GURU KASHI UNIVERSITY
PUNJAB - INDIA

Program Syllabus Booklet

Master of Science in Medical Laboratory Technology (Clinical Microbiology)

(MMLT -805)

Session: 2021-22

University College of Paramedical Sciences

Guru Kashi University,Talwandi Sabo

GURU KASHI UNIVERSITY
PUNJAB - INDIA

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Annexure -1

Program: Master of Science in Medical Laboratory Technology (Clinical Microbiology)

Program Code: 805

Program Outcomes (PO): The Program Outcomes for the Master of Science in Medical Laboratory Technology (Clinical Microbiology) are as follows:-

PO	Statement
PO1	Perform routine clinical laboratory procedures within acceptable quality control parameters in Hematology, Biochemistry, Immunohematology, Cytopathology, Histopathology, Blood transfusion and Microbiology
PO2	Demonstrate technical skills, social behavior, and professional awareness incumbent upon a laboratory technician.
PO3	Explain the basic nature of disease processes from the standpoint of causation, epidemiology, natural history, and the structural and functional abnormalities that result.
PO4	Apply systematized problem solving techniques to identify and correct procedural errors.
PO5	Operate and maintain laboratory equipment, utilizing appropriate quality control and safety procedures.
PO6	Effect a transition of information and experiences learned in the MLT program to employment situations and performance on the written examinations.
PO7	Recognize and participate in activities which will provide current knowledge and upgrading of skills in laboratory medicine.
PO8	Practice professional and ethical responsibilities with high degree of credibility, integrity and social concern.

The Program Specific Outcomes (PSO) for the programme Master of Science in Medical Laboratory Technology (Clinical Microbiology) are as follows:

PSO	Statement
PSO1	To apply knowledge of entry-level skills to accurately perform testing in all areas of the medical laboratory.
PSO2	To employ interpersonal communication skills when interacting with patients, lab personnel and other health care professionals
PSO3	Successful students may go for doctorate in the field of their interest or may work for

Annexure-2

Semester: 1st										
Sr.	Course Code	Course Name	Type of Course T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	805101	Human Anatomy and Physiology	T	4	1	0	5	50	50	100
2	805102	Clinical Microbiology	T	4	0	0	4	50	50	100
3	805103	Clinical Biochemistry	T	4	0	0	4	50	50	100
4	805104	Immunology	T	4	1	0	5	50	50	100
5	805105	Hematology	T	4	0	0	4	50	50	100
6	805106	Hematology Laboratory	P	0	0	4	2	60	40	100
7	805107	Clinical Biochemistry Laboratory	P	0	0	4	2	60	40	100
8	805108	Clinical Microbiology Laboratory	P	0	0	4	2	60	40	100
Total No. of Credits				28						

Semester: 2nd									
Sr.	Course Code	Course Name	Type of CourseT/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	805201	Molecular Biology and Genetics	T	4	1	0	5	50	50	100
2	805202	Systemic Bacteriology	T	4	1	0	5	50	50	100
3	A805203	Biotechniques	T	4	1	0	5	50	50	100
4	805204	Cell Biology	T	4	0	0	4	50	50	100
5	805205	Applied Microbiology and Quality Control	T	3	1	0	4	50	50	100
6	A301101	Communication Skills	T	4	0	0	4	50	50	100
7	805206	Systemic Bacteriology Laboratory	P	0	0	6	3	60	40	100
Total No. of Credits				30						

Semester: 3rd										
Sr.	Course Code	Course Name	Type of Course T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	805301	Virology and Mycology	T	4	1	0	5	50	50	100
2	805302	Biostatistics	T	3	1	0	4	50	50	100
3		**Elective – I**	T	4	1	0	5	50	50	100
4	805304	Parasitology	T	4	0	0	4	50	50	100
5	805305	Computer Applications	T	4	0	0	4	50	50	100
6	805306	Virology and Mycology Laboratory	P	0	0	4	2	60	40	100
7	805307	Histopathology and Cytology Laboratory	P	0	0	4	2	60	40	100
8	805308	Parasitology Laboratory	P	0	0	4	2	60	40	100
Total No. of Credits				28						

Elective - I (Select one of the following subjects)

Sr. No.	Subject Code	Subject Name
1	805303	Histopathology and Cytology
2	805309	Advance Principle of Toxicology

Semester: 4th										
Sr.	Course Code	Course Name	Type of Course T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	805401	Internship (6 Months)	NA	NA	NA	NA	20	500	500	1000
Total No. of Credits				26						

Annexure-3

Course Name: Human Anatomy and Physiology

Course Code: 805101

Semester: 1st

Credit: 05 **L T P**

4 1 0

Course Outcomes: On completion of this course, the successful students will be able to:

CO	Statement
CO1	Understand about the various muscles, organs, bones, joints, tendons, ligaments, blood vessels and cells.
CO2	Identify the anatomy of cell organelles, blood component, function, skeletal system, circulatory system, lymphatic system and its structure.
CO3	Learn different properties of nerve fibres, anatomy of neuralgia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.
CO4	Recognize the roles of hormones and clinical importance of pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas
CO5	Analyze malfunctioning organs, their causes, symptoms and clinical investigations.

Course Contents

UNIT-1

Introduction to anatomy and physiology: Cell physiology and homeostasis, classification of tissue with structure and function of each type, body cavities, body fluids and membranes

Cardiovascular System: Anatomy and physiology of heart, blood vessels, conductive system of heart, cardiac cycle

Lymphatic System: Structure and function of lymph vessels, lymph nodes, primary and secondary lymphoid organs

UNIT-2

Excretory System: Structure and function of kidney, Ureter, urinary bladder and urethra, renal functions tests

Endocrine System: Structure and function of pineal, pituitary, thyroid, parathyroid, thymus, pancreas and adrenal

UNIT-3

Muscular System: Structure and types of muscles in human body, neuromuscular transmission and mechanism of muscle contraction

Skeletal System: Classification, structure and function of skeletal system, development and types of bones, micro anatomical and gross structure of a bone, various movement and types of joints

Nervous System: CNS, ANS, PNS, conduction of nerve impulse

Reproductive System: The male and female reproductive systems, gametogenesis, menstrual cycle, fertilization and embryo genesis.

UNIT-4

Gastrointestinal System : Gastrointestinal tract and associated glands, digestion of food in mouth, stomach and small intestine, gastrointestinal tract movements and absorption, structure and function of liver and pancreas

Respiratory System: Functional anatomy of respiratory system, pulmonary function test, mechanism of respiration

REFERENCES:

Waugh, A., & Grant, A. (2014). *Ross & Wilson Anatomy and physiology in health and illness E-book*.Elsevier Health Sciences.

Sembulingam, K., &Sembulingam, P. (2012). Essentials of medical physiology. JP Medical Ltd

Chaurasia, B. D. (2004). *Human anatomy* (p. 53).CBS Publisher.

Marieb, E. N., &Nicpon-Marieb, E. (1992). Human anatomy and physiology Redwood City, CA: Benjamin/Cummings Publishing Company.

Hall, J. E., & Hall, M. E. (2020). Guyton and Hall textbook of medical physiology e-Book.Elsevier Health Sciences.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	-	-	-	2	2	1
CO2	2	2	2	2	2	2	-	-	2	2	2
CO3	3	3	3	2	2	2	1	1	2	3	2
CO4	3	3	3	3	3	3	2	2	3	3	3
CO5	2	3	3	3	3	3	2	2	3	3	3
Average	**2.4**	**2.6**	**2.6**	**2.4**	**2.4**	**2.0**	**1.0**	**1.0**	**2.4**	**2.0**	**2.0**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Clinical Microbiology

Course Code: 805102

Semester: 1st

Credit: 04 **L T P**

4 0 0

Course Outcomes: On completion of this course, the successful students will be able to:

CO	Statement
CO1	Understand sterilization methods- moist and heat
CO2	Diagnose pathogenic microorganism's helps in treatment of diseases.
CO3	Recall types, pathogencity and laboratory diagnosis of nosocomial infection.
CO4	Narrate microbial growth identification and laboratory diagnosis of bacterial infection, prevention and control of infections.
CO5	Understand sterilization methods- moist and heat. Identify bacterial, fungal, and parasitic species by microscopic examination.

Course Contents

UNIT-1

Introduction, history & scope of Microbiology: Introduction and historical developments of microbiology, scope of microbiology, general characteristics of prokaryotes and eukaryotes, classification of prokaryotes, introduction to mycology, virology and parasitology

UNIT-2

Microscopy: Importance of microscopy, principle, operation and applications of light microscope, phase contrast microscopy, fluorescence microscopy, electron microscopy

Structure of Bacterial cell :General structure and functions of gram positive and gram negative bacteria, cell wall, cell membrane, cytoplasmic inclusions and mesosomes, flagella, capsule, ribosome, chromosome, plasmid and endospore, morphological classification of bacteria

UNIT-3

Sterilization &Disinfection: Introduction and its types, principle, procedure and its application, quality control for sterilization and disinfectant techniques, biosafety in microbiology lab.

Sterilization control and sterility testing (heat sterilization, D value, z value, survival curve, Radiation, gaseous and filter sterilization) Chemical and biological indicators. Design and layout of sterile product manufacturing unit

Nutrition &Growth: kinetics of growth, continuous culture and synchronous growth cultures, aerobic & anaerobic cultures, Introduction and its types, various factors affects on microbial growth

Chemotherapeutic Agents: Introduction, types, mode of action and its clinical importance of antibiotic sensitivity tests, Introduction, types, mode of action and importance of multiple drugs resistance, mechanism of drug resistance

UNIT-4

Lab diagnosis of pathogenic microorganisms: Normal microbial flora of the human body, collection and transport of specimens, processing of clinical specimens for microbiological examination

Environmental and Applied Microbiology: Bacteriology of air, water, food, milk

Nosocomial Infections: Introduction and its types, pathogenicity and laboratory diagnosis of nosocomial infection, prevention and control of nosocomial infections

References:

Brown, A., & Smith, H. (2014). Benson's Microbiological Applications, Laboratory Manual in General Microbiology, Short Version.McGraw-Hill Education.

