॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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विद्यापीठ अनुदान आयोगाने शैक्षणिक वर्ष २०२०–२१ पासून मान्यता दिलेल्या बी. व्होक (व्होकेशनल कोर्सेसचे) पदवी तृतीय वर्षाचे अभ्यासक्रमाचे (Syllabus) शैक्षणिक वर्ष २०२२–२३ पासून लागू करणे बाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, विज्ञान व तंत्रज्ञान विद्याशाखेतील विद्यापीठ अनुदान आयोगाने शैक्षणिक वर्ष २०२०–२१ पासून मान्यता दिलेल्या बी. व्होक (व्होकेशन कोर्सेस) पदवी अभ्यासक्रमाचे तृतीय वर्षाचे Syllabus शैक्षणिक वर्ष २०२२–२३ पासून लागू करण्यास मा. कुलगुरू महोदयांनी मा. विद्यापरिषदेच्या मान्यतेच्या अधीन राहून मान्यता दिलेली आहे. त्यानुसार खालील अभ्यासक्रम लागू करण्यात येत आहेत.

1. B. Voc Software Development III year
2. B. Voc. Bachelor of Medical Laboratory Technology. III year
3. B. Voc. Herbal Medicine III year
4. B. Voc. Agriculture/commercial Aquaculture III year
5. B. Voc. Horticulture and Post Harvest Technology III year
6. B. Voc. Food Processing /Food Processing Technology III year
7. B. Voc. Chemical & Petrochemical Applied Analytical Chemistry III year
8. B. Voc. Life Science/Skill Based Zoology III year

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-२०२२–२३/624

दिनांक : २९.०९.२०२२

सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

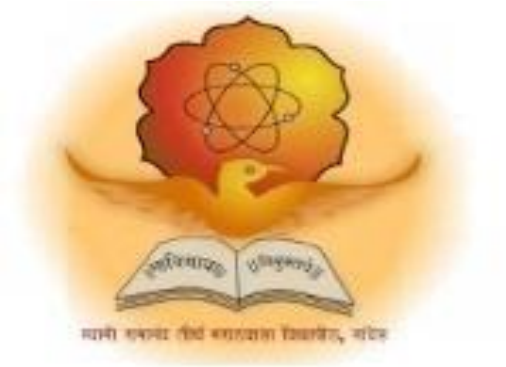
प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, 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. याना देवून कळविण्यात येते की, सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसिध्द करण्यात यावे.

Swami Ramanand Teerth Marathwada University,

Nanded (Maharashtra)

(NAAC Re-accredited with 'A' Grade)



Syllabus of

B. Voc. Medical Laboratory Technology (Third Year)

(3 years Degree Course)

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.

In view of this our University initiated to start skill based courses which are in demand of industries to be carry responsibilities of society. The programme is highly relevant for all those who want to pursue a professional career in software development.

2. Aim:

3. Objective:

4. Eligibility and Fees

5. Program outcome:

First Exit Point (Diploma) and Outcome of First Year

Second Exit Point (Advance Diploma) and Outcome of Second Year

• Third Exit Point (B. Voc. Degree) and Outcome of Third Year

Students will be awarded:

Certificate	Student shall be required to appear in examinations of all courses. However, to award the Certificate (Medical Laboratory Technology) 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 (Medical Laboratory Technology) a student shall study the minimum of **60 creditscourse 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 (Medical Laboratory Technology) 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 weightage for equivalent hours shall be 50% of that for lectures /tutorials. For self-learning, based on e-content or otherwise, the credit weightage 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

$$SGPA\ (Si) = \Sigma(Ci \times Gi) / \Sigma Ci$$

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.

$$CGPA = \Sigma(Ci \times Si) / \Sigma\ Ci$$

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 leve

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 / Marks	
	General Education		**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**
1	BMLT101	English language and communicative skills	2	50	20	2	50	20	4	100
2	BMLT102	Computer Fundamentals & IT	2	50	20	2	50	20	4	100
3	BMLT103	Fundamentals of Microbiology-I	2	50	20	2	50	20	4	100
	Skill Courses									
4	BMLT104	Fundamentals of Anatomy and Physiology	2	50	20	2	50	20	4	100
5	BMLT105	Laboratory Science & Human body	2	50	20	2	50	20	4	100
6	BMLT106	Hematology	2	50	20	2	50	20	4	100
	Practical Skill Courses									
7	BMLT 107	LAB1:Fundamentals of anatomy and physiology	1	25	10	1	25	10	2	50
8	BMLT 108	LAB2:Laboratory Science & Human body	1	25	10	1	25	10	2	50
9	BMLT 109	LAB3:Hematology	1	25	10	1	25	10	2	50
	Total								30	750

