।। सा विद्या या विमुक्तये ।।
स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड
"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)
Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade
ACADEMIC (1-BOARD OF STUDIES) SECTION
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विद्यापीठ अनुदान आयोगाने शैक्षणिक वर्ष २०२०–२१ पासून मान्यता दिलेल्या व्होकेशनल कोर्सेसचे (बी.व्होक पदवी, ॲडव्हॉस डिप्लोमा, डिप्लोमा व सर्टिफिकेट) अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करणे बाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, विद्यापीठ अनुदान आयोगाने शैक्षणिक वर्ष २०२०–२१ पासून मान्यता दिलेल्या व्होकेशनल कोर्सेसच्या (बी. व्होक पदवी, ॲडव्हान्स डिप्लोमा, डिप्लोमा व सर्टिफिकेटस) अभ्यासक्रमांना मा विज्ञान व तंत्रज्ञान विद्याशाखेने **दिनांक ३१ मे २०२१ रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व मा. विद्यापरिषदेच्या दिनांक १२ जून २०२१ रोजीच्या बैठकीतील विषय क्रमांक २६/५१–२०२१ च्या** ठरावानुसार खालील अभ्यासक्रमांस मान्यता देण्यात आली आहे.

1. B. Voc. IT/Hardware and Networking.
2. B. Voc Software Development.
3. B. Voc. Medical Laboratory Technology.
4. B. Voc. Horticulture and Post-Harvest Technology.
5. B. Voc. Herbal Medicine.
6. B. Voc. Commercial Aquaculture.
7. B. Voc. Food Processing Technology.
8. B. Voc. Skill Based Zoology.
9. B. Voc. Vocational Biotechnology.
10. B. Voc. Plant Tissue Culture Secretary.
11. Advance Diploma Radiological Physics.
12. Diploma – Computer Hardware.
13. Diploma – Computer Network Assistant.
14. Diploma – PGDMLT.
15. Diploma – Embedded System Design.
16. Diploma- Biofertilizer.
17. Diploma- Fisheries and Farm Management.
18. Diploma - Bee Keeping.

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी. ही विनंती.

जा.क्र.:शैक्षणिक–१/परिपत्रक/व्होकेशनल अभ्यासक्रम/N-२०२०–२१/६८

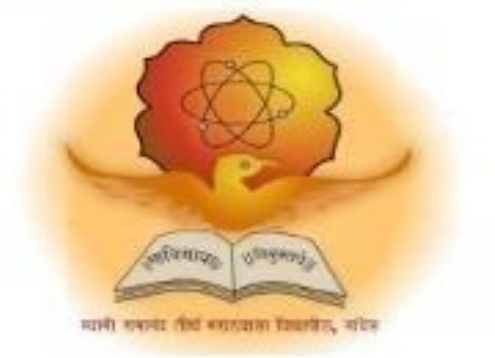
दिनांक : ०५.०७.२०२१

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded

(NAAC Re-accredited with 'A' Grade)



Syllabus of

B. Voc. Medical Laboratory Technology (First Year)
(3 years Degree Course)

Introduced from Academic Year 2020-21

TITLE OF THE PROGRAMME

B. Voc. Medical Laboratory Technology

1. Preamble:

Skills and knowledge are the driving forces of economic growth and social development for any country. Presently, the country faces a demand – supply mismatch, as the economy needs more 'skilled' workforce than that is available. In the higher education sphere, knowledge and skills are required for diverse forms of employment in the sectors of education, health care, manufacturing and other services.

Government of India, taking note of the requirement for skill development among students, launched National Vocational Education Qualification Framework (NVEQF) which was later on assimilated into National Skills Qualifications Framework (NSQF). Various Sector Skill Councils (SSCs) are developing Qualification Packs (QPs), National Occupational Standards (NOSs) and assessment mechanisms in their respective domains, in alignment with the needs of the industry.

2. Aim:

1. To develop a healthy attitude among students towards work and life.
2. To enhance individual employability.
3. To reduce the mismatch between the demand and supply of skill man-power.
4. To provide an alternative for those intending to pursue higher education without particular interest or purpose.
5. To prepare students for identified vocations spanning several area of activity.
6. An emphasis in vocational education will also be on development of attitudes, knowledge, and skills for entrepreneurship and self-employment.
7. To provide opportunities to fulfil the needs of women, rural and tribal students and the deprived sections of society.

3. Objective:

(1) To increase the productive potential of the country.
(2) To raise the economic standard of people.
(3) To reduce the level of unemployment by providing self- employment schemes.
(4) To utilize man-power to fullest extent.
(5) To make the students skilled technician.
(6) To help for equitable sharing of benefits of economic development to ensure social and economic justice.
(7) To help students understand the scientific and technological aspects of contemporary civilization.
(8) To make use of material and human resources.
(9) To exploit the scientific and technical knowledge for betterment of the society.
(10) To generate in pupils a love and appreciation for work.