Brown, A., & Smith, H. (2014). Benson's Microbiological Applications, Laboratory Manual in General Microbiology, Short Version.McGraw-Hill Education.

E Brown, A. (2001). Benson's Microbiological Applications Laboratory Manual in General Microbiology-Alfred E Brown.

Tortora, G. J., Funke, B. R., Case, C. L., Weber, D., & Bair, W. (2004). Microbiology: an introduction (Vol. 9). San Francisco, CA: Benjamin Cummings.

Parija, S. C. (2013). Textbook of Microbiology & Immunology-E-book.Elsevier Health Sciences.

Murray, P. R., Rosenthal, K. S., &Pfaller, M. A. (2020). Medical microbiology E-book.Elsevier Health Sciences.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO 2	PSO 3
CO1	3	2	2	3	2	1	1	1	2	2	1
CO2	1	3	3	3	1	1	1	2	3	3	3
CO3	2	3	3	3	2	1	-	1	1	2	2
CO4	1	3	3	2	2	1	-	1	2	1	2
CO5	2	3	3	3	3	1	1	2	2	2	2
Average	**1.8**	**2.8**	**2.8**	**2.8**	**2**	**1**	**1**	**1.4**	**2**	**1.8**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Clinical Biochemistry

Course Code: 805103
Semester: 1st

Credit: 04 **L T P**

4 0 0

Course Outcomes: On completion of this course, the successful students will be able to:

CO	Statement
CO1	Understand biomolecules, metabolism and inborn errors of metabolism.
CO2	Recall various organ function tests and their significance in result interpretation.
CO3	Correlate the knowledge of patho-physiology of organ system and hormonal imbalance.
CO4	Apply biochemical changes involved in various clinical conditions associated with glands and organs of human body.
CO5	Identify deficiency disease and their correlate conditions including interpretations.

Course Contents

UNIT-1

Biomolecules :Introduction to carbohydrates and their functions, metabolic reactions of carbohydrates, introduction to lipids and their functions, metabolic reactions of lipids, introduction to proteins and their functions, metabolic reactions of proteins

Inborn errors of metabolism: Inborn errors of carbohydrate metabolism, Inborn errors of lipid metabolism, Inborn errors of protein metabolism, inborn errors of amino acid metabolism: phenyl ketonuria, alkeptonuria, albinism, cystinuria, inborn errors of carbohydrate metabolism: Glycogen storage disease.

UNIT-2

Biochemical changes in diseases: Biochemistry of diabetes mellitus, fatty liver its cause and symptoms, biochemical changes involved in fatty liver, atherosclerosis and biochemical changes involved

Organ function tests 1: Liver function tests, functions of Liver, Metabolic functions, excretory functions, protection and detoxification, diseases of Liver, principle and clinical importance of liver markers

UNIT-3

Organ function tests 2 :Formation of urine, excretory and reabsorptive functions, regulatory functions, homeostasis, introduction to disease of kidney, kidney profile test, blood urea nitrogen, serum creatinine, total protein, albumins, globulins, A/G ratio., clearance tests, urine examination, Thyroid gland structure and functions, production of thyroid hormones, types of hyper and hypothyroidism, Hashimoto's disease and Grave's disease, thyroid function test

UNIT-4

Malnutrition disorders: Marasmus, kwashiorkor, nutritional deficiency of vitamins& minerals, prescribed diet, hypervitaminosis and hypovitaminosis

Cancer: Etiology of cancer, biochemical changes of cancer, role of oncogenes, apoptosis, biochemical basis of metastasis

References:

Champe, P. C., Harvey, R. A., & Ferrier, D. R. (2005). Biochemistry.Lippincott Williams & Wilkins.

Ferrier, D. R. (2014). Biochemistry.Lippincott Williams & Wilkins.

Varley, H. (1954). Practical clinical biochemistry. Practical clinical biochemistry.

Lucock, M. (2000). Folic acid: nutritional biochemistry, molecular biology, and role in disease processes. Molecular genetics and metabolism, 71(1-2), 121-138.

Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2008). Lehninger principles of biochemistry. Macmillan.

Vasudevan, D. M., Sreekumari, S., &Vaidyanathan, K. (2013). Textbook of biochemistry for medical students. JP Medical Ltd.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	1	1	2	2	3	3	2	3	1	2	3
CO2	1	2	1	1	2	2	3	3	1	2	1
CO3	3	2	2	2	1	3	-	1	2	2	2
CO4	2	2	3	3	2	3	1	1	1	2	1
CO5	1	2	3	3	2	1	3	2	2	3	2
Average	**1.6**	**1.8**	**2.2**	**2.2**	**2**	**2.4**	**1.8**	**2**	**1.4**	**2.2**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Immunology

Course Code: 805104

Semester: 1st

Credit: 05 **L T P**

4 1 0

Course Outcomes: On completion of this course, the successful students will be able to:

CO	Statement
CO1	Acknowledge immune system, antigens, antibodies, immunoglobulin, monoclonal antibodies, and immunoglobulin and their structure and function.
CO2	Recall antigen - antibody binding, precipitation and agglutination reaction.
CO3	Assess vaccine against AIDS, immune system, cancer and other immune deficiency diseases.
CO4	Demonstrate factors responsible for Antigen-antibody reactions and their significance in diagnosis tools
CO5	Analyze immuno-electrophoresis and immune fluorescence, ELISA and Western blotting, their use in diagnosis.

Course Contents

UNIT-1

Immune System: Introduction and overview on innate and adaptive immunity, primary and secondary lymphoid tissues and organs, cells of immune system

Antigens: Factors responsible for immunogenicity, immunogen, haptenandadjuvant, epitopes, heterophile antigen, super antigen

Antibodies: Structure and function of immunoglobulin, monoclonal antibodies, immunoglobulin genes, generation of antibody diversity, immunoglobulin super family

UNIT-2

Antigen-antibody reactions: Molecular mechanism of antigen - antibody binding, precipitation and agglutination reaction, immuno-electrophoresis and immune fluorescence, ELISA and Western blotting

MHC: Structure of MHC molecules, MHC and peptide interaction, antigen processing and presentation, transplantation rejection, HLA complex in human

UNIT-3

Cytokines and Regulation: Common properties of cytokines and cytokine types, biological activities of cytokines, pro-inflammatory cytokines, cytokine diseases and therapies

B-cell and T-cell Activation :BCR and TCR, cell interactions in antibody response, B cell activation, synthesis and secretion of immunoglobulin's, T cell maturation, activation and differentiation

Humoral and cell-mediated effectors responses: Immune responses to infection, leukocyte recirculation and inflammation, neutralization, opsonisation and ADCC, vaccines

UNIT-4

Tolerance and Autoimmunity: Mechanism of self tolerance, hypersensitivity reactions, AIDS and other immune deficiencies, cancer and the immune system

Complement System: Introduction to complement system, classical, alternative and lectin complement pathway, biological effect of complement system, regulation of complement system

REFERENCES:

Silverstein, A. M. (2009). A history of immunology.Academic Press.

Abbas, A. K., &Pillai, S. (2012). Cellular and Molecular Immunology, 9e. Philadelphia, PA: Elsevier Saunders.

Owen, J. A., Punt, J., &Stranford, S. A. (2013). Kuby immunology (p. 574). New York, NY, USA:: WH Freeman.

Rastogi, S. C. (2002). Elements of Immunology.CBS Publishers & Distributors.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO /CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	1	2	3	2	-	-	2	2	1
CO2	3	3	3	2	2	3	2	-	3	3	2
CO3	3	3	3	3	2	3	2	2	3	3	2
CO4	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	**2**	2	3	3	3
Average	**2.8**	**2.8**	**2.6**	**2.6**	**2.6**	**2.8**	**1.6**	**1.2**	**2.8**	**2.8**	**2.0**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Haematology

Course Code: 805105

Semester: 1st

Credit: 04 **L T P**

4 0 0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Perform routine hematological tests and collection of specimens, reception and labeling and recording of laboratory investigations.
CO2	Learn blood cell formation and its composition, factor affecting production of blood cells, Preparation of smears and staining for diagnostic purposes.
CO3	Understand working, maintenance and calibration of cell counters.
CO4	Perform hematological testing for diagnosis, internal quality control, external quality control, standardization of instruments.
CO5	Prepare anticoagulants and heir uses in various investigations.