Semester II

Sr. No.	Course Code	Course Title	Continuous Assessment Credits(CA)			End Semeser Exam Credits (ESE)			Total Credits / Marks	
	General Education		**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**
1	BMLT 201	Soft Skill & Personality Development I	2	50	20	2	50	20	4	100
2	BMLT 202	Environmental Studies	2	50	20	2	50	20	4	100
3	BMLT 203	Microbiology-II	2	50	20	2	50	20	4	100
	Skill Courses									
4	BMLT 204	Advanced Laboratory Science Techniques &Testing Process	2	50	20	2	50	20	4	100
5	BMLT 205	Biochemistry-I	2	50	20	2	50	20	4	100
6	BMLT 206	Bioinstrumentation, Haematological Techniques	2	50	20	2	50	20	4	100
	Practical Skill Courses									
7	BMLT 207	LAB4:Advanced Laboratory Science Techniques & Testing Process	1	25	10	1	25	10	2	50
8	BMLT 208	LAB5:Biochemistry-I	1	25	10	1	25	10	2	50
9	BMLT 209	LAB 6 Bioinstrumentation, Hematological Techniques	1	25	10	1	25	10	2	50
	Total								30	750

B.Voc.Medical Laboratory Technology, Second Year

Semester III

Sr. No.	Course Code	Course Title	Continuous Assessment Credits(CA)			End Semester Exam Credits (ESE)			Total Credits	
	General Education		**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**
1	BMLT 301	Value Education	2	50	20	2	50	20	4	100
2	BMLT 302	Biostatistics	2	50	20	2	50	20	4	100
3	BMLT 303	Soft Skills & Personality Development - II	2	50	20	2	50	20	4	100
	Skill Courses									
4	BMLT304	Advanced Virology	2	50	20	2	50	20	4	100
5	BMLT 305	Medical Pathology - I	2	50	20	2	50	20	4	100
6	BMLT 306	Essentials of Immunology	2	50	20	2	50	20	4	100
	Practical Skill Courses									
7	BMLT 307	LAB 7- Advanced Virology	1	25	10	1	25	10	2	50
8	BMLT 308	LAB 8 : Medical Pathology - I	1	25	10	1	25	10	2	50
9	BMLT 309	LAB 9 Essentials of Immunology	1	25	10	1	25	10	2	50
	Total								30	750

B.Voc.Medical Laboratory Technology, Second Year

Semester - IV

Sr. No.	Course Code	Course Title	Continuous Assessment Credits(CA)			End Semester Exam Credits (ESE)			Total Credits	
	General Education		**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**
1	BMLT 401	Medical Ethics	2	50	20	2	50	20	4	100
2	BMLT402	Biomedical Waste Management	2	50	20	2	50	20	4	100
3	BMLT403	Metabolism - I	2	50	20	2	50	20	4	100
	Skill Courses									
4	BMLT 404	Bioinstrumentation Techniques - II	2	50	20	2	50	20	4	100
5	BMLT 405	Microbial Physiology	2	50	20	2	50	20	4	100
6	BMLT 406	Diagnostic Microbiology	2	50	20	2	50	20	4	100
	Practical Skill Courses									
7	BMLT 407	LAB 10-Bioinstrumentation Techniques - II	1	25	10	1	25	10	2	50
8	BMLT 408	LAB 11:Microbial Physiology	1	25	10	1	25	10	2	50
9	BMLT 409	LAB 12: Diagnostic Microbiology	1	25	10	1	25	10	2	50
	Total								30	750

B.Voc.Medical Laboratory Technology, Third Year
Semester - V

Sr. No.	Course Code	Course Title	Continuous Assessment Credits(CA)			End Semester Exam Credits (ESE)			Total Credits	
	General Education		**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**	**Min. Marks**	**Credits**	**Marks**
1	BMLT 501	Human Psychology	2	50	20	2	50	20	4	100
2	BMLT 502	Advanced Biotechnology	2	50	20	2	50	20	4	100
3	BMLT 503	Laboratory Management & Ethics	2	50	20	2	50	20	4	100
	Skill Courses									
4	BMLT 504	Histopathology & Cytopathology	2	50	20	2	50	20	4	100
5	BMLT 505	Parasitology & Mycology	2	50	20	2	50	20	4	100
6	BMLT 506	Microbiology - III	2	50	20	2	50	20	4	100
	Practical Skill Courses									
7	BMLT 507	LAB 13- Histopathology & Cytopathology	1	25	10	1	25	10	2	50
8	BMLT 508	LAB 14: Parasitology & Mycology	1	25	10	1	25	10	2	50
9	BMLT 509	LAB 15**:** Microbiology - III	1	25	10	1	25	10	2	50
	Total								30	750

B.Voc.Medical Laboratory Technology, Third Year
Semester - VI

Sr. No.	Course Code	Course Title	Continuous Assessment Credits(CA)			End Semester Exam Credits (ESE)			Total Credits	
	General Education		Credits	Marks	Min. Marks	Credits	Marks	Min. Marks	Credits	Marks
1	BMLT 601	R–DNA Technology	2	50	20	2	50	20	4	100
2	BMLT 602	Entrepreneurship Program	2	50	20	2	50	20	4	100
3	BMLT 603	Research Methodology	2	50	20	2	50	20	4	100
	Skill Courses									
4	BMLT 604	Hematology - III	2	50	20	2	50	20	4	100
5	BMLT 605	Pathology - III	2	50	20	2	50	20	4	100
	Practical Skill Courses									
7	BMLT 606	LAB 16- Hematology - III	1	25	10	1	25	10	2	50
8	BMLT 607	LAB 17: Pathology - III	1	25	10	1	25	10	2	50
9	BMLT 608	LAB 18 : Project & Seminar on Hospital Training	6	150	60	-	-	-	6	150
	Total								30	750

Semester V

Paper Title - BMLT 501	Human Psychology	Creadits - 4

Objective – The classic blend of psychology and human resource will help to deal with the individuals in the corporate sector. The study of proper human mind is to be emphasized before the role of human resource management comes to play.

