NAAC II[nd] Cycle: B[++] (2.91), ISO: 9001-2015 Certfied

Km. Mayawati Govt. Girls P.G. College

Badalpur, G.B. Nagar-203207
http://kmgcbadalpur.org/

UGC Sponsored
Vocational Course

CURRICULUM

FOR

UGC - B.Voc.

Under National Skills Qualification Framework (NSQF)

Bachelor of Vocational

in

Medical Lab and Molecular Diagnostics Technology

(3 years – Six Semester Full Time Course)

PROGRAM OBJECTIVES

The University Grants Commission (UGC) has launched a scheme on skills development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Certificate /Diploma /Advanced Diploma and Degree under the NSQF. The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles along with broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge

The proposed vocational programme in Medical laboratory and Molecular diagnostic Technology will be a judicious mix of skills, professional education related to Medical laboratory and Molecular laboratory and also appropriate content of general education. It is designed with the objective of equipping the students to cope with the emerging trends and challenges in the Medical laboratory and Molecular diagnostic Technology.

CURRICULUM

The curriculum in each of the years of the programme would be a suitable mix of skill development components and general education component.

PROGRAMME STRUCTURE

The B.Voc (Medical laboratory and Molecular diagnostic Technology) shall include:

- General Education Components
- Skill Components
- Project
- Internship
- Industrial Training

- Educational Trips
- Soft Skills and Personality Development Programmes

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

PAPER - I

MMDT 1.1: Fundamentals of Anatomy and physiology and Basic chemistry				
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 and related diseases	A. Composition of blood B. Erythrocytes-Structure and functions C. Leucocytes-Types, Structure and functions D. Platelets- Structure and functions, Haemostasis E. Anaemia and various types of anaemias, Thalassemia's, Polycythaemia, Leukaemia, haemolytic disease of new born, multiple myeloma, parasitic infections of blood		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 D. Synapse and chemical transmitters		7

		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.	Elementary knowledge of chemistry	A. Structure of atom, atomic weight, molecular and equivalent weight. B. Acids, bases balance and imbalance. C. pH indicators (pH meter, pH paper, universal indicator). D. Molar solutions, normal solutions E. Buffer solutions, percent solutions, saturated solutions, standard solutions F. Osmosis, osmotic pressure, diffusion, hypotonic, hypertonic and isotonic solutions.		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
• **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		7
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		6
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		6

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 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		6
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.	Routine Laboratory Techniques	A. Basic causes of accidents, common types of laboratory B. Importance of Biomedical Waste. NABL and SOP. C. Functional components of clinical laboratories, (cleanliness, precautions to be taken WRT patients, reports, analysis. D. Communication between physician, patients, and the medical laboratory professional E. Basic needs of clinical laboratory technician, awareness of soft skills. F. Identification, use, maintenance and care of common laboratory glassware and equipment, handling of al glassware. Use, principle and care of centrifuge, colorimeter, oven, incubator, microscope,		6
8.	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, CO2 requirement, temperature, pH, light. D. Sterilization and Disinfection: Physical agents- Sunlight, Temperature less than 100^0C, Temperature at 100^0C, steam at atmospheric pressure and steam under pressure, irradiation, filtration.		6

		E. Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide		
9.	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
10.	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

- **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		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		15

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		15
Total			100	60
• 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 & 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 & 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 & related metabolism	A. Introduction-Definition B. Elementary chemistry of DNA and RNA C. Structure of nucleotide D. DNA and RNA molecule and its structure E. Functions of nucleic acids F. Nucleotide metabolism- purines and pyrimidines		8

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
• 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 Godkar; Bhalani	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 & Applications. G. **Autoanalyzer** - Principle & Applications		10
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.		10

		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		
3.	**Hormones**	A. Mechanisms of Action of Hormones and Signalling Molecules B. Hypothalamic and Pituitary Hormones C. Steroid Hormones D. Thyroid Hormones E. Gut Hormones		10
4.	**Cardiac Profile and Heart Diseases**	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 D. Abnormal heart rhythms, Congenital heart disease, Heart valve disease, Stroke, Vascular disease.		10
5.	**Fundamentals of Haematology**	A. History and discovery of blood group system, Principles used in blood grouping. ABO system and the methods used. B. Factors influencing the results of blood grouping. C. Rhesus blood group system (Rh-system), Rh-antigen, Source of antigens and types of antibodies D. Compatibility tests in blood transfusion (Direct & indirect), Cross-matching, Coomb's test - Principles involved and the methods used E. Bone marrow aspiration methods, staining, preparation of bone marrow smears and preparation of histological sections. F. Preparation and staining procedures of blood smears - thin smears, thick smear, buffy coat smear and wet preparation		10
6.	**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		10

