GURU KASHI UNIVERSITY
PUNJAB - INDIA

Program Syllabus Booklet

Bachelor of Science in Medical Laboratory Technology

(BMLT -804)

Session: 2021-22

University College of Paramedical Sciences,
Guru Kashi University, Talwandi Sabo

Annexure -1

Programme Name: Bachelor of Science in Medical Laboratory Technology
Programme Code: 804
Programme Outcomes (PO): The PO for the Bachelor of Medical Laboratory Technology is as follows:

PO	Statements
PO1	**Medical laboratory Technology knowledge:** To apply knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations support.
PO2	**Problem analysis:** To apply problem solving techniques in identification and correction of pre analytical, post analytical & analytical variables.
PO3	**Design/Development of solutions:** To demonstrate effective analysis of scientific issues through the use of case studies, laboratory and field research work.
PO4	**Conduct investigations of complex problems:** To have thorough knowledge and become qualified and skilled advanced laboratory diagnostic professionals in clinical practice.
PO5	**Modern tool usage:** To operate and maintain laboratory equipment's utilizing, appropriate quality control and safety procedures.
PO6	**The Technician and society:** To perform various diagnostic tests, analysis and bring forth important and vital information about the status and particulars of an individual's health.
PO7	**Environment and sustainability:** To recognize the impact of laboratory tests in a global and environmental context.
PO8	**Ethics:** To exhibit a sense of commitment to the ethical and human aspects of patient care.
PO9	**Individual and team work:** To function as a leader / team member in diverse professional and industrial research areas.
PO10	**Communication:** To communicate appropriately through verbal and written communication to the scientific and social community.
PO11	**Project management and finance:** To apply the fundamentals of research process to complete and present research studies that enrich the field of physical therapy.
PO12	**Life-long learning:** To be a competent and ethical individual, committed to life-long learning to meet current and future workplace challenges.

Program Specific Outcome (PSO): The PSO for the Bachelor of Science in Medical Laboratory Technology (B.Sc. MLT) are as follows:

PSO	Statements
PSO1	To attain the skills to accurately perform testing in areas of medical laboratory with safety regulations and standards.
PSO2	To become eligible for higher studies in field of microbiology, pathology, biochemistry, virology, biotechnology.
PSO3	To become proficient in interpersonal communication skills when interacting with patients, lab personnel and other health care professionals.

Annexure-2

Semester: 1st										
Sr.	Course Code	Course Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	A804101	General Anatomy –I	T	2	1	0	3	50	50	100
2	A804102	General Physiology-I	T	2	1	0	3	50	50	100
3	A804103	Basics of Computer and Information Science	T	2	1	0	3	50	50	100
4	A804106	Introduction to Quality & Patient Safety	T	3	1	0	4	50	50	100
5	A804107	General Clinical Microbiology	T	2	1	0	3	50	50	100
6	A804108	English and Communication Skills	T	2	0	0	2	50	50	100
7	A804110	Basic Hematology	T	2	1	0	3	50	50	100
8	A804111	General Anatomy - I (Practical)	P	0	0	4	2	60	40	100
9	A804112	General Physiology-I (Practical)	P	0	0	4	2	60	40	100
10	A804113	General Clinical Microbiology (Practical)	P	0	0	2	1	60	40	100
11	A804114	Basics of Computer and Information Science (Practical)	P	0	0	2	1	60	40	100
12	A804115	Basic Hematology (Practical)	P	0	0	2	1	60	40	100
Total No. of Credits							28			

Semester: 2nd										
Sr.	Course Code	Course Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	A804201	General Anatomy -II	T	2	1	0	3	50	50	100
2	A804202	General Physiology-II	T	2	1	0	3	50	50	100
3	A804203	Basic Clinical Biochemistry	T	3	1	0	4	50	50	100
4	A804204	Systematic Bacteriology	T	3	1	0	4	50	50	100
5	A804205	Medical Ethics and Legal Aspects	T	3	0	0	3	50	50	100
6	A100302	Environment Studies	T	4	0	0	4	50	50	100
7	A804206	General Anatomy-II (Practical)	P	0	0	2	1	60	40	100
8	A804207	General Physiology-II (Practical)	P	0	0	2	1	60	40	100
9	A804208	Basic Clinical Biochemistry (Practical)	P	0	0	4	2	60	40	100
10	A804209	Systematic Bacteriology (Practical)	P	0	0	4	2	60	40	100
Total No. of Credits							27			

Semester: 3rd										
Sr.	Course Code	Course Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	A804301	Basics of Hematological diseases	T	2	1	0	3	50	50	100
2	A804302	Biochemical Metabolism	T	2	1	0	3	50	50	100
3	A804303	Fundamental Histology	T	2	1	0	3	50	50	100
4	A804304	Applied Bacteriology	T	2	1	0	3	50	50	100
5	A804305	Applied Hematology-I	T	2	1	0	3	50	50	100
6	A804306	Medical Parasitology & Entomology	T	2	0	0	2	50	50	100
7	A804307	Basics of Hematological diseases(Practical)	P	0	0	4	2	60	40	100
8	A804308	Biochemical Metabolism(Practical)	P	0	0	4	2	60	40	100
9	A804309	Fundamental Histology(Practical)	P	0	0	4	2	60	40	100
10	A804310	Applied Bacteriology(Practical)	P	0	0	2	1	60	40	100
11	A804311	Applied Hematology-I(Practical)	P	0	0	2	1	60	40	100
Total No. of Credits							25			

Semester: 4th										
Sr.	Course Code	Course Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	A804401	Analytic Clinical Biochemistry	T	3	0	0	3	50	50	100
2	A804402	Applied Histopathology-I	T	2	0	0	2	50	50	100
3	A804403	Immunology and Bacterial Serology	T	2	1	0	3	50	50	100
4	A804404	Applied Hematology-II	T	2	1	0	3	50	50	100
5	A804405	Applied Clinical Biochemistry-I	T	2	1	0	3	50	50	100
6	A804406	Cytopathology	T	2	0	0	2	50	50	100
7	A804407	Analytic Clinical Biochemistry (Practical)	P	0	0	4	2	60	40	100
8	A804408	Applied Histopathology-I(Practical)	P	0	0	4	2	60	40	100
9	A804409	Immunology and Bacterial Serology(Practical)	P	0	0	4	2	60	40	100
10	A804410	Applied Hematology II (Practical)	P	0	0	4	2	60	40	100
11	A804411	Applied Clinical Biochemistry-I (Practical)	P	0	0	2	1	60	40	100
Total No. of Credits							25			

Semester: 5th										
Sr.	Course Code	Course Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	A804501	Applied Histopathology II	T	2	1	0	3	50	50	100
2	A804502	Advanced Hematology	T	2	1	0	3	50	50	100
3	A804503	Applied Clinical Biochemistry II	T	2	1	0	3	50	50	100
4	A804504	Blood Banking & Genetics	T	2	0	0	2	50	50	100
5		Elective-1	T	2	0	0	2	50	50	100
6	A804506	Research Methodology and Biostatistics	T	3	0	0	3	50	50	100
7	A804507	Applied Histopathology II (Practical)	P	0	0	2	1	60	40	100
8	A804508	Advanced Hematology (Practical)	P	0	0	4	2	60	40	100
9	A804509	Applied Clinical Biochemistry-II (Practical)	P	0	0	4	2	60	40	100
10	A804510	Blood Banking & Genetics(Practical)	P	0	0	4	2	60	40	100
11	A804511	Medical Mycology and Virology(Practical)	P	0	0	4	2	60	40	100
Total No. of Credits							25			

Elective - I (Select one of the following subjects)

Sr. No.	Subject Code	Subject Name
1	**A804505**	**Medical Mycology and Virology**
2	**805309**	**Advance Principle of Toxicology**

Semester 6th									
Sr.	Course Code	Course Name	Type of Subject	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	A804601	Professional Training/Internship (6 Months)	NA	NA	NA	NA	20	500	500	1000

Annexure-3

Course Name: General Anatomy-I
Course Code: A804101
Semester: 1st **L T P**
Credits: 03 **2 1 0**

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

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

Course Contents

Unit 1

Introduction to Anatomical terms of the human body - Basic anatomical terminology, anatomical position, anatomical planes, levels of organization in the body, organ systems, skeleton, cavities of the body.

Organization of the human body at the cellular level - Structure of the cell comprising of cell membrane, cytoplasm, cell organelles, nucleus, cell extensions etc.

Organization of the human body at the tissue level - Epithelial, Connective, Muscular& Nervous tissue.

Unit 2

Blood - Composition of blood, Features of red blood cells, white blood cells, platelets.

Lymphatic System - Features of lymph vessels, lymphatic tissue & organs, lymphatic's, spleen, tonsil, and thymus.

Nervous System - Central nervous system, brain, cerebellum, spinal cord, cranial nerves, autonomic nervous system.

Muscular System - Skeletal muscle, cardiac muscle, smooth muscle, muscles of the body.

Skeletal System - Features of bones, axial skeleton, and appendicular skeleton.

Musculoskeletal system - Joints of upper & lower limb.

Unit 3

Respiratory System - Nose & paranasal sinuses, pharynx, larynx, trachea, lungs.

Cardiovascular System - Heart & blood vessels.

Digestive System - Oral cavity, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas.

Urinary System - Kidneys, juxtaglomerular apparatus, Ureter, urinary bladder, urethra.

Unit 4

Introduction to Genetics - Features of chromosomes, DNA.

Reproductive System In Females - External & internal genital organs, breast.

Reproductive System In Males - Penis, scrotum, testes, prostate gland.

Endocrine System - Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas.

Special Senses - Olfactory system, taste apparatus, external middle & internal ear, eye.

Skin - Features of skin, hair, sebaceous glands, sweat glands, nails.

