**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.**

**CIRCULAR NO.SU/ Faculty of Science & Technology./B.VOC./ 60 /2023.**

It is hereby informed to all concerned that, on the recommendation of Ad-hoc Board in Vocational Studies and Dean, Faculty of Science & Technology the Hon'ble Vice-Chancellor has **accepted the curriculum of following B.Voc. Courses under Choice Based Credit and Grading System in** his emergency powers under Section-12 [7] of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith:

| Sr.No. | Course Name | Semester |
|---|---|---|
| 1. | B.Voc in Medical Laboratory Technology | V & VI |
| 2. | B.Voc in Software Development | V & VI |

This is effective from the **Academic Year 2022-23 and** onwards. This curriculum is also available on the University website www.bamu.ac.in.

All concerned are requested to note the contents of the circular and bring notice to the students, teachers and staff for their information and necessary action.

University campus,
Aurangabad-431 004.
Ref. No.SU/B.voc./Curri./2022-23/28094-104

Date: 28.04.2023

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**Deputy Registrar,**
**Academic [Syllabus]**
**Section.**

**Copy forwarded with compliments to :-**

1] **The Principal All Affiliated Concerned Colleges, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.**
2] **The Director,** University Network & Information Centre, UNIC, with **a request to upload the curriculum along with this Circular on University Website.**

**Copy to :-**

1] The Director, Board of Examinations & Evaluation, Dr.BAMU, A'bad
**2] The Concerned Section, Examination Branch,**
3] The Section Officer, [Eligibility Unit],
**4] The Programmer [Computer Unit-1] Examinations, section,** Dr. BAMU, A'bad
**5] The Programmer [ Computer Unit-2] Examinations, section,** Dr. BAMU, A'bad
6] The In-charge, [E- Suvidha Kendra],
7] The B.Voc Section, Dr. BAMU, A'bad
8] The Public Relation Officer,
9] The Record Keeper,

SSR/27042023/-

# MARATHWADA UNIVERSITY
# AURANGABAD

SYLLABUS OF
BACHELOR OF VOCATIONAL
IN

**B.Voc in Medical Laboratory Technology**
**Sem-V & VI**

## Choice Based Credit System

Effective form the Academic Year
2022-23 Onwards

कृष्णाई शिक्षण प्रसारक मंडळ, लातूर संचलित,

# जनविकास महाविद्यालय, बनसारोळा

ता. केज, जि. बीड - ४३१५१८ (महाराष्ट्र)
दूरध्वनी (०२४४५) २३७२४९, फॅक्स : ०२४४५ - २३७२४९
संलग्न : डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद
Email : principaljanvikas@rediffmail.com

| सौ. आर.ए. तट | डॉ.बी.एम. गोरे | डॉ. बाबासाहेब गोरे |
|---|---|---|
| अध्यक्ष | सचिव | प्राचार्य |


जा.क्र.
जा.क्र. : जमब/अभ्यासक्रम/२०२२-२३/९४२-२

दि.
दि.१२/०४/२०२३

प्रति,

**मा. उपकुलसचिव,**
शैक्षणिक विभाग (बी.व्होक.),
डॉ.बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ,
औरंगाबाद.

**विषयः- बी.व्होक. तृतीय वर्ष (पाचवे व सहावे सत्र) पदवी कोर्सचा (विज्ञान व तंत्रज्ञान विद्याशाखा) त्रुटी पुर्ततेसह स्विकारणे बाबत.**

**संदर्भः- जा.क्र. : जमब/अभ्यासक्रम/२०२२-२३/८८६ दि.०५/०९/२०२२.**

महोदय,

वरील संदर्भिय पत्रान्वये आमच्या महाविद्यालयात कडून सादर **Medical Laboratory Technology** केलेल्या अभ्यासक्रमात **विज्ञान व तंत्रज्ञान विद्याशाखा** यांच्या बैठकीमध्ये निघालेली त्रुटीची पुर्तता करुन सुधारीत अभ्यासक्रम सादर करत आहोत. अभ्यासक्रम प्रमाणित करण्यासाठी विद्यापीठाच्या विहीत फॉरमॅट मध्ये अभ्यासक्रम तयार करुन सोबत देत आहोत. अभ्यासक्रम प्रमाणित करुन मिळावा ही विनंती.

