Course Units Offered by the Department

Bachelor of Science Honours in Medical Laboratory Science

1000 LEVEL – SEMESTER I

Course Code	Course Title	No. of Credits	Prerequisites
EL 1101	Basic English for Allied Health Sciences 1	3*	None
AH 1101	Information Technology	2*	None
AH 1102	Human Physiology I	3	None
AH 1103	Basic Human Anatomy	3	None
ML 1101	Laboratory Practice, Safety and First Aid	2	None
ML 1102	Biochemistry	3	None
ML 1103	Histology	1	None

1000 LEVEL – SEMESTER II

Course Code	Course Title	No. of Credits	Prerequisites
EL 1202	Basic English for Allied Health Sciences 2	3*	None
AH 1201	General Pathology	3	None
AH 1202	Human Physiology II	3	None
ML 1201	Analytical Chemistry	3	None
ML 1202	Molecular Biology	1	None
ML 1203	General Microbiology	2	None
ML 1204	Professional skills in MLS	1	None

2000 LEVEL – SEMESTER I

Course Code	Course Title	No. of Credits	Prerequisites
EL 2103	Intermediate English for Allied Health Sciences 1	3*	None
ML 2101	Haematology I	3	AH 1102
ML 2102	Clinical Chemistry I	3	ML 1102 ‡ , ML 1201
ML 2103	Medical Bacteriology	2	ML 1203
ML 2104	Histotechnology	3	ML 1103, AH 1201
ML 2105	Specimen Collection and Transport	2	None

ML 2106	Basic Immunology	1	None
ML 2107	Molecular Genetics and Cytogenetics	2	None

2000 LEVEL – SEMESTER II

Course Code	Course Title	No. of Credits	Prerequisites
EL 2204	Intermediate English for Allied Health Sciences 2	3*	None
ML 2201	Haematology II	3	ML 2101
ML 2202	Clinical Chemistry II	3	ML 2102
ML 2203	Systematic Virology & Mycology	2	None
ML 2204	Cytotechnology	3	AH 1201, AH 1202
ML 2205	Medical Parasitology & Entomology	2	None
ML 2206	Immunotechnology	2	ML 2106
ML 2207	Biomedical Instrumentation	1	None

3000 LEVEL – SEMESTER I

Course Code	Course Title	No. of Credits	Prerequisites
ML 3101	Transfusion Medicine	1	None
ML 3102	Clinical Chemistry III	3	ML 2101, ML 2202
ML 3103	Diagnostic Virology and Mycology	2	ML 2203
ML 3104	Laboratory Quality Assurance & Accreditation	3	None
ML 3105	Diagnostic Parasitology	2	ML 2205
ML 3106	Experimental Laboratory Technology	3	None
ML 3107	Medical Statistics	2	None
ML 3108	Research Methodology & Proposal Writing	2	None

3000 LEVEL – SEMESTER II

Course Code	Course Title	No. of Credits	Prerequisites
ML 3201	Laboratory Management	2	None
ML 3202	Biotechnology and Molecular diagnostics	2	ML 2102
ML 3203	Diagnostic Bacteriology	3	ML 1203‡
ML 3204	Public Health Microbiology	2	None

ML^	Optional Courses	1	
ML 3207	Medical Ethics	1	None
ML 3208	Portfolio Development	1	None
ML 3209	Research Project	6	ML 3108
Optional Courses (Only one optional course should be selected)			
ML 3205	Healthcare Marketing	1	None
ML 3206	Human Resource Management	1	None

4000 LEVEL (Work Place- Based Training: 30 credits)

Course Code	Course Title	No. of Hours	Prerequisites
ML 4CLIN01	Haematology	250 hrs	ML 2101, ML 2201
ML 4CLIN02	Clinical Chemistry	300 hrs	ML 2102, ML 2202, ML 3102
ML 4CLIN03	Microbiology & Immunotechnology	400 hrs	ML 3103, ML 3203, ML 2206
ML 4CLIN04	Histotechnology & Cytotechnology	250 hrs	ML 2104, ML 2204
ML 4CLIN05	Medical Parasitology & Entomology	100 hrs	ML 3105
ML 4CLIN06	Transfusion Medicine	100 hrs	ML 3101
ML 4CLIN07	Industrial Training	100 hrs	ML 3201

* Courses will not be considered for GPA calculation
‡ Prerequisite courses that students should obtain a minimum of C grade

The final year is dedicated to fulltime work place-based learning (30 credits) and it does not follow the semester system/course unit system.

Total of 8 credits are allocated for Research Project and split between Research Methodology & Proposal Writing (ML 3108) as 2 credits and Reserch Project (ML3209) as 6 credits.

Portfolio Development (ML3208) and Research Project (ML3209) start in 3000 Level Semester II and will continue throughout the 4000 Level. The evaluation procedure will be concluded, and results will be released at the end of 4000 Level.