Course Contents

Unit - 1

Introduction and routine hematological tests : Routine hematological tests and collection of specimen, reception and labeling and recording of laboratory investigations

Anticoagulant : Classification of anticoagulants, EDTA, citrates and oxalates anticoagulants, mode of action and use of heparin, collection of blood sample, assure continual accuracy of patient identification (including STAT, call reports for inpatient and outpatient), match name, medical records, date of birth, registration number, and other identifiers with tests and orders to confirm positive patient identification, storage of blood

Unit - 2

Blood and its composition : Cellular and plasma composition of blood., formation of blood - erythropoiesis, leucopoiesis, thrombopoiesis, morphology of normal blood cells

Haemoglobin : Synthesis and break down of hemoglobin, types of haemoglobin and normal values, estimation of haemoglobin by photoelectric colorimeter method, visual Method - Sahli's acid haematin method, WHO haemoglobin color scale, fetal hemoglobin and its importance, estimation of fetal hemoglobin

Total WBC &RBC count : Introduction to neubauer counting chamber and total leucocyte count, normal values, procedure and clinical significance of red blood cell count, platelets Count - Normal values, procedure and clinical significance of platelets count

Unit - 3

Preparation of smears and staining : Leishman's stain and Giemsa's stain, Normal blood smear preparation, thick and thin smears, wet preparation for parasites and bone marrow smears, supravital stains and MGG stain

Cytochemical stains : Introduction, myeloperoxidase stain, periodic acid schiff's stain, specific and non-specific esterase stain, Sudan black stain, and stain for neutrophil alkaline phosphatase activity

Haemostasis : Mechanism, various coagulation factors, theories of coagulation and fibrinolysis

Unit – 4

Haematological Disorders : Erythrocyte Disorder with Its Laboratory Diagnosis, Anemia - Definition with Classification, Morphologic- Microcytic, Hypochromic, Macrocytic Anemia, Iron Deficiency Anemia, Hemolytic Anemia, Aplastic Anemia, Pernicious Anemia, Sideroblastic Anemia, Anemia of Chronic Renal Insufficiency, Hereditary Spherocytosis, Hereditary Elliptocytosis, Sickle Cell anemia, Hemolytic Disease of The Newborn.
Leukocyte Disorders with Its Laboratory Diagnosis, Leukemia – Definition with Classification(FAB–French American British Classification)
Thrombocyte Disorder With Its Laboratory Diagnosis, Perpura's Disease d) Abnormal Haemoglobin and Related Disorders, Thalassemia, Polycythemia.

Coagulation factors : Differentiation of factors into groups and physiochemical properties of coagulation factors

Automation : Principle, working, maintenance of cell counters, coagulometer and ESR analyzers
Quality control : Introduction, internal quality control, external quality control, standardization, proficiency surveillance, control materials.

REFERENCES:

1. Medical Laboratory Technology: Procedure Manual For Routine Diagnostic Tests, Vol I By Mukherjee K.L, Mcgraw Hill Education
2. Dacie And Lewis Practical Haematology By Bain & Bates & Laffan & Lewis, Churchill Livingston
3. Greer, J. P., List, A. F., Arber, D. A., Glader, B., Means Jr, R. T., & Paraskevas, F. (2019). Wintrobe's clinical hematology, Wolters Kluwer. *Philadelphia, PA*.
4. Mohan, H., & Mohan, S. (2011). *Practical Pathology for Dental Students*. JP Medical Ltd.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	-	-	2	2	2
CO2	3	3	3	3	3	3	2	-	3	3	3
CO3	3	3	3	3	3	3	2	2	3	3	3
CO4	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	3	3	3
Average	**3.0**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**1.6**	**1.2**	**2.8**	**2.8**	**2.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Hematology Laboratory

Course Code: 805106

Semester: 1st

Credit: 02 **L T P**

0 0 4

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Learn estimation of cell count, and various conditions associated with them.
CO2	Estimate various tests for study of coagulation disorders.
CO3	Apply various staining procedure and result interpretation.
CO4	Differentiate specific role of red cell indices in red cell abnormality, hemolytic anemia
CO5	Understand coagulation disorders- PT, APTT etc.

Course Contents

List of Practical's / Experiments:

a. Haemoglobin estimation.
b. Total leukocyte count
c. Differential leukocyte count
d. Platelet count
e. Red cell count
f. Reticulocyte count and RCI.
g. Absolute Eosinophil count
h. Plasma hemoglobin
i. Coagulation disorders test
j. Myeloperoxidase stain
k. PAS stain
l. Erythrocyte sedimentation rate
m. Packed cell volume
n. Hemolytic anemia

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	3	1	3	-	2	1	1	1
CO2	3	2	1	2	2	3	2	2	2	3	1
CO3	3	2	3	3	2	3	1	3	3	1	3
CO4	1	2	1	3	3	3	2	1	2	1	1
CO5	2	2	1	2	3	1	3	1	3	2	3
Average	**2.4**	**2**	**1.4**	**2.6**	**2.2**	**2.6**	**1.6**	**1.8**	**2.2**	**1.6**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Clinical Biochemistry Laboratory

Course Code: 805107

Semester: 1st

Credit: 02 **L T P**

0 0 4

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Perform qualitative test for carbohydrates, protein, and lipids in various biological specimens.
CO2	Do quantitative analysis of blood glucose, blood urea, cholesterol, proteins.
CO3	Analyze blood parameters i.e. quantitative estimation of creatinine, uric acid.
CO4	Diagnose liver enzymatic markers, cardiac marker, prostate gland enzymatic marker and their correlation with health condition.
CO5	Estimate prostate functioning test.(PSA)

Course Contents

List of Practical's / Experiments:

Qualitative analysis of biomolecules
Qualitative test for carbohydrates: Molisch Test, Benedict test
Qualitative test for amino acid and protein: Biuret test, Ninhydrine test
Qualitative test for lipid: Acrolein test
Quantitative analysis of blood parameters 1
Quantitative estimation of blood cholesterol
Quantitative estimation of blood glucose

Quantitative estimation of blood urea

Quantitative analysis of blood parameters 2
Quantitative estimation of creatinine
Quantitative estimation of protein albumin

Quantitative estimation of uric acid

Quantitative analysis of liver enzymatic markers

Quantitative estimation of SGPT

Quantitative estimation of ALP

Quantitative analysis of heart enzymatic marker

Quantitative estimation of SGOT a cardiac marker

Quantitative analysis of prostate gland enzymatic marker

Quantitative estimation of ACP

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	2	-	-	2	1	1
CO2	3	2	3	2	2	3	-	-	2	1	1
CO3	3	3	3	3	2	3	2	2	2	2	2
CO4	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	3
Average	**2.8**	**2.4**	**2.8**	**2.6**	**2.4**	**2.8**	**1.4**	**1.2**	**2.4**	**1.6**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Clinical Microbiology Laboratory

Course Code: 805108

Semester: 1st

Credit: 02

L	T	P
0	0	4

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Prepare bacterial smear from different bacterial cultures to identify bacterial strain.
CO2	Know the effect of different carbon nitrogen sources on the growth of microorganisms, effect of environmental factors on growth.
CO3	Observe the effect of pH on the growth of microorganisms.
CO4	Perform the bacteriological examination of water and milk.
CO5	Analyze gram negative and special stains for bacterial identification.

Course Contents

UNIT-1

List of Practical's / Experiments:

Simple staining of bacteria

To prepare bacterial smear and perform simple staining using methylene blue

Gram staining

To perform Gram staining of different bacterial cultures

Special stain

To perform endospore staining and Albert's staining of bacterial cultures

Counting of bacteria

To perform viable count of bacteria using pour plating technique

Effect of nutritional factors on growth

To study the effect of different carbon nitrogen
sources on the growth of microorganisms

Effect of environmental factors on growth

To study the effect of pH on the growth of microorganisms

To study the effects of UV radiation on growth of microorganisms

Bacteriological examination of water & milk

To perform the bacteriological examination of water and milk

To perform the bacteriological examination of milk by methylene reductase test

Microbes in hospital environment

To isolate and identify the bacteria and fungi from hospital environment

The mapping for PO/PSO/CO attainment is as follow:

PO/PSO/ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO 2	PSO 3
CO1	2	1	2	2	2	2	-	-	2	1	1
CO2	3	2	3	2	2	3	-	-	2	1	1
CO3	3	3	3	3	2	3	2	2	2	2	2
CO4	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	3
Average	**3.0**	**2.4**	**2.8**	**2.6**	**2.4**	**2.8**	**1.4**	**1.2**	**2.4**	**1.8**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Molecular Biology and Genetics

Course Code: 805201

Semester: 2nd

Credit: 05 **L T P**

4 1 0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Understand molecular structure of DNA & RNA and use DNA & RNA templates for diagnostic application.
CO2	Clarify DNA repair mechanisms, light dependent repair, methyl-directed mismatch repair, nucleotide excision repair, post-replication repair, SOS repair.
CO3	Perform Cloning strategies for preparation of genomic DNA library and cDNA library, and applications of genetic engineering.
CO4	Recall the use of enzymes in genetic engineering technique,
CO5	Analyze transcription and translation processes.

Course Contents

UNIT-1

Molecular basis of heredity: central dogma, structure of DNA & RNA, denaturation and renaturation of DNA, genetic code, Wobble hypothesis

DNA Replication: components, mechanism, unidirectional and bidirectional replication, rolling circle mechanism of replication

Genetic Variability: mutations- types of mutations (spontaneous, induced, forward, backward, suppressor, point and frame shift), chemical mutagens- base analogues, nitrous acid, acridines, alkylating and hydroxylating agents, biochemical basis of mutations & genetic mechanism of drug resistance

UNIT-2

DNA damage and repair: types of DNA damages (alkylation, deamination, pyrimidine dimmers),, repair mechanisms (light dependent repair, methyl-directed mismatch repair, nucleotide excision repair, post-replication repair, SOS repair)

Genetic recombination in bacteria: types of plasmids- F-plasmid, R-plasmid, col-plasmid, Ti-plasmid, transformation, conjugation, transduction

UNIT-3

Transcription :prokaryotic transcription,, transcription cycle (initiation, elongation and termination), bacterial promoters and regulating factors, rho dependent and rho independent terminations, eukaryotic transcription- RNA polymerases, transcription factors, processing of mRNA in eukaryotes

Translation: initiation of translation, elongation and termination of translation (bothprokaryotic and eukaryotic)

Regulation of gene expression: operon concept, lac operon- positive control andnegative control, trpoperon- repressible regulation and attenuator regulation

Transposable Elements: transposable elements- IS elements, composite transposons and Tn3 transposons, mechanisms of transposition (conservative and replicative), retrotransposons and retroposons

UNIT-4

Genetic Engineering :enzymes used in genetic engineering- restriction endonucleases, nuclease, polymerase, terminal deoxynucleotidyltransferase, reverse transcriptase and ligases, vectors- cloning vectors, expression vectors and shuttle vectors, cloning strategies, preparation of genomic DNA library and cDNA library, applications of genetic engineering.