आपला विश्वासू

प्राचार्य
जनविकास महाविद्यालय
बनसारोळा, ता. केज, जि. बीड

**सोबत :**

१) अभ्यासक्रम आराखडा

Pattern verified
18/4/23

# Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (MS)

Syllabus of

## B. Voc. Medical Laboratory Technology ( Third Year)

(3 years Degree Course)

## Introduced from Academic Year 2022-23

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 ofworkshops/ 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 endsemester 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 theexamination.

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 studentin 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 x Gi) / $\Sigma$Ci

Where 'Ci'is the number of credits of the ith course component and 'Gi' is the grade point scored by the studentin the ith course component.

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

CGPA = $\Sigma$(Ci x 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 withgiven credit weightage at respective level.

# Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (MS)

## B. Voc. Medical Laboratory Technology

Syllabus with effective from 2022-2023

## B.Voc.Medical Laboratory Technology, Third Year

## Semester – V

| Sr. No. | Course Code | Course Title | Contact Hours Per Week | | Evaluation Scheme (Marks) | | Total Credits |
|---|---|---|---|---|---|---|---|
| | | | L | P | CIA | SEE | |
| | **General Education** | | | | | | |
| 1 | BMLT 501 | Human Psychology | 4 | 0 | 20 | 80 | 4 |
| 2 | BMLT 502 | Advanced Biotechnology | 4 | 0 | 20 | 80 | 4 |
| 3 | BMLT 503 | Laboratory Management & Ethics | 4 | 0 | 20 | 80 | 4 |
| | **Skill Courses** | | | | | | |
| 4 | BMLT 504 | Histopathology & Cytopathology | 4 | 0 | 20 | 80 | 4 |
| 5 | BMLT 505 | Parasitology & Mycology | 4 | 0 | 20 | 80 | 4 |
| 6 | BMLT 506 | Microbiology - III | 4 | 0 | 20 | 80 | 4 |
| | **Practical Skill Courses** | | | | | | |
| 7 | BMLT 507 | LAB 13- Histopathology & Cytopathology | 0 | 4 | 25 | 25 | 2 |
| 8 | BMLT 508 | LAB 14: Parasitology & Mycology | 0 | 4 | 25 | 25 | 2 |
| 9 | BMLT 509 | LAB 15: Microbiology - III | 0 | 4 | 25 | 25 | 2 |
| | **Total** | | | | **195** | **555** | **30** |

21/04/23

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

18/4/23

## Semester - VI

| Sr. No. | Course Code | Course Title | Contact Hours Per Week | | Evaluation Scheme (Marks) | | Total Credits |
|---|---|---|---|---|---|---|---|
| | | | L | P | CIA | SEE | |
| | **General Education** | | | | | | |
| 1 | BMLT 601 | R–DNA Technology | 4 | 0 | 20 | 80 | 4 |
| 2 | BMLT 602 | Entrepreneurship Program | 4 | 0 | 20 | 80 | 4 |
| 3 | BMLT 603 | Research Methodology | 4 | 0 | 20 | 80 | 4 |
| | **Skill Courses** | | | | | | |
| 4 | BMLT 604 | Hematology - III | 4 | 0 | 20 | 80 | 4 |
| 5 | BMLT 605 | Pathology - III | 4 | 0 | 20 | 80 | 4 |
| | **Practical Skill Courses** | | | | | | |
| 6 | BMLT 606 | LAB 1- Hematology - III | 0 | 4 | 25 | 25 | 2 |
| 7 | BMLT 607 | LAB 2: Pathology - III | 0 | 4 | 25 | 25 | 2 |
| 8 | BMLT 608 | LAB 3 : Project & Seminar on Hospital Training | 0 | 6 | 50 | 100 | 6 |
| | **Total** | | | | **200** | **550** | **30** |

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Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

**Semester V**

| Paper Title - BMLT 501 | Human Psychology | Creadits – 4 Marks : 100 |
|---|---|---|

**Objective –**

1. To encourage people towards discovering and nurturing their character strengths
2. To study human mind properly so as to emphasize where the role of human resource management comes to play.
3. To describe, explain, predict, and change or control behaviors.