Total		100	60

- 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

SEMESTER - II

PAPER - III

MMDT 2.3: Functional English, Communication Skills and Basic Computer Skills

No.	Topics	Details	Marks	Min. Lec.
1.	Grammar	A. 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 B. Prepositions / Prepositional Phrases		15
2.	Writing Comprehension	A. 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 vii. Business report viii. Press report B. Job Application / Resume Writing. i. Introduction ii. A Cover Letter iii. Curriculum Vitae / Resume C. Letters of Appointment & Resignation.		15
3.	Communication Skills	A. Group discussion skills i. Meaning ii. Characteristic		15

		iii. Do's & Don'ts iv. Relevance v. Moderating a group discussion B. Presentation skills i. Meaning ii. Planning a presentation skill iii. Preparing a presentation skill iv. Delivering a presentation skill v. Presentation skills C. Public Speaking i. Meaning ii. Essential of effective public speaking D. Facing Interviews i. Importance ii. Do's & Don'ts		
4.	Basics of Computer Skills	A. Data, information, properties, Types of information. Computing files, internet, server. B. Introduction to computer: Introduction to associated terms like CPU, storage devices, peripherals output & input devices etc. C. MS WORD: Basic. Making new document, editing. formatting the text (text: border, colour, spacing, copying the text, undo, Redo, repeat) Formatting: Paragraph alignment, (line spacing, paragraph spacing, paragraph indents) Borders paragraph border, shading. Spelling and grammar. D. TABLES: selecting the table, insertion of row, columns text, merging the cell converting table to text and text to table, insert date, time, foot notes, header footer, end notes. MS E. WINDOW: making new file, folders, saving data		15
Total			100	60

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

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

Sr. No	**Paper No.**	**Subject Name**	**Component**	**Credit**
1	MMDT 3.1	Immunology & Serology	*Skill*	*5*
2	MMDT 3.2	Endocrinology, Tumor & Cancer markers	*Skill*	*5*
3	MMDT 3.3	Practical	*Skill*	*15*
5	MMDT 3.4	Introduction to Bioinformatics & Biostatistics	General education	*5*
		Total Credits of Semester - III		*30*
One-month training in Pathological Laboratory				

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

Sr. No	**Paper No.**	**Subject Name**	**Component**	**Credit**
1	MMDT 4.1	Immunohematology & Blood Banking Techniques	*Skill*	*5*
2	MMDT 4.2	Histopathology & Cytology techniques	*Skill*	*5*
3	MMDT 4.3	Systemic Bacteriology, Mycology & Virology	*Skill*	*5*
4	MMDT 4.4	Practical	*Skill*	*12*
5	MMDT 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)

Sr. No	**Paper No.**	**Subject Name**	**Component**	**Credit**

1	MMDT 5.1	Molecular biology and rDNA technology	*Skill*	*5*
2	MMDT 5.2	Clinical genetics	*Skill*	*5*
3	MMDT 5.3	Molecular diagnostics	*Skill*	*5*
4	MMDT 5.4	Practical	*Skill*	*12*
5	MMDT 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)

Sr. No	**Paper No.**	**Subject Name**	**Component**	**Credit**
1	MMDT 6.1	Therapeutic Drug monitoring and toxicology	*Skill*	*5*
2	MMDT 6.2	Molecular diagnostics	*Skill*	*5*
3	MMDT 6.3	Small Research Projects / Dissertation based on Diagnostic techniques/Research Proposal/ Review writing	*Skill*	*9*
4	MMDT 6.4	Practical	*Skill*	*8*
5	MMDT 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)	KMGGPGC or Collaborating industry/SDC
Theory Part/ General Education	40%	Objective (Offline/ Online/ By PRS) 100 MCQ	By CCSU or KMGGPGC

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, I 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

Bachelor of Vocational Studies
in
Medical Laboratory and Molecular Diagnostics Technology
Semester I (Certificate course-Lab technology)

Paper code	Subject/Paper Title	Examination Pattern	Total Marks	Exam by SDC/ Industrial/ Training partner	Exam by CCS University	Internal exam by KMGGPGC	Credits
PAPER-1	General Component of Paper-1	Multiple Choice Questions	100	-	75	25	4
PAPER-2	General Component of Paper-2	Multiple Choice Questions	100	-	75	25	4
PAPER-3	General Component	Multiple Choice Questions	100	-	75	25	4
PAPER-4	Practical /Internship/Training-1*	Practical	100	100	-		4
PAPER-5	Practical /Internship/Training-2*	Practical	100	100	-		4
PAPER-6	Skill Component of Paper-1	Multiple Choice Questions	100	75	-	25	4
PAPER-7	Skill Component of Paper-2	Multiple Choice Questions	100	75	-	25	4
PAPER-8	Skill Component (Field Work / Hospital Lab Visit / Industry Visit (Report writing/ Presentation)	Report Submission/ Presentation	50	-	-	50	2
	Total marks		750	350	225	175	30
	Total credit		30	14	9	7	

- *1 credit=25 Marks*
- *If student completed a SWYAM/MOOCs/NEPTEL course with eCertification, she can opt out equal credit paper up to 6 credit in one semester. College will send the eCertification to university, So it can replaced and added in place of opt out paper.*
- *College will submit the marks of SDC/Industry/Training Partner/KMGGPGC to the University to issue the certificate.*
- ** Practical in MMDT course and Intenship/ Training in ATHM course*