Molecular mapping of genome: Genetic and physical maps, physical mapping and map –based cloning, choice of mapping population, simple sequence repeat loci, southern and fluorescence in situ hybridization for genome analysis, Chromosome microdissection and microcloning, molecular markers in genome analysis: RFLP, RAPD and AFLP analysis, molecular markers linked to disease resistance genes,

REFERENCES:

Ramawat, K. G., &Goyal, S. (2004). *Comprehensive biotechnology*. S. Chand Publishing.

Pierce, B. A. (2018). *Genetics essentials: concepts and connections* (p. 488). WH Freeman.

Nelson, D. L., Cox, M. M., & Freeman, W. H. (2000). Lehninger Principles of Biochemistry.Third. *Worth Publishers. N. Y.*

Morange, M. (2000). *A history of molecular biology*.Harvard University Press.

Watson, J. D. (1970). Molecular biology of the gene. *Molecular biology of the gene.*, (2nd edn).

The mapping for PO/PSO/CO attainment is as follow

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	2	-	-	2	2	2
CO2	3	2	3	3	3	2	1	-	3	3	3
CO3	3	3	3	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	3	3	3
Average	**2.8**	**2.6**	**2.8**	**2.8**	**2.6**	**2.6**	**1.6**	**1.2**	**2.8**	**2.8**	**2.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Systemic Bacteriology

Course Code: 805202

Semester: 2ND

Credit: 05 **L T P**

4 1 0

Course Outcomes: On completion of this course, the successful students will be able to:

CO	Statement
CO1	Identify various bacterial contaminants present in sample.
CO2	Illustrate morphology, biochemical reactions, to differentiate bacteria and their related diseases.
CO3	Differentiate between gram positive and gram negative bacteria by using staining.
CO4	Perform antibiotic susceptibility testing for recommendation of antibiotic for treatment.
CO5	Learn structural and morphological characteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Corynebacterium, Bacillus and Clostridium

Course Contents

UNIT-1

Epidemiology and control of community infections: Study of normal flora of human body, control and prevention of community, epidemiological markers, different carries and sources of infection

Gram positive cocci: A detailed account of morphological characteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Staphylococcus, Streptococcus and Pneumococcus

Gram positive bacilli: A detailed account of cultural and morphological characteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Corynebacterium, Bacillus and Clostridium

UNIT-2

Acid fast bacteria and Gram negative cocci: A detailed account of cultural and morphological characteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Mycobacterium tuberculosis and Mycobacterium leprae, Neisseria

Enterobacteriaceae-I: A detailed account of cultural and morphological characteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Enterobacterifamilies like E.Coli and Klebsiella, Shigella and Salmonella

Enterobacteriaceae-II:A detailed account of cultural and morphological characteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Enterobacteriaceae like Proteus and Acinetobacter, Hafnia and Enterobacter, Serratiamarcescens and Citrobacter

UNIT-3

Gram negative bacilli-I: A detailed account of cultural and morphologicalcharacteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Pseudomonas aeruginosa and Vibrio, Haemophilusinfluenzae and Campylobactorjejuni

Gram negative bacilli-II: A detailed account of cultural and morphological characteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Bordetella pertussis and Yersinia pestis, Bacteroides and Helicobacter pylori

Miscellaneous bacteria-I :A detailed account of cultural and morphological characteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Mycoplasma and Rickettsia, Ehrlichia,Chlamydiae and Moraxella catarrhalis

UNIT-4

Miscellaneous bacteria-II: A detailed account of cultural and morphological characteristics, pathogenicity, clinical manifestations and laboratory diagnosis of Actinomycetes (Actinomyces and Nocardia) and Spirochaetes (Treponema, Borrelia, Leptospira), Brucellae and Listeria monocytogenes

Mechanism of action of antibiotics (inhibitors of cell wall synthesis, nucleic acid and protein synthesis). Molecular principles of drug targeting. Drug delivery system in gene therapy Bacterial resistance to antibiotics. Mode of action of bacterial killing by quinolinones. Bacterial resistance to quionolinones. Mode of action of non – antibiotic antimicrobial agents. Penetrating defenses – How the antimicrobial agents reach the targets (cellular permeability barrier, cellular transport system and drug diffusion).

REFERENCES:

Ananthanarayan, R. (2006). *Ananthanarayan and Paniker's textbook of microbiology*. Orient Blackswan

Panjarathinam, R. (2007). *Medical microbiology*.New Age International.

Kumar, S. (2012). *Textbook of microbiology*. JP Medical Ltd.

Willey, J. M., Sherwood, L., &Woolverton, C. J. (2011). *Prescott's microbiology* (Vol. 7). New York: McGraw-Hill.

Tortora, G. J., Funke, B. R., & Case, C. L. (2007). *Microbiology: an introduction* (p. 912). San Francisco, CA: Pearson Benjamin Cummings.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	2	-	2	3	2
CO2	3	2	3	2	2	3	-	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3
Average	**2.8**	**2.6**	**2.8**	**2.6**	**2.2**	**2.8**	**1.2**	**2.8**	**3.0**	**2.8**

correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Biotechniques

Course Code: A805203

Semester: 2ND

Credit: 05 **L T P**

4 1 0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Apply various bio-techniques such as HPLC, GC, HPTLC, for separation of bio molecule.
CO2	Use various machines for sample separation, mixing of samples and analyze the sample.
CO3	Perform various tests based on spectrophotometer, UV Visible and fluorescence techniques.
CO4	Detect and measurement of radioactivity applications in biological sciences analytical, diagnostics and metabolic studies.
CO5	Analyze centrifugation, their types and uses, preparative and analytical centrifugation, rotors types and safety aspects of centrifugation

Course Contents

UNIT-1

Chromatography :Separation of biomolecules, chromatographic techniques-principles and applications, column, thin-layer, paper chromatography, ion-exchange and affinity chromatography, high performance liquid chromatography (HPLC), gas chromatography (GC), high performance thin-layer chromatography (HPTLC), detection and interpretation, Gel Filtration Chromatography,

Immuno-assays: SRID, ELISA, ELISA-PCR, RIA, Western Blotting, Immunofluroscens and their application. Immune deficiencies and autoimmunity.

UNIT-2

Centrifugation techniques: Theory and principle of centrifugation, centrifuges and their uses, preparative and analytical centrifugation, rotors types and safety aspects of centrifugation

Electrophoretic techniques: Theory and application of electrophoresis, polyacrylamide gel electrophoresis, isoelectric focusing, capillary electrophoresis, microchip electrophoresis, 2D gel electrophoresis, electro blotting, pulsed-field gel electrophoresis, automation in clinical field.

UNIT-3

Spectrophotometric techniques: Electromagnetic radiations, theory and applications of UV-VIS, infrared, fluorescence and atomic absorption spectrophotometry

Spectroscopy techniques: Electro spin resonance (ESR), nuclear magnetic resonance (NMR) spectroscopy, mass spectroscopy (MS)

UNIT-4

Radioisotope techniques: Radioactivity and radioisotopes, detection and measurement of radioactivity and Cerenkov counting, applications in biological sciences - analytical, diagnostics and metabolic studies, safety aspects of radioactive handling

Microscopy: Theory and principles of microscopy, light, dark field, fluorescent, UV microscopy, TEM, SEM, confocal microscopy, flow cytometry, phase contract microscopy

REFERENCES:

Wilson, K., & Walker, J. (Eds.).(2010). *Principles and techniques of biochemistry and molecular biology*.Cambridge university press.

Rana, S. V. S. (2008). *Biotechniques Theory &Practice*.Rastogi Publications.

Gurdeep, R., Chatwal, S., &Anand, K. (2016). *Instrumental methods of chemical analysis*.Himalaya publishing house.

Robinson, J. W., Frame, E. M. S., Frame, G. M., Eileen, M., & Skelly, F. (2005).Undergraduate instrumental analysis.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	-	-	2	-	-
CO2	3	3	2	2	2	3	-	-	2	-	-
CO3	3	3	3	3	2	3	2	2	2	2	2
CO4	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3	3
Average	**2.8**	**2.8**	**2.6**	**2.6**	**2.4**	**2.8**	**1.4**	**1.2**	**2.4**	**1.6**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Cell Biology

Course Code: 805204

Semester: 2ND

Credit: 04 **L T P**

4 0 0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Learn the cell biology including the cell structure and various cell organelles.
CO2	Understand about cell interaction, cell division, cell death, cell regulation and all about the cell knowledge and their functions.
CO3	Know cell theory and organelles such as eukaryotic and prokaryotic cell,
CO4	Understand morphology and functions of organelles, nuclear membrane, nucleoplasm, nucleolus, chromatin fibers and solenoid model of chromatin.
CO5	Analyze stem cells and their types, applications of stem cells, induced pleuripotent stem cells (iPSCs).