4. Eligibility and Fees

10+2 Pass

Students will be awarded:

Certificate	Student shall be required to appear in examinations of all courses. However, to award the Certificate a student shall study the minimum of **30 credits course and opt minimum passing credits as per university rule.**
Diploma:	Student shall be required to appear in examinations of all courses. However, to award the Diploma a student shall study the minimum of **60 credits course and opt minimum passing credits as per university rule.**
Advanced Diploma	Student shall be required to appear in examinations of all courses. However, to award the Advanced Diploma a student shall be required to study minimum of **120 credits course and opt minimum passing credits as per university rule.**
B.Voc Degree	Student shall be required to appear in examinations of all courses. However, to award the degree a student shall be required to study minimum of **180 credits course and opt minimum passing credits as per university rule.**

6. Assessment:

The Skill component of the course will be generally assessed by the respective Sector Skill Councils. In case, there is no Sector Skill Council for a specific trade, the assessment may be done by an allied Sector Council or the Industry partner. Further if Sector Skill Council in concerned / relevant trade has no approved QP which can be mapped progressively or due to any other reason, if the SSC expresses its inability to conduct the assessment or cannot conduct the skill assessment in stipulated time frames as per academic calendar, the institutions may conduct skill assessment through a Skill Assessment Board by 'Certified Assessors' as per the provisions enumerated in MHRD Skill Assessment Matrix for Vocational Advancement of Youth (SAMVAY). The Skill Assessment Board may have Vice-Chancellor/Principal/Director/Nodal officer/Coordinator of the programme / Centre, representatives of the partner industy(s), one nominee of the Controller of Examination or his/her Nominee of affiliating University / Autonomous College and at least one external expert. The affiliating university may nominate additional experts on the Skill Assessment Board, if required.

The certifying bodies may comply with / obtain accreditation from the National Accreditation Board for Certification Bodies (NABCB) set up under Quality Council of India (QCI). Wherever the

university/college may deem fit, it may issue a joint certificate for the course(s) with the respective Sector Skill Council(s).

The general education component will be assessed by the concerned university as per the prevailing standards and procedures. General Education credit refers to a unit by which the course work is measured. It determines the number of hours of instructions required per week.

One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week. Accordingly, one Credit would mean equivalent of 14-15 periods of 60 minutes each or 28 – 30 hrs of workshops/ labs. For internship / field work, the credit weighage for equivalent hours shall be 50% of that for lectures /tutorials. For self-learning, based on e-content or otherwise, the credit weighage for equivalent hours of study shall be 50% of that for lectures / tutorials.

The institutions offering B.Voc degree programme should adopt and integrate the guidelines and recommendations of the respective Sector Skill Councils (SSCs) for the assessment and evaluation of the vocational component, wherever available.

Letter Grades and Grade Points: it is recommended to adopt 10- point grading system with the Letter grades as given below:

Grades and Grade Points

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B (Above Average)	6
C (Average)	5
P (Pass)	4
F(Fail)	0
Ab (Absent)	0

Passing percentage for each paper each course is 40%. Separate passing for continuous assessment and end semester examination and/or as per time to time guidelines of the university.

A student obtaining Grade F and Ab shall be considered failed and he/she will be required to reappear in the examination.

Computation of Semester Grade Point Average System (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the course components taken by a student and the sum of the number of credits of all the courses undergone by a student in a semester, i.e

SGPA (Si) = Σ(Ci x Gi) / ΣCi

where 'Ci'is the number of credits of the ith course component and 'Gi' is the grade point scored by the student in the ith course component.

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

CGPA = Σ(Ci x Si) / Σ Ci

Where 'Si' is the SGPA of the ith semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

The skill component would be taken as one of the course components in calculation of SGPA and CGPA with given credit weightage at respective level.

Swami Ramanand Teerth Marathwada University, Nanded

B. Voc. Medical Laboratory Technology

Syllabus with effective from 2020-2021

Semester I

Sr. No.	Course Code	Course Title	Continuous Assessment Credits (CA)	End Semester Exam Credits (ESE)	Total Credits
	General Education				
1	BMLT101	English language and communicative skills	2	2	4
2	BMLT 102	Computer fundamentals & IT	2	2	4
3	BMLT 103	Fundamentals of Microbiology -I	2	2	4
	Skill Courses				
4	BMLT 104	Fundamentals of anatomy and physiology	2	2	4
5	BMLT105	Laboratory science & human body	2	2	4
6	BMLT106	Hematology	2	2	4
	Practical Skill Courses				
7	BMLT 107	LAB1: Fundamentals of anatomy and physiology	1	1	2
8	BMLT108	LAB 2:Laboratory science & human body	1	1	2
9	BMLT109	LAB3: Hematology	1	1	2
	Total				30

