# KURUKSHETRA UNIVERSITYKURUKSHETRA

## Syllabus forUnder-Graduate

## Programme

## Course: Bachelor of Vocation in Medical Laboratory Technology ($3^{rd}$ & $4^{th}$ semester)

## Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020 w.e.f. 2023-24

# PLOs for Life Sciences

| PLOs | UG Certificate in Life Sciences |
|---|---|
| **After the completion of UG certificate in Life Sciences, the student should be able to:** | |
| **PLO_1: Knowledge and Understanding** | • Demonstrate the knowledge of basic principles, concepts, facts and broad linkage of chosen subjects of Life sciences. |
| **PLO_2: Skills And creativity** | • Selecting and using relevant methods, tools, and materials to assess the appropriateness of approaches for solving problems associated with the chosen subjects of Life sciences. |
| **PLO_3: Application of knowledge and Skills** | • Apply the acquired operational or theoretical knowledge, and a range of practical skills to select and use basic methods, tools, materials, and information to generate solutions to specific problems relating to the chosen subjects of Life sciences. |
| **PLO_4: Critical thinking** | • Listen carefully, read texts, make judgments and take decisions based on analysis of data and evidences. |
| **PLO_5: Ethics** | • Put forward convincing arguments to respond to the ethical and moral issues associated with the chosen subjects, practice ethical and moral values in one's life. |
| **PLO_6: Communication** | • Express scientific thoughts and ideas effectively in writing and orally and communicate on scientific activities with others using appropriate media. |
| **PLO_7:Life Long Learning** | • Acquire knowledge and skills including learning 'How to learn' that are necessary for participating in learning activities throughout life. |
| **PLO_8: Environmental Awareness** | • Demonstrate knowledge of effects of environmental degradation, climate change and pollution, effective waste management. |
| **PLO_9:Digital Literacy** | • To use ICT in a variety of learning and work situations. |

| PLOs | UG Diploma in Life Sciences |
|---|---|
| **After the completion of UG Diploma in Life Sciences, the student should be able to:** | |
| **PLO_1: Knowledge and Understanding** | • Demonstrate the deeper knowledge and understanding of principles, concepts, facts and broad linkage of chosen subjects of Life sciences. |
| **PLO_2: Skills And creativity** | • Selecting and using relevant methods, tools, and materials to assess the appropriateness of approaches from a range of sources for solving complex problems associated with the chosen subjects of Life sciences. |
| **PLO_3: Application of knowledge and Skills** | • Apply the acquired operational or theoretical knowledge, and a range of practical skills to select and use appropriate methods, tools, materials, and information to generate solutions to specific problems relating to the chosen subjects of Life sciences. |
| **PLO_4: Critical thinking** | • Listen carefully, read texts, make judgments and take decisions based on analysis of data and evidences, present complex information in a clear, scientific and concise manner. |
| **PLO_5: Ethics** | • Formulate arguments in support of actions to address the ethical and moral issues associated with the chosen subjects, practice ethical and moral values in one's life. |
| **PLO_6: Communication** | • Express scientific thoughts and ideas effectively in writing and orally and communicate on scientific activities with others using appropriate media. |
| **PLO_7:Life Long Learning** | • Acquire knowledge and skills including learning 'How to learn' that are necessary for participating in learning activities throughout life. |
| **PLO_8: Environmental Awareness** | • Apply knowledge, skills and attitude to mitigate the effects of environmental degradation, climate change and pollution, effective waste management. |
| **PLO_9:Digital Literacy** | • To use ICT in a variety of learning and work situations. |