Course Contents

UNIT-1

Cell organelles 1: Introduction to cell theory, eukaryotic and prokaryotic cell, morphology and functions of endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles, peroxisome, mitochondria

Cell organelles 2: Morphology and functions of nuclear membrane, nucleoplasm,nucleolus, chromatin fibers, nucleosome and solenoid model of chromatin

Cytoplasm, cytoskeleton and cell movement :Chemical organization of cytoplasm, microtubules, actin filaments, intermediate filaments, cytoskeleton in cell motility

UNIT-2

Plasma Membrane: Structure and origin of plasma membrane, phospholipidbilayer, fluidity and asymmetrical nature of membrane, phase transition, membrane proteins

Mode of transport-I: Passive transport (types and mechanism), active transport (types and mechanism), uniport-symport mechanism, antiport mechanism

UNIT-3

Mode of transport-II :Bulk transport by vesicle formation - molecular mechanism, endocytosis and exocytosis, transport of proteins into mitochondria, transport of proteins into endoplasmic reticulum, transport of proteins into and out of nucleus

Cell-cell interaction and extracellular matrix: Tight junction, gap junction, desmosomes, hemidesmosomes, plasmodesmata, extracellular matrix molecules

Cell signaling and signal transduction: Principles of cell signaling, types of cellsignaling, ion channel coupled receptors, G-protein couple's receptors, and enzyme couples receptors

Cell regeneration: Stem cells and their types, applications of stem cells, induced pleuripotent stem cells (iPSCs)

Cell-division cycle and cell death: Cell cycle, cell cycle control system, mitosis,cytokinesis, meiosis, Programmed cell death (apoptosis)

REFERENCES:

Verma, P. S., &Agarwal, V. K. (2004). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology: Evoloution and Ecology*. S. Chand Publishing.

Pollard, T. D., Earnshaw, W. C., Lippincott-Schwartz, J., & Johnson, G. (2016). *Cell biology E-book*.Elsevier Health Sciences.Alberts, B., Bray, D., Hopkin, K., Johnson, A. D., Lewis, J., Raff, M., ...& Walter, P. (2015). *Essential cell biology*. Garland Science.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	-	1	2	2	3
CO2	1	2	2	1	2	2	2	1	2	1	1
CO3	2	1	2	2	2	2	2	2	2	2	2
CO4	2	2	2	2	2	2	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Average	**1.6**	**1.8**	**2.2**	**1.6**	**1.8**	**1.8**	**1.8**	**1.6**	**2.4**	**2.2**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Applied Microbiology and Quality Control

Course Code: 805205

Semester: 2ND

Credit: 04 **L T P**

3 1 0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Know about gene cloning, recombinant DNA technology, recombinant proteins expressions.
CO2	Understand about quality control in molecular techniques etc.
CO3	Identify properties of good vectors to make DNA library.
CO4	Perform gene cloning, restriction endonucleases, recognition sequences, isolation and identification of desired gene/clone.
CO5	Analyze recombinant proteins and its production in other organisms.

Course Contents

UNIT-1

Gene Cloning: Steps in gene cloning, restriction endonucleases, recognition sequences, modification of cut ends, other enzymes used in cloning, properties of good vectors, E.Coli vectors, bacteriophage vectors, cosmid vectors, phagemid vectors, plasmids vectors, artificial chromosome vectors, cloning and expression vectors, shuttle vectors, yeast vectors, complementary DNA library, isolation of desired gene, identification of desired clone, problems in cDNA preparation, genomic library

UNIT-2

Recombinant DNA technology :Integration of DNA insert into the vector, introduction of recombinant DNA into a suitable host, integration of DNA inserts through site specific recombination, selection of the desired recombinant clones, selection of clones containing recombinant DNA, selection of the clone containing a specific DNA insert

Expression of recombinant proteins: Production of recombinant proteins in E.Coli, transcriptional , translational fusions, runaway plasmid, production of recombinant proteins in other organisms, production of recombinant proteins in other microorganism

UNIT-3

Molecular Techniques :Chemical Synthesis of Gene, gene amplification through PCR, variations of PCR, applications, limitations and advantages of PCR,RFLP,RAPD and AFLP

Automation: BACTEC, Vitek 2, Microscan walkaway, Phoenix, Sensititre Aris 2X, use of MALDI-TOF for microbial identification (Vitek MS)

UNIT-4

Quality Control: Introduction, quality assurance, specimen collection, preservation and transport, levy-Jennings chart, internal and external quality control, Clinical Establishment Act Standard for Medical (Clinical) Laboratory, in vitro diagnostic (IVD) regulation, professionalism, ethical responsibility and code of conduct

References:

Singh, B. D., & Singh, B. D. (2007). *Biotechnology expanding horizons*.Kalyani publishers.

Primrose, S. B., &Twyman, R. (2013). *Principles of gene manipulation and genomics*.John Wiley & Sons.

Sood, R. (2009). *Concise Book of Medical Laboratory Technology: Methods and Interpretations*. Jaypee Brothers Medical Publishers (P) Limited.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	2	1	3	2	-	-	3	2	1
CO2	2	3	1	2	1	2	-	1	3	2	3
CO3	3	3	1	2	2	1	-	-	2	3	2
CO4	2	3	2	2	2	3	-	1	2	3	2
CO5	2	3	2	3	1	2	1	-	2	2	3
Average	**2.2**	**2.8**	**1.6**	**2**	**1.8**	**2**	**1**	**1**	**2.4**	**2.4**	**2.2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Communication Skills

Course Code: A301101

Semester: 2ND

Credits -03

L	T	P
3	0	0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Analyze and restate the meaning of a text & practice listening effectively to communicate in English.
CO2	Demonstrate the skill to write in English without grammatical errors, compose articles and compositions in English
CO3	Develop the ability to speak English language with the right way of pronunciation.
CO4	Express the view point with confidence in English, discuss and socialize effectively in English
CO5	Learn values and skills gained through effective communication to other disciplines

Course Contents

UNIT-1

Writing and Speaking English

Parts of Speech, Resume Writing, Business Letters Vowels, Diphthongs, Consonants, Consonant Clusters, Stress, Syllable, Syllabic

UNIT-2

The Art of Communication

Verbal Communication: Effective Communication, Effective/Active listening paraphrasing, and Feedback Non Verbal Communication: Personality Enhancement, Body Language

UNIT-3

The Hidden Data of Communication

The importance of feelings in communication, dealing with feelings, The importance of developing assertive skills, developing self-confidence, developing Emotional Intelligence, Dealing with People,

Group Activities and World of Teams

Importance of Team work, working with Groups, Group Discussions, Group Decision-making

UNIT-4

Getting Ready for Interviews

Corporate Dressing, Business Etiquettes, Media Etiquettes, Table Etiquettes

REFERENCES :

Covey, S. R. (1991). *The seven habits of highly effective people*. Provo, UT: Covey Leadership Center.
Galanes, G. J., Adams, K. H., &Brilhart, J. K. (2007). *Effective group discussion: Theory and practice*.McGraw-Hill.
Hargie, O. (Ed.). (1997). *The handbook of communication skills*. Psychology Press.
Kurtz, S., Silverman, J., Draper, J., van Dalen, J., & Platt, F. W. (2017). *Teaching and learning communication skills in medicine*. CRC press.
Downing, J. E. (2005). Teaching communication skills. *Baltimore, MD: Paul H. Brookes*.
McCabe, C., & Timmins, F. (2013). *Communication skills for nursing practice*.Macmillan International Higher Education.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	-	-	-	3	2	3
CO2	3	3	2	1	1	1	-	-	2	2	2
CO3	3	3	3	2	2	1	2	-	2	3	2
CO4	2	2	3	-	3	2	3	2	3	2	3
CO5	3	2	3	3	3	1	2	3	3	3	3
Average	2.6	2.4	2.6	1.4	2.2	1.0	1.4	1.0	2.6	2.4	2.6

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Systemic Bacteriology Laboratory

Course Code: 805206

Semester: 2ND

Credit: 03 **L T P**

0 0 6

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Understand and identify microbes from skin/pus samples.
CO2	Isolate microorganism and perform identification of various bacterial strains from different samples.
CO3	Prepare specific media used for culture, identification and differentiation process of microorganism.
CO4	Collect samples from various sites of body for diagnose and culture of microorganism.
CO5	Analyze Bacteriological examination of pathogens present in air.

Course Contents

UNIT-1

Skin/pus pathogens: Isolation and identification of microbes from skin/pus
Blood pathogens: Isolation and identification of microorganisms from blood sample
Pathogens in urine: Isolation and identification of microorganisms from urine sample
Respiratory tract: Isolation and identification of microorganisms from throat
Lower respiratory tract: Isolation and identification of microorganisms from sputum sample
Air-borne pathogens: Bacteriological examination of pathogens present in air

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	2	-	-	2	3	2
CO2	3	2	3	3	3	3	1	1	3	3	3
CO3	3	3	3	3	3	3	2	2	3	3	3
CO4	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	3	3	3
Average	**2.8**	**2.6**	**2.8**	**2.8**	**2.4**	**2.8**	**1.6**	**1.4**	**2.8**	**3.0**	**2.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Virology and Mycology

Course Code: 805301

Semester: 3RD

Credit: 05 **L T P**

4 1 0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Understand various properties of virus, pathogenecity, and transmission of virus.
CO2	Cultivate virus and purification of virus strains,
CO3	Develop various testing kits for detection the presence of virus in samples.
CO4	Learn classification of fungi, media used for culturing fungi.
CO5	Apply molecular techniques used for the diagnosis of fungal infection.

Course Contents

UNIT-1

General Properties of Viruses: Origin of virology, properties of viruses, classification and nomenclature of viruses, structure of viruses, capsid symmetry and architecture

DNA & RNA viruses: Transmission of viruses, epidemiology of viral infection, prevention and control measures of viral infection, molecular techniques for clinical diagnosis of viral diseases.