Prerequisites are met if course is followed, except courses marked as (‡) prerequisite courses. Followed means to meet the requirements stipulated in the Rules and Regulations in order to be eligible to sit for the end semester examination.

Synopses of Course Contents

1000 Level

EL 1101 Basic English for Allied Health Sciences 1 (3 Credits)

The aim of this course is to provide the students with the knowledge of basic grammar and language skills and enable students to read, understand and evaluate basic descriptive texts, and to write accurately at UTEL Band 4 Level of competence in the skill areas of Reading and Writing as they transit into a degree programme which is conducted in the English medium. English for General Purposes (EGP) and Allied Health Science-based English for Specific Purposes (ESP) are introduced in an attempt to improve the knowledge of the undergraduates and the course will provide them with an insight and the required knowledge of English in order to function within the academic milieu of a University.

Key Areas of Focus: Selected reading passages describing people, places, Allied Health Science disciplinary themes, texts with appropriate punctuation exercises, reading comprehension texts, and relevant passages with appropriate and sequenced vocabulary elements. Surveying a textbook, skimming and scanning text and processing information appropriately. Language Development and Writing, formulating simple descriptions of general and scientific context and developing methods of note-taking, Writing short descriptions of self, immediate environment and current situations, formal and informal letters, email and similar communication. Mechanics of Writing: subject-verb agreement, use of connectives, spelling and punctuation. Introduction to dictionary skills for self-learning purposes, Pronunciation and phonetic symbols, Speech activities related to general and academic contexts.
Course assessment: In-course 40%, End semester 60%

AH 1101 Information Technology (2 Credits)

Basic concept of computers, Types of computers, Components of a computer, System analysis and design, Data processing, Web page development & languages, System analysis and design, Data processing, Computer networks, E-mail/Internet concepts.
Course assessment: In-course 30%, End semester 70%

AH 1102 Human Physiology I (3 Credits)

Introduction to basic organization of the human body, Integration & regulation of the human body functions organized around the homeostasis, Cell physiology, Nervous system, Cardiovascular system, Respiratory system, Lymphatic and Gastrointestinal systems.
Course assessment: In-course 30%, End semester 70%

AH 1103 Basic Human Anatomy (3 Credits)

The cell, Cell division, Basic tissue types, Functional organization of nervous system, Cardiovascular system, Bone cartilage and joints, Muscular system, Gastrointestinal system, Respiratory system, Lymphatic system, Urinary system, Reproductive system, Structure of special sensory organs.

Course assessment: In-course 30%, End semester 70%

ML 1101 Laboratory Practice, Safety and First Aid (2 Credits)

Introduction to laboratory safety, Organisation and design of a medical laboratory, Hazards associated with laboratories and means of prevention, Sterilization and disinfection, Laboratory waste disposal, Storage of chemicals and safety aspects, Occupational health in the laboratory, Use of bio safety manual in prevention of laboratory accidents, Use of safety cabinets, Safety aspects of using radioisotopes, equipment and processing of human samples, Washing glassware for laboratory use, First aid for emergency.

Course Assessment: In-course 30%, End-semester 70%

ML 1102 Biochemistry (3 Credits)

Introduction to Biochemistry, pH and buffer solutions, Structure and Function of macro- nutrients (Carbohydrates, Proteins, Lipids),Micro-nutrients (Vitamins and Minerals) and nucleic acids, Properties and kinetics of enzymes, Intermediary metabolism (Glycolysis, TCA cycle, Electron transport chain, oxidative phosphorylation, gluconeogenesis, pentose phosphate pathway), Metabolism of proteins, lipids and nucleotides, Regulation and integration of metabolism, Introductory Medical Biochemistry (Haemoglobinopathies, Collagenopathies, Glucose- 6-phosphate dehydrogenase deficiency, Jaundice, Gout, Inborn errors of amino acid metabolism, Diabetes, Obesity, Lipid profile, Liver function tests, Kidney function tests, Glycemic index, Atherosclerosis), Biochemical tests for identification of Carbohydrates, Proteins and Lipids, Analysis of enzyme properties.

Course Assessment: In-course 30%, End-semester- 70%

ML 1103 Histology (1 Credit)

Introduction to histology specimen preparation, Histology of basic tissue types: epithelial tissue, supporting/ connective tissue, muscle tissue and nerve tissue, Histology of organ systems: respiratory, cardiovascular, gastrointestinal tract, accessory gastrointestinal organs, liver, pancreas and gallbladder, urinary system, endocrine system, male and female reproductive systems, nervous system, skeletal tissue, immune system and skin.

Course Assessment: In-course 30%, End semester 70%

EL 1202 Basic English for Allied Health Sciences 2 (3 Credits)

The aim of this course is to enable students to understand simple instructions, statements, notices and questions, and to be able to formulate these themselves. This will place them at UTEL Band 4 Level of competence in the skill areas of Listening and Speaking.