Semester II

Sr. No.	Course Code	Course Title	Continuous Assessment Credits (CA)	End Semester Exam Credits (ESE)	Total Credits
	General Education				
1	BMLT 201	Soft skill & Personality Development	2	2	4
2	BMLT 202	Environmental Studies	2	2	4
3	BMLT 203	Microbiology - II	2	2	4
	Skill Courses				
4	BMLT 204	Advanced Laboratory Science Techniques & Testing Process	2	2	4
5	BMLT 205	Biochemistry - I	2	2	4
6	BMLT 206	Bioinstrumentation, Haematological Techniques	2	2	4
	Practical Skill Courses				
7	BMLT 207	LAB4: Advanced Laboratory Science Techniques & Testing Process	1	1	2
8	BMLT 208	LAB5: Biochemistry - I	1	1	2
9	BMLT 209	LAB6: Bioinstrumentation, Haematological Techniques	1	1	2
	Total				30

SEMESTER-I

Paper Title: BMLT – 101:	ENGLISH LANGUAGE AND COMMUNICATIVE SKILLS

Objective: The objective of this paper is to familiarize the students with the importance of Communication and its associated components in the hard core corporate sector.

UNIT I- The Sentence and Its Structure - How to Write Effective Sentence -- Phrases - What Are They? - The Noun Clauses - The Adverb Clause - The Relative Clause - How the Clauses Are Conjoined - Word - Classes and Related Topics - Understanding the Verb - Understanding the Auxiliary Verb - Understanding the Adverbs - Understanding the Pronoun - Prepositions.

UNIT II- Spelling and Pronunciation - Pronunciation, The Tense and Related topics- Presentness and Present Tenses - The Presentences of a Past Action - Interrogatives and Negatives - Negatives - How to Frame Questions - What's What? - Polite Expressions – Some Time Expressions - In Conversation – Letter Writing - Academic Assignments.

UNIT III - Self - Assessment; Identifying Strength & Limitations; Habits, Will-Power and Drives, Developing Self - Esteem and Building Self - Confidence, Significance of Self - Discipline, Understanding Perceptions, Attitudes, and Personality Types, Mind - Set: Growth and Fixed, Values and Beliefs, Motivation and Achieving Excellence; Goal Setting, Life and Career Planning , Constructive Thinking, Communicating Clearly: Understanding and Overcoming barriers.

UNIT IV - Active Listening, Persuasive Speaking and Presentation skills conducting Meetings, Writing Minutes, Sending Memos and Notices; etiquette: Effective E - mail Communication; Telephone Etiquette, Body Language in Group Discussion and Interview.

Books Recommended:

1. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.
2. Kulbhushan Kumar, Effective Business Communications, Khanna Publishing House (AICTE Recommended-2018)
3. Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders Washington, DC: Pfeiffer & Company, 2013.
4. Klaus, Peggy, Jane Rohman & Molly Hamaker. The Hard Truth about Soft Skills. London: HarperCollins E - books, 2007.
5. Petes S. J. , Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw - Hill Education, 2011.
6. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success. Canada: Wiley & Sons, 2006.

Paper Title: BMLT – 102:	COMPUTER FUNDAMENTALS & IT

Objectives: The objective of this course is to familiarize students with Fundamentals of Computer and IT applications. It enablesthe student to get practical exposure towards MS - Office tools.

UNIT I - KNOWING COMPUTER: Introduction, Objectives, Basic Applications of Computer, Components of Computer System: Central Processing Unit, Keyboard, mouse and VDU, Other Input devices, Other Output devices, Computer Memory. Concept of Hardware and Software: Hardware, Software: Application Software, Systems software. Concept of computing, data and information. Bringing computer to life: Connecting keyboard, mouse, monitor and printer to CPU, Checking power supply.

UNIT II - OPERATING COMPUTER USING GUI BASED OPERATING SYSTEM: Introduction, Objectives, Basics of Operating System: Operating system, Basics of popular operating system (LINUX, WINDOWS). The User Interface: Task Bar, Icons, Menu, Running an Application. Operating System Simple Setting: Changing System Date And Time, Changing Display Properties, To Add Or Remove A Windows Component, Changing Mouse Properties, Adding and removing Printers. File and Directory Management: Creating and renaming of files and directories, Common utilities.

UNIT III - INTRODUCTION TO INTERNET, WWW AND WEB BROWSERS: Introduction, Objectives. Basic of Computer Networks: Local Area Network (LAN), Wide Area Network (WAN). Internet: Concept of Internet, Applications of Internet, Connecting to the Internet, Troubleshooting, World Wide Web (WWW), Web Browsing Software, Popular Web Browsing Software. Search Engines: Popular Search Engines / Search for content, Accessing Web Browser, Using Favorites Folder, Downloading Web Pages, Printing Web Pages. Understanding URL, Surfing the web: Using e - governance website.

UNIT IV - COMMUNICATIONS AND COLLABORATION: Introduction, objectives, Basics of E - mail: What is an Electronic Mail, Email Addressing, Using E - mails: Opening Email account, Mailbox: Inbox and Outbox, Creating and Sending a new E - mail, Replying to an E - mail message, Forwarding an E - mail message, Sorting and Searching emails. Introduction to MS - Office: MS - Word, MS - Excel, MS - Power Point.