| PLOs | Bachelor Degree in Life Sciences |
|---|---|
| **After the completion of Bachelor degree in Life Sciences, the student should be able to:** | |
| **PLO_1: Knowledge and Understanding** | • Demonstrate the comprehensive and specialized knowledge and deep understanding of principles, concepts, and factsabout current and emerging issues relevant to chosen subjects of Life sciences. |
| **PLO_2: Skills And creativity** | • Selecting and using relevant methods, tools, and materials to assess the appropriateness of approachesfor solving specific problems associated with the chosen subjects of Life sciences. |
| **PLO_3: Application of knowledge and Skills** | • Apply the acquired operational or theoretical knowledge, and a range of practical skills to analyze quantitative and qualitative data to assess the different approaches to generate solutions to specific problems related to the chosen subjects of Life sciences. |
| **PLO_4: Critical thinking** | • Listen carefully, read texts, make judgments and take decisions based on analysis of data and evidences, present complex information in a clear, scientific and concise manner. |
| **PLO_5: Ethics** | • Follow ethical practices in all aspects of research and development, including avoiding unethical practices such as fabrication, falsification or misrepresentation of data or committing plagiarism. |
| **PLO_6: Communication** | • Able to communicate effectively on complex scientific activities with the scientific community and with society at large, such as, being able to comprehend and write effective scientific reports and design documentation, make effective presentations. |
| **PLO_7:Life Long Learning** | • Acquire knowledge and skills including learning 'How to learn' that are necessary for participating in learning activities throughout life. |
| **PLO_8: Environmental Awareness** | • Apply knowledge, skills and attitude to mitigate the effects of environmental degradation, climate change and pollution, effective waste management. |
| **PLO_9:Digital Literacy** | • To use ICT in a variety of learning and work situations, appropriate software to analysis the data. |
| **PLO_10:Research Aptitude** | • Ask relevant/appropriate questions, identifying, formulating and analyzing the research problems and to draw conclusion from the analysis. |

**CC-A3**

<table>
<tr><td colspan="4">Session:2024-25</td></tr>
<tr><td colspan="4">Part A-Introduction</td></tr>
<tr><td>Subject</td><td colspan="3">Bachelor of Vocation in Medical Laboratory Technology</td></tr>
<tr><td>Semester</td><td colspan="3">III</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Biochemistry–III</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-MLT-301</td></tr>
<tr><td>Course Type:</td><td colspan="3">CC</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">200-299</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3">---</td></tr>
<tr><td>Course Learning Outcomes (CLO):<br><br>CLO5 is based on practical component</td><td colspan="3">After completing this course, the learner will be able to:<br>1. Know about the analytical techniques by using sophisticated equipment.<br>2. Introduce the students to various apparatus and reagents used in analytical and diagnostic sections of Biochemistry.<br>3. Understand the principle procedures and applications of important techniques like ELISA.<br>4. Impart general insight into theoretical and practical education of various procedures like PCR.<br>5. Provide skills for accurate laboratory results in a timely manner as well as safeguard experimental controls and calibrate laboratory instruments.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>03</td><td>01</td><td>04</td></tr>
<tr><td>Contact Hours</td><td>03</td><td>02</td><td>05</td></tr>
<tr><td colspan="2">Max.Marks:100<br>Internal Assessment Marks:30 (Theory 20+ Practical 10)<br>End Term Exam Marks: 70 (Theory 50 + Practical 20)</td><td colspan="2">Exam duration: Theory:3 Hours<br>Practical:4 hours</td></tr>
<tr><td colspan="4">Part B- Contents of the Course</td></tr>
<tr><td colspan="4"><u>Instructions for Paper-Setter:</u><br>Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.</td></tr>
</table>

| Unit | Topics | Contact Hours |
|---|---|---|
| I | Analytical Biochemistry-I : Titrimetry, Colorimetry, Spectrophotometry, Flame photometry, Atomic absorption spectroscopy, Automatic washer. | 10 |
| II | Analytical Biochemistry-II : Electrometric determination of $Na^+$ and $K^+$, Chromatography (Thin-layer and liquid chromatography), Electrophoresis (Paper and Gel electrophoresis) for haemoglobin. | 10 |
| III | Principle procedures and applications of :<br>(a) Semi auto-analyzer, diluters and dry chemistry analyzer.<br>(b) Osmometry<br>(d) ELISA (Enzyme Linked Immunosorbent Assay) | 12 |
| IV | Principle procedures and applications of :<br>(a) Coulter-counters<br>(b) RIA (Radio-Immunoassay)<br>(c) PCR (Polymerase Chain Reaction) | 13 |
| V* | **PRACTICAL**<br>1. Demonstration of principle and working of: Colorimeter, spectrophotometer, flame photometer, PCR (Polymerase Chain Reaction), coulter-counters.<br>2. Demonstration of osmometry.<br>3. Demonstration of RIA(Radio-Immunoassay)<br>4. Demonstration of DOT ELISA (Enzyme Linked Immunosorbent Assay)<br>5. Demonstration of polyacrylamide Gel Electrophoresis of a biological sample. | 30 |

| Suggested Evaluation Methods | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory**<br>• Class Participation: 5<br>• Seminar/presentation/assignment/quiz/classtestetc.:5<br>• Mid-Term Exam: 10<br>➢ **Practicum**<br>• Class Participation: NA<br>• Seminar/Demonstration/Viva-voce/Labrecordsetc.:10<br>• Mid-Term Exam: NA | **End Term Examination:**<br>**Theory: 50**<br>(Written exam)<br>**Practical: 20**<br>(Seminar/ Demonstration/ Viva-voce/Lab records etc) |

## Part C- Learning Resources

**Recommended Books/e-resources/LMS:**

1. Textbooks of Medical Laboratory Technology, Volume 1, 3rd Edition by Praful Ghodkar.
2. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar.
3. Medical Laboratory Technology (Volume I) : Procedure Manual for Routine Diagnostic, Kanai Mukharjee.
4. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukherjee.
5. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukherjee.