Key Areas of Focus: Instructions and directions, announcements, basic questions and answers, sequence markers and conjunctions/connectives, short speeches and dialogues, professional instructions, creative expression, telephone conversations. Sharing personal information appropriately, using and explaining quantitative and qualitative data at a basic level, making short speeches, asking and answering questions, telephone and other conversations for social and information-gathering purposes. Vocabulary development and expansion, Group discussions, Presentations, Impromptu Speaking on general and general health topics, Speech related to formal and informal settings and identifying contextual references.

Course assessment: In-course 40%, End semester 60%

AH 1201 General Pathology (3 Credits)

Introduction to pathological mechanisms common to all tissue-cell pathology, Processes of cell injury, Cellular adaptations to injury, Inflammation and repair, Circulatory disturbances, Immunopathology, Neoplasia and genetic basis of diseases.

Course assessment: In-course 30%, End semester 70%

AH 1202 Human Physiology II (3 Credits)

Foundation on information of normal physiological functions of the nervous, endocrine, renal and reproductive systems, which will allow an increased understanding of the integration, regulation and homeostasis of the human body as well as changes seen in pathological states.

Course assessment: In-course 30%, End semester 70%

ML 1201 Analytical Chemistry (3 Credits)

Introduction to basic equipment used in analytical chemistry, Measurement & errors in chemical analysis, Preparation of laboratory reagents & standardization, Titrations, Buffers, Centrifugation, Spectrophotometry and analytical aspects, Electrophoresis, Chromatography, Electro-analytical chemistry in laboratory analysis, Principles of enzymology, Detection methods.

Course Assessment: In-course 30%, End semester 70%

ML 1202 Molecular Biology (1 Credit)

Overview on cell division and cell cycle, DNA & RNA structure and function, DNA replication process, Gene expression, Transcription, Translation, Mutations and DNA repair mechanisms, Genes to genomes, Structure of a gene, Human genome and human genome project (HGP), Other genomes, Short tandem repeats (STR) and variations, Single nucleotide polymorphisms, Molecular basis of microbes, Embryonic stem cells & pluripotent stem cells and uses, Introduction to genetic engineering.

Course Assessment: In-course 30%, End semester 70%

ML 1203 General Microbiology (2 Credits)

Introduction to microbiology, History of microbiology, Taxonomy and classification of microbes, Microbial variety, Microbial metabolism and growth, Human microbiome concept, Microbial habitat and transmission, Microbial pathogenicity, Koch's postulates and proof of causation, Principles of detection and identification of microorganisms, Storage of microorganisms, Bacterial genetics, Basic microbiological techniques and quality control, Biosafety in microbiology.

Course Assessment: In-course 30%, End semester 70%

ML 1204 Professional skills in MLS (1 Credit)

History of Medical Laboratory Science, Legislation pertaining to health care system focusing Medical Laboratory Scientist as a profession and its development, Structure and practice settings, Role of MLS professional associations, Patient care and communication skills, interviewing skills, taking instructions, handling patient expectations, avoiding and handling complaints, Work and case management, Time management, Professional liability, mindfulness and stress management, Soft skills and good moral values for personal and professional development, Introduction to portfolio development.

Course Assessment: In-course 40%, End semester 60%

2000 level

EL 2103 Intermediate English for Allied Health Sciences 1 (3 Credits)

The second year courses are developed with the aim of introducing students to English for Academic Purposes (EAP). A higher level of competency is expected at this level as students will be introduced to technical and formal writing.

The aim of this course is to ensure that students are successful at UTEL Level 5 in the Reading and Writing examinations. More specifically, the course aims to familiarize students with academic texts of a descriptive and argumentative nature, including visuals such as graphs and tables, as well as to ensure that they can summarize, take notes, skim and scan effectively, and write narrative/descriptive/informative texts of approximately 500 words.

This module caters to the need of English competency for academic and professional purposes.

Students will also be familiarized with IELTS, and complex technical writing. Students are expected to undertake writing assignments of some complexity, identify the authorial voice in texts and to state and defend one's position on issues in an argument.

Key Areas of Focus: Academic and professional texts from the main field and sub-fields of Allied Health Sciences, reading comprehension passages of general and specific interest to undergraduates, reference and citation style guides. Academic and professional text writing, visuals (tables, charts, graphs) and data commentaries (qualitative and quantitative). Language Development and Writing, Cause-effect relationships, Process writing, Comparisons, Formal Letter writing, Direct-Indirect Speech, Vocabulary expansion, Thesis statements, Idioms and proverbs, Phrasal Verbs, Varieties of English, Exposure to different accents of English, Poster presentations, Debates, Group discussions and puzzles. Developing schemata and description, Transitional devices, Report writing, Conditionals, Preparation of a Curriculum Vitae, Application procedure, Reading and understanding Journal Articles, Précis Writing, IELTS Practice tests, How to face an Interview, How to make a presentation, Presentation of a report.