References:

1. **Chaurasia, B. D. (2010). *BD Chaurasia's Human Anatomy*. CBS Publishers & Distributors PVt Ltd..**
2. Mescher, A. L. (2013). *Junqueira's basic histology: text and atlas* (Vol. 12). 13th ed. New York: McGraw-Hill
3. Halim, A. (2008). *Human Anatomy: Volume I: Upper Limb And Thorax*. IK International Pvt Ltd.
4. Hallam, J. (2009). Grey's Anatomy: Scalpels, sex and stereotypes. *Medical Humanities*, *35*(1), 60-61.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO 1	PSO 2	PSO3
CO1	2	2	2	1	2	1	-	-	1	2	1	3	2	1	1
CO2	1	3	1	2	1	2	2	1	2	1	2	2	3	2	2
CO3	3	2	3	3	3	1	1	-	-	-	1	2	2	3	3
CO4	2	1	2	1	2	3	1	2	1	2	3	1	1	2	1
CO5	2	1	1	2	1	1	2	1	2	1	1	2	2	1	2
Average	**2.0**	**1.8**	**1.8**	**1.8**	**1.8**	**1.6**	**1.2**	**0.8**	**1.2**	**1.2**	**1.6**	**2.O**	**2.0**	**1.8**	**1.6**

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

Course Name: General Physiology-I
Course Code: A804102
Semester: 1st

	L	T	P
Credits: 03	**2**	**1**	**0**

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

CO	Statement
CO1	Illustrate the functions of structures related to human body.
CO2	Memorize cell and its organelles, blood component, function, skeletal system, circulatory system, lymphatic system and its structure
CO3	Identify properties of nerve fibers, function of neuralgia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.
CO4	Categories functioning of Hormones of pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas,
CO5	Explain the malfunctioning of the organs and diagnose the disorders.

Course Contents

Unit 1

Introduction to physiology of the human body –Composition of body, Homeostasis, Introduction to chemistry of life.
Organization of the human body at the cellular level – Function of lipids, carbohydrates, proteins & cell organelles.
Organization of the human body at the tissue level – Function of Epithelial, Connective, Muscular & Nervous tissues.

Unit 2

Blood – Haemopoiesis, homeostasis, coagulation of blood, blood transfusion.
Lymphatic System – Function of lymph vessels, lymphatic tissue & organs, lymphatic's, spleen, tonsil, and thymus.
Resistance & Immunity – Innate immunity, acquired immunity, humoral& cell mediated immunity.

Unit 3

Nervous System-Properties of nerve fibres, function of neuroglia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.
Muscular System – Properties of skeletal muscle, cardiac muscle, smooth muscle, muscles of the body.
Skeletal System – Functions of bones, axial skeleton, and appendicular skeleton.
Musculoskeletal System- Movement in the joints of upper & lower limb.

Unit 4

Respiratory System -Physiology of respiration, pulmonary function tests, gas exchange in lungs, transport of gases between lungs & tissues, regulation of respiration.
Cardiovascular System - Heart & blood vessels: Systemic circulation, pulmonary circulation, ECG, cardiac output, blood pressure.

Digestive System – Process of digestion, function of oral cavity, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas.

Urinary System – Function of kidneys, juxtaglomerular apparatus, Ureter, urinary bladder, urethra, physiology of urine formation, Glomerular filtration, tubular reabsorption, water balance, and micturation.

Introduction to Genetics - Features of chromosomes, DNA, protein synthesis, dominant inheritance, recessive inheritance, sex linked inheritance.

Reproductive System– Female: Physiology of female reproductive system.

Reproductive System – Male: Physiology of male reproductive system.

Endocrine System - Mechanism of action of hormones, function of pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas.

Special Senses - Physiology of olfaction, taste, hearing, balance & vision.

Skin – Function of skin, hair, sebaceous glands, sweat glands, nails, temperature regulation

References:

1. Ashalatha, P. R., &Deepa, G. (2012). *Textbook of Anatomy & Physiology for Nurses*. JP Medical Ltd.
2. Chatterjee, C. C. (2020). Human Physiology. (13 th edition). CBS Publisher and Distributor Pvt. Ltd.Colorimetry
3. Heilbrunn, L. V. (1952). *General physiology*. Saunders, Philadelphia.
4. Hall, J. E. 1. (2016). Guyton and Hall textbook of medical physiology (13th edition.). Philadelphia, PA: Elsevier.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	3	2	-	3	2	2	1	1	2	2	1
CO2	2	3	2	3	2	1	2	1	3	1	2	1	3	1	2
CO3	1	2	-	1	1	2	-	2	3	2	-	2	3	2	3
CO4	2	1	3	1	3	3	1	3	1	1	1	3	1	1	1
CO5	2	2	1	3	2	2	1	2	3	3	2	2	3	3	2
Average	**1.8**	**1.8**	**2.0**	**2.0**	**2.2**	**2.0**	**1.0**	**2.2**	**2.4**	**1.8**	**1.2**	**1.8**	**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: Basics in Computer & Information Science
Course Code: A804103
Semester: 1st

L T P

Credits: 03 **2 1 0**

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

CO	Statement
CO1	Understand the concepts of computer system, Windows operating system, Internet ,various storage devices and computer Networks, e-waste
CO2	Analyze various components and Input Output devices used in a computer system.
CO3	Utilize various applications and software's of computer.
CO4	Create and manipulate presentation, views, formatting and enhancing text, and slide with graphs
CO5	Investigate various applications used in Clinical Setting.

Course Contents

Unit 1

Introduction to Computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input Output Devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Processor and Memory: The Central Processing Unit (CPU), main memory.

Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Unit 2

Introduction of Windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Unit 3

Introduction to Power-Point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Introduction of Operating System: introduction, operating system concepts, types of operating system. Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of computers in clinical settings.

References:

1. Rajaraman, V., & Radhakrishnan, T. (2006). *Digital Logic and Computer Organization*. PHI Learning Pvt. Ltd..
2. Mehdi, M. M. (2015). Information Technology for Management by. *FIIB Business Review*, *4*(1), 46-47.
3. Ram, B. (2000). *Computer fundamentals: architecture and organization*. New Age International.
4. Basandara, S. K. (2017).Computers Today,,Galgotia publication PvtLtd. Daryaganj, New Delhi.
5. Sadagopan, S. (1998).Internet for everyone by Alexis Leon and Matthews Leon, Vikas Publishing House, 1997, Rs. 128.00.
6. Saxena, S. (2009). *A first course in computers: Based on Windows Xp& Office*. Vikas Publishing House Pvt Ltd.
7. Sinha P.K. and Sinha, P. (2007) Computer Fundamentals, BPB Publications.
8. Bangia, R. (2008). *Computer Fundamentals and Information Technology*. Firewall Media.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	3	1	2	2	2	2	-	2	1	2	1
CO2	2	3	3	3	2	-	-	2	2	2	-	2	2	1	2
CO3	3	2	3	3	3	-	-	2	2	2	-	2	2	3	1
CO4	3	3	2	3	3	-	-	2	2	2	-	2	1	2	2
CO5	2	3	3	3	3	-	-	2	2	2	-	3	1	3	1
Average	2.6	2.6	2.6	3	2.8	0.2	0.4	2	2	2	0	2.2	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: Introduction to Quality and Patient Safety
Course Code: A804106
Semester: 1st

	L	T	P
Credits: 04	**3**	**1**	**0**

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

CO	Statement
CO1	Narrate the health care discipline that emerged with the evolving complexity.
CO2	Absorb knowledge to prevent and reduce risks, errors and harm that occur to patients during provision of health care.
CO3	Restate continuous improvement based on learning from errors and adverse events.
CO4	Perform important role in quality improvement approaches, standards and norms.
CO5	Use quality improvement tools, introduction to NABH guidelines.

Course Contents

Unit 1

Quality Assurance and Management- Introduction, Quality improvement approaches, standards and norms, quality improvement tools, introduction to NABH guidelines.
Basic of Emergency care and Life support skills
Basic life support (BLS) following cardiac arrest, recognition of sudden cardiac arrest and activation of emergency response system, early cardiopulmonary resuscitation (CPR) and rapid defibrillation with an automated external defibrillator (AED)

Unit 2

Basic Emergency Care
First aid, choking, rescue breathing methods, ventilation including use of bag valve master (BVMs)
Biomedical Waste Management
Definition, waste minimization, BMW-segregation, collection, transportation, treatment and disposal (Including color coding), Liquid BMW, Radioactive waste, metals/chemicals/drug waste, BMW management and methods of disinfection, use of Personal protective equipment (PPE)

Unit 3

Infection Prevention and Control

Sterilization, Disinfection, Effective hand hygiene, use of PPE, Prevention and control of common health care associated infections, Guidelines (NABH) and JCI for hospital infection control.
Disaster preparedness and management
Fundamentals of emergency management

References:

1. Vincent, C. (2011). *Patient safety*.John Wiley & Sons.
2. Hall, L. M. (Ed.). (2005). *Quality work environments for nurse and patient safety*.Jones& Bartlett Learning.
3. Sandars, J., & Cook, G. (Eds.).(2009). *ABC of patient safety* (Vol. 72).John Wiley & Sons.
4. Carayon, P. (2006). *Handbook of human factors and ergonomics in health care and patient safety*.CRC press.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	2	3	1	2	3	3	1	2	3	2	1	3
CO2	3	2	1	1	2	2	-	1	2	2	1	1	3	1	2
CO3	1	3	2	3	1	2	-	2	1	2	-	2	1	3	2
CO4	2	2	1	2	1	1	3	3	1	1	3	3	3	2	1
CO5	2	1	2	1	2	3	1	2	2	3	1	2	1	1	3
Average	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**2**	**2.2**	**1.8**	**1.8**	**1.75**	**2.2**	**2**	**1.6**	**2.2**

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

Course Name: General Clinical Microbiology
Course Code: A804107
Semester: 1st

	L	T	P
Credits: 04	**3**	**1**	**0**

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

CO	Statement
CO1	Get detailed information about the host, parasite, their life cycle and various diseases caused by them.
CO2	Learn the procedures of sample collection and transportation for microbiology tests.
CO3	Prepare various culture media, Care & handling of laboratory animals and get their extracts for culture preparations.
CO4	Classify microbes with special reference to prokaryotes & eukaryotes, Bacterial anatomy
CO5	Care and handling of glassware, their use and cleaning techniques, sterilization processes.

Course Contents

Unit 1

Introduction to Medical Microbiology

Definition, History, Host - Microbe relationship, Safety measures in Clinical Microbiology, Glassware used in Clinical Microbiology Laboratory, Care and handling of glassware, cleaning of Glassware, Equipment used in clinical Microbiology Laboratory, Care and maintenance including calibration.

Unit 2

Microscopy & Sterilization

Microscopy, Introduction and history, Types, principle and operation mechanism of following microscopes, Light microscope, DGI, Fluorescent, Phase contrast, Electron microscope: Transmission/ Scanning, Definition, Types and principles of sterilization methods, Heat (dry heat, moist heat with special Reference to autoclave), Radiation, Filtration, Efficiency testing to various sterilizers.