Books Recommended:

1. Computer Fundamentals, R.S. Salaria, Khanna Publishing House (AICTE Recommended Textbook – 2018)
2. Handbook of Computer Fundamentals, N.S. Gill, Khanna Publishing House (AICTE Recommended Textbook – 2018)
3. Fundamentals of Computers, V. Rajaraman, PHI Publication
4. Computer Fundamentals, P. K. Sinha, BPB Publication
5. Introduction to Computers with MS - Office 2007, Leon, TMH Publication

Paper Title: BMLT – 103:	FUNDAMENTALS OF MICROBIOLOGY-I

Objectives: The structure of the course comprises the instrumental use, study of microscopes, micro organisms, sterilization and the other related concepts.

UNIT I – Classification, morphology and physiology of bacteria, anatomy of bacterial cell, growth requirement of bacteria-growth curve, nutrients required. Gram positive & Gram negative Bacteria. Normal flora of human body.

UNIT II – Use of microscope in examination of unstained bacteria, fungi, algae, parasites and stained cell preparations including simple staining, Gram's staining, acid fast staining, capsule staining, spore staining using prokaryotic and eukaryotic cells, hanging drop preparation,
Preparation of culture media, spread plates, pour plates, selective media, differential media.

UNIT III - Separation of pure cultures and study the effect of selective nutrients on prokaryotes.
Isolation of Soil Bacteria, Soil Fungi, Soil Actinomycets

UNIT IV - Selective media for Soil microflora and use of growth factors, Study of Rhizosphere interactions, Quantitative measurements of Soil nutrients and Rhizosphere microflora and preparation of starter cultures of Rhizobia, Azotobacter.

Suggested Readings:

1. Textbook of Pathology - Harsh Mohan; Jaypee
2 Basic Pathology - V.Kumar, S.Robbins; Harcourt
3. Text Book of Microbiology - Pelczar, Chan, Kreig
4. Bacteriology - A.J. Salle
5. Text Book of Microbiology - Vol I and Vol II - Powar and Daginawala
6 Text Book of Microbiology - Stanier
7. Human Anatomy, Physiology & Health Education by Harie R. Berasari, Gandhi & Goel
8. Textbook of Medical Physiology by Guyton and Hall

Paper Title: BMLT – 104:	FUNDAMENTALS OF ANATOMY AND PHYSIOLOGY

Objectives: The course offers a classic blend of anatomy and physiology, enabling the students to understand the fundamentals as well as the advanced level of the course.

Unit-I

A) Body as a whole and its constituents

The cells, tissues and organization of the body

Tissues- epithelial, connective, muscle, nervous

Cell regeneration, membranes, glands, Organization of the body

Bones of the skeleton, Axial skeleton, Appendicular skeleton, Cavities of the body,Cranial, thoracic, abdominal, pelvic.

B) Blood

Composition of blood

Erythrocytes-Structure and functions

Leucocytes-Types, Structure and functions

Platelets- Structure and functions, Hemostasis

Haemoglobin, Blood groups, Coagulation Factors, Anaemia & Immunoglobulins

C) Cardiovascular System

Heart-Functional anatomy; Properties of heart muscle; Heart as a pump; Cardiac output and venous return; Vascular system; Systemic arterial blood pressure

Unit-II

A) Respiratory System

Basic features and functional anatomy, Ventilation, Functions, Lungs Volumes and capacities

B) Digestive System

Elementary functional anatomy; Salivary glands; Stomach and its secretion; Liver, pancreas and their role in digestion, Bile, Small and large intestine; Movement of alimentary tract; Gastrointestinal hormones and their functions

C) Excretory system

Functional anatomy of kidney; Mechanism of formation of urine; Water, electrolyte and acid-base balance; Skin and its functions

Unit-III

A) Nervous System

Elementary neuroanatomy; Properties of neurons; Nerve impulse, Types of nerves; Synapse and chemical transmitters; Central nervous system-Neuroglia, membranes of; brain and spinal cord, Ventricles of brain and cerebrospinal fluid.

Brain- cerebrum, cerebellum

Spinal cord- structure

Peripheral nervous system-Spinal nerves and cranial nerves
Autonomic nervous system-Sympathetic NS, Parasympathetic NS.
Functions of ANS
Central visceral regulations

B) Special senses and Endocrinology

Eye and Ear (in brief)-
a) List of Endocrine Glands; Hormones : Their secretion and functions (in brief)

Unit-IV: A) Reproductive System

Female reproductive system; Anatomy- External and internal parts; Puberty, menstrual cycle, Fertilization.
Male reproductive system- Elementary anatomy; Functions of male reproductive system

B) Muscular System

Muscles characteristics
Properties of skeletal muscles
Properties of smooth muscles

Suggested Readings:

1. Anatomy and physiology in health and illness - Wilson Katheen, Anne Waugh ; Churchill livingstone
2. Concise medical physiology - Sujit Chaudhari; Central
3. Textbook of medical physiology - Arthur Guyton and Hall; W.B. Saunders
4. Understanding medical physiology R. L. Bijlani, Jaypee

Paper Title: BMLT – 105:	LABORATORY SCIENCE & HUMAN BODY

Objectives: The aim of the course is to familiarize the students not only with the human anatomy but also the practical edge to understand the various organs and functions as well.