Unit 1 - Introduction to psychology, Nature of psychology; Basic concepts: Person, States of Consciousness: Sleep and Wakefulness and altered States of Consciousness, Behavior and Experience, II Evolution of the discipline of psychology; Psychology and other disciplines; Linkages across psychological processes

Unit 2 - Methods of psychology, The bases of human behavior, Evolutionary perspective on human behavior; Biological and cultural roots; Nervous system and endocrine system: Structure and relationship of with behavior and experience; Brain and behavior, Socialization, Enculturation and Acculturation; Globalization; Diversity and pluralism in the Indian context.

Unit 3 - Evolution and growth of human resource management (with special reference to Scientific management and Human relations approaches). Role of HR in strategic management. Nature. objectives, scope, and functions of HR management, Challenges of HR (the changing profile of the workforce - knowledge workers, employment opportunities in BPOs, IT and service industries, Flexi options), Workforce diversity (causes, paradox, resolution of diversity by management).

Unit 4 - Concepts of line - staff in the structure of human resource department and the role of human resource manager, Manpower planning, Job analysis, Job evaluation.

Books Recommended –

1) General Psychology by S. Dandapani, Neelkamal Publication (2016)
2) General Psychology by R. K. Gupta
3) Aswathappa K. (2002) Human Resource and Personnel Management, Tata McGraw - Hill, New Delhi.
4) Bhattacharyya Kumar Deepak (2006) Human Resource Managing, Excel Books, New Delhi.
5) Cascio F. W. (2003) Managing Human Resources, Productivity, Quality of Life, Profits, Tata Mc - Graw - Hill, NewYork

Paper Title - BMLT 502	Advanced Biotechnology	Creadits - 4

Objective :- The student will understand and be able to explain different branches of Microbiology such as Bacteriology and Virology. The student will be able to explain about various applications of Statistics in the field of Medical, Pathology, Immunological Science.

Unit 1:- Historical Perspective.Biotechnology in pharmaceutical industry.Current Trends in Drug Development.Fermentation products in pharmaceutical industry.Types of antibiotics and synthetic antimicrobial agents.Clinical uses of antimicrobial drugs.Mechanisms of action of antibiotics. Chemical disinfectants and antiseptics Identification and Development of New Antimicrobial Drugs.

Unit 2 :- Biopharmaceuticals & Microbial aspects

Vaccine: Genetically improved vaccines, Synthetic peptide-based vaccines, Nucleic acid vaccines.Technical aspects of vaccine production. Plants as bioreactor for pharmaceutical products.Principles and practice of sterilization. Contamination of non-sterile pharmaceuticals. Sterile pharmaceutical products. Sterility testing.

Unit 3 :- The drug development process

Drug discovery - Regulatory and Intellectual property aspects.Strategies in pharmaceutical products development Delivery of biopharmaceuticals.Pre-clinical trials a. Pharmacokinetics and pharmacodynamics b. Toxicity studies c. Mutagenicity & carcinogenicity.Clinical trials

Unit 4 :- Drug manufacturing process and Biogeneric Drugs

Introduction to Indian and International Pharmacopoeia. Good manufacturing practices (GMP).International regulations of GMP.Good laboratory practices (GLP) in pharmaceutical industry.Advanced Drug Delivery a. Rationale and Basic Principles b. Physiologic and Mechanistic Approaches c. Molecular Approaches Design and layout of sterile pharmaceutical manufacturing unit. Introduction to biogenetic drugs Bigeneric targets

Books Recommended –

1) Advances in Applied Biotechnology series Vol.10, Biopharmaceutical in transition. Industrial Biotechnology Association by Paine Webber, Gulf Publishing Company Houston.
2) Analytical Microbiology- Edited by Fredrick Kavanagh volume I &II. Academic Press New York.
3) Biotechnology – Expanding Horizon by B.D. Singh., First Edition, Kalyani Publication, Delhi.
4) Biotechnology- Edited by H.J. Rhem & Reed, vol 4 VCH publications, Federal Republic of Germany.
5) Drug carriers in biology & medicine Edited by Gregory Gregoriadis. Academic Press New York.
6) Good manufacturing practices for Pharmaceuticals. By Sydney H. Willing, Murray M. Tuckerman, William S. Hitchings IV. Second edition Mercel Dekker NC New York.
7) Lippincott's illustrative Reviews: Pharmacology Edition: 02 Maryjnycck by Lippincott's review Publisher Pheladelphia 1997.
8) Pharmaceutical Biotechnology by S. P. Vyas & V.K. Dixit. CBS publishers & distributors, New Delhi.
9) Pharmaceutical Microbiology- Edited by W. B. Hugo & A.R. Russel Sixth Edition. Blackwell Scientific Publications.
10) Pharmacognosy by Gokhle S.D., KoKate C.K. Edition: 18, Nirali Publication.
11) Principles of medicinal chemistry Vol. 1 by Kadam S.S., Mahadik K.R., Bothra K.G. Edition: 18, Nirali Publication.