**Outcomes : -**

**After successful completion of this course students will be able to:**

1. Discuss the psychological intermediary process.
2. Explain the diverse manifestations of memory, emotion, attention, language, planning, judgement, insight and thoughts.
3. Develop a base in cognitive psychology with the help of relevant examples of everyday life.
4. Apply psychological principles to understand personal as well as social issues and problems.

**(15 Hours)**

**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

**(15 Hours)**

**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.

**(15 Hours)**

**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).

**(15 Hours)**

**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

**Weblinks :**
**https://www.verywellmind.com/psychology-basics-4157186**
**https://humanpsychology.com.au/**

| Paper Title - BMLT 502 | Advanced Biotechnology | Creadits – 4 Marks : 100 |
|---|---|---|

**Objective :-**

1. To enable students to explain different branches of Microbiology such as Bacteriology and Virology.
2. To enable students to explain about various applications of Statistics in the field of Medical, Pathology, Immunological Science.
3. To Develop and present a strategic plan for ongoing personal and professional development to enhance work performance.

**Outcomes : -**

**After successful completion of this course students will be able to:**

1. Apply the scientific method by developing valid hypotheses, designing experiments, gathering relevant data using current technology, and interpreting quantitative and qualitative data.
2. Use existing software effectively to extract information from large databases and to use this information in computer modelling.
3. Upgrade knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics.
4. Develop A strong sense of wellbeing, A strong sense of identity, Connection to and contribution with their world.

**(15 Hours)**

**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.

**(15 Hours)**

**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.

**(15 Hours)**

**Unit 3 :- The drug development process**

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

**(15 Hours)**

**Unit 4 :- Drug manufacturing process and Biogenetic 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 | Creadits – 4 Marks : 100 |
|---|---|---|

**Objectives :-**

1. To provide the skill of successful Pathological Laboratory management and its ethics
2. To prepare lab personnel who are able to deliver their assigned duties within limited time and resources.
3. To provide students, knowledge of acquiring grants, personnel, equipment, or the necessary tools, as well as designing the workflow, overseeing the daily operation of the lab, and training new lab personnel.

**Outcomes : -**

**After successful completion of this course students will be able to:**

1. Implement their knowledge of ethics which helps to protect confidence; operational integrity, capability,
2. Apply concepts of safety management for staff.
3. Exhibit a sense of commitment to the ethical and human aspect of patient care.
4. Recognize the role of clinical laboratory scientist in the assurance of quality health care.
5. Apply the norms of safety and governmental regulation and standards as applied to medical laboratory practice.

**(15 Hours)**

## 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.

**(15 Hours)**

## 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

**(15 Hours)**

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

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 programmers', First aid and safety measures for Mechanical, Electrical, Chemical, Radioactive and Biological hazards, Universal safety precautions.

**(15 Hours)**

## 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.
5) Principles of Clinical Laboratory Management, Jane Hudson, Pearson Prentice Hall, 2004 - Medical - 344 pages

| Paper Title - BMLT 504 | Histopathology & Cytopathology | Creadits – 4 Marks : 100 |
|---|---|---|

**Objectives :-**

1. To deliver knowledge about the derangement of tissue due to diseases at cellular level, including exfoliation of cells from surfaces of various passages, organs and viscera.
2. To educate students to become competent cytopathologic, capable of practicing in either an academic center or private practice setting;
3. To make students proficient in effective communication with clinical colleagues; and to be self-motivated and diligent in continuing
4.

**Outcomes : -**

**After successful completion of this course students will be able to:**

1. Analyze on the architecture of the tissue and provide better information about the tissue than cytology.
2. Describe the receipt, preparation and processing of specimens for histopathological diagnosis.
3. Explain and recognise normal the cellular morphology of specified tissues and organs and relate these to the pathobiological processes associated with them.

