

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
B.Voc. in Medical Lab Technology (UGC)
(Effective for Academic Session 2024-2025)

Year - 2 - Advanced Diploma (SEMESTER - III)

Paper Title: UMLTV – 301: MICROBIOLOGY – III

Job Role: Assistant Medical Lab Technician

Course Objectives:

- Understand the importance and role of staining in microbiology.
- Learn about the composition, purpose, and classification of various bacterial culture media:
- Learn key biochemical tests for bacterial identification: Sugar fermentation, IMViC (Indole, Methyl Red, VP, Citrate), Urease, Nitrate reduction, TSI test.
- Understand basic terms like pathogen, opportunist, infection, virulence, and pathogenicity.

Course Outcomes

- CO 1: Explain the types, importance, and applications of microbiological stains, and perform appropriate staining techniques for identification of bacteria, spores, parasites, and fungi; understand basic virology techniques including embryonated egg use and cell culture.
- CO 2: Classify and describe various bacteriological media, their preparation and use; demonstrate aerobic and anaerobic culture techniques, and operate manual and automated culture systems such as the Bactec method.
- CO 3: Identify bacteria using staining reactions, cultural characteristics, and biochemical properties, including tests like IMViC, urease, TSI, and perform pathogenicity testing using lab animals when needed.
- CO 4: Describe the pathogenesis of infectious diseases, routes and sources of infection; perform diagnosis of parasitic and protozoal infections through microscopy and slide identification; identify disease-causing arthropods and life cycle stages.

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Course Code:	UMLTV – 301	
Course:	MICROBIOLOGY – III	Credits: 3L+1T
Contents		
Chapter	Name of the Topic	Hours
Unit-I	Stains used in Microbiology: Introduction of stain; Importance of stain in microbiology; Types of stain in detailed giving example- Simple stain, differential stain, negative stain, impregnation method; Special staining for certain bacteria, bacterial spores, parasites & fungi;. Different staining techniques used in virology, Use of Embronated eggs in clinical Virology, Principles of animal cell culture and their use in virology, Use of common laboratory animals in viral diagnosis.	10
Unit-II	Bacteriological Media & Culture Techniques: Introduction of culture media; Basic requirements & uses of culture media; Classification of culture media: Based on their consistency (solid, liquid, semisolid), Based on constituents/ingredients (simple, complex, synthetic or defined, special), Based on Oxygen requirement (aerobic & anaerobic media); Indication of culture media; Types of culture methods (streak culture, stab culture, pour plate method, broth culture); Anaerobic culture methods: Displacement Method, Chemical or biological method, Reduction of Oxygen; Automated methods (Bactec- blood culture method).	14
Unit-III	Methods of Identification of Bacteria: Brief introduction of how bacteria is identified in pure culture; Identification of the bacterium by staining reactions; Identification of the bacterium by cultural characteristics; Identification by fermentation & other biochemical properties (Sugar fermentation, Litmus milk, Indole production, Methyl Red test (MR), Voges Proskauer test (VP), Citrate utilization test, Nitrate reduction, Production of ammonia, Urease test, Triple Sugar Iron medium); Pathogenicity test into laboratory animals.	14
Unit-IV	Pathogenesis of Infectious Diseases: Introduction of microbes & related terms (commensals, pathogen, opportunistic pathogens, pathogenicity, and virulence); Definition of infection; Types of infection; Routes of infection: Reservoir, Mode of transmission, The susceptible host; Sources of infection: Endogenous sources, Exogenous sources; Factors predisposing to microbial pathogenicity; Types of infectious diseases: Localised, Generalised.	10
Unit-V	Anti-microbial Agents & Sensitivity Testing: Introduction of antimicrobial agents & sensitivity testing; Meaning, definition of anti-microbial agents; Ideal qualities of an antimicrobial agent; Mechanism of action of anti-microbial drugs; Resistance of bacteria to antimicrobial drugs; Definition of antimicrobial sensitivity testing; Measurement of antimicrobial activity techniques; Factors affecting anti-microbial activity in vitro; Quality assurance in antibiotic susceptibility testing with control strains.	12
	Total:	60

Books Recommended:

- "Microbiology: A Laboratory Manual" by James G. Cappuccino & Natalie Sherman
- "Bailey & Scott's Diagnostic Microbiology" by Patricia Tille
- "Microbiology: An Introduction" by Gerard J. Tortora, Berdell R. Funke, Christine L. Case

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Paper Title: UMLTV – 391: MICROBIOLOGY LAB– III

Credit: 2P (Allotted Hours: 60)

List of Experiments: (Based on UMLTV – 301)

- Microbial media: Preparation of media for bacteria
- Collection of samples and processing in microbiology laboratory
- Methods of inoculation of different microbes in common media: Streak plate, spread plate, pour plate, serial dilution
- Staining techniques: Differential Staining: Gram staining, Albert staining, Acid fast staining, capsule staining, spore staining
- Observation of morphology of bacteria – shape and arrangement
- Hanging drop preparation,
- Isolation of bacteria: different plating methods
- Identification of common Pathogenic bacteria: - by staining & their biochemical tests. (Catalase, Coagulase, Oxidase, IMVIC, Urease, etc.) and Serological tests
- Antibiotic Susceptibility Test

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Paper Title: UMLTV – 302: PATHOLOGY – I

Job Role: Assistant Medical Lab Technician

Course Objectives:

- Understand the pathological changes in tissues and organs due to disease.
- Learn correct techniques for collection and preservation of stool samples. Understand the composition of stool and its clinical significance. Perform and interpret routine stool tests (macro, micro, physical, chemical).
- Understand the difference between transudates and exudates.
- Learn proper urine collection and preservation methods.