Unit 3

Antiseptics and Disinfectants

Definition, Types and properties, Mode of action - Uses of various disinfectants, Precautions while using the disinfectants - Qualities of a good disinfectant, Testing efficiency of various disinfectants.
Biomedical waste management in a Medical Microbiology laboratory
Types of the waste generated – Segregation – Treatment – Disposal

General Characteristics & Classification Of Microbes: (Bacteria &Fungi)
Classification of microbes with special reference to prokaryotes & eukaryotes, Morphological classification of bacteria, Bacterial anatomy (Bacterial cell structures)

Growth and Nutrition of Microbes
General nutritional & other requirements of the bacteria, Classification of bacteria on the basis of their nutritional requirements, Physical conditions required for growth, Normal growth cycle of bacteria (growth curve), Types of microbial cultures: Synchronous, Static, continuous culture.

Unit 4

Culture Media
Introduction, Classification of culture media (Example & Uses) solid media, liquid media, semisolid, Media, routine/synthetic/defined media, basal media, enriched, enrichment, Selective differential media, sugar fermentation media, transport media, preservation media and anaerobic culture media, Quality control in culture media, Automation in culture media preparation
Aerobic & anaerobic culture methods: Concepts, Methods Used for aerobic cultures, Methods used for anaerobic cultures

Immunology- Introductions to Immunology, Immunity, Antigens and Antibodies
Care & handling of laboratory animals: Introduction General care & handling, Ethics & legality in use of laboratory animal.

References:

1. Collee, J. C., Dugmid, J. P., Fraser, A. G., &Marmion, B. P. (1996). Practical medical microbiology, Mackie and McCartney.
2. Gupte, S. (2007). *Review of medical microbiology* (No. Ed. 2).Jaypee Brothers Medical Publishers (P) Ltd.
3. Mukherjee, K. L. (2013). *Medical Laboratory Technology Volume 3* (Vol. 3).Tata McGraw-Hill Education.
4. Cheesbrough, M. (2018).District Laboratory Practice in Tropical Countries. *IJMS*, *1*(1).
5. Willey, J. M., Sherwood, L., &Woolverton, C. J. (2011). *Prescott's microbiology* (Vol. 7). New York: McGraw-Hill.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1	2	3	-	1	1	2	1	1	2	1
CO2	1	3	2	3	2	1	1	1	3	2	1	2	1	1	3
CO3	2	1	3	2	1	2	2	3	2	1	2	3	2	2	2
CO4	3	2	1	3	2	3	3	1	3	2	3	1	3	3	1
CO5	2	1	3	2	2	1	1	3	2	2	1	2	2	1	2
Average	2	1.8	2.2	2.2	1.6	1.8	2	2	2.2	1.6	1.8	1.8	1.8	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: English & Communication Skills
Course Code: A804108
Semester: 1st

	L	T	P
Credits: 02	**2**	**0**	**0**

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

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

Course Contents

Unit 1

Basics of Grammar- Part I
Vocabulary, Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies and Portmanteau words.
Basics of Grammar – Part II
Active, Passive, Direct and Indirect speech, Prepositions, Conjunctions and Euphemisms
Writing Skills
Letter writing, E mail, and Essay, Articles, and Memos, one word substitutes, note making and Comprehension.

Unit 2

Writing and Reading
Summary writing, Creative writing, newspaper reading
Practical Exercise
Formal speech, Phonetics, semantics and pronunciation
Communication:
Introduction:
Communication process, Elements of communication, Barriers of communication and how to overcome them, Nuances for communicating with patients and their attendants in hospitals.

Unit 3

Speaking: Importance of speaking efficiently; Voice culture,
Preparation of speech. Secrets of good delivery, Audience psychology, handling, Presentation skills, Individual feedback for each student, Conference/Interview technique.
Listening: Importance of listening, Self-assessment, Action plan execution, Barriers in listening, Good and persuasive listening.

Unit 4

Reading: What is efficient and fast reading, Awareness of existing reading habits, tested techniques for improving speed, Improving concentration and comprehension through systematic study.
Non Verbal Communication: Basics of non-verbal communication, Rapport building skills using Neuro-linguistic programming (NLP).

References:

1. Jaidka, K.(2009). English and Communication Skills, , Prescribed by NITTTR, Chandigarh Published By Abhishek Publication,
2. Pal and Rorualling (2006). The Essence of Effective Communication, Ludlow andPanthon; Prentice Hall of India
3. Kohli, A. L. (2004). New Design English Grammar, Reading and Writing Skills.Kohli publisher.
4. Sasikumar, V. and P.V. Dhamija. (2006) A Practical English Taylor; Tata McGraw Hill
5. Datta, R. and Dhir, K.K. Communication Skills. Vishal Publication, Jalandhar

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	3	1	2	1	2	1	2	3	2	1	2	1	2	1	2
CO2	1	2	1	3	1	1	3	2	1	3	1	1	1	3	1
CO3	2	3	3	2	2	3	2	1	3	2	-	3	3	2	3
CO4	3	1	2	1	2	2	1	3	2	1	2	2	2	1	2
CO5	2	3	2	2	1	1	-	1	1	2	1	1	1	2	1
Average	**2.2**	**2**	**2**	**1.8**	**1.6**	**1.6**	**2**	**2**	**1.8**	**1.8**	**1.5**	**1.6**	**1.8**	**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: Basic Haematology
Course Code: A804110
Semester: 1st

	L	T	P
Credits: 03	**2**	**1**	**0**

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

CO	Statement
CO1	Illustrate the functions of blood, its composition and various abnormalities related to blood and blood component.
CO2	Identify various types of anticoagulants used in clinical laboratory.
CO3	Narrate the series of erytheropoiesis, leucopoiesis and thrombopoiesis.
CO4	Proficient in internal and external quality control procedures.
CO5	Use Statistical analysis i.e. Standard deviation, Co-efficient of variation, accuracy and precision.

Course Contents

Unit 1

Introduction to Hematology
Definition, Importance, Important equipment used, Laboratory organization and safety measures in Hematology Laboratory, Introduction to blood, its composition, function and normal cellular components.

Unit 2

Anticoagulants
Types, mode of action and preference of anticoagulants for different hematological studies, Collection and preservation of blood sample for various hematological investigations.

Unit 3

Formation Of Cellular Components Of Blood (Haemopoesis)
Erythropoiesis, Leucopoiesis, Thrombopoiesis, Hemoglobin: definition, types, structure, synthesis and degradation, Morphology of normal blood cells, Normal Homeostasis & physiological properties of coagulation factors
Radioactivity Definition, half-life, physical decay and units, Urine analysis

Unit 4

Quality Assurance in Hematology
Internal and external quality control including reference preparation, Routine quality assurance protocol Statistical

Statistical analysis i.e. Standard deviation, Co-efficient of variation, accuracy and precision

References:

1. Bain, Imelda, B. and John V. D. (2001).*Practical Haematology*. London: Churchill Livingstone
2. Christopher, A. L. (1990) *Clinical Hematology*.
3. John, B. H. (2001). *Clinical Diagnosis &Management by Laboratory methods*.
4. McDonald, G.A. (1989). *Atlas of haematology*
5. *Godkar, P. B., &Godkar, D. P. (2003). Textbook of medical laboratory technology. Bhalani.*
6. Stephen, M. (2001). Clinical Hematology (Pathophysiological basis for clinical practice(3rd edition)

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	1	2	1	1	3	1	2	1	2	3	1
CO2	3	1	3	2	2	3	-	2	2	2	3	2	1	2	3
CO3	1	3	2	1	3	1	-	3	1	3	1	2	2	1	2
CO4	2	2	3	2	1	2	1	1	2	1	2	1	3	3	1
CO5	3	3	2	3	2	3	2	2	3	2	-	2	2	2	2
Average	**2**	**2.2**	**2.2**	**2.2**	**1.8**	**2.2**	**1.3**	**1.8**	**2.2**	**1.8**	**2**	**1.6**	**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: General Anatomy-I (Practical)
Course Code: A804111
Semester: 1st

	L	T	P
Credits: 02	**0**	**0**	**4**

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

CO	Statement
CO1	Demonstrate practical knowledge of human gross and microscopic anatomy using human cadavers and prepared histological slides.
CO2	Identify structures in the body and analyze their relationship with other structures.
CO3	Understand chemical and biological principles and knowledge that serve as the foundation of human anatomy and physiology.
CO4	Describe development, regeneration and normal function of body systems.
CO5	Understand the cellular and physiological mechanisms that drive tissue formation and function.

Course Contents

Demonstration of-

Basic anatomical terminology, anatomical position, anatomical planes, levels of organization in the body, organ systems, skeleton, cavities of the body.

1. **Lymphatic System** - Features of lymph vessels, lymphatic tissue & organs, lymphatic's, spleen, tonsil, thymus.
2. **Nervous System** - Central nervous system, brain, cerebellum, spinal cord, cranial nerves, autonomic nervous system.
3. **Muscular System** - Skeletal muscle, cardiac muscle, smooth muscle, muscles of the body.
4. **Skeletal System** - Features of bones, axial skeleton, appendicular skeleton.
5. **Musculoskeletal System** - Joints of upper & lower limb.
6. **Respiratory System** - Nose &paranasal sinuses, pharynx, larynx, trachea, lungs.
7. **Cardiovascular System** - Heart & blood vessels.
8. **Digestive System** - Oral cavity, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas.
9. **Urinary System** - Kidneys, juxtaglomerular apparatus, Ureter, urinary bladder, urethra.
10. **Introduction to Genetics** - Features of chromosomes, DNA.
11. **Reproductive System In Females** - External & internal genital organs, breast.
12. **Reproductive System In Males** - Penis, scrotum, testes, prostate gland.
13. **Endocrine System** - Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	-	1	2	1	-	1	1	2	3
CO2	2	1	3	2	3	2	1	2	3	2	1	2	3	1	2
CO3	3	2	1	1	2	1	2	2	2	1	2	2	1	2	2
CO4	2	3	2	3	1	2	1	3	1	2	1	3	3	1	1
CO5	2	1	2	2	1	3	3	1	1	3	-	1	2	1	2
Average	**2**	**1.8**	**2**	**1.8**	**1.8**	**1.8**	**1.75**	**1.8**	**1.8**	**1.8**	**1.3**	**1.8**	**2**	**1.4**	**2**

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

Course Name: General Physiology-I (Practical)
Course Code: A804112
Semester: 1st

	L	T	P
Credits: 02	**0**	**0**	**4**

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

CO	Statement
CO1	Employ the scientific process for understanding principles of anatomy and physiology.
CO2	Understand the cellular and physiological mechanisms that drive tissue formation and function.
CO3	Demonstrate understanding of chemical and biological principles and knowledge that serve as the foundation for understanding human anatomy and physiology.
CO4	Analyze A&P observations and data and determine the potential physiological consequences.
CO5	Become familiar with current teaching practices and ways to address the various learning styles of students in the human anatomy and physiology laboratory.