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

Skill Component = 60% of 750 marks = 450 Marks
General Component = 40% of 750 marks = 300 Marks

- **External marks will be assessed by SDC/Industry**
- **Internal marks will be assessed by CCS university/KMGGPG college, Badalpur.**

Detail of the Syllabus of Semester-I

Course code	Component	Unit	Topic	Credits
MMDT-1.6	Skill	1	Body as a whole and its constituents	4
	Skill	2	Blood and related diseases	
	Skill	3	Cardiovascular system	
	Skill	6	Excretory system	
	Skill	8	Special senses and overview of endocrine system	
	Skill	9	Elementary knowledge of chemistry	
MMDT-1.7	Skill	2	Haemodynamic disorders	4
	Skill	6	Environmental and nutritional diseases	
	Skill	7	Routine Laboratory Techniques	
	Skill	8	General characters and classification of Bacteria	
	Skill	9	Culture and Staining	
	Skill	10	Collection of Specimen and Disposal of Waste	
MMDT-1.4	Skill		Practical of course code MMDT 1.1	4
MMDT-1.5	Skill		Practical of course code MMDT 1.2	4
MMDT-1.8	Skill		Field Work / Hospital Lab Visit / Industry Visit	**2**

	(Report writing/ Presentation			
MMDT-1.1	General	4	Respiratory system	4
	General	5	Digestive system	
	General	7	Nervous system	
	General	10	Reproductive system	
MMDT-1.2	General	1	Cell Injury and Cellular Adaptations	4
	General	3	Inflammation and healing	
	General	4	Neoplasia	
	General	5	Genetic and paediatric diseases system	
MMDT-1.3	General		Functional English, Communication Skills and Basic Computer Skills	4

Note: -

1. Minimum marks for passing will be 40% of the total marks allotted to that paper / practical.

Credit Calculations

1.One credit would mean equivalent of 15 periods of 60 minutes each, for Theory & Practical's.

2.For internship/ Field work, the Credit Weightage for equivalent hours shall be 50% of that for lectures.

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Paper code	Subject/Paper Title	Examination Pattern	Total Marks	Exam by SDC/ Industrial/ Training partner	Exam by CCS University	Internal exam by KMGGPGC	Credits
MMDT-2.1	General Component of Paper-1	Multiple Choice Questions	100	-	75	25	4
MMDT-2.2	General Component of Paper-2	Multiple Choice Questions	100	-	75	25	4
MMDT-2.3	General Component	Multiple Choice Questions	100	-	75	25	4
MMDT-2.4	Practical /Internship/Training-1*	Practical	100	100	-		4
MMDT-2.5	Practical /Internship/Training-2*	Practical	100	100	-		4
MMDT-2.6	Skill Component of Paper-1	Multiple Choice Questions	100	75	-	25	4
MMDT-2.7	Skill Component of Paper-2	Multiple Choice Questions	100	75	-	25	4
MMDT-2.8	Skill Component (Field Work / Hospital Lab Visit / Industry Visit (Report writing/ Presentation)	Report Submission/ Presentation	50	-	-	50	2
	Total marks		750	350	225	175	30
	Total credit		30	14	9	7	

- *1 credit=25 Marks*
- *If student completed a SWYAM/MOOCs/NEPTEL course with eCertification, she can opt out equal credit paper up to 6 credit in one semester. College will send the eCertification to university, So it can replaced and added in place of opt out paper.*
- *College will submit the marks of SDC/Industry/Training Partner/KMGGPGC to the University to issue the certificate.*
- ** Practical in MMDT course and Intenship/ Training in ATHM course*

Detail of the Syllabus of Semester-II

Course code	Component	Unit	Topic	Credits
MMDT-2.6	Skill	1	Chemistry of carbohydrates & related metabolism	4
	Skill	2	Chemistry of Proteins & related metabolism	
	Skill	5	Enzymes	
	Skill	6	Laboratory instruments	
MMDT-2.7	Skill	1	Bioinstrumentation/ Biophysical Application	4
	Skill	2	Water, electrolyte metabolism and Liver, Kidney function test	
	Skill	4	Cardiac Profile and Heart Diseases	
	Skill	6	Basic Haematological Techniques	
MMDT-2.4	Skill		Practical of course code MMDT 2.1	4
MMDT-2.5	Skill		Practical of course code MMDT 2.2	4
MMDT-2.8	Skill		Field Work / Hospital Lab Visit / Industry Visit (Report writing/ Presentation	2

MMDT-2.1	General	3	Chemistry of Lipids & related metabolism	4
	General	4	Chemistry of Nucleic acid & related metabolism	
	General	7	Reagent Preparation	
MMDT-2.2	General	3	Hormones	4
	General	5	Fundamentals of Haematology	
MMDT-2.3	General		Soft Skill and Aptitude Development, Functional English and Communication Skills	4