Course assessment: In-course 40%, End semester 60%

ML 2101 Haematology I (3 Credits)

Introduction to haematology, Haemoglobin & determination of haemoglobin, Packed cell volume/haematocrit, Erythrocyte sedimentation rate, Preparation of blood smears & identification of common problems, Techniques of blood cell counting, Red blood cells and inclusions & indices, White blood cells & differential count, Reticulocytes & count, Morphology and function of platelets, Automated haematology analyzers, Quality control and identification of errors, Iron deficiency anaemia, Megaloblastic anaemia.

Course Assessment: In-course 30%, End semester 70%

ML 2102 Clinical Chemistry I (3 Credits)

The role of clinical chemistry in preventive medicine, Formation & composition of urine, Physical, chemical, microscopic examination of urine, Automated analysis of urine and point-of-care testing, Use of urine testing in diagnosis of inherited metabolic diseases, Renal calculi & chemical analysis of calculi, Renal diseases and renal function test, Disorders of fluid and electrolytes, measuring techniques, Acid-base imbalance, Abnormalities in glucose metabolism, Incorporate the indications, assay methods & their principles, sample collection & transport, processing & reporting, and quality control of above laboratory tests.
Course Assessment: In-course 30%, End semester 70%

ML 2103 Medical Bacteriology (2 Credits)

Characteristic features, pathogenicity, clinical conditions and identification tests of medically important bacteria, Traditional and rapid diagnostics in microbiology, Maintenance of quality of analytical processes.
Course Assessment: In-course 30%, End semester 70%

ML 2104 Histotechnology (3 Credits)

Introduction to histotechonology, Overview of main steps of histology specimen preparation, accession of histopathological specimens, fixation of tissues, grossing, tissue processing, decalcification of calcified tissues, paraffin embedding and blocking, microtomy, routine staining with H & E, mounting and labeling, Processing fresh histology specimens and cryosectioning, Mechanical faults and remedial measures in H & E stained paraffin sections, Special staining techniques for the evaluation of histological sections, Basics of immunofluorescence and immunohistochemistry techniques, Quality assurance in histotechonology, Accreditation procedures inhistopathology laboratory, Basic concepts of electron microscopy, Histometry, Preparation of fixatives, decalcifying agents, reagents for tissue processing, different haematoxylin stains, eosin stain and main special stains.
Course Assessment: In-course 30%, End semester 70%

ML 2105 Specimen Collection & Transport (2 Credits)

Blood collection techniques (finger prick, heel prick & venipuncture techniques), Anticoagulants, Separation of serum & plasma, Preparation of patients, communication with patients, Collection, transport, processing, and rejection criteria for different specimens in haematology, biochemistry, microbiology & histopathology, Safety aspects in specimen collection and transport, Pre-analytical errors in different disciplines.

Course Assessment: In-course 30%, End semester 70%

ML 2106 Basic Immunology (1 Credit)

Introduction, Cells and organs of the immune system, Innate & acquired immunity, Molecular mechanisms of innate and adaptive immunity, Antigens, antigen processing and presentation, Humoral immunity, immunoglobulins and antibody diversity, Antigen-antibody reactions, Cell-mediated effector responses, Complement system.

Course Assessment: In-course 30%, End semester 70%

ML 2107 Molecular genetics & cytogenetics (2 Credits)

Introduction to molecular genetics, Genetic recombination, Gene expression and regulation, RNA silencing, DNA damage and mutagenesis, DNA & RNA extraction methods, PCR technology, Gel electrophoresis, Ethical and societal impact of molecular genetics, Mendelian inheritance, Laws of inheritance, Sex linked inheritance, Pedigree analysis, Exceptions to Mendelian genetics, Chromosome morphology and structure, Cytogenetic concepts and nomenclature, Assisted reproductive technologies & birth defects, Chromosomal aberrations, chromosome culture & karyotyping methods, Genetic disorders and malignancies, Biochemical genetics, Gene therapy and techniques, Stem cell therapy and applications, Recombinant DNA technology, DNA diagnostics (restriction enzyme digestion and DNA fingerprinting).

Course Assessment: In-course 30%, End semester 70%

EL 2204 Intermediate English for Allied Health Sciences 1 (3 Credits)

This module The aim of this course is to ensure that students are successful at UTEL Level 5 in the Listening and Speaking examinations. They will, therefore, be able to listen to and grasp the main idea of a short speech, through an understanding of sequence markers and key vocabulary related to these spoken texts. This includes subject-related English for Academic Purposes (EAP). The aim is also to enable students to make short descriptive speeches about themselves, their surroundings and their basic substantive disciplines.

Key Areas of Focus: Short lectures and note-taking, discussions on subject- specific areas, answering listening comprehension exercises, identification of main ideas of verbal/visual texts and provide evidence. Understanding and following complex instructions within the field of AHS. Making impromptu speeches, conducting small- group discussions, role plays and simulations, and delivering short speeches on given topics.