Course Outcomes:

CO1: Identify and describe clinical features, causes, and complications of diseases in the alimentary, digestive, cardiovascular, respiratory, urinary, reproductive, nervous, and endocrine systems.

CO2: Demonstrate the correct method of stool sample collection and handling.

CO3: Analyze and interpret findings from various body fluids (ascitic, pleural, CSF, synovial, etc.) to identify pathological conditions.

CO4: Perform and interpret tests for proteins, albumin, glucose, ketone bodies, and occult blood in urine.

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Course Code:	UMLTV – 302	
Course:	PATHOLOGY – I	Credits: 3L+1T
Contents		
Chapter	Name of the Topic	Hours
Unit-I	Histology – Study of Diseases –Digestive Sysytem Gastritis, peptic ulceration, appendicitis, hepatitis, Liver failure, Cirrhosis. Pancreatitis, Gall bladder- Gall stones, jaundice. Heart block, Arteriosclerosis, Disorders of Blood Pressure.renal failure, renal calculi, urinary obstruction, UTI.STD, Pelvic inflammation disease, disorders of cervix,prostitis	18
Unit-II	Stool examination- • Collection • Composition, importance of examination • Routine examination (macro, micro, physical, chemical) • Concentration technique, Occult blood test • Examination for intestinal parasites	12
Unit-III	Body fluids examination- transudate and exudates a) Ascitic fluid b) Pleural fluid c) Pericardial fluid d) Synovial fluid e) Amniotic fluid f) CSF g) Gastric Fluid h) Infertility – Male & Female (Pregnancy test) i) Sperms/Semen - Formation, composition, routine examination - Special examination - Normal values - Abnormalities and its clinical significance	15
Unit-IV	Urine analysis- • Collection • Composition, importance of examination • Routine examination (macro, micro, physical, chemical) • Urine preservation • Quantitative and qualitative test for proteins, albumin • Test for reducing substances • Test for acetone bodies in urine • Strip technology • Evaluation of renal function test • Occult blood test • Change of urine in various diseases • Hematuria, proteinuria, chyluria, ketonuria types, causes and detection in urine	15
	Total:	60

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Books Recommended:

- Clinical Laboratory Diagnostics – Edited by Lothar Thomas
- Bailey & Scott's Diagnostic Microbiology – Betty Forbes
- Textbook of Medical Laboratory Technology – Ramnik Sood

Paper Title: UMLTV – 392: PATHOLOGY LAB – I

Credit: 2P (Allotted Hours: 60)

List of Experiments: (Based on UMLTV – 302)

- Urine analysis- physical, chemical and microscopy
- Stool examination- Physical, Chemical and microscopy
- Body fluids examination
- Study of abnormal urine constituents
 - Glucose
 - Protein
 - ketone bodies
 - blood
 - bile salts and Bile pigments
 - Occult blood test
- To study about CSF examination.
- Examination of sputum

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Paper Title: UMLTV – 303 HEMATOLOGY – I

Job Role: Assistant Medical Lab Technician

Course Objectives:

- To understand the history and discovery of human blood group systems.
- To perform and interpret common hematological tests such as hematocrit (PCV), total and differential leukocyte count (TC/DC), and red blood cell (RBC) count.
- To study the structure, function, and measurement of hemoglobin and related pigments.
- To appreciate the role of coagulation testing in clinical diagnosis and patient management.

Course Outcomes:

CO1: Identify and differentiate between basic and subgroups of ABO blood groups and their clinical relevance.

CO2: Perform hematological tests such as hematocrit, total and differential leukocyte count, erythrocyte count, and platelet count.

CO3: Identify abnormal hemoglobins and describe the techniques used for their detection and quantification

CO4: Perform and interpret routine screening procedures for coagulation such as bleeding time, clotting time, and PT/APTT.

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Course Code:	UMLTV – 303	
Course:	HEMATOLOGY – I	Credits: 3L+1T
Contents		
Chapter	Name of the Topic	Hours
Unit-I	History and discovery of blood group system, ABO and Rhesus blood group system, Study of Human blood groups: Basic blood group system : ABO, Sub groups of ABO, Other variants in the ABO blood group system, Study of Rhesus (Rh) blood group system and immune antibodies - Rh antigen, Rh antibody.	13
Unit-II	Routine hematological test like hematocrit, TC, DC, of leucocytes, total count of erythrocytes, determination of erythrocytes indices, PCB, MCB, MCH, MCHC, Reticulocyte count, platelet count, ESR. Preparation of packed - cells and various fractions of blood for transfusion purposes,	17
Unit-III	Hemoglobin, pigments and their measurement, Abnormal hemoglobin's and their means of identification and estimation and various methods of its demonstration, Hemostatic mechanism and theories of blood coagulation. Routine hemoglobin test and the use of hemoglobinometer.	14
Unit-IV	Physiochemical properties of coagulation factors, Screening coagulation procedures, Quantitative assay of coagulation factors.	16
	Total:	60