Paper Title - BMLT 503	Laboratory Management & Ethics	Credits - 4

Objectives :- To acquire the skill of successful Pathological Laboratory management and its ethics

Unit 1 :- Introduction

Role of laboratory in human health and diseases. Human diseases and methods of diagnosis
Laboratory at different level (National / State / District). Duties and responsibilities of laboratory personnel
Laboratory services are a backbone of health care delivery system.

Unit 2 :- **LABORATORY PLANNING**

General principles, Laboratory goals, Operational data –, Market potential, Selection of area, Competition, Laboratory trends, Space requirements, Designing of laboratory sections, Staff and their duties,
Work schedule and workload assessment

Unit 3 :- **CARE OF LABORATORY GLASSWARE, CHEMICALS EQUIPMENT ANDINSTRUMENTS**

3.1 General Principles, Care and Cleaning of Glassware, Making Simple Glassware in the Laboratory, Care of equipment and apparatus, Laboratory chemicals – Proper use, care, storage and labeling, Specimen handling Appropriate container, Method of collection, Method of transportation, Method of preservation and disposal of laboratory waste. Laboratory Safety- General principles of safety programmes, First aid and safety measures for Mechanical, Electrical, Chemical, Radioactive and Biological hazards, Universal safety precautions.

Unit 4 :- Quality control and quality assurance in following sections of laboratory
(a) Biochemistry, (b) Microbiology, (c) Hematology and Blood Banking
(d) Histopathology and Clinical Pathology

Books Recommended :-

1) Eleanor M.TraversClinical Laboratory Management1st 1997 Williams & Wilkens.
2) K. Anand Hospital Management 1st 1996 Vikas Publishing, New Delhi.
3) Govt.Publication 'Hospital Administration Manual'1st 1976 Govt. of Maharashtra.
4) G. Guru 'Laboratory Setup & procedures'1st 1989 NCERT, New Delhi.

Paper Title - BMLT 504	Histopathology & Cytopathology	Credits - 4

Objectives :- To study the derangement of tissue due to diseases at cellular level, and to study the exfoliation of cells from surfaces of various passages, organs and viscera.

Unit 1 :- Histopathology
Introduction & importance of histopathology Cell, tissue and their functions.
Methods of specimen collection (biopsies) and examination of tissues and cells.

Unit 2 :- : Tissues Fixative
Simple Fixative and their properties**.**Simple Fixative and their properties**.**Micro anatomical fixative Histochemical fixatives

Unit 3:
Section Cutting
Microtome and microtome knives, sharpening and care.Technique of section cutting Mounting of sections,Frozen sections and Cryostat.
Staining
Dyes and their properties,Theory of staining,Types of staining,Basic staining – Hematoxylin and Eosin (H&E) Mounting of sections Common special stains **PAS, Masson trichrome, Fleugens, Geimsa, PTAH**

Unit 4 : CYTOPATHOLOGY
Introduction – cytology and cytopathology Method of specimen collection and transportation.For gynaecological samples.Method of specimen collection, transportation and preservation of non-gynecological samples.Fixation and fixative.Common fixative.Special purpose fixative.Fluid specimen Preservation prior to processing.Preparation for microscopy

The Papanicolaou stain
Main characteristics and modification, Preparation of stain and solutions, Factors influencing staining reaction, Mounting of cell sample, Other routine and special stains, Stains for histological sections, Stains for hormonal evaluation, Stains for sex chromatin, pigments, microorganism, parasites, carbohydrates, lipids and nucleic acid

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Books Recommended :-

1) G. Guru Histotechnology 1st 1988 NCERT, New Delhi.
2) C. F. A.Culling ‘Hand Book of Histotechnological & Histochemcial Techniques’ 3rd 1974 Butterworth – London.
3) G. G. Brown ‘An introduction to Histotechnology’ 3rd 1974 Century - Croft , New York.
4) P.B. Godkar ‘Text Book of Medical LaboratoryTechnology’ 2nd 2003 Bhalani Publication.
5) L. G. Koss ‘Diagnostic Cytology’,Vol - I & II 3rd 1979J. B. Lippincott Co.Philadelhia.

Paper Title - BMLT 505	Parasitology , Mycology & Virology	Credits - 4

Objectives :- To develop the skill of laboratory diagnosis of various parasites, Pathogenic fungi.

Unit-1 PARASITOLOGY

Morphology, Life-Cycle, Pathogenicity and Laboratory diagnosis of protozoa such as :-
(a) E. histolytica and E. coli, (b) Giardia, (c) Trichomonas, (d) Toxoplasma, (e) Plasmodia and Lieshmania

Unit – 2 Morphology,

Life-Cycle, Pathogenicity and Laboratory diagnosis of following helminths and nematodes :-
(a) Hook worm, Round worm, Whip worm, Thread worm, Pinworm.
(b) Tapeworm and Echinococcus
(c) Wucheria bancrofti and B. malayi

Unit- 3 MYCOLOGY

Morphology and classification of pathogenic fungi
Morphology and laboratory diagnosis of fungi causing superficial mycosis
Morphology and laboratory diagnosis of fungi causing deep mycosis.
Morphology and laboratory diagnosis of fungi causing systemic mycosis
Morphology and laboratory diagnosis of fungi causing opportunistic fungal infections