Course assessment: In-course 40%, End semester 60%

ML 2201 Haematology II (3 Credits)

Haemolytic anaemia, Aplastic anaemia & pancytopenia, Laboratory investigations and interpretation of thalassaemia and other haemoglobinopathies, Interpretation of hemoglobin electrophoresis, G6PD

deficiency, WBC disorders and myeloproliferative disorders (leukaemia, lymphoma and multiple myeloma) and paraproteinaemia, Interpretation of flow cytometry, Laboratory investigations for bleeding disorders, Coagulation disorders and thrombotic tendency, Cytogenetics in the diagnosis of haematological disorders.

Course Assessment: In-course 30%, End semester 70%

ML 2202 Clinical Chemistry II (3 Credits)

Abnormalities in lipid metabolism, Clinical significance in lipoproteins, Lipid profile, Clinical enzymology, Cardiac markers, Tumor markers, Liver and GI disorders, Liver function tests, Heme degradation and bilirubin metabolism, Heme biosynthesis and porphyrias, Plasma proteins and their clinical relevance (including acute phase proteins), Exudates & transudates, Examination of other body fluids, Diseases related to CNS and analysis of CSF, Principles of enzyme analysis and photometry.

Course Assessment: In-course 30%, End semester 70%

ML 2203 Systematic Virology and Mycology (2 Credits)

Introduction to fungi, Classification and general properties of fungi, Yeasts (Candida, Cryptococcus), Dimorphic fungi, Dermatophytes, Filamentous fungi pathogenic to humans,

Introduction to viruses including classification and general properties of viruses, General aspects of virology with reference to DNA viruses and RNA viruses, Maternal viral infection that affect the foetus and neonate, Medically important viral infection in immunocompromised patients, Pathogenesis and control of viral diseases.

Course Assessment: In-course 30%, End semester 70%

ML 2204 Cytotechnology (3 Credits)

Introduction to cytotechnology, Overview of cytopreparatory techniques, Cytological fixatives, stains and staining techniques, Cytopreparatory techniques of non–gynecological cytology specimens, pleural, peritoneal and pericardial fluids, CSF, specimens from the respiratory tract, GIT and the urinary tract, fine needle aspiration cytology specimens, Specimens of gynecological cytology, cytological sampling techniques of the female genital tract and preparation of smears, normal and abnormal cervical cytology, Introduction to Bethesda system for reporting cervical cytology, Ancillary techniques in cytology, Cytocentrifugation, Basics of immunocytochemistry and flowcytometry, Artifacts in cytology and remedial measures, Quality assurance in cytology, preparation of fixatives, centrifugation and smear preparation; preparation of smears from fresh specimens, fixation of smears by wet fixation and air drying techniques, Cell block preparation, Preparation of Leishman, Giemsa , H & E stain and Pap stain, Staining cytology smears, Identification of normal and abnormal cytological findings in Pap smears. Course Assessment: In-course 30%, End semester 70%

ML 2205 Medical Parasitology and Entomology (2 Credits)

Introduction to parasitology & medical entomology, Intestinal & luminal protozoans, Intestinal nematodes, trematodes & cestodes, Malaria & its control/ eradication, other important tissue protozoans, Tissue nematodes, Human filariasis & control, Mosquitoes & other arthropods of medical importance, and control of arthropod borne infections.

Course Assessment: In-course 30%, End semester 70%

ML 2206 Immunotechnology (2 Credits)

Methods of detecting antigen-antibody reactions, Monoclonal antibodies, Determination of antibody titres, Flowcytometry, Laboratory diagnosis of autoimmunity, hypersensitivity and immunodeficiency, Serodiagnosis, Immunology in organ transplant/ implant, Vaccine production, Cancer immunodiagnostics and immunotherapy. Course Assessment: In-course 30%, End semester 70%

ML 2207 Biomedical Instrumentation (1 Credit)

Basic concepts, calibration & maintenance of analytical instruments in a clinical laboratory, Biosafety cabinet, Laboratory automation, Automated blood culture analyzer, Automated haematology analyser, Semi/ fully automated biochemistry analyser, Tissue processor, Microtome, ELISA testing equipment and instruments used for PCR.

Course Assessment: In-course 30%, End semester 70%

3000 level

ML 3101 Transfusion Medicine (1 Credit)

Introduction to blood bank, ABO blood grouping and Rh typing, Discrepancies in ABO grouping, Other important blood group systems, Preparation of blood components, Screening tests for transfusion transmissible infections, Pre-transfusion tests, Direct and indirect Coombs tests, Antenatal serology, HLA/ tissue typing, Laboratory investigations for transfusion related reactions, Quality control of blood and blood products.