Books Recommended:

- "Clinical Diagnosis by Laboratory Methods" – John Bernard Henry
- "Bailey & Scott's Diagnostic Microbiology" – Betty Forbes (for background in immunohematology)
- "Textbook of Pathology" – Harsh Mohan (for systemic pathology correlation)

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Paper Title: UMLTV – 393 HEMATOLOGY LAB – I

Credit: 4P (Allotted Hours: 120)

List of Experiments: (Based on UMLTV – 303)

- Identification of Sahli's Haemoglobinometer
- Measurement of the level of hemoglobin in blood
- Performing quantitative assay on coagulation factors of blood
- Analysis of Hematocrit
- Total count of erythrocytes
- Differential count of leucocytes
- Demonstration of toxic granulation of neutrophil
- To perform PT and Calculate INR
- To perform APTT
- To perform reticulocyte count

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Paper Title: UGEN - 381 VALUE EDUCATION & HUMAN RIGHTS

Course Objectives:

- To introduce students to the fundamental concepts of human values and their role in personal, national, and global development.
- To develop awareness about ethical challenges in a rapidly globalizing world and help students manage cross-cultural and professional value conflicts.
- To promote self-awareness and emotional well-being through therapeutic practices such as meditation, yoga, and moral behavior modification techniques.
- To educate students on the evolution, principles, and implementation mechanisms of human rights, with emphasis on vulnerable groups like women and children.

Course Outcomes:

- CO 1: Students will be able to identify and apply core human values in personal and professional contexts, fostering positive character and ethical decision-making.
- CO 2: Students will critically analyze the ethical impact of globalization and mass media on values, behavior, and professional integrity.
- CO 3: Students will demonstrate techniques for self-regulation and emotional control using simplified physical exercises, meditation, and yoga practices.
- CO 4: Students will understand the framework of human rights, constitutional provisions, and institutional mechanisms for protection and redressal of rights violations.

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Course Code:	UGEN – 381	
Course:	VALUE EDUCATION & HUMAN RIGHTS	Credits: 4P
Contents		
Chapter	Name of the Topic	Hours
Unit-I	Concept of Value Education • Meaning, definition, objectives, and importance of value education. • Philosophical foundations of values – moral, ethical, spiritual, social, cultural, political, and economic values. • Role of values in personal and professional life. • Sources of values: family, society, religion, culture, and education. • Value crisis in the modern world – materialism, consumerism, and loss of human touch. • Role of education in value formation. • Case studies of value-based living (e.g., Mahatma Gandhi, Swami Vivekananda, Mother Teresa).	15
Unit-II	Human Rights: Foundations & Evolution • Definition, nature, and scope of human rights. • Historical development of human rights: Magna Carta, American Bill of Rights, French Revolution, UN Charter. • Universal Declaration of Human Rights (UDHR), 1948 – significance and key provisions. • International Covenants on Civil, Political, Economic, Social, and Cultural Rights. • Generations of Human Rights (Civil-Political, Economic-Social-Cultural, Collective-Solidarity Rights). • Role of UNESCO, UNHRC, and other international organizations.	25
Unit-III	Indian Perspective on Human Rights • Human rights in the Indian Constitution – Preamble, Fundamental Rights, and Directive Principles of State Policy. • Fundamental Duties and their significance. • Constitutional safeguards for minorities, women, SC/ST, and other vulnerable groups. • Role of National Human Rights Commission (NHRC), State Human Rights Commissions (SHRCs). • Human Rights and Social Justice in India – issues and challenges. • Landmark Supreme Court cases on human rights in India.	25
Unit-IV	Values in Personal and Social Life • Values in individual life: honesty, integrity, empathy, non-violence, tolerance, cooperation, and compassion. • Interpersonal values – respect, trust, forgiveness, gratitude. • Social values – equity, justice, freedom, secularism, pluralism, democracy. • Gender equity and dignity of labor. • Role of media and education in promoting social values. • Civic responsibility, environmental ethics, and sustainable development.	15
	Human Rights Issues & Challenges • Human rights violations – child labor, bonded labor, custodial violence, trafficking, discrimination, refugees. • Human rights of marginalized groups – women, children, elderly, differently-abled, tribals, LGBTQ+.	