UNIT I- Basic Understanding of Healthcare Service Providers (Primary, secondary & tertiary), Basic Understanding of Hospital Functions, Basic Understanding of Diagnostic Centers and medical laboratory facilities, Understanding of Laboratory at different level (National / State / District).

UNIT II - To develop broad understanding of the Role of MLT, To understand laboratory maintenance needs to be taken care by MLT, To develop Understanding of Patient Comforts and Safety, To develop understanding of Laboratory Test Results, To exhibit Ethical behavior

UNIT III - Basic understanding of organization of body cells, tissue Organs, organ systems, membranes and glands in human body, Understanding basic unit of body - Cell, Understanding different types of tissues, Understanding different types of organ systems, Understanding different types of body fluids, secretions and excretions, Understanding different parts of body, Understanding Endocrine system in human body nderstanding cardiovascular system and blood, vessels in human body.

UNIT IV- Understanding musculo - skeletal system in human body, Describe digestive System in human body, Describe Respiratory system in human body, Describe Urinary System in human body, Describe Nervous System in human body, Describe Sense organs in human body, Describe Reproductive System in human body, Describe Integumentary system and Lymphatic system

Books Recommended:

1. Solomon. E. A. , (2008) Introduction to Human Anatomy and Physiology 3rd Ed, Saunders: St Louis.
2. Chaursia, B. D. , & Garg, K. , (2012) Human Anatomy Regional and Applied. CBS Publications: New Delhi
3. T. S. Ranganathan - A text book of Human Anatomy
4. Fattana, Human anatomy (Description and applied) Saunder's & C P Prism Publishers, Bangalore - 1991

Paper Title: BMLT – 106:	HEMATOLOGY

1. Hematological Disorders

a. Classification of Anemia : Morphological & etiological.

b. Iron Deficiency Anemia : Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.

c. Megaloblastic Anemia : Causes, Lab findings.

d. Hemolytic Anemia : Definition, causes, classification & lab findings.

e. Bone Marrow : Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black, Myeloperoxidase.

f. Leukemia : Classification, Blood Picture, Differentiation of Blast Cells.

2. Basic Hematological Techniques

a. Characteristics of good technician

b. Preparation of specimen collection material.

c. Lab. request form.

d. Basic steps for drawing a blood specimen by veinipuncture. Complications of veinipuncture.

e. Patient after care

f. Specimen rejection criteria for blood specimen

g. Hemolysis of blood

h. Blood collection by skin puncture (Capillary Blood)

i. Arterial puncture.

j. Deciding specimen types and selection of -

o Anticoagulant- EDTA, Citrate, Oxalate, Heparin, sodium fluoride.

k. Separation of serum

l. Separation of plasma

m. Changes in blood on keeping

n. Maintenance of specimen identification

o. Transport of the specimen.

p. Effect of storage on Blood Cell Morphology

q. Universal precautions

Suggested Readings:

1. Text book of medical laboratory technology by Praful Godkar; Bhalani
2. Text book of biochemistry for medical students by D M Vasudevan; Jaypee
3. Fundamentals of biochemistry by J L Jain; S Chand
4. Biochemistry by D Voet, J Voet; Wiley
5. TB of biochemistry and human biology by G P Talwar; Prentice Hall
6. MOLBIO by Avinash and Kakoli Upadyay; Himalaya Publishing house
7. Clinical Biochemistry by G.Guru
8. Principal of Biochemistry by Lehninger

BMLT 107	LAB1: Fundamentals of anatomy and physiology

List of Experiments: (Based on BMLT – 104)

1. Measurement of pulse, blood pressure.
2. Elicitation of Reflexes and jerks.
3. Identification of blood cells by study of peripheral blood smear.
4. Preparation of sterile swabs / sterile tubes and bottles
5. Preparation of smear
6. Staining: Germ & Ziehl – Neelson staining
7. Identification of culture media
8. Identification of instruments commonly used in Microbiology laboratory
9. Identification of common microbes
10. Microscopy:

a) Components and setting of the compound Microscope
b) Focusing of object
c) Use of low & high power objectives of Microscope
d) Use of oil immersion lens
e) Care and maintenance of the Microscope

 Different types of Microscopy:

a) Dark field Microscopy
b) Fluorescence Microscopy

BMLT 108	LAB1: LABORATORY SCIENCE & HUMAN BODY

Practical session: (Based on BMLT – 105)