**PLOCLO Mapping of B23-MLT-301**

| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 |
|---|---|---|---|---|---|---|---|---|---|
| CLO1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.5 | 1 |
| CLO2 | 1.5 | 1 | 2 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO3 | 1 | 1 | 2 | 1.5 | 1.5 | 1.5 | 1 | 1.5 | 1 |
| CLO4 | 1.5 | 1 | 2 | 1.5 | 1.5 | 1 | 1 | 1.5 | 1 |
| CLO5 | 1 | 1 | 2 | 1.5 | 1.5 | 1 | 1 | 1.5 | 1 |

**CC-B3**

| **Session:2024-25** | | | |
|---|---|---|---|
| **Part A-Introduction** | | | |
| Subject | Bachelor of Vocation in Medical Laboratory Technology | | |
| Semester | III | | |
| Name of the Course | Microbiology–III | | |
| Course Code | B23-MLT-302 | | |
| Course Type: | CC | | |
| Level of the course (As per Annexure-I | **200-299** | | |
| Pre-requisite for the course (if any) | --- | | |
| Course Learning Outcomes (CLO):<br><br>CLO5isbasedonpractical component | After completing this course, the learner will be able to:<br>1. Demonstrate the knowledge of various micro-organisms.<br>2. Learn the general characters, diagnosis and life-cycles of medically important micro-organisms.<br>3. Provide the student methods with the study of staining techniques.<br>4. Gain knowledge about the etiological agents responsible for global infectious diseases.<br>5. Get an idea of universal safety precautions. | | |
| Credits | Theory | Practical | Total |
| | 03 | 01 | 04 |
| Contact Hours | 03 | 02 | 05 |
| **Max.Marks:100**<br>**Internal Assessment Marks: 30(Theory 20 + Practical 10)**<br>**End Term Exam Marks: 70 (Theory 50 + Practical 20)** | | **Exam duration: Theory:3 Hours**<br>**Practical:4 hours** | |
| **Part B-Contents of the Course** | | | |
| **Instructions for Paper-Setter:**<br>Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. There remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q. No.1 & four others selecting one question from each unit. All questions carry equal marks. | | | |

| Unit | Topics | Contact Hours |
|---|---|---|
| I | Identification of Bacteria: *Micrococci, Staphylococci, Streptococci, Pneumococci, Corynebacteria, Escherichia, Klebsiella, Enterobacter, Salmonella, Shigella, Citrobacter, Yersinia, Pseudomonas, Vibrio, Haemophilus, Mycoplasma, Rickettsia.* | 10 |
| II | Pathogenic and Non-Pathogenic Fungi: *Candida, Cryptococci, Dermatophytes, Sporothrix, Histoplasma, Blastomyces, Coccidioides, Para-coccidioides,* Dematiaceous fungi, *Mycetoma,* Actinomyces, *Nocardia.* | 10 |
| III | Principles of staining techniques, composition & preparation of stains: Making of films, staining methods, mounting media. Gram stain - preparation of stain and staining methods, speical stains for acid fast bacilli (AFB), Diptheria, intracytoplamic lipids, polysaccharides, nuclear materials, stain for amoeba, fungi, rickettsia. Ziehl - Neelsen stain, Albert stain and negative stain. | 12 |
| IV | Morphology, life cycle and laboratory diagnosis of haemoflagellates (*Leishmania, Trypanosomes*); Morphology and life cycle of tissue and blood nematodes (*Trichinella*; *Filaria; Dracunculus*), Lab. Diagnosis of tissue & blood nematode infection; Morphology and life cycle of intestinal cestodes ( *Taenia, Echinococcus*); Culture techniques for protozoa (*Amoeba, Giardia, Leishmania*) ; Culture methods for Helminths, Hookworm, Round worm; Egg counting techniques; Preparation of stains and staining procedures of malaria; Identification of different plasmodium species; Preparation of media and maintenance of cultures (*E. histolytica*; *Giardia*; *Leishmania*) | 13 |
| V* | **PRACTICALS**<br>1. Identification of Pathogenic and non-pathogenic fungi from class-work materials/diseased tissues.<br>2. Isolation of Lactobacilli and Streptococci from curd.<br>*3.* Morphology and Life cycle of haemoflagellates *Leishmania, Trypanosomes*<br>4. Laboratory diagnosis of *Leishmania, Trypanosomes*.<br>5. Morphology and life cycle of tissue and blood nematodes *Filaria, Trichinella, Dracunculus*<br>6. Lab. diagnosis of tissue & blood nematode infection.<br>7. Morphology and life cycle of intestinal cestodes *Taenia, Echinococcus*<br>8. Culture techniques for protozoa *Amoeba, Giardia, Leishmania*<br>9. Culture methods for Helminths, Hookworm, Round worm.<br>10. Preparation of stains and staining procedures of malaria.<br>11. Identification of different plasmodium species.<br>12. Preparation of media and maintenance of cultures of *E. histolytica, Giardia, Leishmania* | 30 |