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Unit-V	- Global issues: poverty, illiteracy, terrorism, displacement, communal violence, migration. - Environmental rights – right to clean water, air, and sustainable environment. - Human rights in the era of globalization and technology (digital rights, privacy, AI ethics). - Case studies of human rights violations and movements.	15
Unit-VI	Education for Values & Human Rights - Role of teachers, educational institutions, and curriculum in value inculcation. - Pedagogical approaches for value education – storytelling, group discussion, role play, debates, moral dilemmas. - Human rights education – objectives, strategies, and methodologies. - Value-based leadership and good governance. - Role of NGOs, civil society, and social movements in human rights protection. - Building a culture of peace and non-violence through education. - Project work, field visits, and community engagement.	25
	Total	120

Books Recommended:

- Value education and human rights, By R. P. Shukla, Sarup & Sons
- Professional Ethics and Human Values, Premvir Kapoor, Khanna Publishing House (AICTE Recommended Textbook)
- Value Education And Education For Human Rights, By V.C. Pandey, Gyan Publishing House.
- Education for Values, Environment and Human Rights, By Y. K. Sharma, Published by Deep and Deep Publications.
- Human Rights: Twenty First Century Challenges, edited by V.N. Viswanathan (ed. By), Gyan Publishing House.
- Education for Values, Environment and Human Rights, By J. C. Aggarwal, Shipra Publications, 2005
- Human Rights Education: A Global Perspective, edited by Hemlata Talesra, Nalini Pancholy, Mangi Lal Nagda, Published by Daya Books.

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Paper Title: UGEN - 382 BASIC ACCOUNTING

Course Objectives:

- Introduce the fundamentals of accounting, including accounting processes, roles of accountants, and accounting principles.
- Develop the ability to analyze and record business transactions using the accounting equation, T-accounts, and journal entries.
- Teach students to maintain ledgers, prepare financial statements, and make necessary adjustments using work sheets.
- Equip students with skills to handle merchandising transactions, payroll accounting, and prepare financial reports for merchandising businesses.

Course Outcomes:

- CO 1: Analyze financial transactions and prepare balance sheets using the accounting equation.
- CO 2: Maintain general ledgers, post journal entries, and reconcile bank statements accurately.
- CO 3: Apply accounting procedures to merchandising and payroll transactions, including earnings and tax calculations.
- CO 4: Prepare detailed financial statements including income statements, statements of owner's equity, and classified balance sheets for merchandising businesses.

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Course Code:	UGEN – 382	
Course:	BASIC ACCOUNTING	Credits: 4P
Contents		
Chapter	Name of the Topic	Hours
Unit-I	Introduction to Accounting • Meaning, objectives, and importance of accounting. • Users of accounting information – internal & external. • Bookkeeping vs. Accounting. • Basic accounting terms: assets, liabilities, capital, revenue, expenses, drawings, profit, loss, stock, etc. • Accounting principles: concepts (business entity, going concern, money measurement, accrual, conservatism, dual aspect, matching). • Accounting standards – overview.	20
Unit-II	Double Entry System & Accounting Process • Double entry principle and accounting equation. • Journal – meaning, features, format, rules of debit and credit. • Ledger – posting from journal to ledger, balancing of accounts. • Subsidiary books – cash book, purchase book, sales book, purchase return, sales return, petty cash book. • Trial Balance – objectives, preparation, errors and their rectification.	25
Unit-III	Bank Transactions & Reconciliation • Cash Book vs. Pass Book. • Causes of differences between Cash Book and Pass Book. • Bank Reconciliation Statement (BRS) – meaning, importance, preparation. • Adjusted Cash Book method.	15
Unit-IV	Final Accounts of Sole Proprietors • Meaning and preparation of Trading Account. • Profit & Loss Account – preparation and adjustments (outstanding expenses, prepaid expenses, accrued income, depreciation, bad debts, provisions). • Balance Sheet – preparation and classification of assets & liabilities. • Adjustment entries and their effect on final accounts.	20
Unit-V	Depreciation, Reserves & Provisions • Meaning, causes, and need for depreciation. • Methods of depreciation – straight line, written down value, annuity, depletion. • Accounting treatment of depreciation. • Provisions and reserves – differences and importance.	25
Unit-VI	Introduction to Partnership & Company Accounts • Partnership Accounts – features, partnership deed, capital accounts, interest on capital/drawings, profit-sharing ratio. • Admission of a partner – goodwill, revaluation of assets and liabilities. • Retirement & death of a partner – adjustments. • Introduction to Company Accounts – shares, debentures, issue and forfeiture of shares (basic concepts).	15
	Total:	120

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Books Recommended:

- Basic Accounting: The step-by-step course in elementary accountancy, By Nishat Azmat, Andy Lymer, Hachette UK.
- Basic Accounting, By Rajni Sofat, PHI Learning Pvt. Ltd.
- BASIC ACCOUNTING, By SOFAT, RAJNI , HIRO, PREETI, PHI Learning Pvt. Ltd.
- Accounting for Beginners, By Kokab Rahman, Createspace Independent Pub, 2013

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Year - 2 - Advanced Diploma (SEMESTER - IV)

Paper Title: UMLTV - 401 BIOCHEMISTRY – II

Job Role: Assistant Medical Lab Technician

Course Objectives:

- Understand the basic concepts and definitions of photometry.
- Understand the distribution of body fluids: ECF (extracellular fluid) and ICF (intracellular fluid).
- Learn the classification, sources, requirements, and deficiency symptoms of vitamins (both fat-soluble and water-soluble).
- Understand the concept of healthy living and its importance in healthcare.