Course Contents

Practical: demonstration / observation of

Blood tests
Microscopy
Haemocytometery
RBC count
Hb
WBC count
Differential Count
Hematocrit demonstration
ESR
Blood group & Rh. Type
Bleeding time and clotting time.
Digestion
Test salivary digestions
Excretion
Examination of Urine
Specific gravity
Albumin
Sugar
Microscopic examination for cells and cysts
Respiratory System:
Clinical examination of respiratory system
Spirometry
Breath holding test
Cardio Vascular System:
Measurement of blood pressure and pulse rate
Effect of exercise on blood pressure and pulse rate

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	3	2	-	3	2	2	1	1	2	2	1
CO2	2	3	2	3	2	1	2	1	3	1	2	1	3	1	2
CO3	1	2	2	1	1	2	-	2	3	2	-	2	3	2	3
CO4	2	1	3	1	3	3	1	3	1	1	1	3	1	1	1
CO5	2	2	1	3	2	2	1	2	3	3	2	2	3	3	2
Average	**1.8**	**1.8**	**2**	**2**	**2.2**	**2**	**1.3**	**2.2**	**2.4**	**1.8**	**1.5**	**1.8**	**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: General Clinical Microbiology (Practical)
Course Code: A804113
Semester: 1st

	L	T	P
Credits: 01	**0**	**0**	**2**

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

CO	Statement
CO1	Maintain internal and external quality control protocols in clinical laboratory.
CO2	Use cleaning techniques of glassware by various methods according to their uses in laboratory
CO3	Operate microscope, cleaning and maintenance of microscope and objectives.
CO4	Perform Sterilization techniques- dry and moist heat, working of hot air oven and autoclave
CO5	Prepare culture media, sample collection and culturing techniques for the identification of bacteria.

Course Contents

To demonstrate safe code of practice for a Microbiology laboratory
To prepare cleaning agents & to study the technique for cleaning & sterilization of glassware.
To demonstrate the working & handling of Compound microscope.
To demonstrate the method of sterilization by autoclave including its efficacy testing.
To demonstrate the method of sterilization by hot air oven including its efficacy testing.
To demonstrate the method of sterilization of media/solution by filtration.
Demonstration of Antiseptics, Spirit, Cetrimide & SPovidone-Iodine.
To demonstrate the use of disinfectants.
Demonstrate the precaution while using disinfectants.
To prepare working dilution of commonly used disinfectants.
In-use test
Rideal-walker phenol co-efficient test.
Kelsey-Sykes test
To demonstrate the different morphological types of bacteria
Preparation of one culture media from each type
To demonstrate aerobic culture
To demonstrate anaerobic culture
Visit to animal house & demonstrate about care of laboratory animals

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	1	2	1	1	2	2	1	1	2	3	2	2
CO2	2	1	3	2	3	2	1	1	3	2	1	1	2	1	2
CO3	1	2	1	3	2	3	-	2	2	3	-	2	1	1	3
CO4	3	1	2	3	2	1	2	3	2	1	2	3	2	2	1
CO5	2	2	2	2	1	2	1	1	1	2	1	1	2	1	3
Average	**2**	**1.8**	**2**	**2.2**	**2**	**1.8**	**1.25**	**1.8**	**2**	**1.8**	**1.25**	**1.8**	**2**	**1.4**	**2.2**

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

Course Name: Basics in Computer & Information Science (Practical)
Course Code: A804114
Semester: 1st

	L	T	P
Credits: 01	**0**	**0**	**2**

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

CO	Statement
CO1	Understand the concepts of computer system, Windows operating system, Internet ,various storage devices and computer Networks, e-waste
CO2	Analyze various components and Input Output devices used in a computer system.
CO3	Utilize various applications and software's of computer.
CO4	Creating and manipulating presentation, views, formatting and enhancing text, and slide with graphs
CO5	Investigate Various applications used in Clinical Setting.

Course Contents

Practical:

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
Introduction of Operating System: introduction, operating system concepts, types of operating system.
Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.
Application of Computers in clinical settings.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	3	1	2	2	2	2	-	2	1	2	1
CO2	2	3	3	3	2	-	-	2	2	2	-	2	2	1	2
CO3	3	2	3	3	3	-	-	2	2	2	-	2	2	3	1
CO4	3	3	2	3	3	-	-	2	2	2	-	2	1	2	2
CO5	2	3	3	3	3	-	-	2	2	2	-	3	1	3	1
Average	**2.6**	**2.6**	**2.6**	**3**	**2.8**	**0.2**	**0.4**	**2**	**2**	**2**	**0**	**2.2**	**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: Basic Haematology (Practical)
Course Code: A804115
Semester: 1st

	L	T	P
Credits:01	**0**	**0**	**2**

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

CO	Statement
CO1	Prepare anticoagulants used in haematology laboratory.
CO2	Collect, preserve and transportation method of blood samples.
CO3	Perform haematological test by using Microscopes, Haemocytometers, Colorimeter, and Spectrophotometer.
CO4	Identify normal and abnormal blood cells and their clinical significance.
CO5	Perform routine examination of urine- physical and chemical examination

Course Contents

Preparation of various anticoagulants:
EDTA
Sodium Citrate,
Oxalate with Fluoride
Collection of blood sample for various Lab Investigations
Familiarization and working of routine Hematology Lab. Instruments
Microscopes
Haemocytometers
Colorimeter
Spectrophotometer
Glass pipettes & Auto pipettes
Glassware
Sahli's Apparatus
Identification of Normal blood cells
Urine Analysis:
Routine biochemistry of Urine for:
pH
Specific Gravity
Glucose
Ketones
Bilirubin
Albumin
Microscopic Examination of Urine

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	1	1	3	2	1	1	3	2	2	1
CO2	2	3	1	3	1	3	-	2	1	3	2	2	1	1	3
CO3	2	1	2	1	3	2	1	2	3	2	1	2	3	2	2
CO4	1	3	2	3	2	3	2	1	2	3	2	1	2	1	2
CO5	3	2	1	1	2	1	2	2	2	1	-	2	1	1	1
Average	**2**	**2**	**1.6**	**2**	**2**	**2**	**1.5**	**2**	**2**	**2**	**1.5**	**2**	**1.8**	**1.4**	**1.8**

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

Course Name: General Anatomy-II
Course Code: A804201
Semester: 2nd

	L	T	P
Credits: 03	**2**	**1**	**0**

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

CO	Statement
CO1	Find out the parts of digestive system, related glands, urinary system, and genital system.
CO2	Identify the structure and features of meninges ventricles of brain, CSF circulation Development of nervous system & defects.
CO3	Learn various body fluids- site of occurrence and role causes abnormal conditions.
CO4	Describe structure and function of Visual system, Auditory system, Gustatory system
CO5	Understand parts and functions Cerebrum, Cerebellum, Midbrain & brain stem Blood supply & anatomy of brain.

Course Contents

Unit 1

Classification of Nervous System
Nerve – structure, classification, microscopy with examples. Neurons, classification with examples. Simple reflex arc.
Parts of a typical spinal nerve/Dermatome: Central nervous system – disposition, parts and functions Cerebrum, Cerebellum, Midbrain & brain stem Blood supply & anatomy of brain.
Spinal Cord-Anatomy, blood supply, nerve pathways Pyramidal, extra pyramidal system, Thalamus, hypothalamus, Structure and features of meanings Ventricles of brain, CSF circulation Development of nervous system & defects.

Unit 2

Cranial Nerves – (course, distribution, functions and palsy) Sympathetic nervous system, its parts and components
Parasympathetic Nervous System Applied Anatomy.

Unit 3

Structure and Function of Visual system, auditory system, gustatory system, olfactory system, somatic sensor system. Pelvic floor, innervations Kidney, Ureter, bladder, urethra. Reproductive system of male, Reproductive System of Female

References:

1. Judith, A O., Jenni, P., Sharon A. S., Patricia P. J., Kuby K. (2013) A text of Immunology.New

York, Freeman publisher.

2. Ashalath, P.R. and Deepa, (2011).*Textbook Of Anatomy And Physiology*.
3. Clark R.K. (2010).*Anatomy and Physiology: Understanding the Human Body*.
4. Pearce, E. C. (1968). *Anatomy and Physiology for Nurses.*
5. Sears, Gordon, W., Winwood, R. S. and Smith J. L. (1985).*Anatomy and Physiology for Nurses.*
6. Kumar, S. S. and Murugesh, N. (2011).*Anatomy Physiology And Health Education.*

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	2	1	2	1	2	3	2	1	2	1	2	1
CO2	2	2	1	1	2	1	-	1	1	1	2	1	2	1	2
CO3	1	3	2	3	1	2	2	3	2	3	1	2	1	2	2
CO4	3	1	1	2	2	3	-	1	1	2	2	3	1	1	1
CO5	1	2	1	2	1	1	2	2	1	2	-	1	3	1	3
Average	**1.8**	**1.8**	**1.6**	**2**	**1.4**	**1.8**	**1.6**	**1.8**	**1.6**	**2**	**1.5**	**1.8**	**1.6**	**1.4**	**1.8**

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

Course Name: General Physiology-II
Course Code: A804202
Semester: 2nd

	L	T	P
Credits:03	**2**	**1**	**0**

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

CO	Statement
CO1	Assess physiology of kidney and process of urine formation,
CO2	Calculate Glomerular filtration rate, composition of urine
CO3	Restate various types of hormones secreted by endocrine and exocrine glands, their clinical significance.
CO4	Explain functions of ovaries and uterus, pubertal changes, menstrual cycle.
CO5	List the functions of testes, pubertal changes in males, sex hormones

Course Contents

Unit 1

Physiology of kidney and urine formation Glomerular filtration rate, clearance, Tubular function, Ureter, bladder, urethra

Unit 2

Physiology of the Endocrine Glands – Hormones secreted by these glands, their classifications and functions.
Adrenal, Gonads Thymus, Pancreas. Pituitary, Pineal Body, Thyroid, Parathyroid

Unit 3

Male -Functions of testes, pubertal changes in males, testosterone -action & regulations of secretion.
Female -Functions of ovaries and uterus, pubertal changes, menstrual cycle, estrogens and progesterone -action and regulation.