**(15 Hours)**

## Unit 1 :- Histopathology

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

**(15 Hours)**

## Unit 2 :- : Tissues Fixative

Simple Fixative and their properties. Simple Fixative and their properties.Micro anatomical fixative Histochemical fixatives

**(15 Hours)**

## 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**

**(15 Hours)**

**Unit 4 : CYTOPATHOLOGY**

Introduction – cytology and cytopathology Method of specimen collection and transportation. For gynecological 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

,

**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 Marks : 100 |
|---|---|---|

**Objectives :-**

1. To develop the skill of laboratory diagnosis of various parasites, pathogenic fungi among students
2. To empower students with basics of microbiology and parasitology towards diagnosis, treatment and prophylaxis of infectious diseases in humans.
3. To empower students with appropriate methods to identify microorganisms (media-based) Estimate the number of microorganisms in a sample Become conversant in basic biochemistry methods.

**Outcomes : -**

**After successful completion of this course students will be able to:**

1. Explain viruses, fungi and parasites including their classification, morphology, laboratory diagnosis and prevention measures.
2. Perform laboratory investigations for the diagnosis of infectious diseases caused by viruses, fungi and parasites.
3. Discuss various viral fungal and parasitic diseases of human being.
4. Lead in the development of such antibiotic drugs as penicillin, streptomycin, and tetracycline, as well as other drugs, including statins (cholesterol-lowering drugs).

**(15 Hours)**

## 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

**(15 Hours)**

## 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

**(15 Hours)**

## 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

**(15 Hours)**

## 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,
6) https://www.med.upenn.edu/camb/mvp.html -----Weblink

| Paper Title - BMLT 506 | Microbiology – III | Creadits – 4 Marks : 100 |
|---|---|---|

**Objectives –**

1. To provide knowledge about laboratory tools and techniques including microscopes, micro organisms, sterilization and the other related concepts.
2. To provide students with necessary knowledge so that students can apply knowledge of laboratory techniques and research methods

**Outcomes: -**

**After successful completion of this course students will be able to:**

1. Apply the knowledge to understand the microbial physiology and to identify the microorganisms.
2. Discuss the regulation of biochemical pathway and possible process modifications for improved control over microorganisms for microbial product synthesis.
3. Explain the basic genetic systems of bacteria, bacteriophage and plasmids. Explain the role of microorganisms in food production and preservation, and their ability to cause food-borne infections. Demonstrate practical skills in fundamental microbiological techniques

**(15 Hours)**

**Unit- 1 PATHOGENIC FUNGI:**

Candida, Cryptococci, Dermatophytes, Sporotrichoses, Histoplasma, Blastomyces, Coccidiosis's, 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.

**(15 Hours)**

**Unit- 2 VIROLOGY:**

Different staining techniques used in virology, Use of Embryonated 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.

**(15 Hours)**

**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.

**(15 Hours)**

## Unit- 4 INFECTION CONTROL AND PREVENTION

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) Diagnostic 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) Immunodiagnostic of Parasitic diseases; Walls and Sohantz Academic Press.
6) https://www.sigmaaldrich.com/IN/en/technical-documents/technical-article/microbiological-testing/microbial-culture-media-preparation/microbiology-introduction?gclid=Cj0KCQjw1vSZBhDuARIsAKZlijSozYe7nEttUEkiF7AvBknlgXOR9W1jsuaVwoO0QVoBYlB-p8a5TIYaApOiEALw_wcB&gclsrc=aw.ds -**Weblink**

| Paper Title - BMLT 507 | Practical - LAB 13 – Histopathology & Cytology | Credits – 2 Marks : 50 |
|---|---|---|

**Objectives –**

1. To provide knowledge about of microscopes, micro-organisms, sterilization and the other related concepts.
2. To study of diseases of the tissues, and involves examining tissues and/or cells under a microscope.
3. To empower students towards making tissue diagnoses and helping clinicians manage a patient's care.