Unit – 4 VIROLOGY

Classification, general properties of viruses
Cultivation and propagation of human viruses
Bacteriophage and its significance
Morphology, pathogenicity and laboratory diagnosisof hepatitis viruses
Morphology, pathogenicity and laboratory diagnosis of HIV / AIDS virus.
Oncogenic viruses

Books Recommended :-

1) K. D. Chatterji ‘Parasitology’ 11th 1976 Chatterji Medical Publisher, Kolkata.
2) J. W. Rippon ‘Medical Mycology’ 3rd 1988W. B. Saunders Co., London.
3) G. M. More & D. M.Jacio Mycology for clinical Laboratory1st 1979 Reston Publishing co.USA.
4) D. O. White & F.Fenner ‘Medical Virology’ 3rd 1986 New York Academic Press, N. Y.
5) R. B. Bleshe, et. al. ‘Text book of Human Virology’2nd 1991St. Louis Mosby, Year Book,

Paper Title - BMLT 506	Microbiology - III	Credits - 4

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

Unit- 1 PATHOGENIC FUNGI:
Candida, Cryptococci, Dermatophytes, Sporotrichoums, Histoplasma, Blastomyces, Cocciodioides, Para - cocciodiodes, Dematiaceous fungi, Mycetoma, Actinomyces, Nocardiaand common laboratory contaminants. Biochemical tests used for identification ofbacteria and fungi. Antimicrobial sensitivity testing and assay methods for body fluids, Antimicrobial susceptibility testing for Mycobacteria. Preparation and standardization of antigens and antisera.

Unit- 2 VIROLOGY: Different staining techniques used in virology, Use of Embronated eggs in clinical Virology, Principles of animal cell culture and their use in virology, Use of common laboratory animals in viral diagnosis. **PARASITOLOGY**: Morphology and life cycle of - Leishmania, haemoflagellates. - Trypansomes, Laboratory diagnosis of leishmania, trypanosomes; Morphology and life cycle of tissue - Filariaand blood nematodes - Trichinella – Dracuncullus.

Unit – 3 MEDICAL ENTOMOLOGY: Basic concept of medical entomology in relation to medical lab technology. Arthropods of medical importance, arthropods borne diseases and their transmission. Principal of arthropods control, Mosquito- Role of this arthropods in dieses transmission, dieses types and controlling measures. House flies, Role of diseases transmission and controlling measures. Flea: Role of diseases transmission and control measures and itch mite. Filarial: Causes, symptoms and controlling measures. Taeniasis: Causes, symptoms and controlling measures. Collection, Presentation and identification of different disease causing arthropods.

Unit- 4 Whole mount preparation of slide of different disease causing arthropods for their detailed anatomical studies. Identification of different phases of life cycle of arthropods, protozoa having medical importance for causing disease. Slide identification of micro filarial, Taenia solium, ascaris and different stages of malaria. Examination of stool for OPV (Ova parasite cyst). INFECTION CONTROL AND PREVENTION: Practices to curb infection, Hospital borne infections, Prevention and treatment of needle stick injury, Management of blood and body substance spills in the health care setting

Books Recommended :-

1) Diagnositc techniques in medical parasitology; Fleck and Moody John Wright
2) Tropical Medicine and Parasitology; Gold Smith and Heynemann; Appleton and Lange.
3) Parasites: A guide to Laboratory Procedures and identifications; L. R. Ash and T. C. Orihel Am. Soc. Clinical
4) Parasitic Diseases M. Katz Springer – Verlog
5) Immunodiagnosis of Parasitic diseases; Walls and Sohantz Academic Press.

Paper Title - BMLT 507	Practical - LAB 13 – Histopathology & Cytology	Credits - 2

List of Experiments :-

1) Estimation of T3, T4 Estimation of LH
2) Estimation of FSH
3) Measurement of Blood Pressure
4) Estimation of TSH

Paper Title - BMLT 508	Practical - LAB 14 : Parasitology, Mycloogy & Virology	Credits - 2

List of Experiments

Para cytology:
1. Collection, Preservation and Transportation of fecal material and its Physical, Chemical & Parasitic examination
2. Preparation of stained and unstained slide for detection of larvae / ova or cysts
3. Concentration methods for Ova & Cysts.
4. Demonstration of gross specimen of Hookworm, Roundworm, Whip worm, Thread worm, Pin worm and Tape worm,
5. Demonstration of following parasites / ova / cyst under microscope :
6. G. lamblia, (b) T. vaganalis, (c) Malerial parasites, (d) Lieshmania, (e) Roundworm, (f) Whipworm, (g) Threadworm, (h) Pin worm and (i) Tapeworm.

Mycology:
1. Collection and processing of skin scrappings / nail clippings / hair pieces / clinical material for demonstration of fungal elements
2. Microscopy for fungal elements : unstained perpetration : Lactophenol cotton blue.
3. Microscopy for fungal elements : stained perpetration
4. Demonstration of common fungal media with and without growth

Virology:
1. Instruments / Equipments and glassware used in
2. viral diagnostic laboratory
3. Inoculation of chick-embryo and other cell / tissue culture media.