| Suggested Evaluation Methods | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory**<br>• Class Participation:5<br>• Seminar/presentation/assignment/quiz/classtestetc.:5<br>• Mid-Term Exam: 10<br>➢ **Practicum**<br>• Class Participation: NA<br>• Seminar/Demonstration/Viva-voce/Labrecordsetc.:10<br>• Mid-Term Exam: NA | **End Term Examination:**<br>**Theory: 50** (Written exam) **Practical: 20** (Seminar/ Demonstration/Viva-voce/Lab records etc) |

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**

1. Practical and Applied Microbiology Anuradha De 4th Edition
2. Text Book of Microbiology Anantnarayan 10th Edition
3. Text Book of Microbiology and Parasitology Praful Godkar 1st Edition
4. Medical Parasitology C.P. Baweja 3rd Edition
5. Text Book of Microbiology for Nursing Students, Anant Narayan Panikar
6. Text Book of Ophthalmology, Khurana
7. Text Book of Microbiology, Baveja.

**PLOCLO Mapping of B23-MLT-302**

| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 |
|---|---|---|---|---|---|---|---|---|---|
| CLO1 | 1 | 1 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO2 | 1.5 | 1 | 2 | 1 | 1.5 | 1.5 | 1 | 1.5 | 1 |
| CLO3 | 1 | 1 | 2 | 1.5 | 1 | 1.5 | 1 | 1.5 | 1.5 |
| CLO4 | 1.5 | 1 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO5 | 1 | 1 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |

**CC-C3**

| **Session:2024-25** | | | |
|---|---|---|---|
| **Part A-Introduction** | | | |
| Subject | Bachelor of Vocation in Medical Laboratory Technology | | |
| Semester | III | | |
| Name of the Course | Pathology–1II | | |
| Course Code | B23-MLT-303 | | |
| Course Type: | CC | | |
| Level of the course (As per Annexure-I | **200-299** | | |
| Pre-requisite for the course (if any) | --- | | |
| Course Learning Outcomes (CLO):<br><br>CLO5isbasedonpracticalcomponent | After completing this course, the learner will be able to:<br>1. Gain the basic knowledge of cytology and Cytopathology.<br>2. Impart sound knowledge and basic skills of working in a pathology lab.<br>3. Understand the principle, procedure and demonstration of various tissue constituents and advanced tools.<br>4. Diagnose routine and complex clinical problems on the basis of cytopathology specimens.<br>5. Enable the student to collect blood and urine samples under guidance. | | |
| Credits | Theory | Practical | Total |
| | 03 | 01 | 04 |
| Contact Hours | 03 | 02 | 05 |
| **Max.Marks:100**<br>**Internal Assessment Marks:30 (Theory20+Practical10)**<br>**End Term Exam Marks: 70 (Theory 50 + Practical 20)** | | **Exam duration: Theory:3 Hours**<br>**Practical:4 hours** | |
| **Part B-Contents of the Course** | | | |
| **Instructions for Paper-Setter:**<br>Nine questions will be set in all. Question No.1comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks. | | | |