**Outcomes: -**

**After successful completion of this course students will be able to**

1. Describe and recognise normal the cellular morphology of specified tissues and organs and relate these to the pathobiological processes associated with them.
2. Describe the receipt, preparation and processing of specimens for histopathological diagnosis.
3. Explain Professional and Ethical Conduct and Continuing Professional Development.

**(30 Hours)**

**List of Experiments: -**

**Estimation of T3, T4 Estimation of LH**

1) Estimation of FSH
2) Measurement of Blood Pressure
3) Estimation of TSH
4) Parts of microtome
5) Section Cutting of the tissue and staining
6) Tissue processing
7) Hand E staining
8) PAP staining.
9) Precautions to prevent hemolysis
10) Storage of blood specimens
11) Bleeding time & clotting time estimation
12) Routine diagnostic histopathology

13) Histochemistry

14) Immunohistochemistry

15) Bile duct brushings

16) Bronchiole brushings and washings

17) Cerebrospinal fluid

18) Esophageal brushing

| Paper Title - BMLT 508 | Practical - LAB 14 : Parasitology, Mycology & Virology | Creadits – 2 Marks : 50 |
|---|---|---|

**(30 Hours)**

**Objectives –**

1. To provide working knowledge of laboratory instruments
2. To provide comparative overview of laboratory methods used for isolation, characterization and identification of viruses, fungi and parasites.

**Outcomes : -**

**After successful completion of this course students will be able to**

1. Describe the proper methods of collection of specimens for recovery of parasites
2. Analyze different types of sample materials from microbiological laboratory Learning outcome
3. Assess information about methods and analytical instruments, for example by means of manuals and procedure descriptions, could assess the medical probability of a test result, analysis quality in relation to a medical problem.

**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 Marks : 50 |
|---|---|---|

**Objectives –**

1. To provide requisite skill in the use and care of basic microbiological equipment.
2. To provide insights into the complexity of nature and society, which in turn provide many different health, environmental, social, cultural, industrial and economic benefit

**Outcomes : -**

**After successful completion of this course students will be able to**

1. Apply the knowledge to understand the microbial physiology and to identify the microorganisms.
2. Understand the regulation of biochemical pathway and possible process modifications for improved control over microorganisms for microbial product synthesis.
3. Explain the basic genetic systems of bacteria, bacteriophage and plasmids.
4. Explain the role of microorganisms in food production and preservation, and their ability to cause food-borne infections. Demonstrate practical skills in fundamental microbiological techniques.

**(30 Hours)**

**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
6) Selective media for Soil microflora and use of growth factors,
7) Study of Rhizosphere interactions, Quantitative measurements of Soil nutrients and Rhizosphere microflora and preparation of starter cultures of Rhizobia, Azotobacter.
8) Separation of pure cultures and study the effect of selective nutrients on prokaryotes.
9) Preparation of culture media, spread plates, pour plates, selective media, differential media

## *Semester – VI*

| Paper Title - BMLT 601 | R – DNA Technology | Credits – 4 Marks : 100 |
|---|---|---|

**Objectives:-**

1. To provide knowledge on 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.
2. To allow students to manipulate DNA fragments in order to study them in the lab

**Outcomes: -**

**After successful completion of this course students will be able to**

1. Assess the production of vaccines and protein therapies such as human insulin, interferon and human growth hormone.
2. Explain production of clotting factors for treating haemophilia and in the development of gene therapy.
3. Discuss about the human genetics and hereditary.

**(15 Hours)**

**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).

**(15 Hours)**

**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

**(15 Hours)**

**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).

**(15 Hours)**

**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 Marks : 100 |
|---|---|---|

**Objectives :-**

1. To make students understand the validity of various entrepreneurship development programs in the field of economics and its related concepts.
2. To provide inspiration to people for setting up small, local Industries, by utilization of resources available in the nearby areas and areas of their links
3. To increase the knowledge and skill of existing entrepreneurs and encourage others to become one

**Outcomes :-**

**After successful completion of this course students will be able to**

1. Prepare financially feasible ideas.
2. Develop their Entrepreneurship and Innovation skills which will be able to find problems worth solving.
3. Apply skills in preparing business plan.
4. Conducting project feasibility in study.
5. Exhibit their financial literacy, marketing, leadership, product management, negotiation, strategic thinking, soft skills and so much more.