Course Outcomes

- CO 1: Explain the principles and laws of photometry, including absorbance, transmittance, and absorption maxima, and apply knowledge to analyze solutions using photometric techniques like colorimetry and fluorometry.
- CO 2: Demonstrate understanding of fluid and mineral metabolism, including the distribution of body fluids, water balance, and the role of macro and trace minerals in maintaining homeostasis.
- CO 3: Interpret various liver and renal function tests, and correlate biochemical findings with clinical conditions such as jaundice and kidney dysfunction using appropriate parameters like enzyme levels and clearance values.
- CO 4: Identify the sources, functions, and deficiency symptoms of fat and water-soluble vitamins, and explain their biochemical importance in maintaining health and preventing diseases.
- CO 5: Understand the basic cardiac profile, recognize the patterns of cardiac enzymes in heart diseases, and compare various cholesterol estimation methods in terms of their principles and diagnostic relevance.
- CO 6: Apply personal hygiene practices, handwashing techniques, and proper use of PPE in the laboratory to ensure safety and infection control.
- CO 7: Demonstrate knowledge of basic first aid, emergency handling, and procedures for ensuring both patient safety and sample integrity during collection and transportation.

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Course Code:	UMLTV - 401	
Course:	BIOCHEMISTRY – II	Credits:
	3L+1T	
Contents		
Chapter	Name of the Topic	Hours
Unit-I	Photometry: Definition, Laws of Photometry, Absorbance, Transmittance, Absorption maxima, Types of Photometry: Colorimetry, Fluorometry, Choice of appropriate filter. Measurement of solution	12
Unit-II	Water and mineral metabolism: Distribution of fluids in the body, ECF, ICF, water metabolism, dehydration, mineral metabolism, macro nutrients and trace elements. Water electrolyte balance. Liver functions and their assessment: based on carbohydrate metabolism, Protein metabolism, lipid metabolism, measurement of serum enzyme levels, bile pigment metabolism, jaundice, and its types and their biochemical findings, Renal function tests: various tests - GFR clearance.	18
Unit-III	Vitamins , Fats and water soluble vitamins, sources, requirement, deficiency disorders, and bio chemical functions. Cardiac profile - in brief hypertension, angina, Myocardial Infarction, Pattern of cardiac enzymes in heart diseases. Different methods of cholesterol estimation - principal, advantage, disadvantage of different methods.	12
Unit-IV	PERSONNEL HYGIENE: Understanding of the concept of Healthy Living, Understanding & procedures of Hand Hygiene, Techniques of Grooming in microbiology lab, Equipping with Techniques of Use of PPU, Vaccination against common infectious diseases SAFETY & FIRST AID: Understanding and precautions to ensure Patient's Safety, Basic understanding and precautions to ensure sample preservation while Transporting, Common emergency conditions and what to do in medical emergencies, Basics of first aid, Understanding and precautions to ensure self safety	18
	Total:	60

Books Recommended:

- Bacteria: A Very Short Introduction, By Sebastian G.B. Amyes, OUP Oxford.
- Bacteria, edited by Leslie Rowland Hill, L. R. Hill, B. E. Kirsop, Cambridge University Press
- Identification of Pathogenic Fungi, By Colin K. Campbell, Elizabeth M. Johnson, John Wiley & Sons
- Pathogenic Fungi: Structural Biology and Taxonomy, edited by Gioconda San-Blas, Richard A. Calderone, Horizon Scientific Press.
- Principles of Molecular Virology, By Alan J. Cann, Academic Press
- Virology: Principles and Applications, By John Carter, Venetia Saunders, Venetia A. Saunders, John Wiley & Sons
- Parasitology: An Integrated Approach, By Alan Gunn, Sarah Jane Pitt, John Wiley & Sons
- An Introduction to Parasitology, By Bernard E. Matthews, Cambridge University Press

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Paper Title: UMLTV - 491 BIOCHEMISTRY LAB – II

Credit: 2P (Allotted Hours: 60)

List of Experiments: (Based on UMLTV – 401)

- Estimation of serum bilirubin (total and direct).
- Measurement of SGOT/AST and
- SGPT/ALT enzyme levels.
- Urea and creatinine estimation in serum/urine.
- Calculation of Creatinine Clearance for GFR assessment.
- Hand hygiene demonstration: proper technique using WHO's 6-step method.
- Demonstration and practice of PPE usage: gloves, masks, lab coats, goggles, face shields.
- First aid drills: CPR basics, bandaging, managing fainting or bleeding.
- Safe sample collection and transport: using dummy samples, practicing labelling and cold chain maintenance.
- Biohazard disposal training: segregation of waste, use of biohazard bins.

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Paper Title: UMLTV - 402 PATHOLOGY – II

Job Role: Assistant Medical Lab Technician

Course Objectives:

- Understand the basic concepts of histopathology and its role in diagnostics.
- Learn the procedures for collection and transportation of gynecological and non-gynecological cytological samples.
- Identify and understand the use of key histopathology equipment: Tissue processors, microtomes (and their types), and slide strainers.
- Understand the purpose and diagnostic utility of fine needle aspiration (FNA).