| Unit | Topics | Contact Hours |
|---|---|---|
| I | General properties of living organisms; chemistry of the cells; cellular membranes; cytoskeleton; endoplasmic reticulum; golgi body; lysosomes; nuclear envelope; chromatin and chromosomes; mitosis; meiosis; Gametogenesis; reproductive cycle; fertilisation; cleavage; a model of gastrulation; Epithelial tissue; connective tissues (blood connective, cartilage, bone); muscular tissue; nervous tissue. | 10 |
| II | Introduction, evaluation and reporting of cytopathology specimens; Clinical residents in the following, keeping in view the special requirements of each case (Cytohormonal status, malignancy, infection, etc.); Types of smears (morning specimen, evening specimen, pre-menstrual specimen, etc.). | 10 |
| III | Method of obtaining various specimens : urine sample, gastric smear, colonic lavage etc. Principles and preparation of solutions of stains. Techniques for concentration of specimens : various filters and cytocentrifuge. | 12 |
| IV | Normal anatomy, histology and cytology of the cervix and endometrium, Sampling methods for the cervix, Microbiology of the female genital tract and the cytological preparations of common infections of the cervix.<br>Introduction to routine screening and reporting of non-gynaecological cytology specimens including those from : Respiratory system, Urinary system. | 13 |
| V* | **PRACTICALS**<br>1. To study collection of specimens and their clinical significance.<br>2. Preparation of specimens for cytological evaluation.<br>3. Concentrating specimens by centrifugation<br>(a) Thick specimen<br>(b) Watery specimen<br>4. To study preparation of smear, procedure of its fixation and mailing of smears<br>5. To study cell division from prepared slides of mitosis and meiosis.<br>6. Temporary squash preparations of onion root tip for the study of mitosis using acetocarmine stain.<br>7. Gynaecological and non-gynaecological cytology preparations and their studies. | 30 |

| Suggested Evaluation Methods | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory**<br>• Class Participation: 5<br>• Seminar/presentation/assignment/quiz/classtestetc.:5<br>• Mid-Term Exam: 10<br>➢ **Practicum**<br>• Class Participation: NA<br>• Seminar/Demonstration/Viva-voce/Labrecordsetc.:10<br>• Mid-Term Exam: NA | **End Term Examination:**<br>**Theory:50** (Written exam)<br>**Practical: 20** (Seminar/ Demonstration/Viva-voce/Lab records etc) |

| Part C-Learning Resources |
|---|
| **Recommended Books/e-resources/LMS:**<br>1. A Handbook of Medical Technology-second edition, BY V.H. Talib, CBS Publishers<br>2. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by Praful Ghodkar<br>3. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar<br>4. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee<br>5. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee<br>6. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee |

**PLOCLO Mapping of B23-MLT-303**

| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 |
|---|---|---|---|---|---|---|---|---|---|
| CLO1 | 1 | 1.5 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |
| CLO2 | 1.5 | 1 | 2 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO3 | 1 | 1.5 | 2 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |
| CLO4 | 1.5 | 1 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO5 | 1 | 1.5 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |

**CC-A4**

| **Session:2024-25** | | | |
|---|---|---|---|
| **Part A–Introduction** | | | |
| Subject | Bachelor of Vocation in Medical Laboratory Technology | | |
| Semester | IV | | |
| Name of the Course | Biochemistry–IV | | |
| Course Code | B23-MLT-401 | | |
| Course Type: | CC | | |
| Level of the course (As per Annexure-I | **200-299** | | |
| Pre-requisite for the course (if any) | --- | | |
| Course Learning Outcomes (CLO):<br><br>CLO5 is based on practical component | After completing this course, the learner will be able to:<br>1. Provide a good theoretical and practical education in clinical biochemistry which shall help students to work in the field of medical laboratory technology and science.<br>2. Able to do routine and special investigative procedures in medical laboratory practice.<br>3. Teach about various metabolic processes in the body, composition of various fluids and basic concept of nutrition.<br>4. Introduce the concept of internal quality control, safeguard experimental controls and management and maintenance of records.<br>5. Understand the skills to perform various diagnostic profiles, operation of lab information systems and provide accurate laboratory results. | | |
| Credits | Theory | Practical | Total |
| | 03 | 01 | 04 |
| Contact Hours | 03 | 02 | 05 |
| **Max.Marks:100**<br>**Internal Assessment Marks: 30 (Theory20+Practical10)**<br>**End Term Exam Marks: 70 (Theory 50 + Practical 20)** | | **Exam duration: Theory:3 Hours**<br>**Practical:4 hours** | |
| **Part B- Contents of the Course** | | | |
| **Instructions for Paper-Setter:**<br>Nine questions will be set in all. Question No.1comprisingof objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks. | | | |