Paper Title - BMLT 509	Practical - LAB 15 Microbiology - III	Credits - 2

List of Experiments :-

1) Identification of different stains used in Virology
2) Slide identification of Candida,
3) Slide identification of fungi
4) Slide identification of Taenia
5) Slide identification of trypanosomes

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Model Question paper Pattern (Theory)

B.Voc.MLT Third Year (Semester V /VI) CBCS Pattern

Subject :- Medical Laboratory Technology

Paper – BMLT 501 to BMLT 506, BMLT 601to BMLT 605

Time :- 2 Hrs. **Max.Marks 50 (ESE)**

Note :- 1) All Questions are Compulsory.
2) All questions carry equal marks.
3) Draw neat & well labeled diagram whenever necessary.

Q.1 Essay Type Question (On Unit I) 10 Marks

OR

a) Short Question 5 Marks
b) Short Question 5 Marks

Q.2 Essay Type Question (On Unit II) 10 Marks

OR

a) Short Question 5 Marks
b) Short Question 5 Marks
c)

Q.3 Essay Type Question (On Unit III) 10 Marks

OR

a) Short Question 5 Marks
b) Short Question 5 Marks
c)

Q.4 Essay Type Question (On Unit IV) 10 Marks

OR

a) Short Question 5 Marks
b) Short Question 5 Marks

Q.5 Short Notes (Any Two) 10 Marks

a) Short Note
b) Short Note
c) Short Note

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Model Question paper Pattern (Practical)

B.Voc.MLT Third Year (Semester V /VI) CBCS Pattern

Subject :- Medical Laboratory Technology

Practical Paper – BMLT 507 TO 509 and BMLT 606 to 607

Time :- 4 Hrs. **Max.Marks : 25**

Q. 1 : Long Experiment	10 Marks
Q. 2 : Short Experiment	05Marks
Q. 3 : Record Book	05 Marks
Q. 4 : Viva Voce	05 Marks

Semester – VI

Paper Title - BMLT 601	R – DNA Technology	Credits - 4

Objectives :- Students can understand Molecular Biology, Recombinant DNA Technology, and Microbial Genetics, and will be able to execute a short research project incorporating techniques of Basic and Advanced Microbiology under supervision. The student will be equipped to take up a suitable position in academia or industry, and to pursue a career in research if so desired.

Unit 1:- Tools of R – DNA Technology

Enzymes used with their types, mode of activity and examples: NucleasesExonucleases (BAL 31 nuclease, Exonuclease I, III), EndonucleasesRestriction endonucleases type I, II, III, restriction modification system: nomenclature and classification of type II endonucleases (S1 nuclease). DNA polymerase (E. coli DNA pol. I, T7 DNA Pol., Klenow fragments, Thermostable DNA Pol., Terminal Transferase and Reverse Transcriptase). DNA ligation (Linkers and Adaptors). DNA Manipulating enzymes (Polynucleotide kinase, Phosphatase, Methylase, Topoisomerase and Ribonucleases).

Unit 2:- Cloning Vectors

Cloning Vectors (their structure, genealogy and derivatives): Plasmids (pBR 322 and pUC18). Bacteriophage lambda (λ), Cosmids, Phasmids and Phagemids as vectors. Artificial chromosome vectors (YACs, BACs, PACs, and MACs). Animal virus derived vectors, SV40vaccina/bacculo and retroviral vectors. Expression vectors, Shuttle vectors, Integrative vectors. 3. Gene probes: development and labeling of DNA and RNA probes

Unit 3 :- Polymerase Chain Reaction (PCR) - Primer design, fidelity of thermal enzymes, DNA polymerase, variations in PCR and its applications. PCR in gene recombination, deletion, addition, overlap extension and SOEing, site specific mutagenesis, PCR based mutagenesis, PCR in molecular diagnostics, viral and bacterial detection. 2. Methods of nucleic acid detection, sequencing methods (enzymatic DNA sequencing, chemical DNA sequencing, principles of automated DNA sequencing, RNA sequencing, thermal cycle dideoxy DNA sequencing, and pyrosequencing). 3. Methods of nucleic acid hybridization (Southern blotting, Northern blotting, in situ hybridization). DNA fingerprinting, chromosome walking and jumping.

Unit 4 :- Applications

Molecular Markers- types and applications. Construction of molecular maps (genetic and physical maps). DNA chip Technology and Microarrays (a brief account) Applications of recombinant DNA technology in medicine, agriculture, Forensic and veterinary sciences. 3. Engineering microbes for the production of antibiotics, enzymes, Insulin, growth hormones, monoclonal antibodies etc. Human genetic engineering and Gene therapy- methods of gene therapy, gene therapy in treatment of diseases, Stem cell therapy, Future of stem cell therapy, gene targeting. Gene silencing in bacteria. CRISPR-Cas systems for editing and targeting genome. 4. Science and the constitution-ethical, legal and environmental issues associated with rDNA Technology

Books Recommended :-

1. DNA cloning: A practical approach by D.M. Glover and D.D. Harmes, RL press, Oxford 1995.
2. Essentials of molecular biology vol. I (A Practical Approach) by Brown T.A., IRL press Oxford. 1995.
3. From Gene to Clone by E. L. Winnacker.
4. Genetic engineering, principles and practice, by Sandhya Mitra. Macmillan India Ltd.
5. Genome mapping and sequencing by Ian Dunham. Horizon Scientific press.