Course Outcomes

- CO 1: Demonstrate a basic understanding of histopathology, including specimen collection, labeling, fixation, tissue processing, embedding, section cutting, staining, and decalcification.
- CO 2: Describe the principles of cytopathology, including sample collection, preservation and staining techniques like Papanicolaou stain, and differentiate between gynaecological and non-gynaecological cytology.
- CO 3: Identify and explain the working principles, usage, and maintenance of histopathology equipment such as microtomes, tissue processors, cryostats, and slide strainers.
- CO 4: Understand various staining techniques, including routine, histochemical, and cytochemical staining, and describe the chemistry and role of different dyes, mordents, and accelerators.
- CO 5: Demonstrate knowledge of Fine Needle Aspiration (FNA), including its procedure, importance, and integration into cytological analysis and section cutting.

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Course Code:	UMLTV - 402	
Course:	PATHOLOGY – II	Credits:
	3L+1T	
Contents		
Chapter	Name of the Topic	Hours
Unit-I	INTRODUCTION TO HISTOPATHOLOGY: Brief introduction of histopathology, Elementary knowledge of specimen collection, , Elementary knowledge of tissue processing, Understand about section cutting, Understand about Staining, Elementary knowledge of Decalcification Elementary knowledge of tissue fixatives, General Principle: Reception, recording and labeling of histology specimens.Fixation and various fixatives - Mode of action and indication preparation. Processing of histological tissues for paraffin -embedding, Embedding and embedding media, Vacuum embedding.	13
Unit-II	INTRODUCTION TO CYTOPATHOLOGY: Brief introduction of cytology and cytopathology, Elementary knowledge of specimen collection and transportation, precautions to be taken for gynaecological samples, Elementary knowledge of specimen collection, transportation and preservation of non gynaecological samples, Understand about fluid specimen, Describe the Papanicolaou stain, Describe about mounting of cell sample, Describe different dyes used for staining different cytopathological Specimen Preparation of Haematoxylin and Eosine, Methods of preparation, staining technique for rapid diagnosis, Histo - chemical staining, Cyto - chemical staining.	17
Unit-III	Equipment used in Histopathology : Tissue Processor, Microtome - various types, their working principle and maintenance, Microtome knives and knife - sharpening, Automatic slide strainer, Freezing microtome, Cryostat Section cutting, cutting faults and remedies, Decalcification - Methods, advantages and disadvantages, various types - their mechanisms of action, Major techniques used in Histopathology ;Routine staining procedures, mounting and mounting media, Dye chemistry, theory and practice of staining, Solvent mordents, accelerators and accentuators, Use of controls in various staining procedures.	16
Unit-IV	FINE NEEDLE ASPIRATION: Understand the purpose of fine needle aspiration; describe the procedure of fine needle aspiration, Understand about section cutting.	14
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Books Recommended:

- Histopathology, edited by Guy Orchard, Brian Nation, OUP Oxford
- Atlas of Histopathology, By Ivan Damjanov, Wife Goes On
- Recent Advances in Histopathology: 24, By Adrienne M Flanagan, JP Medical Ltd.
- Histopathology Techniques and Its Management, By Ramadas Nayak, JP Medical Ltd.

Paper Title: UMLTV - 492 PATHOLOGY LAB – II

Credit: 2P (Allotted Hours: 60)

List of Experiments: (Based on UMLTV – 402)

- Preparation of Haematoxylin and Eosine
- Use of Microtome
- Fixation of an epithelial tissue tissue
- Paraffin embedding of tissues
- Demonstration of glass wares and equipment used in histopathology lab.
- To prepare alcohol of different concentration.
- To prepare formalin from stock solution.
- To sharp knife by honing and stropping.
- Grossing of tissue
- To perform tissue processing by manual method.
- To perform section cutting of paraffin embedded tissue.
- To fix the smear on glass slide

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Paper Title: UMLTV - 403 HEMATOLOGY – II

Job Role: Assistant Medical Lab Technician

Course Objectives:

- Understand the definition and classification of anemia, including megaloblastic, iron deficiency, and hemolytic anemia.
- Understand the application of radioisotopes in hematology, including safety protocols for handling radioactive materials in the lab.
- Learn the principles and techniques of major serological tests, including precipitation, flocculation, agglutination, and neutralization.
- Identify and manage complications and hazards of blood transfusion, including investigations of transfusion reactions and mismatches.

Course Outcomes

- CO 1: Describe the types and causes of anemia and leukemia, and perform relevant laboratory investigations including cytochemical staining and tests for bleeding disorders.
- CO 2: Conduct and interpret coagulation and platelet function tests, identify disseminated intravascular coagulation (DIC), and demonstrate knowledge of cytogenetics and radioisotope applications in hematology, including safety measures.
- CO 3: Demonstrate the ability to carry out a wide range of serological tests for bacterial and viral infections, autoimmune disorders, pregnancy, and parasitic diseases using standard immunological techniques.
- CO 4: Understand and perform blood compatibility testing, manage pre-transfusion protocols, investigate transfusion reactions, and conduct donor screening following safety guidelines in a blood bank.
- CO 5: Demonstrate the skills required for bone marrow aspiration, staining, smear preparation, and histological sectioning, and understand the technician's role in hematology and transfusion laboratories.

