



School of Allied Health Sciences

B. Sc. Medical Laboratory Technology

	Courses					Credits
Year: 1 Sem. I	UML101 Principles of Medical Laboratory Technology (T-3, P-1)	UML102 Human Anatomy - I (T-2, P-2)	UML103 Human Physiology - I (T-2, P-2)	UML104 General Chemistry & Biochemistry (T-2, P-2)	UCM001 Foreign Language - I (T-2, P-2)	20
Year: 1 Sem. II	UML201 Bio-analytical Techniques and Instrumentation (T-2, P-2)	UML202 Human Anatomy - II (T-2, P-2)	UML203 Human Physiology - II (T-2, P-2)	UML204 Biochemistry - II (T-2, P-2)	UCM002 Communication skills & English (T-2, P-2)	20
Year: 2 Sem. III	UML301 Pathology - I (T-2, P-2)	UML302 Hematology - I (T-2, P-2)	UML303 Immunology (T-2, P-2)	UML304 Microbiology - I (T-2, P-2)	UCM003 Biomedical Waste Management (T-2, P-2)	20
Year: 2 Sem. IV	UML401 Pathology - II (T-2, P-2)	UML402 Hematology - II (T-2, P-2)	UML403 Histopathology (T-2, P-2)	UML404 Microbiology - II (T-2, P-2)	UCM004 Environmental Science (T-3, P-1)	20
Year: 3 Sem. V	UML501 Immuno-hematology (T-2, P-2)	UML502 Parasitology and Virology (T-2, P-2)	UML503 Diagnostic Cytology (T-2, P-2)	UML504 Clinical Enzymology (T-2, P-2)	UCM005 Employability Skills (T-2, P-2)	20
Year: 3 Sem. VI	UML 601 Health Care and Health Education & Communication (T-2, P-2)	UML602 Bio- statistics & Bioinformatics (T-2, P-2)	UML603 Research Project (T-, P- 4)	UML604 Internship (T-, P-8)		20



Third Year B. Sc. Medical Laboratory Technology

Course Structure Semester V

Course Code	Subject Name	Teaching Scheme (Hours / Week)		Credit Assigned		
		L	P	Theory	Practical	Total
UML501	Immunoematology	2	4	2	2	4
UML502	Parasitology and Virology	2	4	2	2	4
UML503	Diagnostic Cytology	2	4	2	2	4
UML504	Clinical Enzymology	2	4	2	2	4
UCM005	Employability Skills	2	4	2	2	4
	Total	10	20	10	10	20



Detailed Syllabus Third Year B. Sc. MLT Semester V (Without NEP)

UML 501: Immunohematology

Unit I

Define the following terms in relation to the red blood cell (RBC) and transfusion: antigens, immunogens, epitopes, and antigenic determinants, Transfusion reaction: Principles and methods of investigating Transfusion reactions, diseases transmitted by blood transfusion. Haemolytic diseases, Apheresis, Indications of hemapheresis, plasmapheresis, plateletspheresis, and plasmapheresis.

Unit II

Role of cytokines in immune response. Compare and contrast immunoglobulin M (IgM) and IgG antibodies with regard to structure, function, and detection by agglutination reactions. Primary and secondary immune responses with regard to immunoglobulin class, immune cells involved, level of response, response time, and antibody affinity.

Unit III

Grade and interpret observed agglutination reactions using the agglutination grading. Classical and alternative pathways of complement activation; Component therapy: preparation and transfusion of leucocytes poor blood, RBC concentrate platelet rich plasma, platelet concentrate factor VIII, Transfusion of plasma, components and preparation of cryoprecipitate, its use and advantages.

Unit IV

Principles of tissue matching, select the best potential graft given the human leukocyte antigen (HLA) typing and antibody specificities, HLA testing in platelet transfusion support and organ and hematopoietic progenitor cell (HPC) transplants. Define graft-versus-host (GVH) disease and select methods of prevention in transfusion and transplantation.

List of Practicals

1. Quantitation of IgG, IgA, IgM, IgD, and IgE in serum and other body fluids
2. Immunoelectrophoretic analysis of serum immunoglobulin abnormalities
3. Detection/quantitation of Bence-Jones protein in the urine
4. Cryoglobulin determination and analysis
5. Tests for circulating immune complexes by immunochemical methods



6. Immunochemical and electrophoretic analysis of CSF
7. Measurement of overall complement function
8. The cross- match (compatibility testing)
9. The Direct Anti- Globulin Test (DAT) and Indirect Anti- Globulin Test (IAT)
10. ELISA Tests: 1. HIV 2. Hepatitis B (HBsAg) 3. Hepatitis C (HCV) 4. Malaria antigen 5. Tuberculosis-IgG/IgM
11. Immunoprophylaxis schedule in neonates, children and in pregnancy