6. Manipulation and expression of Recombinant DNA. Robertson.
7. Methods in enzymology gene expression technology by D.A Godgel. Academic press Inc, San Diego.
8. Methods in enzymology guide to molecular cloning techniques, vol. 152 S. L. Berger. Academic press .Inc, san Diegn, 1996.
9. Molecular biotechnology (2nd edition), by S.B. Primrose, Blackwell Scientific publishers, Oxford.
10. Molecular biotechnology: principles and application of Recombinant DNA II by Bernard R. Glick and J. Pastemak, ASM publication.
11. An introduction to genetic engineering (2nd edition) by Nicholl D.S.T., Cambridge University press, Cambridge, U.K.
12. PCR application. Protocol for functional genomics by Michael A. Innis. David H., Gelfand John J. Sninsky, Academic Press.
13. PCR technology- principles and application for DNA amplification by Henry A Erilch (Ed) Stockton Press. 1989. 14. Route maps in gene technol

Paper Title - BMLT 602	**Entrepreneurship Program**	**Credits - 4**

Objectives :- The course aim to give a shape to understand the validity of various entrepreneurship development programs in the field of economics and its related concepts.

Unit 1 :- To make the students understand about entrepreneurs and different classifications. Entrepreneur and entrepreneurship - Definition; traits and features; classification; Entrepreneurs; Women entrepreneurs; Role of entrepreneur in Entrepreneurs in India, Create an awareness about EDP. Entrepreneurial development programme concept; Need for training; phases of EDP; curriculum & contents of Training Programme; Support systems, Target Groups; Institutions conducting EDPs in India and Kerala.

Unit 2:-

General awareness about edeutification of project financing new enterprises; Promotion of a venture; opportunity Analysis Project identification and selection; External environmental analysis economic, social, technological an competitive factors; Legal requirements for establishment of a new unit; loans; Over rum finance; Bridge finance; Venture capital; Providing finance in Approaching financing institutions for loans.

Unit 3:- To identify different Discuss opportunities in small business; Small business Enterprise - Identifying the Business opportunity in various sectors - formalities for setting up of a small business enterprise - Institutions supporting small business enterprise - EDII (Entrepreneurship Development Institute of India), SLDO (Small Industries Development Organization NSIC (National small Industries Corporation Ltd. (CNSIC) NIESBUD (National Institute for Entrepreneurship and small Business Development) Sickness in small business enterprise causes and remedies.

Unit 4 :-

To understand about a project report relating to a small business; Project formulation - Meaning of a project report significance contents formulation planning commissions guidelines for formulating a project report - specimen of a project report, problems of entrepreneurs case studies of entrepreneurs.

Books Recommended :-

1) Cliffton, Davis S. and Fylie, David E. , Project Feasibility Analysis, John Wiley, New York, 1977.
2) Desai A. N., Entrepreneur and Environment, Ashish, New Delhi, 1990.
3) Drucker, Peter, Innovation and Entrepreileurship, Heinemann, London, 1985
4) Jain Rajiv, Planning a Small Scale Industry: A guide to Entrepreneurs, S. S. Books, Delhi, 1984
5) Kumar S. A. , Entrepreneurship in Small Industry, Discovery, New Delhi, 1990
6) McCleffand, D. C. and Winter, W. G. , Motivating Economic Achievement, Free Press, New York, 1969

Paper Title - BMLT 603	**Research Methodology**	**Credits - 4**

Objectives :- The course aims to teach the students to read, understand and explore something new from the conventional material before they climb up the ladder for more progressive research works.

UNIT 1: Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method - Understanding the language of research - Concept, Construct, Definition, Variable. Research Process (10%)

UNIT - 2

Problem Identification & Formulation - Research Question - Investigation Question - Measurement Issues - Hypothesis - Qualities of a good Hypothesis - Null Hypothesis & Alternative Hypothesis. Hypothesis Testing - Logic & Importance (10%)

UNIT 3: Research Design: Concept and Importance in Research - Features of a good research design - Exploratory Research Design - concept, types and uses, Descriptive Research Designs - concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.

UNIT 4:- Qualitative and Quantitative Research: Qualitative research - Quantitative research - Concept of measurement, causality, generalization, replication. Merging the two approaches.

Books Recommended :-

1) Research methodology by P. K. Manoharam
2) Research methodology by Dr. C. Rajindra Kumar
3) Research methodology methods and techniques by C. R. Kothari

Paper Title - BMLT 604	Hematology - III	Credits - 4

Objectives - The course is designed to focus on the various studies of blood and its components with help of intense laboratory work.

Unit 1: Definition and classification of anaemias, Laboratory investigation for megaloblasticanaemia, Laboratory investigation for iron deficiency anaemia. , Laboratory investigation for haemolyticanaemia including classification and causes.