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Course Code:	UMLTV - 403	
Course:	HEMATOLOGY – II	Credits: 3L+1T
Contents		
Chapter	Name of the Topic	Hours
Unit-I	Definition and classification of anemia, Laboratory investigation for megaloblastic anemia, Laboratory investigation for iron deficiency anemia, Laboratory investigation for haemolytic anemia including classification and causes, Leukemia: definition and classification, Cytochemical staining procedures in various haemopoietic disorders, Laboratory test for assessing bleeding disorders.	14
Unit-II	Laboratory investigation for disseminated intravascular coagulation (DIC), Mechanism of fibrinolysis: tests for fibrinolysis, Platelet function tests and their interpretation, Techniques available for cytogenetic studies, Use of Radioisotopes in hematology, Safety measures for handling Radioisotopes.	14
Unit-III	Understand Serum immunoglobulin, SEROLOGICAL TESTS: Collection and preparation of specimen used in serological laboratory. Principal of serodiagnostic tests, Precipitation, Flocculation, Agglutination, Neutralization and Coagulation.	16
Unit-IV	Compatibility tests in blood transfusion, complications and hazard of blood transfusion, Laboratory investigations of transfusion reactions and mismatched transfusion. TTI (Transfusion Transmitted Infection)., Preparation of bone - marrow smears Understanding of different aspects of working in blood bank.	16
	Total:	60

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Books Recommended:

- Blood: Principles and Practice of Hematology, Volume 1, edited by Robert I. Handin, Samuel E. Lux, Thomas P. Stossel, Lippincott Williams & Wilkins.
- Hematology for the Medical Student, edited by Alvin H. Schmaier, Lilli M. Petruzzelli, Lippincott Williams & Wilkins
- Hematology: Clinical Principles and Applications, By Bernadette F. Rodak, George A. Fritsma, Kathryn Doig, Elsevier Health Sciences.
- Lanzkowsky's Manual of Pediatric Hematology and Oncology, edited by Philip Lanzkowsky, Jeffrey M. Lipton, Jonathan D. Fish, Academic Press.
- Hematology, edited by William Samson Beck, MIT Press.
- Wintrobe's Clinical Hematology, Volume 1, edited by John P. Greer, Lippincott Williams & Wilkins
- Desk Reference for Hematology, Second Edition, edited by N.K. Shinton, CRC Press.
- Hematology, An Issue of Veterinary Clinics of North America: Exotic Animal , By Terry Campbell, Elsevier Health Sciences.

Paper Title: UMLTV - 493 HEMATOLOGY LAB – II

Credit: 2P (Allotted Hours: 60)

List of Experiments: (Based on UMLTV – 403)

- Determination of Blood groups
- VDRL,
- CRP
- Widal test
- Serodiagnosis tests for AIDS
- Study of pre - transfusion testing – Antibody screen,
- Major cross - match, Study of compatible blood groups, Screening of donors,
- Cross - matching of blood - samples - Coomb's test,
- Preparation and storage of plasma,
- Methods of storage of blood

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Paper Title: UGEN - 481 ENVIRONMENTAL STUDIES

Course Objectives

- To introduce students to the multidisciplinary nature, scope, and importance of environmental studies and the necessity of public awareness in environmental conservation.
- To help students understand ecosystems, biodiversity, and the threats to natural resources, along with individual and collective responsibilities in sustainable living.
- To examine various types of environmental pollution, their causes, effects, and control measures, including disaster management and urban environmental challenges.
- To sensitize students about environmental ethics, laws, population-related issues, and the role of technology and education in promoting human health and environmental sustainability.

Course Outcomes

- CO 1: Students will be able to explain the structure and functioning of ecosystems, and analyze the role of individuals in conserving renewable and non-renewable resources for sustainable development.
- CO 2: Students will be able to identify and evaluate biodiversity at various levels and demonstrate knowledge of conservation strategies and the significance of biodiversity hotspots in India.
- CO 3: Students will be able to recognize and assess different forms of pollution, propose suitable control measures, and understand the social and environmental challenges of urbanization and disasters.
- CO 4: Students will be able to interpret major environmental laws and ethical issues, assess the impact of population growth and consumerism, and apply information technology in promoting environmental and human health.

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Course Code:	UGEN – 481	
Course:	ENVIRONMENTAL STUDIES Credits: 4P	
Contents		
Chapter	Name of the Topic	Hours
Unit-I	Introduction to Environment & Natural Resources • Definition, scope, importance of Environmental Studies. • Components of environment – lithosphere, hydrosphere, atmosphere, biosphere. • Renewable & Non-renewable resources: ◦ Forest resources – uses, deforestation, afforestation, forest conservation. ◦ Water resources – uses, overexploitation, floods, droughts, conflicts over water, dams & their impacts. ◦ Mineral resources – exploitation, environmental effects of mining. ◦ Energy resources – renewable (solar, wind, hydro, biomass, geothermal) & non-renewable (coal, petroleum, natural gas, nuclear). ◦ Food resources – world food problems, sustainable agriculture. • Role of an individual in conservation of natural resources.	20
Unit-II	Ecosystems • Concept, structure & function of an ecosystem. • Energy flow in an ecosystem – food chains, food webs, ecological pyramids. • Types of ecosystems: ◦ Forest ecosystem ◦ Grassland ecosystem ◦ Desert ecosystem ◦ Aquatic ecosystem (ponds, rivers, oceans, wetlands). • Biodiversity and its conservation: ◦ Levels of biodiversity – genetic, species, ecosystem. ◦ Value of biodiversity – consumptive, productive, social, ethical, aesthetic. ◦ Threats to biodiversity – habitat loss, poaching, pollution, invasive species. ◦ Conservation methods – in-situ & ex-situ.	25
Unit-III	Environmental Pollution • Definition, causes, effects, and control measures of: ◦ Air pollution ◦ Water pollution ◦ Soil pollution ◦ Marine pollution ◦ Noise pollution ◦ Thermal pollution ◦ Nuclear hazards • Solid waste management – causes, impacts, control measures. • Role of individuals and communities in pollution prevention.	15