Reference Books

1. Wintrobe's Clinical Haematology,(2014),13th edition, Lippincott Williams & Wilkins
2. De Gruchy's Clinical Haematology in Medical Practice,(2012),Sixth edition, Wiley Publications
3. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition, Bhalani Publications
4. Ochei J & Kolhatkar A (2000),Medical Laboratory Science: Theory &Practice, 3 rd edition,Mcgraw Hill Education
5. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill



UML502: Parasitology and Virology

Unit I:

An elementary study of the types of animal associations parasitism commensalisms and symbiosis; Types of parasites; Classification of protozoan & Helminthes. An elementary knowledge of the structure like history of parasites belonging to the parasite genera with reference to the forms seen in human pathological material, and the methods used to identify them.

Unit II:

Protozoa: Life cycle, Morphology, Disease & Lab Diagnosis

1. Intestinal Amoebae: *E. histolytica*, *E. coli*
2. Flagellates of intestine/genitalia: *Giardia lamblia*, *Trichomonas vaginalis*
3. Malarial Parasite: *Plasmodium vivax* ; Differences between *P. vivax*, *P. malaria*, *P. falciparum* & *P. ovale*.

Nematodes: Intestinal Nematodes:

1. *Ascaris*: Life cycle, Morphology, disease & lab diagnosis
2. *Enterobius vermicularis* (Thread worm) and *Ancylostomaduodenale* (Hook worm) (in brief)
3. Tissue Nematodes: *W. bancrofti* - Life cycle, Morphology, Disease & Lab Diagnosis

Phylum Platyhelminths

1. Cestodes - *T. solium*, *T. saginata* & *E. granulosus*.
2. Trematodes - *S. haematobium* & *F. hepatica*

Unit III:

Introduction to virology-General characters of viruses, Classification, Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses and General properties of Viruses, Laboratory diagnosis of viral infections-Specimens collected, Processing of specimens, Different methods of diagnosis. Cultivation of viruses, Bacteriophage.

Unit IV:

Retro viruses - HIV; Hepatitis virus, Pox virus, Picorna virus - Polio, Orthomyxo virus - Influenza, Arbo virus - Chikungunya, Dengue. Herpes and Adeno virus.



List of Practicals

1. Examination of Blood parasites: Thick and Thin smears for malaria and Filaria and other parasites. Concentration methods.
2. Identification of parasites (Malaria) microfilaria, L D bodies, typanosoma in blood and bone marrow films.
3. Laboratory diagnosis of parasitic infections.
4. Demonstration of various stages of parasites
5. Direct and indirect means of demonstration of parasites in the body nonspecific gamma globulins, specific antibody demonstration, complement fixation, malaria card antigen
6. Laboratory diagnosis of viral infections
7. Diagnosis of viral infections, isolation and serological test

Reference Books

1. Mukherjee .L.K(2017), Medical Laboratory Technology, Vol.1-3, 3rd edition, Tata Mcgraw Hill
2. Sood Ramnik,(2015), Text book of Medical Laboratory Technology, 2nd edition, Jaypee Publications



UML503 Diagnostic Cytology

Unit I:

Cell: basic structure and function, cell organelles, cell cycle, Benign and Malignant tumors, Instruments used in cytology, preparation of buffers, stains, Microscopy: Light, compound, phase contrast, fluorescence Microscope.

Unit II:

Laboratory requirements for Cytology: Chemicals & Reagents, Instruments and equipments used in cytology Fixation and Fixatives used in cytology, Adhesive and mounting media, Cell block and cytopsin technique. Microtome, Normal cell structure, functions, cytologic criteria of malignancy, Types of specimens, methods of collection & preparation of cell block, Different fixatives and methods of fixation.

Unit III:

Staining Methods: Hematoxylin & Eosin stain, Reticulin stain, PAP staining for cytology smears. (a) Papanicolaou's stain- principle , preparation and staining Techniques (b) May Grunwald Giemsa stain (c) Shorr's stain (d) Aceto orcin stain

Unit IV:

Cytogenetics: Introduction to cytogenetics, terminology, classification and nomenclature of human chromosomes, Methods of karyotypic analysis, Culture of bone marrow cells and peripheral blood lymphocytes, solid tumors and skin fibroblasts Direct preparation from tumour materials, Characterization of human chromosomes by various banding techniques, Sex chromatin identification, Chromosomes in neoplasia and oncogenes, Automation in cytology, Liquid based preparation & automated screening device

List of Practicals

1. Parts of microtome
2. Automation in Cytology: Flow cytometry
3. Hematoxylin & Eosin staining
4. PAP staining.
5. Investigation of hemolytic disease of new born
6. Preparation of various cytology smears and fixation
7. Papanicolaou's and May Grunwald Geimsa staining
8. Hormonal cytology study