References:

1. Ashalatha, P. R., &Deepa, G. (2012). *Textbook of Anatomy & Physiology for Nurses*.

2. JP Medical Ltd.Chatterjee, C. C. (2020). Human Physiology. (13 th edition). CBS Publisher and Distributor Pvt. Ltd.

3. Hall, J. E. 1. (2016). Guyton and Hall textbook of medical physiology (13th edition.). Philadelphia, PA: Elsevier.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	1	2	1	2	2	1	-	1	2	2	1
CO2	2	1	2	2	3	2	2	-	2	-	2	2	1	2	3
CO3	3	2	1	3	1	1	2	1	3	1	1	2	3	1	2
CO4	1	1	3	2	2	3	3	2	2	2	3	3	1	1	3
CO5	2	3	2	1	2	1	2	1	1	2	1	2	3	2	1
Average	**1.8**	**1.8**	**1.8**	**2**	**1.8**	**1.8**	**2**	**1.5**	**2**	**1.5**	**1.75**	**2**	**2**	**1.6**	**2**

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

Course Name: Basic Clinical Biochemistry
Course Code: A804203
Semester: 2nd

	L	T	P
Credits:04	**3**	**1**	**0**

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

CO	Statement
CO1	Calibrate volumetric apparatus, analytical balance.
CO2	Prepare solutions, understand volumetric analysis, Normal and Molar solutions,
CO3	Use pH paper, pH meter to check the nature of fluid.
CO4	Apply proper ethics and responsibility, safety measures and first aids.
CO5	Compare S.I unit and CGS units, Conversion, Strength, Molecular weight, Equivalent weight, Normality, Morality, Molality, and Numerical.

Course Contents

Unit 1

Introduction to Medical Lab. Technology, Role of Medical lab Technologist, Ethics and responsibility, Safety measures, First aid.

Cleaning and care of general laboratory glass ware and equipment, Steps involved in cleaning soda lime glass, Steps involved in cleaning borosil glass, Preparation of chromic acid solution
Storage, Distilled water, Method of preparation of distilled water, Type of water distillation plants, Storage of distilled water.

Unit 2

Units of Measurement, S.I unit and CGS units, Conversion, Strength, molecular weight, equivalent weight, Normality, Molarity, Molality, Numerical.

Calibration of volumetric apparatus, Flask, Pipettes, Burettes, Cylinders, Analytical balance, Principle, Working, Maintenance.

Unit 3

Concept of Ph, Definition, Henderson Hassel batch equation, pH value, pH indicator, Methods of measurement of pH, pH paper, pH meter, Principle, working, maintenance and calibration of pH meter.

Unit 4

Volumetric Analysis, Normal and molar solutions, Standard solutions, Preparation of reagents, Storage of chemicals, Osmosis, Definition, Types of osmosis, Factors affecting osmotic pressure, Vant Hoff's equation, Applications of osmosis, Dialysis.

References:

1. L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).
2. Varley, H., Gowenlock, A. H., McMurray, J. R., and McLauchlan, D. M. (1988). *Varley's practical clinical biochemistry*. London: Heinemann Medical Books.
3. Siddiqi, M.A. (2006). *Principal of Biochemistry*.
4. Chatwal, G.R. and Anand, S.K. (1979).Text book of Medical Biochemistry, Himlayan publishing house.
5. Nelson, D. L., & Cox, M. M. (2017). *Lehninger principles of biochemistry* (7th ed.). W.H. Freeman
6. Voet, D., and Voet, J. G. (1995). *Biochemistry*. New York: J. Wiley & Sons.
7. Berg, J. M., Tymoczko, J. L., Stryer, L., & Stryer, L. (2002). *Biochemistry*. New York: W.H. Freeman

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	2	1	3	1	2	1	3	2	1	2
CO2	2	1	3	1	2	3	-	1	2	3	3	1	3	2	1
CO3	1	3	2	3	1	2	1	3	1	2	1	3	1	1	3
CO4	3	2	3	3	2	2	2	2	2	2	2	2	2	2	1
CO5	2	2	1	2	3	1	3	1	3	1	-	1	1	1	2
Average	**2**	**2**	**2**	**2.2**	**1.8**	**2**	**1.75**	**2**	**1.8**	**2**	**1.75**	**2**	**1.8**	**1.4**	**1.8**

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

Course Name: Systematic Bacteriology
Course Code: A804204
Semester: 2nd

	L	T	P
Credits:04	**3**	**1**	**0**

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

CO	Statement
CO1	Apply techniques for Inoculation of bacteria on culture media.
CO2	Describe bacterial identification by staining methods.
CO3	Prepare the reagents to demonstrate positive and negative control bacteria.
CO4	Classify biochemical tests for identification of different bacteria.
CO5	Understand Significance of staining in bacteriology, Principle, Reagent preparation

Course Contents

Unit 1

Bacterial Culture
Instruments used to seed culture media, Culture procedures – seeding a plate.
Staining techniques in bacteriology
Significance of staining in bacteriology, Principle, Reagent preparation,
Procedures and interpretation of the following-
Simple staining, Negative staining, Gram stain, Albert‘s stain, Nasser’s stain, Ziehl –Nielsen staining, Capsule staining
Flagella staining, Spore staining, Fontana stain for spirochetes**.**

Unit 2

Principle, procedures and interpretation of the following biochemical tests for identification of different bacteria.
Catalase
Coagulase
Indole
Methyl Red
VogesProskauer
Urease
Citrate
Oxidase
TSIA
Nitrate reduction
Carbohydrate fermentation
Huge and Leifson

Bile solubility
H 2 S productions
Demonstration of motility
Decarboxylases
CAMP
Hippurate hydrolysis
Nagler‘s reaction
Cholera-red reaction

Unit 3

Definition, Classification, Various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of the following bacteria
Staphylococcus
Streptococcus
Pneumococcal
Neisseria gonorrhea and Neisseria meningitis
Hemophilic
Corynebacterium
Enterobacteriaceae: Escherichia coli, Klebsiella, Citrobacter, Enterobacter, Proteus, Salmonella, Shigella, Yersinia enterocolitica and Yersinia pestis
Vibrio, Aeromones and Plesiomonas
Clostridia of wound infection

Unit 4

Definition, Classification, Various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of the following bacteria
Mycobacterium tuberculosis complex, Atypical Mycobacteria and M. leprae
Spirochetes – Treponema, Borrellia and leptospira
Bordetella and brucella
Mycoplasma and Ureaplasma
Rickettsia
Chlamydia, Actinomyces
Pseudomonas and Burkholderia
Brief introduction about non sporing anaerobic cocci and bacilli

References:

1. Collee, J. G., Mackie, T. J., and McCartney, J. E. (1996). *Mackie & McCartney practical medical microbiology*. New York: Churchill Livingstone
2. Ananthanarayan, R. and Paniker, C., 1980. *Textbook of microbiology*.1st ed. Orient Longman.
3. Murray, P. R., Rosenthal, K. S., &Pfaller, M. A. (2013). *Medical microbiology.*
4. Cheesbrough, M. (1984).*Medical Laboratory manual for tropical countries.*Doddington publisher.
5. Muralidhar, V. (2006). *Hospital Acquired Infections*. Viva Books private limited.

The mapping of PO/PSO/CO is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	1	2	1	2	1	2	1	2	2	1	3
CO2	2	1	2	1	3	1	-	3	3	1	-	3	2	1	2
CO3	1	2	3	3	1	3	1	2	1	3	1	2	1	2	1
CO4	1	3	2	2	3	2	2	1	3	2	2	1	2	2	3
CO5	3	2	1	2	2	3	-	2	2	3	3	2	2	1	1
Average	**1.6**	**2**	**1.8**	**2.2**	**2**	**2.2**	**1.3**	**2**	**2**	**2.2**	**1.75**	**2**	**1.8**	**1.4**	**2**

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

Course Name: Medical Ethics and Legal Aspects
Course Code: A804205
Semester: 2nd

	L	T	P
Credits: 03	**3**	**0**	**0**

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

CO	Statement
CO1	Interact with the patients and health care professionals in working area.
CO2	Handle Legal Responsibilities, Patient safety and quality
CO3	Discuss management of Biomedical waste generated from hospital
CO4	Maintain Medical records and reports preparation
CO5	Employ a body systems-oriented, word-analysis approach to learning medical terminology.

Course Contents

Unit 1

Role, Definition and Interaction with the Patients and Health Care Professionals, Ethical, Moral, and Legal Responsibilities, Patient safety and quality, restrain policies and role of health professionals. Biomedical waste Management, medical records and reports.

Unit 2

Medical Terminology- The course employs a body systems-oriented, word-analysis approach to learning medical terminology.

Unit 3

The goal of the class is to prepare students for the terminology they might encounter in their subsequent coursework, in their clinical rotations and ultimately in their roles as health care professionals.

References:

1. Pozgar, G. D. (2012). *Legal aspects of health care administration*. Sudbury, Mass: Jones & Bartlett Learning
2. Morrison, E. E., & Furlong, E. (2014). *Health care ethics: Critical issues for the 21st century*. Burlington, MA: Jones & Bartlett Learning.
3. Kliegman, R., Stanton, B., St. Geme, J. W., Schor, N. F., & Behrman, R. E. (2016). *Nelson textbook of pediatrics* (Edition 20.).Phialdelphia, PA: Elsevier.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	1	2	1	2	1	2	1	3	1	2	1	3	2	1	3
CO2	2	1	3	2	3	1	1	2	3	1	-	2	1	2	2
CO3	2	3	1	3	2	3	2	1	2	3	2	1	2	2	3
CO4	2	2	1	2	1	2	2	3	1	2	2	3	3	1	2
CO5	3	2	2	3	2	2	-	2	2	2	3	2	3	2	1
Average	**2**	**2**	**1.6**	**2.4**	**1.8**	**2**	**1.5**	**2.2**	**1.8**	**2**	**2**	**2.2**	**2.2**	**1.6**	**2.2**

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

Course Name: Environmental Science
Course Code: A100302
Semester: 2nd

	L	T	P
Credits:04	**4**	**0**	**0**

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

CO	Statement
CO1	Understand Natural Resources and associated problems, use and over exploitation.
CO2	Classify causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution
CO3	Categorise the concept of ecosystem, structure, interrelationship of producers, consumers and decomposers.
CO4	Inspect sustainable development, urban problems related to energy, Water conservation, rain water harvesting.
CO5	Illustrate the issues involved in enforcement of environmental legislation Public awareness.

Course Contents

Unit 1

Introduction

Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness.

Natural Resources

Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources.

Unit 2

Ecosystems

Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hotspots of biodiversity

Environmental Pollution

Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards, Solid waste management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies, Disaster management: Floods, earthquake, cyclone and landslides.

Unit 3

Social blemishes and the Environment

From Unsustainable to Sustainable development, urban problems related to energy, Water conservation, rain water harvesting, water shed management Resettlement and rehabilitation of people; its pros and concerns. Case studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Wasteland reclamation, Consumerism and waste products. Environment Protection Act, Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness.