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Unit-IV	Social Issues and Environment • Sustainable development – concept and strategies. • Urban problems related to energy and environment. • Climate change, global warming, acid rain, ozone layer depletion. • Environmental ethics – issues and possible solutions. • Environmental impact of resettlement and rehabilitation projects. • Consumerism and waste products. • Environmental movements in India – Chipko, Silent Valley, Narmada Bachao Andolan. • Disaster management – floods, earthquakes, cyclones, landslides.	25
Unit-V	Environmental Policies, Acts & Human Rights • Environment Protection Act, 1986. • Air (Prevention and Control of Pollution) Act, 1981. • Water (Prevention and Control of Pollution) Act, 1974. • Wildlife Protection Act, 1972. • Forest Conservation Act, 1980. • Issues involved in enforcement of environmental legislation. • Role of judiciary, public awareness, NGOs, and media. • Environmental rights as human rights.	15
Unit-VI	Human Population and Environment • Population growth, population explosion, and impact on environment. • Human health & environment – communicable and lifestyle diseases. • Family welfare programmes – role in controlling population. • Environment & human rights – equity and social justice. • Role of information technology in environment and human health (GIS, remote sensing, environmental monitoring). • Case studies: population & resource consumption, health epidemics, sustainable urban development.	20
	Total:	120

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Books Recommended:

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

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Paper Title: UGEN - 482 QUALITY MANAGEMENT

Course Objectives

- To introduce the evolution and fundamental concepts of quality management, including philosophies of quality pioneers like Deming, Juran, and Crosby.
- To equip students with graphical and statistical tools for analyzing and improving process quality.
- To develop students' understanding of advanced quality management techniques such as hypothesis testing, control charts, Six Sigma, TQM, and quality auditing.
- To impart knowledge of modern quality improvement practices like QFD, Taguchi methods, DFMEA, and product reliability in product and process development.

Course Outcomes

- CO 1: Students will be able to explain the principles and evolution of quality management, and compare various quality philosophies and dimensions of product/service quality.
- CO 2: Students will be able to apply basic and advanced statistical tools such as control charts, sampling methods, and hypothesis testing for process quality analysis and improvement.
- CO 3: Students will be able to analyze and implement quality management frameworks like TQM, Six Sigma, PFMEA, and ISO standards for continuous quality improvement.
- CO 4: Students will be able to develop quality-focused product and process designs using tools like QFD, Taguchi methods, and reliability analysis to enhance customer satisfaction and organizational performance.

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Course Code:	UGEN – 482	
Course:	QUALITY MANAGEMENT	Credits: 4P
Contents		
Chapter	Name of the Topic	Hours
Unit-I	Introduction to Quality Management, Evolution of Quality Management, Concepts of Product and Service Quality Dimensions of Quality, Deming's, Juran's, Crosby's Quality Philosophy, Quality Cost	14
Unit-II	Introduction to Process Quality, Graphical and statistical techniques for Process Quality Improvement Graphical tools for data representation, 7 QC tools	14
Unit-III	Sampling, sampling distribution, and hypothesis Testing Regression, Control charts, Process capability analysis, Measurement system analysis, Analysis of Variance (ANOVA), Design and Analysis of Experiment (DOE), Acceptance sampling plan, TQM, Leadership, Lean and JIT Quality Philosophy, Benchmarking, Process failure mode and effect analysis(PFMEA), Service Quality, Six sigma for Process Improvement, ISO 9001 and QS 9000 Quality Audit, Quality Circles	16
Unit-IV	Quality Improvement, Quality Function Deployment, Robust Design and Taguchi Method, Design Failure Mode & Effect Analysis, Product Reliability Analysis, Six Sigma in Product Development	16
	Total:	60

Books Recommended:

- D. C. Montgomery, Introduction to Statistical Quality Control, John Wiley & Sons, 3rd Edition.
- M.P. Poonia & S.C. Sharma, Total Quality Management, Khanna Publishing House (AICTE Recommended Textbook)
- Mitra A. , Fundamentals of Quality Control and Improvement, PHI, 2nd Ed. , 1998.
- J Evans and W Linsay, The Management and Control of Quality, 6'th Edition, Thomson, 2005
- Besterfield, D H et al. , Total Quality Management, 3rd Edition, Pearson Education, 2008.