Course Assessment: In-course 30%, End semester 70%

ML 3102 Clinical Chemistry III (3 Credits)

Reproductive endocrinology, Sub fertility and assisted reproductive technologies, Seminal fluid analysis, Disorders in bone metabolism, Thyroid disorders, thyroid function tests, Diseases related to pituitary gland and adrenal gland, Principles of screening and the use of biochemical tests in inborn errors of metabolism, Clinical nutrition, Disorders in purine metabolism, Therapeutic drug monitoring, Toxicology, Blood gas analysis and point of care testing, Clinical chemistry at the extremes of age and pregnancy, Troubleshooting in clinical chemistry, Incorporate the indications, assay methods & their principles, sample collection & transport, processing & reporting, quality control of above laboratory tests.

Course Assessment: In-course 30%, End semester 70%

ML 3103 Diagnostic Virology and Mycology (2 Credits)

Laboratory diagnosis and prevention of fungal infections of medical importance including infections caused by yeasts (Candida, Cryptococcus), dimorphic fungi, dermatophytes and other filamentous fungal infections in humans, Laboratory diagnosis and prevention of viral infections caused by DNA viruses and RNA viruses, Maternal viral infection that affect the foetus and neonate, Pathogenesis, diagnosis and control of emerging and re- emerging viral infections, Laboratory diagnosis of viral infection in immunocompromised patients.

Course Assessment: In-course 30%, End semester 70%

ML 3104 Laboratory Quality Assurance & Accreditation (3 Credits)

Introduction to Quality Management System (QMS), concepts of quality assurance, internal quality control, external quality assurance, Standards, quality control & reference materials, Establishment of method verification & performance specifications, quality indicators, Systematic troubleshooting, Quality control in pre-analytical & post-analytical procedures in different disciplines of laboratory tests, Internal audits, Document control.

Introduction to laboratory accreditation, ISO 15189 standards, Sequence of accreditation & document preparation, Method of internal auditing, Measurement of uncertainty for different tests, calibration of equipment, Identify the opportunities for continual improvement within an organization.

Course Assessment: In-course 40%, End-semester 60%

ML 3105 Diagnostic Parasitology (2 Credits)

Micrometry relevant to parasitology, Faecal examination for parasitic infections: collection, transport and preservation of specimens, direct smears (Iodine, saline, eosin), concentration techniques, culture techniques, permanent staining (trichrome, iron-haematoxylin, acid fast stains), Examination of blood/ smears for parasitological infections, direct, concentration techniques, Molecular and immunodiagnosis of malaria, filariasis, trichomoniasis, toxoplasmosis & leishmaniasis, Arthropods of medical importance, collection techniques, identification, preservation and transport to reference laboratories, dissection of medically important insects, Quality control and quality assurance in parasitology.

Course Assessment: In-course 30%, End semester 70%

ML 3106 Experimental Laboratory Technology (3 Credits)

Introduction of *in-vivo*, *in-vitro*, *in-silico* and *in-situ* techniques, Introduction to in-vivo experimental techniques, Use of laboratory animals, laboratory animal biology, nutrition, welfare, planning and handling, Alternative techniques used for laboratory animal research, Introduction to in-vitro experimental techniques, risk assessment, laboratory practices under sterile environment, Introduction to primary cells & cell lines and applications specially focusing on human cells, Identification of culture characteristics and culture environments, Culturing and maintenance of cells, Cryopreservation and cell banking, Disposal of cell culture waste, Introduction to regenerative medicine and tissue engineering, Introduction to in-silico methods for identifying biomarkers/ metabolites, Introduction to in-situ experimentation and applications.

Course Assessment: In-course 30%, End semester 70%

ML 3107 Medical Statistics (2 Credits)

Big picture of statistics, Data, Sample and population, Variables, Describing data, measures of central tendency, measuring variability, presenting data, Probability and normal curve, Hypothesis and hypothesis testing, Comparing means, parametric tests, hypothesis testing with categorical data, analysis of variance (ANOVA), Non- parametric tests, Introduction to linear regression, Applications of basic statistics knowledge in research (sample size calculations and selection of appropriate statistical test).
Course Assessment: In-course 30%, End semester 70%

ML 3108 Research Methodology & Proposal Writing (2 Credits)

Introduction to research in health sciences, Scientific method and the research process, Types and methods of research, Research designs and data collection tools, Use of search engines for literature review, Reference management system for citations, Use of statistical software for data analysis, Critical assessment on research and address ethical and practical issues, Conceptualization of research proposals referring to case studies,
surveys, interviews, participant observation and other published information. Course
Assessment: In-course 30%, End semester 70%

ML 3201 Laboratory Management (2 Credits)

Basic management concepts, Scope of medical laboratory management & laboratory manager's role, Laboratory planning & organization, Specimen management & processes, Personal management & training, Equipment management, Financial management, Chemical management & ordering process, Data management & statistics, Health & safety in laboratory, Medical laboratory waste management (routine and special), Occurrence management, Root cause analysis as a problem solving tool, Customer satisfaction surveys, Principles of good laboratory practice (GLP) & application, Risk assessment, Supply chain management.
Course Assessment: In-course 30%, End semester 70%