UNIT-2

Cultivation and Purification of Viruses: Cultivation, isolation, purification and virus assays, virus receptors, interaction with host cell, attachment and penetration, uncoating and replication, lysogenic and lytic bacteriophages, lysogeny with special reference to lambda and mu phages

Pathogenicity, clinical features, laboratory diagnosis, immunoprophylaxis and prophylaxis:Dengue, Japanese encephalitis, Yellow fever, Kyasanurforestdisease, Polio, Influenza virus, Rubeola virus, Hepatitis, HIV, Smallpox, Rabies, Rotavirus and Oncovirus

UNIT-3

Introduction to medical mycology: Introduction and classification of fungi, mediaused for culturing fungi, chemotherapeutic agents for fungi, mechanism of resistance of chemotherapeutic agents

Pathogenicity, clinical features and laboratory diagnosis of superficial and subcutaneous mycosis: Dermatophytoses, Piedra, Tineanigra, Tineaversicolor, chromoblastomycosis, mycetoma, sporotrichosis and rhinosporidiosis

UNIT-4

Pathogenicity, clinical features and laboratory diagnosis of systemic mycosis and opportunistic mycosis: Paracoccidioidomycosis, coccidiodomycosis, histoplasmosis, blastomycosis, cryptococcosis candidiasis, aspergillosis, penicillosis

Molecular techniques: Recent molecular techniques used for the diagnosis offungal infection

REFERENCES:

Ananthanarayan, R. (2006). *Ananthanarayan and Paniker's textbook of microbiology*. Orient Blackswan

Panjarathinam, R. (2007). *Medical microbiology*.New Age International.

Kumar, S. (2012). *Textbook of microbiology*. JP Medical Ltd.

Willey, J. M., Sherwood, L., &Woolverton, C. J. (2011). *Prescott's microbiology* (Vol. 7). New York: McGraw-Hill.

Tortora, G. J., Funke, B. R., & Case, C. L. (2007). *Microbiology: an introduction* (p. 912). San Francisco, CA: Pearson Benjamin Cummings.

Lederberg, J. (2000). *Encyclopedia of microbiology, four-volume set*.Academic Press.

Mahon, C. R., Lehman, D. C., &Manuselis, G. (2018). *Textbook of diagnostic microbiology-e-book*.Elsevier Health Sciences.

Procop, G. W., Church, D. L., Hall, G. S., &Janda, W. M. (2020). *Koneman's color atlas and textbook of diagnostic microbiology*.Jones& Bartlett Publishers.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2	-	1	3	2	1
CO2	2	3	2	1	2	2	-	-	3	2	2
CO3	2	3	3	2	2	1	1	-	2	3	2
CO4	2	1	2	2	3	1	-	1	2	2	2
CO5	3	2	2	2	1	2	1	1	2	2	3
Average	**2.4**	**2.2**	**2**	**1.8**	**2.2**	**1.6**	**1**	**1**	**2.2**	**2.2**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Biostatistics

Course Code: 805302

Semester: 3RD

Credit: 05 **L T P**

4 1 0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Statistical analysis of data, implementing solutions that efficiently utilize resources and effort.
CO2	Recognize, develop and distinguish between models for cross-sectional analysis.
CO3	Build sufficient skills to interpret the data in statistical.
CO4	Select and deploy the correct statistical method for a given data analysis requirement for test result.
CO5	Apply testing of hypothesis by t-test, chi-square test, F-test and Fisher's z- test, ANOVA.

Course Contents

Unit - 1

Introduction to biostatistics : Introduction, biological variations and uncertainties, role of statistics

Descriptive statistics : Variables, variations and distributions

Measures of dispersion : Variance and standard deviation, coefficient of variation, skewness, kurtosis

Unit - 2

Measure of central tendency : Averages, mean, median

Correlation : Association between variables, positive and negative correlation, linear and non-linear correlation

Unit - 3

Elements of probability : Introductio n, independent and non-independent event, law of additivity, multiplication law of probability, inverse probability, elementary law of probability

Regression : Linear and non-linear regression, regression analysis

Unit - 4

Introduction to research methods : Meaning, objective, types and significance of research methods, research designs, research process and problem

Interpretation and report writing : Meaning, techniques, precaution and significance of report writing, different steps in writing report, mechanism and precaution of writing a research report

References:

Khanal, A. B. (2015). *Mahajan's methods in biostatistics for medical students and research workers*. Jaypee Brothers Medical P.

Gupta, S. P., & Gupta, M. P. (2009). Business Statistics. *Sultan Chand & Sons, New Delhi*.

Daniel, W. W., & Cross, C. L. (2018). *Biostatistics: a foundation for analysis in the health sciences*. Wiley.

Burt, b. (2013). *Basic biostatistics: statistics for public health practice*. Jones & bartlett learning.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2	-	1	3	2	1
CO2	2	3	2	1	2	2	-	-	3	2	2
CO3	2	3	3	2	2	1	1	-	2	3	2
CO4	2	1	2	2	3	1	-	1	2	2	2
CO5	3	2	2	2	1	2	1	1	2	2	3
Average	**2.4**	**2.2**	**2**	**1.8**	**2.2**	**1.6**	**1**	**1**	**2.2**	**2.2**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Principles of Toxicology

Course Code: 805309

Semester: 3RD

Credit-4 **L T P**
4 0 0

Course Outcomes:On completion of this course, the successful students would be able to:

CO	Statement
CO1	Understand the General principles and terminology related to the course
CO2	Attain knowledge and information regarding classification of intoxicants.
CO3	Learn toxins of animal and plant origin; radiation types, detection and effects.
CO4	Understand how the toxins target the following organs of the body liver, kidney, skin, immune system, respiratory system, nervous system etc.
CO5	Analyze the processes of Absorption; Digestion; Metabolism; Excretion; Mutagenecity; Carcinogenecity; Teratogenecity and mechanism of toxicity.

Course Contents

UNIT-1

Basic Toxicology: General principles and terminology; Types of toxicity; Factors affecting toxicity; Acute, Subacute, Subchronic and Chronictoxicity; LD5O, LC5O, IC50, EC50; Route of administration; Dose response relationship and its evaluation.

UNIT-2

Toxicants: Classification of toxicants; Metals; Pesticides; Xenobiotics; Teratogens; Food additives and contaminants; Toxins of animal and plant origin; Radiation types, detection and effects

UNIT-3

Target Organ Toxicity:

Toxic responses of Blood, Liver, Kidney, Skin, Immune system, Respiratory system, Nervous system, Ocular and visual system, Heart and vascular system, Reproductive system, Endocrine system.

UNIT-4

Toxicokinetics:

Absorption; Digestion; Metabolism;Excretion; Mutagenecity; Carcinogenecity; Teratogenecity; Biotransformation; Bioactivation; Mechanism of Toxicity.

References:

Chatterjee, K. D. (2018). *Parasitology: protozoology and helminthology*. CBS Publishers & Distributors Pvt Ltd.

Arora, B., &Arora, D. R. (2007). *Practical microbiology*.CBS Publishers & Distributors.

Paniker, C. J. (2007). *Textbook of medical parasitology* (No.Ed. 6).Jaypee Brothers Medical Publishers (P) Ltd.

John, D. T., & Petri, W. A. (2013). *Markell and Voge's medical parasitology-e-book*.Elsevier Health Sciences.

The mapping for PO/PSO/CO attainment is as follows:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	2	-	-	3	2	1
CO2	3	2	2	2	3	2	-	1	3	2	2
CO3	3	3	2	2	2	3	2	2	2	3	3
CO4	3	3	3	3	2	3	2	2	2	3	3
CO5	3	3	3	2	3	3	2	3	3	3	3
Average	**2.8**	**2.6**	**2.4**	**2.0**	**2.4**	**2.6**	**1.2**	**1.6**	**2.6**	**2.6**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Histopathology and Cytology

Course Code: 805303

Semester: 3RD

Credit: 05 **L T P**

4 1 0

Course Outcomes:On completion of this course, the successful students would be able to:

CO	Statement
CO1	Understand preservatives or fixatives, simple fixatives, compound fixatives, cytological fixatives for special component of tissue.
CO2	ApplyTissue processing, dehydration, clearingand paraffin embedding for section cutting.
CO3	Perform various staining procedures for identification of various tissue components in section.
CO4	Prepare various histologist fixatives used for histochemical study of tissue section.
CO5	Learn to operate microtome, honing and sharpening of blades.

Course Contents

UNIT-1

Introduction and lab organisation: Histopathology lab organisation, maintenance of important equipments used in lab

Histological specimens: Types, transportation, preservation, labeling & fixation, types of fixatives, simple fixatives, compound fixatives, fixatives for special component of tissue

UNIT-2

Tissue processing :Tissue processing, dehydration and dehydrating media, clearing and clearing agents, embedding and embedding agents, different types of embedding methods, alternative tissue processing method, automated tissue processor, microwave tissue processor, open and closed tissue processor, paraffin embedding station and cryostat, Microtomy, haematoxylin and eosin stain

Detection and identification of bacteria, virus, protozoa and fungi :Gramstain and modified methods, ZiehlNeelsen stain for mycobacterium tuberculosis, fluorescence method for Mycobaterium tuberculosis, methods for Mycobacterium leprae, cresyl violet acetate and Gimenez method for Helicobacter pylori, Warthin Starry method for spirochetes, Grocottmethenamine silver method, McManus PAS method for fungi, demonstration of rickettsia, detection and identification of viruses, demonstration of protozoa and other organisms.