**(15 Hours)**

**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.

**(15 Hours)**

**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.

**(15 Hours)**

**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.

**(15 Hours)**

**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 Marks : 100 |
|---|---|---|

**Objectives :-**

1. To improve the design of your research projects. To this end, we will focus on the importance of careful theoretical thinking and on the conceptual difficulties associated with establishing causality in empirical work..
2. To make students realize what hois/her research is trying to achieve and explain why you are pursuing it.
3. To provide knowledge on techniques and tools used to collect, process and analyze data regarding the research topic.
4. To provide better familiarity with the research topic by properly explaining each concept associated with it

**Outcomes :-**

**After successful completion of this course students will be able to**

1. Choose methods appropriate to research aims and objectives and understand the limitations of particular research methods. .
2. Develop skills in qualitative and quantitative data analysis and presentation.
3. Develop advanced critical thinking skills.

**(15 Hours)**

**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%)

**(15 Hours)**

**UNIT – 2 Problem Identification & Formulation**

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

**(15 Hours)**

**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.

**(15 Hours)**

**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
4) Research methodology education Research ,Lokesh koul
5) Case study Research ,john mcleod

| Paper Title - BMLT 604 | Hematology – III | Creadits – 4 Marks : 100 |
|---|---|---|

**Objectives -**

1. Identify and appropriately respond to relevant ethical issues arising in hematological patient care
2. The course is designed to focus on the various studies of blood and its components with help of intense laboratory work.
3. Demonstrate medical expertise in situations other than patient care.
4. Demonstrate effective use of all Can MEDS competencies relevant to Hematology.

**Outcomes :-**

**After successful completion of this course students will be able to**

1. Explain the blood and blood diseases.
2. Explain the treatment of blood disorders and malignancies, including types of hemophilia, blood clots, leukaemia, lymphoma, myeloma and sickle-cell anaemia.
3. Take care for patients suffering from cancer, genetic disorders, and diseases that can result from hospitalization for other conditions.

**(15 Hours)**

**Unit 1: Definition and classification of anemias:**
Laboratory investigation for megaloblastic anemia, Laboratory investigation for iron deficiency anemia. , Laboratory investigation for hemolytic anemia including classification and causes.

**(15 Hours)**

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

**(15 Hours)**

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

**(15 Hours)**

**Unit 4 : Use of Radioisotopes in hematology:**
Safety measures for handling Radioisotopes.

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**Books Recommended :-**

1) Recombinant Human Erythropoietin (rhEPO) in Clinical Oncology, edited by Mohammad Resa Now rousing, 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 Marks : 100 |
|---|---|---|

**Objectives :-**

1. To provide pathology training that emphasizes interpretative, investigative and management skills
2. To provide residents the tools to identify and pursue their own career path and foster their professional development.
3. To Promote the development of investigative skills to better understand pathologic processes as they apply to both individual patients and the general patient population

**Outcomes :-**

**After successful completion of this course students will be able to**

1. Provide diagnostic information to patients and clinicians.
2. Manage chronic diseases through accurate laboratory testing.
3. Get a job as an Anatomical pathology technician, Medical laboratory assistant, Biomedical scientist, etc.
4. Earn is 18.2 Lakhs per year (1.5L per month) An Entry Level Pathologist with less than three years of experience earns an average salary of 8.5 Lakhs per year.