Unit 2 : Leukemia: definition and classification, Cytochemical staining procedures in various haemopioetic disorders, Laboratory test for assessing bleeding disorders, Laboratory investigation for disseminated intravascular coagulation (DIC)

Unit 3 : Mechanism of fibrinolysis: tests for fibrinolysis, Platelet function tests and their interpretation, Techniques available for cytogenetic studies.

Unit 4 : Use of Radioisotopes in haematology, Safety measures for handling Radioisotopes.

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Books Recommended :-

1) Recombinant Human Erythropoietin (rhEPO) in Clinical Oncology, edited by Mohammad Resa Nowrousian, Springer Science & Business Media.
2) A Cancer Source Book for Nurses, By American Cancer Society, Jones & Bartlett Learning.
3) Hemostasis and Thrombosis: Practical Guidelines in Clinical Management, edited by Hussain I. Saba, Harold R. Roberts, John Wiley & Sons .
4) Radionuclide Tracer Techniques in Haematology, By C. S. Bowring, Butterworth & Co (Publishers) Ltd 1981.

Paper Title - BMLT 605	Pathology - III	Credits - 4

Objectives :- The course aims at covering the fundamental concepts of biology apart from the primary focus on the study of diseases and the possible remedies.

UNIT I: Preservation of microbes and Iyophilisation methods, Total and viable counts of bacteria, Testing of disinfectants - Rideal - Walker, Chick - Martin and In - use tests, Preparation and standardization of vaccines and immunization schedule.

UNIT II: Bacteriological examination of water, milk, food and air, Nosocomial infections and sterility testing of I/V fluids and processing of various samples for hospital infections, Toxin - Antitoxin assays and pathogenicity tests, Epidemiological markers of microorganisms - Serotyping, Bacteriophage and Bacteriocine typing methods.

UNIT III: Lab, Diagnosis of common bacterial infection viz: Pyogenic infections, Respiratory tract infections, Meningitis, Diphtheria, whooping cough, Gas gangrene, Food - poisoning, Enteric fever, Acute diarrhoes, diseases, Cholera Urinary tract infection, Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, Syphilis, Gonorrhoea and other STD's,

UNIT IV : Lab diagnosis of fungal infections viz: Superficial Dermatophyle fungal infections, Candidiasis, Cryptococosis, pulmonary infections, Mycetoma, other deep mycoticinfections, subcutaneous fungal infections - Spozotrichosis, Chromoblastomycsis, Eye and Ear fungi infections, Serological tests for fungal infections and skin tests, Advanced techniques inmicrobiology - ELISA, RIA, CCIEP, Co–agglutinationGLC, HPLC etc. , Rapid diagnostic methods and Automation. in Microbiology**.**

Books Recommended :-

1) Medical Laboratory Science : Theory And Practice, By Ochei Et Al, Tata McGraw-Hill Education
2) The Chemistry and Bacteriology of Public Health, By Cuthbert Lindsay Dunn, Butterworth & Company.
3) Bartram's Encyclopedia of Herbal Medicine, By Thomas Bartram, Hachette UK
4) Diagnosis: A Symptom-based Approach in Internal Medicine, By Madgaonkar CS, Jaypee Brothers Medical Publishers Pvt. Ltd.
5) Clinical Anatomy by Regions, By Richard S. Snell, Lippincott Williams & Wilkins

Paper Title - BMLT 606	LAB – 16 Hematology - III	Credits - 4

List Of Experiments

1) Estimation of Haemoglobin
2) Identification of Megaloblassts
3) Identification o stains used in haempoetic disorders
4) Use of stains t to detect haemopoetic disorders
5) Measurement of Bleeding time
6) Measurement of Clotting time

Paper Title - BMLL 607	Practical – LAB 17 Pathology - III	Credits - 2

List of Experiments

1) Bacteriological examination of water, milk, food and air
2) Identification of Vibrio Cholerae
3) Identification of Mycobacterium tuberculosis
4) Identification of Mycobacterium leprae
5) Identification of Syphilis Spirochate
6) Identification of Yersnia Pestis

Paper Title - BMLT 608	Practical – LAB 18 Project & Seminar on Hospital Training	Credits - 6

Objective :-

1. To develop the students from all facets of various domains of skills such as Personal, social, professional & life long learning and make them a perfect human being with awareness of all social responsibilities.

2. To develop confidence as well as to promote the attitude of the students towards self developer and entrepreneur and also to developed the skill of presentation art.

Training Details:
The students are placed in research & development, pathological / clinical departments of various health care industries / hospitals / diagnostic centers / pathological laboratories / organisations for four months duration. During the hospital training tenure, the students are expected to gain actual pathological and clinical experience and try to make them familiar with the hospital environment.

The students have to keep day-to-day record of their actual work done during hospital training and same is to compiled along with the information about the hospital / pathological laboratory (in which they have been placed) in a bound volume which is to be submitted as a project report. The concerned teachers are supposed to guide the students for the preparation and presentation of the project report.

Seminar:
The students are required to deliver seminar on the topic of their pathological laboratory experiences i.e. actual work done by them in that pathological laboratories / pathological department / hospitals / diagnostic centre during their tenure of hospital training of one month duration. The duration or time allotted for students for delivering a seminar is 10 minutes only and in this stipulated time period he/she has to present his/her pathological laboratory experiences about the actual work done by him/her in pathological laboratory during hospital training.

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