protein estimation
22. Serum albumin and Globulin estimation
23. Serum glucose estimation
24. Total cholesterol estimation
25. HDL and LDL cholesterol (direct) estimation.
26. Triglyceride estimation
27. Serum Bilirubin total and Bilirubin direct estimation
28. Serum amylase estimation
29. Serum SGOT (AST) and SGPT (ALT) estimation
30. Alkaline phosphatase estimation
31. Serum sodium estimation
32. Serum potassium estimation
33. Serum chloride estimation
34. CK-NAC estimation

D. Haematology Practical's

12. Basic requirements for haematology laboratory.
13. Glassware's and Equipment's for Haematology.
14. Anticoagulant vial preparation.
15. Determination of Blood group by ABO blood group system
16. Complete Blood Counts.
17. Determination of Haemoglobin.

18. TRBC Count by Haemocytometers.
19. TLC by Haemocytometer.
20. Differential Leukocyte count.
21. Determination of Platelet Count.
22. Determination of ESR by wintrobes.

Reference Books:

S. No	Title	Author	Publisher
1.	Biophysical Chemistry	Upadhyay, Upadhyay & Nath	Himalaya Publishing house
2.	Essential haematology	A.V.Hoffbrand	Black well
3.	Principles of haematology	Peter Haen	WCB
4.	Text book of medical laboratory technology	Praful Godkar; Bhalani	Bhalani Publishing House

MMDT 1.4: Practical	
Paper	Marks
MMDT 1.1 Course related practical's	100
MMDT 1.2 Course related practical's	100
MMDT 1.3 Related practical's/GD	50

The detail syllabus of Semester III to VI will be decided after consultation of SDC/Industry/

**B. Voc. –
Medical Laboratory and Molecular Diagnostics Technology
(Semester – III)**

<i>Sr. No</i>	Paper No.	Subject Name	Component	Credit
1	MLMDT 3.1	Immunology & Serology	<i>Skill</i>	5
2	MLMDT 3.2	Endocrinology, Tumor & Cancer markers	<i>Skill</i>	5
3	MLMDT 3.3	Clinical Biochemistry	<i>Skill</i>	5
4	MLMDT 3.4	Practical	<i>Skill</i>	12
5	GMLMDT 3.5	Introduction to Bioinformatics & Biostatistics	General education	3
		Total Credits of Semester - III		30
One month training in Pathological Laboratory				

**B. Voc. –
Medical Laboratory and Molecular Diagnostics Technology
(Semester – IV)**

<i>Sr. No</i>	Paper No.	Subject Name	Component	Credit
1	MLMDT 4.1	Immunohaematology & Blood Banking Techniques	<i>Skill</i>	5
2	MLMDT 4.2	Histopathology & Cytology techniques	<i>Skill</i>	5
3	MLMDT 4.3	Systemic Bacteriology, Mycology & Virology	<i>Skill</i>	5
4	MLMDT 4.4	Practical	<i>Skill</i>	12
5	GMLMDT 4.5	Basic Computer Skills	General education	3
		Total Credits of Semester - IV		30
One month training in Pathological Laboratory				

B. Voc.-
Medical Laboratory and Molecular Diagnostics Technology
(Semester –V)

<i>Sr. No</i>	Paper No.	Subject Name	Component	Credit
1	MLMDT 5.1	Molecular biology and rDNA technology	<i>Skill</i>	5
2	MLMDT 5.2	Clinical genetics	<i>Skill</i>	5
3	MLMDT 5.3	Molecular diagnostics	<i>Skill</i>	5
4	MLMDT 5.4	Practical	<i>Skill</i>	12
5	MLMDT 5.5	Hospital / Private Pathology Laboratory internship & report submission	Skill & General Education	3
		Total Credits of Semester - V		30

B. Voc.-
Medical Laboratory and Molecular Diagnostics Technology
(Semester –VI)

<i>Sr. No</i>	Paper No.	Subject Name	Component	Credit
1	MLMDT 6.1	Therapeutic Drug monitoring and toxicology	<i>Skill</i>	5
2	MLMDT 6.2	Molecular diagnostics	<i>Skill</i>	5
3	MLMDT 6.3	Small Research Projects / Dissertation based on Diagnostic techniques/Research Proposal/ Review writing	<i>Skill</i>	9
4	MLMDT 6.4	Practical	<i>Skill</i>	8
5	GMLMDT 6.5	Molecular Tools in Forensic Sciences	Skill & Gen. Education	3
		Total Credits of Semester - VI		30

Examination

Examination Module: As per UGC/NSQF guideline in 60 (By SDC/Industry) and 40 Ratio (By University/College)

Type	Credit weightage	Pattern	Place
Skill Part	60%	Practical/ OJT/ Internship assessment (As decided by SDC or Industry partner)	KMGPPGC or Collaborating industry/SDC
Theory Part/ General Education	40%	Objective (Offline/ Online/ By PRS) 100 MCQ	By CCSU or KMGPPGC

Skill Course day/hours calculation

NSQF Level	Total credit	Skill Credit	Theory Credit	Duration	Exit point/ Award
4	30	18	12	1 Sem.	Certificate
5	60	36	24	2 Sem.	Diploma
6	120	72	48	4 Sem.	Advance Diploma
7	180	108	72	6 Sem.	B.Voc. Degree

1 Skill credit equals to 28 hours, 1 theory credit equals to 14 Hours

Day Distribution chart

NSQF Level	Total Available Day in Semester	Internship Day	Field Visit Day	Lab or Training day	Total Theory day	Holiday	Total day
4	180	30	10	43	64	33	180
5	365	60	20	86	128	71	365
6	730	120	40	172	256	142	730
7	1095	180	60	258	384	213	1095

General Education/Theory part

NSQF Level	Skill Credit	In Hours x14	E-Content Hours -Allotted	E-Content Hours 50% of Hours Weightage	Hours of theory class	Total Day, If 2 class/day
4	12	168	80	40	128	64
5	24	336	160	80	256	128
6	48	672	320	160	512	256
7	72	1008	480	240	768	384

Skill Component part

NSQF Level	Total credit	In Hours x28	Internship Day	Internship Hours X8	Internship Hours 50% of Hours Weightage	Field Visit Day	Filed Visit Hours X8	Field Visit Hours 50% of Hours Weightage	Total Hours Spent in Internship and field visit	Lab Hours	Lab or Training day
4	18	504	30	240	120	10	80	40	160	344	43
5	36	1008	60	480	240	20	160	80	320	688	86
6	72	2016	120	960	480	40	320	160	640	1376	172
7	108	3024	180	1440	720	60	480	240	960	2064	258