1. PPT on role and importance of a medical lab technologist in the society
2. PPT/Audio visual demonstration of a qualified medical technologist working in sophisticated medical lab
3. Video demonstration on the mechanism of blood coagulation
4. Video demonstration on the mechanism of urine formation
5. Video demonstration on the mechanism of respiration
6. An audio visual presentation on the "Ethical behavior" of a medical lab technician
7. An audio visual presentation on the complication of the medical lab work
8. PPT presentation on the life and career of a professionally sound lab technologist
9. PPT presentation on the statutory regulations of a good medical lab technologist
10. Video demonstration of identification of different equipments of a medical lab
11. PPT on the history of a medical lab technologist in India
12. Video demonstration on "How to deal with patient" and professional medical history compilation

BMLT 109	LAB 3: HEMATOLOGY

Practical session: (Based on BMLT – 106)

PRACTICAL

1. Basic requirements for hematology laboratory.
2. Glasswares for Hematology.
3. Equipments for Hematology.
4. Anticoagulant vial prepration.
5. Complete Blood Counts.
6. Determination of Hemoglobin.
7. TRBC Count by Hemocytometers.
8. TLC by Hemocytometer.
9. Differential Leukocyte count.
10. Determination of Platelet Count.
11. Determination of ESR by wintrobes.
12. Determination of ESR by Westergeren's method.
13. Determination of PCV by Wintrobes.
14. Erythrocyte Indices- MCV, MCH, MCHC.
15. Reticulocyte Count.
16. Absolute Eosinophil Count.
17. Morphology of Red Blood Cells.

SEMESTER-II

Paper Title: BMLT – 201:	SOFT SKILL & PERSONALITY DEVELOPMENT

Objective: On completion of the course, the students will be able to listen to lectures, public announcements, news on TV, radio and engage in telephonic conversation to communicate effectively and accurately in English used as spoken language for various purposes.

UNIT I - Listening Skills: Barriers to listening; effective listening skills, feedback skills. Attending telephone calls; note taking. Activities: Listening exercises - Listening to conversation, News and TV reports. Taking notes on a speech / lecture.

UNIT II - Speaking and Conversational Skills: Components of a meaningful and easy conversation; understanding the cue and making appropriate responses; forms of polite speech; asking and providing information on general topics. The study of sounds of English, stress and intonation. Situation based Conversation in English.

UNIT III - Essentials of Spoken English: Activities, Making conversation and taking turns, Oral description or explanation of a common object, situation or concept, Giving interviews.

UNIT IV - Oral Presentation with / without audio visual aids. Group Discussion . Listening to any recorded or live material and asking oral questions for listening comprehension.

Books Recommended:

1. Soft skills Training - A workbook to develop skills for employment by Fredrick H. Wentz
2. Personality Development and Soft skills , Oxford University Press by Barun K. Mitra

Paper Title: BMLT – 202:	ENVIRONMENTAL STUDIES

Objective: Keeping in view the modern status of environment, the course primarily aims at providing various awareness programs required for the welfare of the environment apart from the emphasis on the general and conventional issues surrounding the environment.

UNIT I- Multidisciplinary nature of environmental studies - Definition, scope and importance, need for public Awareness, Natural Resources: Renewable and non - renewable resources, Natural resources and associated problems, Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles, Ecosystems: Concept, Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids.

UNIT II- Biodiversity and its conservation, Bio - geographically classification of India, Value of biodiversity, Biodiversity at global, National and local levels. India as a mega diversity Nation, Hot - sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man - wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In – situ and Ex - situ conservation of biodiversity.

UNIT III- Environmental Pollution: Definition , Cause, effects and control measures of : Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides . Social Issues and the Environment: From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and Rehabilitation of people; its problems and concerns. Case Studies.

UNIT IV- Environmental ethics: Issues and possible solutions. Climate global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution)Act. Wildlife Protection Act Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment. Population growth, variation among nations. Population explosion - Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and Human health. Case Studies.

Books Recommended:

1. M.P. Poonia & S.C. Sharma, Environmental Studies, Khanna Publishing House
2. Mike Hulme, Climates and Cultures.
3. Mark Garrett, Encyclopaedia of Transportation Social Science and Policy.
4. Steel, Science An A - to - Z Guide to Issues and Controversies.
5. John A Matthews, Encyclopaedia of Environmental Change.
6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House

Paper Title: BMLT – 203:	**MICROBIOLOGY - II**

Objectives: The structure of the course comprises the instrumental use, study of microscopes, micro organisms, sterilization and the other related concepts.

UNIT I - Basic principles and usage of Instruments, General Instruments and Distillation plant, Centrifuge machine, Analytical Balance, Hotplate, Magnetic Stirrer, Water Bath, Automatic dispenser and diluters, Deionizer, Microbiological Instruments : pH - meter, Autoclave, Incubator, Hot air oven, Laminar Air flow, Colony counter, Muffle furnace, Refrigerator, Inoculator, McIntosh and Flides anaerobic jar.