Unit 4

Human Population and the Environment, Population growth, variation among nations. Population explosion–Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies.

Understanding the Hospital Environment

Understanding the environment in the following clinical laboratories:

Microbiology, Biochemistry, Histopathology, Hematology

Clinical laboratory hazards to the environment from the following and means to prevent:

Infectious material, Toxic Chemicals, Radioactive Material, Other miscellaneous wastes

References:

1. Chawla S., 2012. A Textbook of Environmental Studies, Tata McGraw Hill, New Delhi.
2. Jadhav, H andBhosale, V.M., 1995.Environmental Protection and Laws.Himalaya Pub. House, New Delhi.
3. Gadi, R., Rattan, S., 2006. Environmental Studies, KATSON Books, New Delhi.
4. Wanger, K.D., 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	1	2	3	1	3	2	1	2	1	3
CO2	2	3	2	1	2	-	1	2	2	1	2	3	1	2	2
CO3	1	2	1	3	3	2	3	1	1	3	3	2	2	1	3
CO4	2	1	3	2	1	1	2	2	-	2	1	1	3	1	1
CO5	2	3	2	1	2	2	1	2	2	1	2	2	2	1	2
Average	1.8	1.6	1.6	1.6	1.4	1.8	1.5	1.8	1.6	1.8	1.6	1.8	1.4	1.4	1.8

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

Course Name: General Anatomy-II (Practical)

Course Code: A804206

Semester: 2nd

L T P

Credits: 01 **0 0 2**

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

CO	Statement
CO1	Identify and describe all anatomical structures of human body.
CO2	Demonstrate skeleton-articulated and disarticulated
CO3	Demonstrate dissected parts of bone, and muscles.
CO4	Identify surface anatomy: surface land mark-bony, muscular and ligaments
CO5	Outline the surface anatomy of major nerves, arteries of the limbs.

Course Contents

Identification and description of all anatomical structures.
Demonstration of dissected parts
Demonstration of skeleton-articulated and disarticulated.
Surface anatomy: Surface land mark-bony, muscular and ligamentous.
Surface anatomy of major nerves, arteries of the limbs.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	1	1	1	2	2	1	-	2	2	1	3
CO2	2	1	2	1	2	2	-	3	2	2	2	3	1	2	2
CO3	2	2	1	2	1	1	2	1	1	1	2	1	1	1	1
CO4	1	1	2	1	2	3	1	1	2	3	1	1	2	2	1
CO5	3	2	2	2	1	2	2	2	1	2	-	2	1	1	2
Average	**1.8**	**1.6**	**1.6**	**1.6**	**1.4**	**1.8**	**1.5**	**1.8**	**1.6**	**1.8**	**1.6**	**1.8**	**1.4**	**1.4**	**1.8**

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

Course Name: General Physiology-II (Practical)

Course Code: A804207
Semester: 2nd

	L	T	P
Credits:01	**0**	**0**	**2**

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

CO	Statement
CO1	Classify the different tests to check the state of kidney.
CO2	Understand the function of testis, penis and other male reproductive parts.
CO3	Explain the physiology of the endocrine glands.
CO4	Evaluate examination of urine by various techniques.
CO5	Analyze the function of ovaries, fallopian tube and ovum in female reproductive system.

Course Contents

Practical

Enumerate Physiology of kidney
Explain Physiology of lower Urinary tract
Label Physiology of the endocrine glands
Enumerate Physiology of reproductive system

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	3	1	2	1	3	2	1	1	3	2	1	3
CO2	2	2	2	2	2	1	2	1	2	2	2	2	1	1	2
CO3	1	1	2	2	1	2	1	2	1	1	2	2	3	2	3
CO4	2	3	3	1	2	1	2	1	2	3	-	1	2	-	1
CO5	2	2	1	2	2	2	-	3	2	2	1	2	2	1	2
Average	**1.8**	**1.8**	**2**	**2**	**1.6**	**1.6**	**1.5**	**2**	**1.8**	**1.8**	**1.5**	**2**	**2**	**1.25**	**2.2**

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

Course Name: Basic Clinical Biochemistry (Practical)

Course Code: A804208

Semester: 2nd

	L	T	P
Credits: 01	**0**	**0**	**2**

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

CO	Statement
CO1	Apply cleaning of the laboratory glass ware by recommended techniques.
CO2	Check the pH of reagents or body fluid by using pH meters.
CO3	Prepare distilled water and reagents- 0.1 N NaOH solution, Molar Sodium carbonate solution.
CO4	Perform calibration of volumetric apparatus, flask, pipettes, burettes, cylinders, analytical balance, principle, working, maintenance.
CO5	Compare the osmosis and dialysis processes.

Course Contents

Practical:

Cleaning of the laboratory glass ware (Volumetric and non-volumetric)
Preparation of distilled water
Principle, working and maintenance of pH meter.
To prepare 0.1 N NaOH solution.
To prepare 0.2N HCl solution.
To prepare 0.1 molar H_2SO_4
To prepare 0.2 Molar Sodium carbonate solution.
Demonstration of osmosis and dialysis.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	-	1	3	1	2	3	1	3	2
CO2	2	1	1	2	2	1	1	2	2	2	1	1	3	2	1
CO3	2	2	3	1	1	3	2	1	1	1	-	2	1	1	2
CO4	1	3	2	1	2	1	1	2	1	2	1	1	3	2	1
CO5	2	2	3	2	2	2	3	1	2	2	2	3	2	1	3
Average	**1.6**	**2**	**2.2**	**1.8**	**1.6**	**1.8**	**1.75**	**1.4**	**1.8**	**1.6**	**1.5**	**2**	**2**	**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: Systematic Bacteriology (Practical)

Course Code: A804209

Semester: 2nd

	L	T	P
Credits: 01	**0**	**0**	**2**

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

CO	Statement
CO1	Isolate specific bacteria from a mixture of organisms.
CO2	Plan techniques for Inoculation of bacteria on culture media
CO3	Categorize bacterial identification, reagent preparation, procedure and interpretation of staining.
CO4	Evaluate Inoculation of different culture media, isolation of pure culture.
CO5	Interpret the growth on culture media and biochemical reactions.

Course Contents

To demonstrate the instruments used to seed culture media
To learn techniques for Inoculation of bacteria on culture media
To isolate specific bacteria from a mixture of organisms.
To demonstrate simple staining (Methylene blue)
To prepare India ink preparation to demonstrate negative staining.
Bacterial identification: To demonstrate reagent preparation, procedure and interpretation for
Gram stain
Albert stain
Neisser‘s staining
Z-N staining
Capsule staining
Demonstration of flagella by staining methods
Spore staining
To demonstrate spirochetes by Fontana staining procedure
To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria:
Catalase
Coagulase
Indole
Methyl Red (MR)
VogesProskauer (VP)
Urease

Citrate
Oxidase
TSIA
Nitrate reduction
Carbohydrate fermentation
Huge and Leifson
Bile solubility
H2S production
Demonstration and motility
Decarboxylases
CAMP
Hippurate hydrolysis
Nagler‘s reaction
To demonstrate various characteristics (morphological, cultural and biochemical) of bacteria commonly isolated from clinical samples i.e.
Staphylococcus
Streptococcus
Corynebacterium
Escherichia coli
Klebsiella
Citrobacter
Enterobacter
Proteus
Salmonella
Shigella
Vibrio cholera
Mycobacterium tuberculosis
Pseudomonas

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	2	3	1	1	2	3	1	1	1	2	1
CO2	1	3	2	2	1	2	2	3	1	2	2	3	2	1	3
CO3	2	2	1	3	2	1	-	1	2	1	-	1	1	1	2
CO4	2	1	3	1	2	1	2	2	2	1	2	2	3	1	2
CO5	1	3	2	1	3	2	1	1	3	2	1	1	2	2	1
Average	**1.4**	**2**	**2**	**1.6**	**2**	**1.8**	**1.5**	**1.6**	**2**	**1.8**	**1.5**	**1.6**	**1.8**	**1.4**	**1.8**

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

Course Name: Basics of Haematological Diseases

Course Code: A804301

Semester: 3rd

	L	T	P
Credits: 03	**2**	**1**	**0**

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

CO	Statement
CO1	Categorize the type of anaemia and lab diagnosis.
CO2	Find out blood cell disorders by examining the morphology and count of blood cells.
CO3	Assess knowledge of clotting mechanism and bleeding disorders.
CO4	Learn the cause and investigating techniques of thrombosis.
CO5	Use and prepare anticoagulants.

Course Contents

Unit 1

Anemia-Introduction, Classification, Microcytic hypo chromic anemia, Macrocytic anemia, Normocytic norm chromic anemia

Quantitative disorders of Leukocytes Cause and significance

Granulocytic and Monocytic Disorders, Lymphocytic Disorders

Unit 2

Morphologic Alterations in Neutrophils

Toxic granulation, Cytoplasmic vacuoles, Döhle bodies, May–Hegglin anomaly, Alder–Reilly anomaly, Pelger–Huët anomaly, Chédiak–Higashi syndrome

Unit 3

Bleeding Disorders

Introduction Causes of bleeding disorders

Vascular defect, Platelet defect, Factor deficiency, Inhibitors, Hyper fibrinolysis, Types of bleeding disorders,

Inherited bleeding disorders, Acquired bleeding disorders

Unit 4

Thrombosis

Introduction, Causes of thrombosis

Monitoring of Anticoagulants

Oral anticoagulants by INR, Heparin

References

1. Godkar, P. B. and Godkar, P. (2014).*Textbook Of Medical Laboratory Technology.* Bhalani Publishing House
2. L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).
3. Soor, R. (2003) *Haematology for Students & Practitioners.* Jaypee Brothers.
4. Talib, V.H. (1985). *Hand book of Medical Laboratory Technology*(First edition).
5. Emmanuel, C. B. *Haematology* (International edition) Harwal Publisher.
6. Bain, Imelda, B. and John V. D. (2001).*Practical Haematology*. London: Churchill Livingstone
7. Christopher, A. L. (1990) *Clinical Haematology*.
8. John, B. H. (2001). *Clinical Diagnosis &Management by Laboratory methods*.
9. McDonald, G.A. (1989). *Atlas of haematology*.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	2	1	2	2	2	1	1	2	2	2	2	1
CO2	3	2	3	1	3	1	1	3	3	2	-	1	1	3	2
CO3	3	1	1	2	2	1	2	1	3	1	1	2	3	1	1
CO4	3	2	2	1	1	3	1	2	3	2	2	1	2	2	3
CO5	2	1	1	3	3	2	2	1	2	1	1	3	1	3	1
Average	2.4	1.4	1.8	1.8	2	1.8	1.6	1.8	2.4	1.4	1.5	1.8	1.8	2.2	1.6

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

Course Name: Biochemical Metabolism

Course Code: A804302

Semester: 3rd

	L	T	P
Credits:03	**2**	**1**	**0**

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

CO	Statement
CO1	Classify Carbohydrate Metabolism And Its Digestion And Absorption Processes.
CO2	Identify disorders of Gluconeogenesis, Glycogenolysis, Glycogenesis
CO3	Assess mechanism of protein synthesis, metabolic process and disorders.
CO4	Narrate the role nucleic acids as genetic material- DNA/RNA
CO5	Understand mechanism of enzyme action, Factors affecting, Enzyme kinetics & enzyme inhibiters

Course Contents

Unit 1

Carbohydrate Metabolism

Introduction, Importance and Classification, Digestion and Absorption
Metabolism: - Glycolysis, Citric acid cycle, Gluconeogenesis, Glycogenolysis, Glycogenesis,
Disorders of carbohydrate metabolism.