| Unit | Topics | Contact Hours |
|---|---|---|
| I | Carbohydrae metabolism, glycolysis, Kreb cycle (Tricarboxylic acid cycle) and their clinical importance, glucose tolerance test (GTT). Protein metabolism-urea cycle and its biomedical significance, Lipid metabolism, Beta-oxidation of fatty acids, ketonebodies, metabolic changes in liver and adipose tissues during starvation, lipid profile. | 10 |
| II | Principle, assay procedures and clinical significance of following; Glucose, total proteins, A/G ratio, Albumin, globulin, urea, Blood Urea Nitrogen level (BUN), uric acid, creatinin, cholesterol, Billirubin (Direct and Indirect).<br>Essential Electrolytes : Quantitative estimation of Sodium, potassium, calcium, chloride, lithium, phosphorus, magnesium inorganic phosphate, Protein Bound iodine (PBI) 17 Ketosteroids, Barbiturates and their clinical significance. | 12 |
| III | Principle techniques and clinical significance of acid base balance test, D-Xylose absorption test, Inulin clearance test, urea and creatinin clearance tests, renal function tests, glycosylated haemoglobin & Liver function tests. | 10 |
| IV | Collection and preservation of biological fluids (blood, serum, plasma, urine and cerebrospinal fluid (CSF), Quality control of clinical investigation, normal ranges of various bio-metabolites and their confidence limits, automation in clinical biochemistry laboratory, laboratory organization management and maintenance of records. | 13 |
| V* | **PRACTICALS**<br>1. Separation of sugars by Paper Chromatography.<br>2. Separation of lipids by thin-layer chromatography.<br>3. Determination of total soluble sugars by ferricyanide method (Colorimetric method).<br>4. Quantitative estimation of glucose in blood plasma using glucose oxidase by enzymatic method.<br>5. Determination of glycogen in liver.<br>6. Estimation of protein by Lowry's method.<br>7. Determination of protein by Bradford method.<br>8. Determination of sodium and potassium content in blood serum samples by flame photometer.<br>9. Quantitative estimation of calcium by volumetric procedure.<br>10. Quantitative analysis of lipids :<br>(a) The determination of the acid value of a fat.<br>(b) The saponification value of a fat.<br>(c) The iodine number of a fat.<br>(d) The estimation of blood cholesterol.<br>11. Estimation of blood sugar, urea, uric acid, creatinin, bilirubin etc. | 30 |

| Suggested Evaluation Methods | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory**<br>• Class Participation: 5<br>• Seminar/presentation/assignment/quiz/classtestetc.:5<br>• Mid-Term Exam: 10<br>➢ **Practicum**<br>• Class Participation: NA<br>• Seminar/Demonstration/Viva-voce/Labrecordsetc.:10<br>• Mid-Term Exam: NA | **End Term Examination:**<br>**Theory: 50**<br>(Written exam)<br>**Practical: 20**<br>(Seminar/ Demonstration/ Viva- voce/Lab records etc) |

## Part C-Learning Resources

**Recommended Books/e-resources/LMS:**

1. Essentials of Biochemistry, Second Edition, Dr.(Prof.) Satyanarayan
2. Essentials of Biochemistry, 2nd Edition, Dr. Pankaja Naik
3. Principles and Techniques of Biochemistry and Molecular Biology, 5th Edition, Wilson & Walker
4. An Introduction to Chemistry, 8th Edition by Mark Bishop
5. Clinical Chemistry made easy, 1st Edition by Hughes
6. Tietz Fundamentals of Clinical Chemistry, 7th Edition by Carl Burtis

**PLOCLO Mapping of B23-MLT-401**

| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 |
|---|---|---|---|---|---|---|---|---|---|
| CLO1 | 1 | 1.5 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |
| CLO2 | 1.5 | 1 | 2 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO3 | 1 | 1.5 | 2 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |
| CLO4 | 1.5 | 1 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO5 | 1 | 1.5 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |

**CC-B4**

| **Session:2024-25** | | | |
|---|---|---|---|
| **Part A-Introduction** | | | |
| Subject | Bachelor of Vocation in Medical Laboratory Technology | | |
| Semester | IV | | |
| Name of the Course | Microbiology–IV | | |
| Course Code | B23-MLT-402 | | |
| Course Type: | CC | | |
| Level of the course (As per Annexure-I | **200-299** | | |
| Pre-requisite for the course (if any) | --- | | |
| Course Learning Outcomes (CLO):<br><br>CLO5isbasedonpracticalcomponent | After completing this course, the learner will be able to:<br>1. Impart theoretical as well as practical training in various branches of microbiology namely virology, parasitology and bacteriology.<br>2. Knowledge about the equipment used in microbiology, universal safety precautions and quality control measures.<br>3. Gain directions for the care of animals, common diseases and experimental procedures to deal with animals.<br>4. Know about the normal and pathogenic microorganisms, methods for recovery antibiotic testing and sterilization techniques.<br>5. Gain knowledge of computers for the computation of laboratory results. | | |
| Credits | Theory | Practical | Total |
| | 03 | 01 | 04 |
| Contact Hours | 03 | 02 | 05 |
| **Max.Marks:100**<br>**Internal Assessment Marks:30(Theory20+Practical10)**<br>**End Term Exam Marks: 70 (Theory 50 + Practical 20)** | | **Exam duration: Theory:3 Hours**<br>**Practical:4 hours** | |

| **Part B-Contents of the Course** |
|---|
| **Instructions for Paper-Setter:**<br>Nine questions will be set in all. Question No.1comprisingof objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks. |

| Unit | Topics | Contact Hours |
|---|---|---|
| I | Safety measure in Microbiology Laboratory : Occurence of Lab infections, route of infection in laboratory, safety measure precaution in use of pathogens in teaching. Lab organization managment, recording of results and quality control in Medical Microbiology Lab. | 10 |
| II | Preservation of microbes and lyophilisation methods; Total viable count of microorganisms (bacteria, yeast & moulds); Testing of disinfectants : Rideal - Walker, Chick - Martin and In-use tests; Preparation and standardization of vaccines and immunization schedule; Sterilization - Definition, methods, principles, bacteriological filtration, irradiation, tyndalization. | 12 |
| III | Virology: Definition, General introduction of Virus, physico-chemical characteristics of viruses, diseases caused by different viruses and mode of infection, mode of transmission of viral agents, 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, prevention of viral diseases, immunity in viral infection. | 13 |
| IV | Care and management of experimental animals: General directions for the care of animals, common diseases and experimental procedures. Various experimental animals - rabbits, guineapigs, mice, rats, fowls, and monkeys - their data, cages, feeding and handling. | 10 |
| V* | **PRACTICALS**<br>1. Handling and care of laboratory animals.<br>2. Recording of laboratory data and use of computers.<br>3. Safety measures in Microbiology laboratory<br>4. Methods of preservation of microbes.<br>5. Isolation of bacteria from curd.<br>6. Indole, Methyl red, Voges-Proskauer, Citrate utilization (IMViC) test from coliform bacteria.<br>7. Study of sterilization techniques. | 30 |

**Suggested Evaluation Methods**

| | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory**<br>• Class Participation: 5<br>• Seminar/presentation/assignment/quiz/classtestetc.:5<br>• Mid-Term Exam: 10<br>➢ **Practicum**<br>• Class Participation: NA<br>• Seminar/Demonstration/Viva-voce/Labrecordsetc.:10<br>• Mid-Term Exam: NA | **End Term Examination:**<br>**Theory:50** (Written exam)<br>**Practical: 20** (Seminar/ Demonstration/Viva-voce/Lab records etc) |

## Part C-Learning Resources

**Recommended Books/ e-resources/LMS:**

1. Medical Parasitology C.P. Baweja 3rd Edition
2. Practical and Applied Microbiology Anuradha De 4th Edition 1
3. Text Book of Microbiology and Parasitology Praful Godkar 1st Edition
4. Parasitology in relation to Clinical Medicine by K.D. Chhatterjee
5. Concise Microbiology C.P. Baweja 1st Edition
6. Text Book of Microbiology Anantnarayan 10th Edition

**PLOCLO Mapping of B23-MLT-402**

| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 |
|---|---|---|---|---|---|---|---|---|---|
| CLO1 | 1 | 1.5 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |
| CLO2 | 1.5 | 1 | 2 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO3 | 1 | 1.5 | 2 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |
| CLO4 | 1.5 | 1 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO5 | 1 | 1.5 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |

**CC-C4**

| **Session:2024-25** | | | |
|---|---|---|---|
| **Part A-Introduction** | | | |
| Subject | Bachelor of Vocation in Medical Laboratory Technology | | |
| Semester | IV | | |
| Name of the Course | Pathology– IV | | |
| Course Code | B23-MLT-403 | | |
| Course Type: | CC | | |
| Level of the course (As per Annexure-I | **200-299** | | |
| Pre-requisite for the course (if any) | --- | | |
| Course Learning Outcomes (CLO):<br><br>CLO5isbasedonpracticalcomponent | After completing this course, the learner will be able to:<br>1. Provide general insight into the basics of cytology.<br>2. Gain knowledge about metal impregnation techniques, metachromasia and metachromatic dyes.<br>3. Learn about classification of tissues and their functions.<br>4. Introduce the concept of quality control in cytology laboratory.<br>5. Perform the techniques and staining procedures in histopathology and cytology. | | |
| Credits | Theory | Practical | Total |
| | 03 | 01 | 04 |
| Contact Hours | 03 | 02 | 05 |
| **Max.Marks:100**<br>**Internal Assessment Marks:30(Theory20+Practical10)**<br>**End Term Exam Marks: 70 (Theory 50 + Practical 20)** | | **Exam duration: Theory:3 Hours**<br>**Practical:4 hours** | |
| **Part B-Contents of the Course** | | | |
| **Instructions for Paper-Setter:**<br>Nine questions will be set in all. Question No.1comprisingof objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks. | | | |

| Unit | Topics | Contact Hours |
|---|---|---|
| I | Cytopathology: General functions of the cells, cellular membranes, cytoskeleton**,** golgi body, lysosomes**,** nuclear envelope**,** chromatin & chromosomes**,** mitosis | 10 |
| II | Cyto-chemistry: Carbohydrates and amyloid - special stains and procedures; Connective tissues, trichrome staining and other special stains for muscle fibres, elastic, reticulin fibres and collagen fibres; Staining technique for Glycogen; Staining technique for fat; Staining technique for mucin. | 13 |
| III | Principles of metal impregnation techniques; Demonstration and identification of minerals and pigments; Metachromasia and metachromatic dyes | 10 |
| IV | Cytology: Stains and cytologic preparation with special emphasis on May-Grünwald Giemsa stain MGG, and Papanicolaqu stains (PAP) method; Special stains like periodic acid Schiff (*PAS*), Mucicarmine, Alcian blue, Schmorl's, Perl's stain and Congo Red; Cytologic screening and quality control in cytology laboratory. | 12 |
| V* | **PRACTICALS**<br>1. Study of cytological stains and staining techniques :<br>(a) Papanicolaou staining (PAP) method<br>(b) May-Grünwald Giemsa stain (MGG) method<br>2. Staining techniques for :<br>(a) Glycogen<br>(b) Fat<br>(c) Mucin<br>3. Preparation of special cytological stains like :<br>(a) periodic acid Schiff (PAS)<br>(b) Mucicarmine<br>(c) Alcian blue<br>(d) Schmorl<br>(e) Perl's stain<br>(f) Congo red<br>4. To study staining procedures for :<br>(a) Muscle fibres<br>(b) Elastin fibres<br>(c) Reticulin fibres<br>(d) Collagen fibres<br>5. Trichome staining | 30 |

| Suggested Evaluation Methods | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory**<br>• Class Participation: 5<br>• Seminar/presentation/assignment/quiz/classtestetc.:5<br>• Mid-Term Exam: 10<br>➢ **Practicum**<br>• Class Participation: NA<br>• Seminar/Demonstration/Viva-voce/Labrecordsetc.:10<br>• Mid-Term Exam: NA | **End Term Examination:**<br>**Theory:50** (Written exam)<br>**Practical: 20** (Seminar/ Demonstration/Viva-voce/Lab records etc) |

## Part C-Learning Resources

**Recommended Books/e-resources/LMS:**

1. A Handbook of Medical Technology-second edition, By V.H. Talib, CBS Publishers
2. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by Praful Ghodkar
3. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar
4. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5. Medical Laboratory Technology (Volume 2): Procedure Manual for routine Diagnostic, Kanai Mukharjee
6. Medical Laboratory Technology (Volume 3: Procedure Manual for routine Diagnostic, Kanai Mukharjee

**PLOCLO Mapping of B23-MLT-403**

| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 |
|---|---|---|---|---|---|---|---|---|---|
| CLO1 | 1 | 1.5 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |
| CLO2 | 1.5 | 1 | 2 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO3 | 1 | 1.5 | 2 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |
| CLO4 | 1.5 | 1 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1 |
| CLO5 | 1 | 1.5 | 1 | 1 | 1 | 1.5 | 1 | 1.5 | 1.5 |