UNIT II - Microscopy :Study of compound microscope – magnification numerical aperture, resolution and components of microscope, Dark ground illumination, care of microscope and common difficulties. Study of phase contrast, interference, fluorescent, polarizing and electron microscope. Calibration of ocular micrometer and measurement of microorganisms.

UNIT III - Microbiology & Medicine :Introduction to Medical Microbiology, Discovery of microorganisms. Contribution of Robert Koch, Antonie Van Leeuwenhoek, Louis Pasteur, Bordet, Paul Ehrlich, Alexander Flemming, Elie Metchnikoff, Needham, Tyndall Janssen, Joseph Lister, Karl Landsteiner etc. Scope & relevance and safety measurers of Medical Microbiology. Role of medical microbiology in identification and management of various infectious diseases.

UNIT IV - Sterilization and Disinfection : Definition, mode of action and use of various physical methods of sterilization - heat, UV radiation, ionizing radiation, character affecting sterilization, autoclave control and sterilization indicators. Chemical disinfectants - phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compounds. Use and abuse of disinfectants. Disinfectants, antiseptics, chemotherapeutic agents, chemotherapeutic index, development of chemotherapy, antibiotics and effect of antibiotics on protein and nucleic acid synthesis and cytoplasmic membrane. Future development of chemo - therapy.

Books Recommended:

1. Clinical Microbiology; J. Stokes and G. L. Ridgeway; William &Wilkins
2. Mannual of Practical Medical Microbiology and Parasitology; T. R. Oberhofer Churchill and Livingston
3. Introduction in Medical Microbiology; Anant - Narainyan Indian

4. Practical Medical - Microbiology; Mackie and MC Cathey
5. Laboratory Mannual and work book for Microbiology in Health and Disease; Robert Fuerst W. B. Sunderu

Paper Title: BMLT – 204:	ADVANCED LABORATORY SCIENCE TECHNIQUES & TESTING PROCESS

Objectives: The course is designed to enable the students on the use and application of the advanced laboratory techniques and the process of testing as well.

UNIT I -Broad understanding of different types of samples to be taken in medical laboratory, Sample Handling, Various equipments useful for blood sample collection, broad understanding of correct method of blood sample collection, broad understanding on collection method of samples other than blood samples, broad understanding of correct procedure of sample transportation.

UNIT II -Understanding about Laboratory planning, develop understanding about laboratory operations, gain broad understanding of care of laboratory glassware, equipment and instruments, understanding about Specimen Handling, Techniques of Disinfection & Sterilization of rubber goods, laboratory equipment & other instruments

UNIT III -Importance and method of Observing and reporting while dealing with patients during sample and report collection, Method of Observing and reporting while assisting the pathologists and other members of the team, Understanding the importance of verbally informing the person in authority,

UNIT IV -Understanding of chemicals/reagents useful in sample analysis, understanding of maintaining record of inventory , test results, etc. , Able to inspect the availability of medical supplies or diagnostic kits To develop understanding about laboratory safety

Books Recommended:

1. Crocker J, Burnett D. The science of laboratory diagnosis, 2nd ed, Chichester: Wiley, 2006
2. Turgeon M. L, Linné and Ringsrud´s Clinical laboratory science: the basic and routine techniques, 5thed, St. Louis, Mo:
Mosby Elsevier, 2007

Paper Title: BMLT – 205:	BIOCHEMISTRY - I

Objectives: The course is designed to encapsulate the fundamentals of chemistry, the laboratory application and the current scenario of the subject.

UNIT I - Introduction to Medical Lab Technology, Role of Medical Laboratory technologists - ethics, responsibility, safety measures and hazards in clinical biochemistry, first aid (accidents), Units of measurements, S. I. Units, measurement of volume, various volumetric apparatus (cylinders, flasks, pipettes), calibration of volumetric apparatus, Cleaning and caring of general laboratory glassware and equipment, preparation and storage of distilled water, preparation of reagents and standard solutions, storage of chemicals and reagents, use of analytical balance, dry and moist heat radiation, filtration, autoclaving and chemical disinfection for sterilization.

UNIT II - Introduction, aim and scope of Biochemistry. Elementary knowledge of inorganic chemistry: atomic weight, molecular weight, equivalent weight, acid, bases. Elementary knowledge of organic chemistry : Organic compounds, Aliphatic and aromatic compounds, Alcohols, Aldehydes, Ketones, Amines, Esters, Phenol etc.