ML 3202 Biotechnology & Molecular Diagnostics (2 Credits)

Introduction and applications of biotechnology, Advanced recombinant DNA technology, DNA sequencing methods and applications, Functional genomics & proteomics, GWAS, oncogenomics, Precision medicine, Pharmacogenetics & pharmacogenomics, Gene editing, CRISPR and applications, RNA sequencing, Transcriptomics & microarray analysis, Introduction to bioinformatics and applications, Bioinformatics databases, Retrieving and analyzing sequence data, Phylogenetic analysis, Primer designing and genotyping assays, ethics in biotechnology, Molecular diagnostics, DNA,RNA extraction, RFLP, DNA/RNA amplification using PCR/RT-PCR, Real time PCR & qPCR, multiplex & nested PCR, LAMP, post-PCR processing, Sequencing, Applications of molecular tools in diagnosis of genetic diseases, Biochemical disease screening, Cancer detection and infectious disease diagnosis, Forensic DNA analysis.

Course Assessment: In-course 30%, End semester 70%

ML 3203 Diagnostic Bacteriology (3 Credits)

Use of microbiology laboratory in the diagnosis of respiratory tract infections, gastrointestinal infections, sexually transmitted infections, central nervous system infections, bacteraemia/ infective endocarditis, skin and soft tissue infections, urinary tract infections, ENT & eye infections, Infection in the compromised host, Choice of appropriate test in an infective disease, Antibiotics and their mode of actions, Principles and procedures of different types of antibiotic sensitivity testing (ABST) methods used in diagnostic and research laboratories, Antibiotic resistance mechanisms and methods of their detection, Quality assurance in a microbiology laboratory.Course Assessment: In-course 30%, End semester 70%

ML 3204 Public Health Microbiology (2 Credits)

Introduction to public health microbiology, Containment levels , Infections of public health importance in Sri Lanka and the world: mode of transmission, epidemiology of infectious diseases and role of public health microbiologists, Prevention and control of infection in the light of one health approach, Community and hospital outbreak investigations, Laboratory protocol and disease surveillance in relation to food poisoning, food and water borne diseases, Emerging and re-emerging infections, Zoonotic diseases, Tests used on food and water quality investigations, Bio-terrorism and bio-invasion.

Course Assessment: In-course 30%, End semester 70%

ML 3207 Medical Ethics (1 Credit)

Introduction and definition of terms, Principles of bioethics, History, Codes of ethics-Hippocratic oath and other codes, Introduction to medical ethics, Ethics in public health– rights, duties, obligations related to health care professionals and patients, Ethical issues related to professionalism, truth telling and informed consent, confidentiality, Ethics and mental health, Ethics in research, Ethics in use of animals in research, Ethics and biotechnology, Major ethical issues-in organ and tissue donation, biofuels, forensic use of bio information & international collaboration, Cases for discussion.

Course Assessment: In-course 40%, End semester 60%

ML 3208 Portfolio Development (1 Credit)

Develop an individual portfolio to reflect upon all learning experiences (soft skills and good moral values) including those that have taken place at outside working environments, in training programmes (workshops, seminars, conferences, and classes to enhance professional development), working as a volunteer, during self-study, while pursuing hobbies or other interests, etc. and consider multiple ways to provide evidences of different learning aspects within those environments.

Course Assessment: End semester 100%

ML 3209 Research Project (6 Credits)

Retrieval of information required such as conducting literature surveys, Identification and optimal utilization of available resources, Project execution, Ethical evaluation and safety evaluation when applicable, Follow the approved research methodology, Data collection & analysis, Discussing the results, Making conclusions, Scientific dissertation writing according to the given format and presentation (oral) of the findings.

Course Assessment: In-course 30%, End semester 70%

Optional courses

ML 3205 Healthcare Marketing (1 Credit)

Introducing marketing and orientation towards marketing, marketing environment and marketing research, consumer market and consumer buying behavior, Market segmentation and selecting target markets, Product strategy and new product development, Pricing strategies and programs, Distribution strategy, Marketing communications strategy, Strategic marketing, Ethics and social responsibility in health care marketing, Emerging issues in healthcare marketing.

Course Assessment: In-course 30%, End semester 70%

ML 3206 Human Resource Management (1 Credit)

Introduction to human resource management, The role of human resource professionals, Job analysis & human resource planning, Employee recruitment & selection, Career management, Employee training, Employee development, Employee performance management, Compensation management, Emerging issues in human resource management, Talent management.