Reference Books

1. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill
2. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications
3. Bibbo, (1997),Comprehensive Cytopathology,2nd edition, Saunders Publishers
4. Koss's Diagnostic Cytology,Vol.1 & 2,(2006),5th edition, Lippincott
5. Todd and Sanford- clinical diagnosis by Laboratory Medicine



UML504 Clinical Enzymology

Unit I:

Introduction to enzymes Nomenclature and Classification, Coenzymes, Mechanism of enzyme action, Enzyme inhibition/Enzyme regulation

Unit II:

Chemical Nature and Properties of enzymes, Active site of enzyme, Isoenzymes, Proenzymes, Allosteric enzymes, Constitutive enzymes, Induced enzymes

Unit III:

Enzyme specificity, Factors affecting enzyme activity, Clinical importance of Enzymes and Isoenzymes in pathological disorders, Diagnostic use of enzymes, Use of enzymes as reagents

Unit IV:

Therapeutic use of enzyme as reagents; Enzyme pattern in Diseases; Determination of Alkaline phosphatase, alanine transaminase (ALT), aspartate transaminase (AST), Amylase, Chromatographic separation of amino acids, Precipitation reactions of proteins

List of Practicals

1. Blood glucose by Glucose oxidase – peroxidase method
2. Immobilization of enzymes
3. Determination of Alkaline phosphatase
4. Determination of alanine transaminase (ALT)
5. Determination of alanine aspartate transaminase (AST)
6. Determination of Serum Amylase,
7. Determination of Serum Lipase
8. Determination of Cardiac Enzymes

Reference Books

1. D M Vasudevan, (2011), Text book of Medical Biochemistry, 6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde, (2012), Text book of Medical Biochemistry, 8th edition, Jaypee Publications
3. Singh & Sahni, (2008), Introductory Practical Biochemistry, 2nd edition, Alpha science
4. Lehninger, (2013), Principles of Biochemistry, 6th edition, W H Freeman
5. U Satyanarayan, (2008), Essentials of Biochemistry, 2nd edition, Standard Publishers
6. Teitz, (2007), Fundamentals of Clinical Chemistry, 6th edition, Elsevier Publications



Sanjay Ghodawat University, Kolhapur

Established as a State Private University under Govt. of Maharashtra Act no. XL dated 3rd May 2017

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School of Allied Health Sciences

B. Sc. Medical Laboratory Technology

Second Year: Semester VI

Course Structure

Subject Code	Subject Name	Teaching Scheme		Credit Assigned		
		L	P/ TW	Theory	TW/ Practical	Total
UML601	Health Care and Health Education & Communication	2	2	2	2	4
UML602	Bio-statistics & Bioinformatics	2	2	2	2	4
UML603	Research Project	--	4	--	4	4
UML604	Internship	--	8	--	8	8
	Total	4	16	4	16	20



Detailed Syllabus Third Year B. Sc. MLT Semester VI (Without NEP)

UML 601: Health care and Health education & Communication

Unit I:

Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept. National Health Policy, National Health Programme (Briefly Objectives and scope) Population of India and Family welfare programme in India.

Unit II:

Health Education: Principles & Objectives, Levels of Health Education, Educational Methods, Evaluation & Practice of Health Education in India. Health Counseling: Introduction, Theories, Process & Techniques. Health Care Reporting, Role of NIC & Other Bodies, Research in Health Education

Unit III:

Health Communication: Basic Concept & Principles of Communication, Definition, Purpose, Types of Communication. Models of communication: Aristotle Model, Shannon and Weaver model, Schramm Model, Laegans Model, Fano Model, Litterer's Model, Westly Maclean's Model.

Unit IV:

Mass communication & Role of Media in health education, Information Communication Technologies (ICT) in health care and awareness. (Telemedicine & e-health, community radio), Future trends in information and communications systems

List of Practicals

1. Bed Side Management: Giving and taking Bed pan, Urinal : Observation of stools, urine.
2. Observation of sputum, Understand use and care of catheters, enema giving.
3. Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion Care of Rubber Goods
4. Recording of body temperature, respiration and pulse



Reference Books

1. Health Education – A new approach – L. Ramachandran & T. Dharmalingan
2. Health Communication in the 21st Century, By Kevin B. Wright, Lisa Sparks, H. Dan O'Hair, Blackwell publishing limited, 2013, first edition
3. Health Communication: From Theory to Practice, By Renata Schiavo, Published by Jossey Bash.
4. Health Communication, R.D. Karma Published by Mohit Publications 2008.
5. Counseling Skills for Health Care Professionals, 1st Edition, Rajinikanth AM, Jaypee Brothers, 2010.
6. Preventive and Social Medicine by J.Park
7. Text Book of P & SM by Park and Park
8. Counseling & Communicate skills for medical and health, Bayne- Orient Longman Pvt. Ltd.