UNIT III - Viscosity - principles and applications; sedimentation – Principles and applications; Radio - isotopes and their use in Biochemistry, mole, molar, molal and normal solutions, pH measurement, buffer solutions, percent solutions, osmosis, dialysis, surface tension. ANALYTICAL BIOCHEMISTRY AND METABOLISM: Colorimetery / Spectrophotometery, Flame photometery, Atomic absorption spectroscopy, electrophoretic determination of Na+ and k+, chromatography

UNIT IV - Introduction, properties and simple metabolism of carbohydrates proteins and fat, Nucleic acids and Enzymes introduction, general properties. Digestion and absorption, Nutrition (Vitamins, Calories) Radioimmunoassay (RIA) and ELISA. (Hepatitis A, B)

Books Recommended:

1. Varley's Practical Clinical Biochemistry; A. HGowehlock; Heineman Medical Books Ltd. , London
2. Lab Manual in Biochemistry; E. A. Storey; V. G. Makarova; MIR Publishers; 2PerbyRizky1 - 110 GSP Moscow
3. Harper's Biochemistry; A. K. Murray Prentice Hall of India Ltd. , New Delhi
4. Introduction to Practical Biochemistry; Plummer D. T. Tata McGraw Publishing co, New Delhi

Paper Title: BMLT – 206:	BIOINSTRUMENTATION HAEMATOLOGICAL TECHNIQUES

Objectives: The course is designed to encapsulate the fundamentals of chemistry, the laboratory application and the current scenario of the subject.

Unit-I Bioinstrumentation

1. Photometry-Definition, laws of photometry, absorbance, transmittance, absorption maxima, instruments, parts of photometer, types of photometry–colorimetry, spectrophotometry, flame photometry, fluuorometry, choice of appropriate filter, measurements of solution, calculation of formula, applications.

2. Electrophoresis - Principle, Types & Applications.

3. Autoanalysers - Principle & Applications

Unit-II

A) Water and Mineral Metabolism-

Distribution of fluids in the body, ECF & ICF, water metabolism, dehydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements.

B) Vitamins- Fat & water soluble vitamins, sources, requirement, deficiency disorders & biochemical functions.

C) Liver Functions & their Assessment- Based on:

Carbohydrate metabolism; Protein metabolism; Lipid metabolism. Measurements of serum enzyme levels Bile pigment metabolism, Jaundice, its types and their biochemical findings.

D) Renal Function Tests- Various Tests, GFR & Clearance

Unit-III

A) Cardiac Profile - 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.

Unit-IV

A) Basic Hematological Techniques

Preparation of blood collection –

Basic steps for drawing blood by vein, capillary and artery puncture; Complications during and after blood collection

Specimen rejection criteria for blood

Anticoagulants- types and concentration Transport of blood sample Effect of storage on blood cell morphology Universal precautions

Books Recommended:

1. Biophysical Chemistry by Upahyay, Upadhyay, Nath; Himalaya Publishing house
2. Text book of medical laboratory technology by Praful Godkar; Bhalani
3. Essential haematology by A.V.Hoffbrand; Black well
4. De Gruchy's Clinical Haematology in medical practice by Frank Firkin, C Chester man; Black well
5. Principles of haematology Peter Haen WCB 17
6. Haematology by Emamanuel Besa; Harwal
7. Text Book of Microbiology by Ananthnarayan and Paniker
8. Clinical diagnosis and management by laboratory methods by Bernard Henry; W B Saunders
9. Text book of biochemistry for medical students by D M Vasudevan; Jaypee
10. TB of biochemistry and human biology by G P Talwar; Prentice Hall
11. Biophysical Chemistry by Dr. Nath, Avinash Upadyay and Kakoli Upadyay; Himalaya Publishing house
12. Clinical Biochemistry by G.Guru

Paper Title: BMLT – 207:	**LAB 1: ADVANCED LABORATORY SCIENCE TECHNIQUES & TESTING PROCESS**

List of Experiments: (Based on BMLT – 204)

1. Blood collection process
2. Use of different instruments used for collection of blood
3. Identification of different instruments used for collection of blood
4. Identification and use of a Tourniquet
5. Identification of body areas for Venepuncture
6. SOP on the use of Vacutainers
7. Sterilization of areas used for where from blood is collected
8. Identification and use of anticoagulants for prevention of clotting of sample blood
9. Restoration of a venepunctured wound
10. Demonstration of the use of a lab request from
11. Demonstration of the morphology of red blood cell
12. Demonstration of the minimum safety requirements to be maintained in a lab for purpose of preventing contamination of slides

Paper Title: BMLT – 208:	LAB 2: BIOCHEMISTRY - I

List of Experiments: (Based on BMLT – 205)

1. Introduction – Aim, basis, interpretation, safety in clinical biochemistry laboratory
2. Laboratory organization: instruments, glassware, sample collection & specimen labeling
3. Routine test & the identification of equipment & supply
4. Identification of supplies of a biochemistry lab
5. Preparation of different solutions used in the biochemistry lab
6. Standardization of methods commonly used in biochemistry lab
7. Detection of carbohydrates in a given sample
8. Detection of proteins in a given sample
9. Interpretation of results obtained from the routine tests
10. Study the general properties of enzyme (urease)
11. Achromatic time of salivary amylase
12. Estimation of glucose in a given sample
13. Centrifugation : principle, type and application
14. Chromatography: description of paper chromatography and methodology of their application

Paper Title: BMLT – 209:	LAB 3: BIOINSTRUMENTATION HAEMATOLOGICAL TECHNIQUES

List of Experiments: (Based on BMLT – 206)

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