UNIT-3

Immunohistochemistry :Immunofluorescence, preparation of material, staining, tests for specificity and applications, types of method, blocking of non specific reactive sites, controls, procedure and application, automated slide strainers for IHC

Cytological Staining :History and types of sample submitted for cytology, collection of various types of samples for cytology, their fixation, cytological preparation with special emphasis on MGG, PAP stain, cytological fixatives, cytological screening and quality control in cytology lab., thin prep 2000, automated slide strainer, automatic coversliper and PAPNET

UNIT-4

Enzymes :Fixation, types of enzymes and types of histochemical reactions, methods for specific phosphatases, methods for specific and non-specific esterases, and oxidative enzymes., methods for demonstration of hydrolytic enzymes, specific phosphatases, specific and non-specific esterases

Hormonal assessment: Introduction, menstrual cycle, and hormonal assess menton PAP smear

Electron microscopy and allied techniques :Preparation of specimen, fixation, tissue processing schedule, ultramicrotomy and knives used for cutting, staining of sections for electron microscopy., frozen section of muscle biopsy

REFERENCES:

Kumar, V., Abbas, A. K., & Aster, J. C. (2017). *Robbins basic pathology e-book*.Elsevier Health Sciences.

Bancroft, J. D., & Gamble, M. (Eds.).(2008). *Theory and practice of histological techniques*.Elsevier health sciences.

Culling, C. F. A., Allison, R. T., & Barr, W. T. (2014). *Cellular pathology technique*.Elsevier.

Mohan, H. (2015). *Textbook of pathology*.Jaypee Brothers Medical Publishers.

Mohan, H. (2012). *Pathology practical book*. JP Medical Ltd.

Culling, C. F. A. (2013). *Handbook of histopathological and histochemical techniques: including museum techniques*. Butterworth-Heinemann.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	3	3	1	2	2	1	2	1
CO2	2	3	3	3	2	-	-	2	2	1	2
CO3	3	2	3	3	3	-	-	2	2	3	1
CO4	3	3	2	3	3	-	-	2	1	2	2
CO5	2	3	3	3	3	-	-	2	1	3	1
Average	**2.6**	**2.6**	**2.6**	**3**	**2.8**	**0.2**	**0.4**	**2**	**1.4**	**2.2**	**1.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Parasitology

Course Code: 805304

Semester: 3RD

Credit: 04 **L T P**

4 0 0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Examine stool- microscopic examination, concentration for study of parasites.
CO2	Study of the morphology, life cycle, pathogenesis and lab diagnosis ofvarious parasites.
CO3	Examination of stool and blood samples for diagnosis of disease.
CO4	Understand morphology, life cycle, pathogenesis and lab diagnosis of tapeworm, ringworm, pinworm.
CO5	Identify Nematode I and Nematode II.

Course Contents

UNIT-1

Introduction to medical parasitology: Classification of parasites, host-parasiterelationships, parasitism, and routes of infection, organs and tissues affected, host response to parasite infections, zoonoses

Stool examination: Gross examination of stool, microscopic examination, concentration methods

Protozoan parasites-I :Morphology, life cycle, pathogenesis and lab diagnosis of Entamoebahistolytica, Giardia lamblia, Trichomonasvaginalis, Trypanosomabruceigambiense, Leishmaniadonovani

UNIT-2

Protozoan parasites-II: Morphology, life cycle, pathogenesis and lab diagnosis of Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae, Plasmodium ovale, Toxoplasma gondii, Cryptosporidium parvum

Cestodes: Morphology, life cycle, pathogenesis and laboratory diagnosis of Taeniasolium, Taeniasaginata, Echinococcus granulizes, Hymenolepis nana

UNIT-3

Trematodes: Morphology, life cycle, pathogenesis and laboratory diagnosis ofSchistosomamansoni, Schistosomahaematobium, Paragonimuswestermanni, Fascioloa hepatica

UNIT-4

Nematode-I: Morphology, life cycle, pathogenesis and lab diagnosis of Ascari slumbricoides, Ancyclostomaduodenale, and Trichinellaspiralis

Nematode-II: Morphology, life cycle, pathogenesis and lab diagnosis of Enterobiusvermicularis, Wuchereriabancrofti, Brugiamalayi, Strongyloidesstercoralis

References:

Chatterjee, K. D. (2018). *Parasitology: protozoology and helminthology*. CBS Publishers & Distributors Pvt Ltd.

Arora, B., &Arora, D. R. (2007). *Practical microbiology*.CBS Publishers & Distributors.

Paniker, C. J. (2007). *Textbook of medical parasitology* (No.Ed. 6).Jaypee Brothers Medical Publishers (P) Ltd.

John, D. T., & Petri, W. A. (2013). *Markell and Voge's medical parasitology-e-book*.Elsevier Health Sciences.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	2	-	-	1	2	1
CO2	2	1	3	3	2	1	-	-	2	1	2
CO3	3	1	2	3	2	1	-	1	1	1	1
CO4	2	2	1	2	3	1	1	1	2	2	3
CO5	2	2	1	2	2	1	1	1	1	2	1
Average	**2.4**	**1.6**	**1.6**	**2.2**	**2.2**	**1.2**	**1**	**1**	**1.4**	**1.6**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Computer Applications

Course Code: 805305

Semester: 3RD

Credit-4 **L T P**

4 0 0

Course Outcomes: On completion of this course, the successful students would be able to:

CO	Statement
CO1	Utilize Computer resources for learning and make education more flexible and easy to access.
CO2	Attain knowledge and information from available online resources.
CO3	Use video tutorials to for demonstrations as per requirements
CO4	Utilize web based resources for data acquisition for educational
CO5	Create and manipulate presentations, views, formatting and enhancing text, and slides with graphs.

Course Contents

UNIT-1

Computers in our Lives Why study Computer Technology

Importance of Computer Literacy, Computer in your career (Computer Knowledge opens doors, Computer Graphics & Design) Applications of Computers

History of Computers Computer Generations Shapes/Types of Computers (Super computers, Mainframe Computers,

Minicomputers, Workstations, Personal Computers, Variants of Personal Computers)

UNIT-2

Introduction to Information Technology & Information Technology Industry
Processing Data
Defining Data, Processing, Knowledge, Information, how Computers represent data
Units of measure of computer memory and storage
Fundamental Computing Model (Input – Process – Output)
How computers process data
Parts of a Multimedia Personal Computer

Hardware & Software

How hardware make system useful.

Critical hardware –(Motherboard, Processor, Memory, input devices, output devices, storage devices)

Input Devices keyboard, mouse, trackball, Alternate input devices (Pen, Touch-screen, Game Controllers, Bar Code Readers, Image Scanners, OCR< Microphones,

Video Input, Digital Camera)

UNIT-3

Output Devices Monitors, Its different types, Comparison of various types of monitors, video controllers, PC projectors, Sound Systems, Printers and its different types,

Functioning of various types of Printers.

Storage Devices, How data is organized on a Magnetic Disk, Magnetic Storage Devices (Floppy Disks, Hard Disks, Magnetic Disks, Tape Drives, Zip Drives), Optical Storage Devices, (CD-ROM, DVD-ROM, CR-Recordable, CD-Rewritable, Photo CD Processing Devices, Central Processing Unit, CPU Speed, Different types of CPUs Memory, Cache Memory, Main Memory, Flash Memory (USB Memory Sticks)

Different Connector Ports, Slots and Boards.

CVT, UPS

Computer Software:

Explanation of a Computer Software (Need, Definition, Application etc)

Basic Types of Software (Application Software and System Software)

UNIT-4

Operating System, The role of the operating system, The User interface-GUI and CUI, running programs, Managing Files, Managing Hardware, Utility Software(Paint, Wordpad, Notepad, Calculator). Different operating systems (Unix, DOS, Mac OS, Windows 3.x, OS/2 Warp, Windows NT, Windows 95 & 98, Linux, Windows 2000.

Device Drivers, Applications Software - Common Examples Computer Security Concerns

Virus & Antivirus.

References:

Sinha, P. K., & Sinha, P. (2010). *Computer fundamentals*. BPB publications.

Lester, J., & Koehler, W. C. (2003). *Fundamentals of information studies: Understanding information and its environment*. Neal-Schuman Publishers.

Stair, R., & Reynolds, G. (2015). *Fundamentals of information systems*. Cengage Learning.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	2	-	-	3	2	1
CO2	3	2	2	2	3	2	-	1	3	2	2
CO3	3	3	2	2	2	3	2	2	2	3	3
CO4	3	3	3	3	2	3	2	2	2	3	3
CO5	3	3	3	2	3	3	2	3	3	3	3
Average	**2.8**	**2.6**	**2.4**	**2.0**	**2.4**	**2.6**	**1.2**	**1.6**	**2.6**	**2.6**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Virology and Mycology Laboratory

Course Code: 805306

Semester: 3RD

Credit: 02 **L T P**

0 0 4

Course Outcomes:On completion of this course, the successful students would be able to:

CO	Statement
CO1	Understand various procedures for diagnosis of various viruses, fungal organism from samples.
CO2	Perform staining techniques for identification of fungi.
CO3	Prepare culture media for isolation of fungi from various samples.
CO4	Collect-samples from skin, nail, and hairs, for identification of fungal agent.
CO5	Isolate and identify Candida sp. and perform germ tube test.