Unit 2

Protein Metabolism

Introduction, Importance and classification, Important properties of proteins, Digestion & absorption of Proteins, Protein synthesis, Metabolism of proteins, Disorders of protein metabolism and Urea Cycle

Unit 3

Lipid

Introduction & Classification, Digestion & absorption of fats, Lipoproteins, Fatty acid biosynthesis & fatty acid oxidation

Nucleic Acid

Introduction, Functions of Nucleic acid, Functions of energy carriers

Unit 4

Enzymes Introductions, Importance & Classifications, Properties of enzymes, Mechanism of enzyme action, Factors affecting enzyme action, Enzyme kinetics & enzyme inhibiters

References:

1. L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).
2. Varley, H., Gowenlock, A. H., McMurray, J. R., and McLauchlan, D. M. (1988). *Varley's practical clinical biochemistry*. London: Heinemann Medical Books.
3. Siddiqi, M.A. (2006). *Principal of Biochemistry*.
4. Chatwal, G.R. and Anand, S.K. (1979).Text book of Medical Biochemistry, Himlayan publishing house.
5. Nelson, D. L., & Cox, M. M. (2017). *Lehninger principles of biochemistry* (7th ed.). W.H. Freeman
6. Voet, D., and Voet, J. G. (1995). *Biochemistry*. New York: J. Wiley & Sons.
7. Berg, J. M., Tymoczko, J. L., Stryer, L., & Stryer, L. (2002). *Biochemistry*. New York: W.H. FreemanBiochemistry by Strye

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	2	1	1	2	3	1	2	1	1	2	1
CO2	3	2	1	2	1	2	2	3	3	2	1	2	2	3	1
CO3	1	3	2	1	2	1	-	1	1	3	2	1	3	2	2
CO4	1	1	2	1	2	2	1	3	1	1	-	1	2	1	2
CO5	2	3	1	3	1	1	2	2	2	3	1	3	1	3	1
Average	**2**	**2**	**1.6**	**1.6**	**1.6**	**1.4**	**1.5**	**2.2**	**2**	**2**	**1.5**	**1.6**	**1.8**	**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: Fundamental Histology

Course Code: A804303

Semester: 3rd

	L	T	P
Credits: 03	**2**	**1**	**0**

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

CO	Statement
CO1	Identify the diseases of Blood vessels- Atheroma, Arteriosclerosis, heart block.
CO2	Carry out basics procedures used in diagnose in Diseases of GIT.
CO3	Explain Glomerulonephritis, Nephrotic syndrome, renal failure, UTI
CO4	Understand the mechanism of sensory organs.
CO5	Find out the abnormalities in endocrine system.

Course Contents

Unit 1

Alimentary System: Diseases of mouth, Diseases of Esophagus- Esophageal varices.
Digestive System: Gastritis, Peptic ulceration, Appendicitis microbial diseases, food poisoning, hernia, Intestinal obstructions & mal absorption.

Accessory Digestive glands: Salivary glands- mumps
Liver – hepatitis, liver failure, cirrhosis.
Pancreas- pancreatitis.
Gall Bladder- Gall stones, jaundice and cardiovascular diseases.

Unit 2

Circulatory System: Diseases of Blood vessels- Atheroma, Arteriosclerosis, heart block. Disorders of Blood Pressure Hyper & Hypotension.
Respiratory System: Upper respiratory tract infection, Bronchi, Asthma, Pneumonia, Lung abscess, Tuberculosis, Lung Collapse.

Unit 3

Urinary System: Glomerulonephritis, Nephrotic syndrome, renal failure, renal calculi, Urinary obstruction, Urinary tract infection.
Reproductive system: Sexually transmitted diseases, Pelvic inflammatory disease, disorder of cervix (CIN), Disease of ovaries, ectopic pregnancy, prostatitis, Infertility

Unit 4

Nervous System: Neuronal damage, ICP, Cerebral Infarction, head injury, Alzheimer‘s disease, dementia.

Endocrine System:

Pituitary: Hyper & Hypo secretions

Thyroid: Goiter

Adrenal: Cushing Syndrome, Addison Disease

Pancreas: Diabetes

Sense Organs:

Ear: Otitis

Eye: Cataract

References:

1. Clark R.K. (2010).*Anatomy and Physiology: Understanding the Human Body*.
2. Pearce, E. C. (1968). *Anatomy and Physiology for Nurses*
3. Sears, Gordon, W., Winwood, R. S. and Smith J. L. (1985).*Anatomy and Physiology for Nurses*

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	1	2	1	1	2	1	-	1	2	1	2
CO2	2	3	2	1	2	1	2	3	3	2	1	2	1	2	1
CO3	1	1	2	1	3	2	1	2	1	2	1	3	2	1	3
CO4	1	3	1	2	1	3	1	3	3	1	2	1	3	1	2
CO5	3	2	3	2	1	1	-	1	2	3	2	1	2	2	2
Average	1.6	2.2	1.8	1.8	1.6	1.8	1.25	2	2.2	1.8	1.5	1.6	2	1.4	2

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

Course Name: Applied Bacteriology

Course Code: A804304

Semester: 3rd

	L	T	P
Credits: 03	**2**	**1**	**0**

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

CO	Statement
CO1	Identify the disease producing organisms that includes bacteria, fungi, parasite and virus.
CO2	Explain the concepts and principles of immunity , hypersensitivity , Autoimmunity , and immunization.
CO3	Assess Collection, transportation and processing of body fluids for laboratory diagnosis
CO4	Perform bacteriological examination of water, milk, food and air.
CO5	Explain Collection, transportation and processing Upper Respiratory tract infections

Course Contents

Unit 1

Laboratory Strategy in the Diagnosis of Various Infective Syndromes: Samples of choice, collection, transportation and processing of samples for laboratory diagnosis of the following complications:
Septicemia and bacteremia
Upper Respiratory tract infections
Lower respiratory tract infections
Wound, skin, and deep sepsis
Urinary tract infections
Genital Tract infections
Meningitis
Gastro intestinal infections
Enteric fever
Tuberculosis (Pulmonary and Extra-pulmonary)
Pyrexia of unknown origin

Unit 2

Antibiotic Susceptibility Testing in Bacteriology
Definition of antibiotics
Culture medium used for Antibiotic susceptibility testing
Preparation and standardization of inoculum
Control bacterial strains
Choice of antibiotics

MIC and MBC: Concepts and methods for determination

Various methods of Antibiotic susceptibility testing with special reference to Stokes and Kirby-Bauer method

Basics of Nucleic acid techniques in diagnostic microbiology with special reference to Polymerase chain reaction (PCR), Automation in bacterial culture detection and antimicrobial susceptibility testing: Principles and importance.

Unit 3

Bacteriological examination of water, milk, food and air, examination of water

Collection and transportation of water sample

Presumptive coli form count

Eijkman test

Introduction and importance of other bacteria considered as indicators of fecal contamination

Membrane filtration tests

Interpretation of results

Examination of Milk and milk products

Basic Concepts regarding gradation of milk

Various tests for Bacteriological examination of milk

Examination of food articles

Basic Concepts regarding classification of food like frozen food, canned food, raw food, cooked food etc.

Various tests for Bacteriological examination with special reference to food poisoning bacteria

Examination of Air

Significance of air bacteriology in healthcare facilities

Settle plate method

Types of air sampling instruments

Collection processing and reporting of an air sample

Unit 4

Sterility Testing of I/V fluids

Collection, transportation and processing of I/v fluids for bacterial contamination

Recording the result and interpretation

Nosocomial Infection:

Introduction, sources and types of nosocomial infections.

Surveillance of hospital environment for microbial load

Role of microbiology laboratory in control of nosocomial infections

Epidemiological markers:

Introduction

Types

Serotyping

Phage typing and

Bacteriocin typing

Preservation methods for microbes

Basic concepts of preservation of microbes

Why do we need to preserve bacteria?

Principle and procedures of various short term and long term preservation methods with special reference to Lyophilization

References:

1. Collee, J. G., Mackie, T. J., and McCartney, J. E. (1996). *Mackie & McCartney practical medical microbiology*. New York: Churchill Livingstone.
2. Ananthanarayan, R. and Paniker, C., 1980. *Textbook of microbiology*.1st ed. Orient Longman.
3. Ananthanarayan, R.; Panicker, J.K. (2005) [1978].*Textbook of Microbiology* (7 ed.)
4. L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).
5. Willey, J., Sherwood, L. and Woolverton, C. (2013). *Prescott's Microbiology*: 9th Revised edition. London: MCGRAW HILL.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	1	2	1	2	3	2	1	-	1	2	1	3
CO2	1	2	1	2	1	2	1	2	1	2	1	2	3	2	1
CO3	2	1	2	2	3	3	1	2	3	3	1	2	1	3	2
CO4	1	3	3	1	2	1	2	3	2	1	2	-	2	1	3
CO5	2	1	2	2	1	2	2	1	2	3	1	2	3	2	1
Average	**1.6**	**1.6**	**2.2**	**1.6**	**1.8**	**1.8**	**1.6**	**2.2**	**2**	**2**	**1.25**	**1.75**	**2.2**	**1.8**	**2**

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

Course Name: Applied Hematology

Course Code: A804305

Semester: 3rd

L T P

Credits: 03 **2 1 0**

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

CO	Statement
CO1	Estimate Hemoglobin with various methods.
CO2	Use haemocytometer to count blood cells
CO3	Perform estimation ESR- both methods.
CO4	Calculate hematocrite values and blood cell indices.
CO5	Evaluate the preparation of stains and staining techniques.