UML 602 Bio-statistics & Bioinformatics

Unit I:

Introduction to Research: The question of legitimate knowledge, knowledge & decision making, the scientific method, quantitative vs qualitative research, application of scientific method, positivistic vs naturalistic paradigm. Classification of Research: Basic vs applied research, evaluation research, research & development (R&D), action research.

Unit II:

Selection & Formulation of a Problem: From generic to a specific program, program statement, getting an access to primary and secondary resources, note taking and information to management, Review of related literature, questions and/or hypothesis of the study. Development of a Research Plan: The ethical, legal and professional obligations, the rational of the study, the research plan, evaluation of a research plan.

Unit III:

Definition and characteristics of statistics Importance of the study of statistics, Branches of Statistics Statistics of and health sciences including Parameters and estimates; Presentation of data, calculation of mean, median and mode, range and standard deviation and their significance. Tabulation of Data, Raw Data, the array, frequency distribution, Basic principles of graphical representation, Types of diagrams: histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, normal probability curve

Unit IV:

Measures of Variability: Introduction: Uses, applications and practical approach, The range, average deviation or mean deviation, The variance and standard variation, Calculation of Variance and standard variation for ungrouped and grouped data, Properties and uses of variance and standard deviation. Sampling Techniques: Introduction: Uses, Application of Sampling in Community, Sampling Methods, Sampling variation and tests of significance

List of Practicals

1. Preparation of a Research Report
2. Software applications
3. Applications and practical approach Criteria for Sampling Techniques
4. Calculation of Variance and standard variation for ungrouped and grouped data



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Empowering Lives Globally !

Reference Books

1. Educational Research: Competencies For Analysis And Applications Columbus: Merrill. Gay.
L.R. (1987) Walpole, R.E.:
2. Introduction To Statistic, Publishing Co. Inc, New York.
3. Spiegel, Murray R.: Theory & Problems Of Statistics, Sehawm Publishing Co., New York.



UML 603 Research Project

Each student is encouraged to take up a research project in the area of Medical Laboratory Technology. The project should be original and should have considerable clinical relevance. The concerned faculty members guide the student in his/her project. After completing the project, each student has to submit a complete report of their respective projects.

Project guidelines

All B.Sc MLT Third year degree students enrolled in the School of Allied Health Sciences should complete a scholarly project as partial fulfillment of requirements for the award of B.Sc MLT degree. Project is a preliminary form of research. It is an independent investigation. It is very largely the student's own work and is to be pursued by them from the inception till completion. It involves the student in a hands-on project led by a research supervisor/faculty advisor who will choose, develop and guide the project from its inception to completion.

Purpose of a project work

The purpose of the Project Work is to enable the student to gain practical experience. It enables the student to meet program objectives through development of an appreciation of the interrelations between theory, research and practicals. A project forms an introduction to scientific thinking and working.

Prior to the practical/experimental work, students work out a concept with their supervisor that could include any of the following points:

- Scientific question
- Educational objectives (which methods have to be mastered and understood)
- Recent trends in the respective fields
- Case study
- Prospective studies
- Retrospective studies

This scholarly project provides the student with the opportunity to participate in a mentored research experience. The student will actively participate in a research project throughout all current applicable phases of the project such as the case study, problem statement development, review of the literature, hypotheses formation, proposal writing, study design, data collection, data analysis, and result reporting. This may be done as a group project.



Assessment

Four copies of the project report should be submitted to the HOS along with a soft copy, before the Practical examinations. Projects are assessed with a written report and a seminar. The written report and the presentation, as well as the practical work in the laboratory are to be assessed during Practical Examination.

GUIDELINES FOR THE PREPARATION OF PROJECT REPORTS

1. The project report should be typed in Times New Roman. The size of the titles should be 14 and Bold and the size of the subtitles should be 12 and bold.
2. The matter should have double spacing except for long quotations, footnotes and endnotes, which are single spaced. The left-hand margin must be 1.5”, other margins should be 1.0”.
3. The project report should be hardbound.
4. The project report should be organized in the following subdivisions:
 - a. Title page
 - b. Certificate
 - c. Acknowledgement
 - d. List of abbreviations used
 - e. Table of contents
 - f. Introduction
 - g. Main project
 - h. Summary of the project work
 - i. List of references
 - j. Annexures



UML 604: Internship

The internship time period provides the students an opportunity to continue to develop confidence and increased skill in diagnosis and management. Students will demonstrate competence in beginning, intermediate, and advanced procedures in above areas. Students will participate in advanced and specialized analysis and clinical procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. Internships postings can be done in the following locations: Blood Bank, Hospitals, clinics in general hospital, Independent clinics, Diagnostic Laboratory, pharmaceutical or medical related industries where the learning objectives can be achieved.