Course Assessment: In-course 30%, End semester 70%

4000 level

Work Place Based Training (30 credits)

ML 4CLIN01 Haematology

Preparation of glassware for haematology, Manual and automated techniques for cell count, Haemoglobin & indices, Blood film preparation & staining, ESR, Blood pictures (anaemia, thalassaemia, leukaemia), Maintenance of analytical equipment in haematology laboratory, Laboratory investigation for anaemias, Myeloproliferative disorders and multiple myeloma, Investigations of leukemia & lymphoma, Investigations of coagulation, bleeding disorders and thrombotic tendency, Bone marrow-slide preparation & staining, Haemoglobin electrophoresis,

Quality control in the haematology laboratory.
Course Assessment: In-course 30%, End semester 70%

ML 4CLIN02 Clinical Chemistry

Urine full report, Urine ketone bodies, bile, specific gravity, Seminal fluid analysis, Body fluid analysis, Blood glucose (FBS, PPBS, OGTT), Blood urea, Blood urea nitrogen, Serum creatinine, Serum bilirubin, Serum proteins, Serum protein electrophoresis, Serum electrolytes, SGOT/SGPT, Serum amylase, Alkaline phosphatase, Serum uric acid, Creatinine clearance, Urine micro albumin, Detail description is given on following aspects: (indication of the test, assay methods and their principles, reagent preparation, sample collection and transport, performance of tests, reporting and quality control in above testing)
Course Assessment: In-course 30%, End semester 70%

ML 4CLIN03 Microbiology & Immunotechnology

Specimen collection and transport, Processing and culture of all clinical specimens (related to bacterial, viral and fungal diagnosis including STDs), Preparation and quality assessment of all stains, reagents, culture media and biochemical tests, Methods of sterilization and disinfection, Waste management, all conventional and modern testing methods including quality control in a diagnostic microbiology laboratory, microbial sensitivity testing, serology and other point of care tests.
Course Assessment: In-course 30%, End semester 70%

ML 4CLIN04 Histotechnology and Cytotechnology

Basic laboratory techniques in histopathology laboratory:- Collection, labeling, fixation and transportation of surgical pathology and postmortem specimens according to the SOPs, Accession of specimens, decalcification, grossing, tissue processing, paraffin embedding and blocking, trimming and section cutting, handling the tissue floatation bath and the slide warmer, preparation of routine H & E stains and other types of haematoxylins, Staining tissue sections with Harris's haematoxylin and different types of commonly used H & E stains, mounting, labeling slides, Preparation of commonly used special stains and perform special staining techniques for evaluation of histology sections.

Basic laboratory techniques in cytology laboratory: Transportation and reception of cytology specimens including smears and fluids, prepare cytological fixatives and perform fixation methods of cyto-smears, Perform cyto- preparatory techniques of non–gynecological cytology specimens and gynaecological cytology specimens,

Preparation of smears from fresh specimens; fixation of smears, Cell block preparation, Preparation of Leishman, Giemsa , H & E and Pap stains, Saining gynaecological and non-gynaecological smears using above mentioned stains appropriately, Screen Pap smears according to Bethesda system for reporting cervical cytology, Advanced techniques in histopathology and cytology laboratories: Cryosectioning; immunohistochemistry, Immunocytochemistry, Immunofluorescence technique, Processing specimens for electron microscopy, Identify and rectify the errors in all histotechnolgical and cytotechnological procedures, Identification of mechanical errors and faults in prepared histology slides and cytology smears, Transportation of fresh specimens and other special type of specimens for advanced laboratory procedures, Laboratory safety and waste disposal in histopathology laboratory, Automation in the histopathology laboratory, Quality assurance in histotechnology and cytotechnology. Course Assessment: In-course 30%, End semester 70%

ML 4CLIN05 Medical Parasitology and Entomology

Preparation and examination of wet faecal smears (saline and iodine) for protozoans and helminthes, Identification of ova (concentration techniques & quantitative techniques), adult worms & larvae, tapeworm segments, Preparation of blood smears & stains (Leishman /Giemsa) & staining blood films for identification of malaria parasites and microfilariae, Rapid Diagnostic Tests (RDTs), Molecular and immunological techniques for parasitic infections, Preparation, staining & identification of Leishmania, Toxoplasma, Trichomonas, Cryptosporidium, Identification of eggs, larva & adults of medically important mosquitoes, Identification of medically important arthropod vectors (flies, ticks, mites, fleas, lice etc.).

Course Assessment: In-course 30%, End semester 70%

ML 4CLIN06 Transfusion Medicine

Perform ABO & Rh typing, Discrepancies in blood grouping, Other blood group systems, Pre-transfusion tests & identify any deviations from the expected results, Antenatal serology, Preparation of blood components/ products, Direct & indirect Coombs tests, Antibody screening & identification, Rh antibody titers, Cold antibody titers, HLA typing, investigations of transfusion reactions, Quality controls/ management in transfusion medicine. Course Assessment: In-course 30%, End semester 70%

ML 4CLIN07 Industrial Training

Specimen management processes, Human potential management & training, Equipment management, Financial management, Chemical management & ordering process, Inventory handling, Data management & statistics,

Health & safety in laboratory, Medical laboratory waste management (routine and special), Occurrence management, Root cause analysis as a problem solving tool, Laboratory ergonomics, healthcare marketing.
Course Assessment: In-course 50%, End semester 50%