**(15 Hours)**

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

**(15 Hours)**

**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 Bacteriocin typing methods.

**(15 Hours)**

**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 diarrheas, diseases, Cholera Urinary tract infection, Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, Syphilis, Gonorrhea and other STD's,

**(15 Hours)**

**UNIT IV :**
Lab diagnosis of fungal infections viz: Superficial Dermatophyte fungal infections, Candidiasis, Cryptococcosis, pulmonary infections, Mycetoma, other deep mycotic infections, subcutaneous fungal infections - Sporotrichosis, Chromoblastomycosis, Eye and Ear fungi infections, Serological tests for fungal infections and skin tests, Advanced techniques in microbiology - ELISA, RIA, CCIEP, Co–agglutinating, 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 – 1 Hematology – III | Creadits – 2 Marks : 50 |
|---|---|---|

**(30 Hours)**

**Objectives -**

1. To focus on the various studies of blood and its components with help of intense laboratory work.
2. To Identify the typical hemoglobin levels that define anemia in children/adolescents and post-pubertal men and women. List the signs and symptoms of anemia and distinguish between the symptoms of acute anemia with volume depletion and chronic anemia in the euvolemic state.
3. To ensure that specialists in Hematological Pathology have the competence to act as consultants to clinicians with respect to appropriate investigation, diagnosis and monitoring of disorders of the blood cells, bone marrow, lymph nodes, spleen, and hemostasis.

**Outcomes :-**

**After successful completion of this course students will be able to**

1. Work on wide varieties of basic and advanced hematology testing on whole blood, serum, urine, cerebrospinal fluids and other body fluids.
2. Treat blood disorders and malignancies, including types of hemophilia, blood clots, leukemia, lymphoma, myeloma and sickle-cell anemia.
3. Identify diagnosis and management of a wide range of benign and malignant disorders of the red and white blood cells, platelets and the coagulation system in adults and children.

**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
7) Determination of erythrocyte sedimentation rate (ESR)
8) Determination and calculation of red blood indices MCH,MCH,MCHC
9) Study of differential leukocyte count
10) Determination of absolute Eosinoehil count
11) Determination of platelet count

| Paper Title - BMLL 607 | Practical – LAB 2 Pathology – III | Creadits – 2 Marks : 50 |
|---|---|---|

**(30 Hours)**

**Objectives :-**

1. To covering the fundamental concepts of biology apart from the primary focus on the study of diseases and the possible remedies.
2. To promote the development of investigative skills to better understand pathologic processes as they apply to both individual patients and the general patient population.
3. To promote the acquisition of knowledge and provide experience in laboratory direction and management and encourage residents to assume a leadership role in the education of other physicians and allied health professionals.

**Outcomes :-**

**After successful completion of this course students will be able to:**

1. Provide diagnostic information to patients and clinicians.
2. Take all aspects of patient care, from diagnosing cancer to managing chronic diseases through accurate laboratory testing.
3. Apply requisite knowledge as an Anatomical pathology technician, Medical laboratory assistant, Biomedical scientist, etc.

**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
7) Estimation of blood sugar level of plasma (or serum) • (a) orthotoluidine method (b)glucose-oxidase method •
8) To perform pregnancy test by dipstick method • Estimation of the serum urea nitrogen • Estimation of serum creatinine. (a)alkaline-picrate method.
9) Determination of protein in blood • Albumin, globulin • Determination of serum bilirubin. (a) malloy and evelyn. • (b) DMSO method.
10) Determination of serum bilirubin. (a) malloy and evelyn. • (b) DMSO method.
11) Determination of serum glutamate pyruvate transaminase (SGPT) and serum glutamate oxaloacette tranasaminase (SGOT) (a)end point reaction
12) Determination of serum alkaline phosphatase
13) To perform glucose tolerance test

| Paper Title - BMLT 608 | Practical – LAB 3 Project & Seminar on Hospital Training | Credits – 6 Marks : 150 |
|---|---|---|

**Objective :-**

1. To develop the students from all facets of various domains of skills such as Personal, social, professional & lifelong 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.

**Outcomes:-**

**After successful completion of this course students will be able to**

1. Upgrade their knowledge and skill about Health & Hospital Administrators and other personnel involved in the management of health care organization through continuous education and research.
2. Build Morale: Offering training to your medical staff sends a message that you are invested in their success. It may help them feel valued as an employee and in return increase their productivity
3. Exhibit their knowledge base and improve their job skills to become more effective in the workplace.

**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.

Principal
Janvikas Mahavidyalaya,
Bansarola, tq.Kaij Dist.Beed