Course Contents

List of Practical's / Experiments:

Serodiagnosis

To perform serodiagnosis of HIV infection by tridot kit

To perform serodiagnosis of hepatitis B infection by cassette method

To perform serodiagnosis of hepatitis C infection by cassette method

To perform serodiagnosis of hepatitis A infection by cassette method

To perform serodiagnosis of hepatitis E infection by cassette method

To perform staining of fungi by lacto phenol cotton blue

To perform staining of fungi with 10% and 40% KOH

To isolate and identify the fungi from soil sample

To isolate and identify the fungi from nail sample

To isolate and identify the fungi from skin sample

To isolate and identify the fungi from hair sample

To isolate and identify Candida sp. and perform germ tube test

To perform slide culture technique for studying morphology of mould

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2	-	1	2	1	1
CO2	2	3	2	3	2	2	-	1	2	1	2
CO3	2	3	2	2	1	3	2	2	2	2	2
CO4	2	3	2	2	1	1	1	1	2	1	1
CO5	2	3	2	2	3	1	1	1	2	1	2
Average	**2.2**	**2.8**	**2**	**2.2**	**1.6**	**1.8**	**1.3**	**1.2**	**2**	**1.2**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Histopathology and Cytology Laboratory

Course Code: 805307

Semester: 3rd

Credit: 02 **L T P**

0 0 4

Course Outcomes:On completion of this course, the successful students would be able to:

CO	Statement
CO1	Acknowledge histological specimen, process the tissue for embedding,
CO2	Learn haematoxylin, eosin stain, buccal smear using PAP stain, MGG stain, Gram's stain on tissue.
CO3	Apply Z-N stain on tissue; perform Grocott'smethenamine silver method.
CO4	Prepare the periodic acid schiff's stain on paraffin section, congo red stain.
CO5	Analyze Cut sections of tissue by the use of microtome, fixing and embedding.

Course Contents

List of Practical's / Experiments:

Histology specimen
To receive/gross the histological specimen.
Tissue processing
To process the tissue for embedding.
Section cutting

To perform the tissue cutting.

Alternative processing

To process a tissue using chloroform and acetone

Routine stain

To perform haematoxylin and eosin stain.

PAP stain

To prepare and stain the buccal smear using PAP stain.

Cytological stain

To perform MGG stain.

Bacterial stain

To perform Gram's stain on tissue.

Acid fast stain

To perform Z-N stain on tissue.

Metal impregnation

To perform Grocott'smethenamine silver method

PAS stain

To prepare the reagents and perform the periodic acid Schiff's stain on paraffin section

Congo red stain

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	2	-	-	1	2	1
CO2	2	2	2	2	2	1	-	-	2	2	2
CO3	1	2	3	3	3	2	1	-	2	2	3
CO4	3	1	2	2	2	3	-	1	3	2	2
CO5	2	2	1	1	2	2	-	-	3	2	1
Average	**2**	**2**	**1.8**	**2**	**2.2**	**2**	**1**	**1**	**2.2**	**2**	**1.8**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Parasitology Laboratory

Course Code: 805308

Semester: 3rd

Credit: 02 **L T P**

0 0 4

Course Outcomes:On completion of this course, the successful students would be able to:

CO	Statement
CO1	Examine stool sample for parasitic infections by physical, chemical microscopic examination method.
CO2	Perform the Giemsa's stain, JSB Stain for the identification of malaria parasite from blood sample
CO3	Understand egg counting by Salt flotation and concentration method
CO4	Examine sputum for parasitic infection.
CO5	Examine sputum for AFB.

Course Contents

List of Practical's / Experiments:

Stool examination

Routine examination of stool for parasitic infections by microscopic examination

Routine examination of stool for parasitic infections by physical and chemical method

Sputum examination

Routine examination of sputum for parasitic infections by physical and microscopic method

Giemsa stain

To prepare and perform the Giemsa's stain for the identification of malaria parasite from blood sample

Egg counting technique

To perform egg counting technique by Salt flotation

To perform egg counting technique by concentration method

Formal ether concentration

To perform formal ether concentration method for demonstration of cysts

Leishman stain

To prepare and perform the Leishman's stain for the identification of malaria parasite from blood sample

Field stain

To prepare and perform the Field's stain for the identification of malaria parasite from blood sample

J.S.B stain

To prepare and perform the J.S.B stains to identify the malarial parasite from blood sample

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	2	2	2	3	2	1	-	1	2	1
CO2	3	2	2	2	1	2	-	1	2	1
CO3	3	3	2	2	3	1	-	-	2	1
CO4	3	2	1	2	3	1	-	-	2	2
CO5	3	2	2	2	2	1	1	1	2	3
Average	**2.8**	**2.2**	**1.8**	**2.2**	**2.2**	**1.2**	**1**	**1**	**2**	**1.6**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Internship

Course Code: 805401

Semester: 4TH

Credits: 20 **L T P**

NA NANA

Course Outcomes:On completion of this course, the successful students would be able to:

CO	Statement
CO1	Demonstrate proper technique in the collection, handling, testing, storage and reporting of all biological specimens in the laboratory.
CO2	Diagnose the various parameters and Interpret laboratory test data for clinical nificances.
CO3	Maintain the records of diagnostic lab.
CO4	Ensure Quality Assurance: Calibrate, perform quality control testing on instruments and diagnostic analyzers
CO5	Demonstrate ethical standards of the laboratory profession in relation to medical information and patient care.

Course Contents

List of Practical's / Experiments:

Stool examination

Routine examination of stool for parasitic infections by microscopic examination

Routine examination of stool for parasitic infections by physical and chemical method

Sputum examination

Routine examination of sputum for parasitic infections by physical and microscopic method

Giemsa stain

To prepare and perform the Giemsa's stain for the identification of malaria parasite from blood sample

Egg counting technique

To perform egg counting technique by Salt flotation

To perform egg counting technique by concentration method

Formal ether concentration

To perform formal ether concentration method for demonstration of cysts

Leishman stain

To prepare and perform the Leishman's stain for the identification of malaria parasite from blood sample

Field stain

To prepare and perform the Field's stain for the identification of malaria parasite from blood sample

J.S.B stain

To prepare and perform the J.S.B stains to identify the malarial parasite from blood sample

OBJECTIVE

The objective of providing professional training is to:

1. Create confidence in the students to work in world of work by developing practical skills pertaining to laboratory management and diagnostic skills in the field of clinical hematology, transfusion medicine blood banking, clinical biochemistry, clinical microbiology, histopathology and cytology and ensuring laboratory safety and quality assurance.

2. Create necessary awareness regarding use of various types of diagnostic equipment, particularly sophisticated ones which are used in the field of medical laboratory technology.

3. Develop appreciation regarding size and scale of operations, environment and other related aspects like value of team work, interpersonal relations and professional ethics in the field of medical laboratory technology.

4. Develop necessary traits for starting small clinical laboratories as per requirements.

SELECTION OF TRAINING PLACES

The institute offering diploma Program in Medical Laboratory Technology should establish contact/rapport by personal visit to following types of organizations:

1. Medical Colleges/Research institutions

2. Civil Hospitals at District Headquarters having well equipped laboratory

3. Hospitals in private sector

4. Well established clinical laboratories being run by a qualified person

Departments for training in lab under Microbiology:

1. Bacteriology
2. Mycology
3. Serology
4. Virology
5. Parasitology s

EVALUATION OF STUDENTS FOR PROFESSIONAL TRAINING

Professional training will have 1000 marks. Out of which 500 marks will be awarded by

the organization where placed for practical/professional training and 500 marks are for (Board) external examination. The criteria for internal assessment will be as under:

a) Criteria for internal assessment by Weightage organization where placed (%) for practical/professional training

Specific criteria	Marks
1. Attendance/Punctuality	10
2. Proficiency in conducting laboratory test	30
3. Preparation of portfolio based on day to day work done in various laboratories	20
4. Initiative/responsibility exhibited	10
5. Interpersonal relations	10
6. Behavior/attitude	10
7. Maintenance of equipment and work place	10

GENERAL GUIDELINES

(i) The students should to prepare practical record book as per given list of the experiments. Besides, they can also add other experiments as well.

(ii) External examiner along with internal faculty should evaluate the student's performance through viva voice/spotting/performance and synopsis.

The mapping for PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	2	3	3	3	2	3	2	3	2
CO2	3	3	3	3	2	2	2	3	2	2	2
CO3	2	2	3	3	1	3	3	1	3	2	3
CO4	3	2	1	2	3	1	2	1	3	2	2
CO5	1	2	3	3	2	3	2	3	3	2	3
Average	**2.2**	**2.2**	**2.4**	**2.8**	**2.2**	**2.4**	**2.2**	**2.2**	**2.6**	**2.2**	**2.4**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Total Number of Course	24
Number of Theory Course	16
Number of Practical Course	08
Total Number of Credits	**112**

Annexure-4

ACADEMIC INSTRUCTIONS

Attendance Requirements

A student shall have to attend 75% of the scheduled periods in each course in a semester; otherwise he / she shall not be allowed to appear in that course in the University examination and shall be detained in the course(s). The University may condone attendance shortage in special circumstances (as specified by the Guru Kashi University authorities). A student detained in the course(s) would be allowed to appear in the subsequent university examination(s) only on having completed the attendance in the program, when the program is offered in a regular semester(s) or otherwise as per the rules.

Assessment of a course

Each course shall be assessed out of 100 marks. The distribution of these 100 marks is given in subsequent sub sections (as applicable).

	Internal (50)						External (50)	Total
Components	**Attendance**	**Assignment**			**MST 1**	**MST2**	**ETE**	
		A1	A2	A3				
Weightage	10	10	10	10	30	30	50	
Average Weightage	10		10		30		50	100

Passing Criteria

The students have to pass both in internal and external examinations. The minimum passing marks to clear in examination is 40% of the total marks.