Course Contents

Unit 1

Haemoglobinometry: Different methods to measure Hemoglobin with merits and demerits
Haemocytometery: Introduction, Principle, Reagent preparation, procedure, errors involved and means to minimize errors.RBC Count, Total leucocytes count(TLC) Platelet Count. Absolute Eosinophilcount

Unit 2

Principle Mechanism and different methods with merit and demerits for the measuring Erythrocyte Sedimentation Rate (ESR) and its significance
Different methods with merit and demerits for packed cell volume/ Hematocrit value
Preparation of blood films
Types, Methodsofpreparation (Thick andthinsmear/film) and utility

Unit 3

Staining techniquesinHematology (Romanowskystains): Principle, composition, preparation of staining reagents and procedure of the following
Giemsastain
Leishman‘sstain
Wright‘sstain
Field‘s stain
JSB stain.
Differential leucocytes count (DLC)
Normal and absolute values in Hematology

Unit 4

Physiological variations in Hb, PCV, TLC and Platelets
Macroscopic and microscopic examination of seminal fluid

Examination of CSF and other body fluids for cytology i.e. pleural, peritoneal and synovial fluid etc.
Preparation of Reagents for coagulation studies:
M/40 Calcium chloride
Brain Thromboplastin
Cephalin
Adsorbed Plasma
Screening Tests for coagulation Studies and their significance

References:

1. Godkar, P. B. and Godkar, P. (2014).*Textbook Of Medical Laboratory Technology*. BhalaniPublishing House
2. L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).
3. Soor, R. (2003) *Haematology for Students & Practitioners.* Jaypee Brothers.
4. Talib, V.H. (1985). *Hand book of Medical Laboratory Technology*(First edition).
5. Emmanuel, C. B. *Haematology* (International edition) Harwal Publisher.
6. Bain, Imelda, B. and John V. D. (2001).*Practical Haematology*. London: Churchill Livingstone
7. Christopher, A. L. (1990) *Clinical Haematology*.
8. John, B. H. (2001). *Clinical Diagnosis &Management by Laboratory methods*.
9. McDonald, G.A. (1989). *Atlas of haematology*.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	1	2	1	2	1	2	1	-	1	3	2	1
CO2	1	2	1	3	1	2	-	2	1	2	1	3	1	2	3
CO3	1	2	3	2	2	1	2	2	1	2	1	2	1	1	2
CO4	2	1	1	2	1	2	1	3	2	1	1	2	2	2	1
CO5	3	3	2	1	3	3	2	1	3	3	2	1	3	1	2
Average	**1.8**	**1.8**	**2**	**1.8**	**1.8**	**1.8**	**1.75**	**1.8**	**1.8**	**1.8**	**1.25**	**1.8**	**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: Medical Parasitology & Entomology

Course Code: A804306

Semester: 3rd

	L	T	P
Credits: 02	**2**	**0**	**0**

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

CO	Statement
CO1	Understand geographical distribution, Habitat, Morphology, life cycle, Mode of action and laboratory diagnosis of various parasites.
CO2	Apply basic diagnostic principles in Parasitology.
CO3	List general characteristics of Cestodes, Trematodes and Nematodes
CO4	Evaluate examination of Stool, blood samples for parasites for intestinal protozoan infections.
CO5	Understand general characteristics of protozoa.

Course Contents

Unit 1

Introduction to **Medical Parasitology** with respect to terms used in Parasitology.
Protozoology/ Protozoan parasites:
General characteristics of protozoa.
Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Entamoeba sp.
Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Intestinal and vaginal flagellates i.e. Giardia, Trichomonas sp.
Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of blood and tissue flagellates i.e. Plasmodium and Toxoplasma sp.
Helminthological/ Helminthes parasites:
General characteristics of Cestodes, Trematodes and Nematodes
Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of :Taeniasolium and saginata, Echinococcusgranulosus, Hymenolepis nana, Schistosomahaematobium and mansoni,
Fascioloa hepatica and buski, Trichuristrichura, Trichinellaspirales, Strongyloidesstercoralis, Ancyclostomaduodenale,
Enterobiusvermicularis, Ascarislumbricoides, Wuchereriabancrofti, Dracuncularismedinensis

Unit 2

Diagnostic Procedures: Examination of Stool for parasites for intestinal protozoa infections, General rules for microscopic examination of stool samples, Collection of stool samples, Preparation of material for unstained and stained preparations, Staining methods i.e. Iodine staining and permanent staining
For Helminthes infections Introduction, direct smear preparation and examination, Concentration techniques i.e. Flotation and sedimentation techniques, Egg counting techniques, Examination of blood for parasites

Unit 3

Preparation of thin and thick blood film, Leishman staining, Examination of thick and thin smear, Field's stain, JSB stain
Examination of blood film for Malaria parasite and Microfilaria
Collection, Transport, processing and preservation of samples for routine parasitological investigations

Unit 4

Morphology, life cycle and lab-diagnosis of Giardia and Entamoeba
Morphology, life cycle and lab-diagnosis of Roundworms and Hookworms, Morphology, life cycle and lab-diagnosis of T. solium and T. saginata
Morphology, life cycle and lab-diagnosis of Malaria parasite with special reference to P.vivax and P.Falciparum, Laboratory diagnosis of hydated cyst and cysticercosis, Concentration techniques for demonstration of Ova and Cysts (Principles and applications)

References:

1. Leventhal, R. (1997). *Medical Parasitology*, A self Instruction Text.
2. Hegazi M. (1994). *Applied Human Parasitology*. 1st ed, Egypt
3. Chaterjee, K. D. (2011). *A text book by parasitology*.
4. Ichhpujani, R.L. and Bhatia, R (2003).*Medical parasitology*

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	3	2	1	3	1	1	-	2	1	1	2
CO2	1	2	1	2	2	1	1	2	1	2	2	1	2	2	1
CO3	2	1	3	2	1	2	2	1	3	2	1	2	3	1	3
CO4	2	1	1	3	2	3	-	1	1	3	-	3	1	2	1
CO5	1	3	2	1	2	1	2	2	2	1	2	1	1	1	2
Average	**1.6**	**2**	**1.6**	**1.8**	**2**	**1.8**	**1.5**	**1.8**	**1.6**	**1.8**	**1.6**	**1.8**	**1.6**	**1.4**	**1.8**

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

Course Name: Basics of Hematological diseases (Practical)

Course Code: A804307

Semester: 3rd

L T P

Credits: 02 **2 0 0**

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

CO	Statement
CO1	Demonstrate an understanding of the functioning of various instruments in laboratory.
CO2	Perform procedure and preparation of the stains and other reagents.
CO3	Understand Recognition and staining of various types of blood cells (normal and abnormal)
CO4	Prepare thick and thin blood smears for malaria parasite.
CO5	Prepare various anticoagulants and their uses.

Course Contents

Parts of microscope; its functioning and care
Parts of centrifuge; its functioning and care
Cleaning and drying of glassware
Preparation of various anticoagulants
Collection of venous and capillary blood
Cleaning of glass-syringes and its sterilization
Preparation of the stains and other reagents
Preparation of peripheral blood film (PBF)
Staining of PBF
Haemoglobin estimation methods (Sahli's, Oxyhaemoglobin, and cyanmethaemoglobin)
Differential leukocyte count (DLC)
Recognition and staining of various types of blood cells (normal and abnormal)
Preparation of thick and thin blood smear for malaria parasite (Leishman/Giemsa/JSB)
RBC counting
WBC counting
Platelet counting
Routine Examination of urine

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	3	2	1	2	1	2	1	2	1	2	2
CO2	1	2	1	3	2	1	2	1	2	1	2	1	2	1	1
CO3	1	2	2	2	1	2	-	1	1	2	2	1	1	2	3
CO4	2	1	2	1	1	3	1	-	1	3	1	3	2	1	2
CO5	3	2	1	1	2	1	2	1	2	1	2	1	1	2	1
Average	**1.8**	**1.6**	**1.6**	**1.6**	**1.8**	**1.8**	**1.5**	**1.25**	**1.4**	**1.8**	**1.6**	**1.6**	**1.4**	**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: Biochemical Metabolism (Practical)

Course Code: A804308

Semester: 3rd **L T P**

Credits: 02 **0 0 4Course**

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

CO	Statement
CO1	Investigate the presence of carbohydrates by different methods.
CO2	Check the level of Urea in serum & urine.
CO3	Determine Cholesterol in serum or plasma.
CO4	Estimate Creatinine in serum or plasma.
CO5	Determinate the level of Glucose in serum and urine.

Course Contents

To determine the presence of carbohydrates by Molisch test.
To determine the presence of reducing sugar by Fehling solutions
To determine the presence of reducing sugar by Benedicts method.
To determine starch by Iodine test.
Determination of Glucose in serum & plasma
Estimates of blood Glucose by Folin& Wu method
Determination of Urea in serum, plasma & urine.
Determination of Creatinine in serum or plasma
Determination of serum Albumin
Determination of Cholesterol in serum or plasma

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	3	2	1	-	2	1	2	1	3	1	2	2
CO2	1	2	1	2	1	2	1	3	2	1	2	1	2	1	1
CO3	1	1	2	3	2	1	2	2	-	2	1	2	1	2	2
CO4	3	1	3	1	3	2	1	1	1	3	2	1	2	1	1
CO5	2	2	2	1	2	1	3	2	1	2	1	3	1	2	3
Average	**1.8**	**1.6**	**1.8**	**2**	**2**	**1.4**	**1.75**	**2**	**1.25**	**2**	**1.4**	**2**	**1.4**	**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: Fundamental Histology (Practical)

Course Code: A804309

Semester: 3rd **L T P**

Credits: 02 **0 0 4**

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

CO	Statement
CO1	Examine stained slide prepared from organs of digestive system.
CO2	Study stained slide prepared from organs of circulatory system.
CO3	Assess microscopic examination of slide prepared from organs of Endocrine system.
CO4	View stained slides of GIT organs.
CO5	Study stained slide prepared from organs of Urinary system.

Course Contents

To study squamous cell from cheek cells (Buccal mucosa)
To study stained slide preparation from organs of digestive system
Study of stained slides of liver, pancreas, gall bladder
Study of various types of microscope and draw diagram in practical notebook
To study stained slide preparation from organs of circulatory system
To study stained slide preparation from organs of Respiratory system
To study stained slide preparation from organs of Nervous system
To study stained slide preparation from organs of Urinary system
To study stained slide preparation from organs of Endocrine system

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	1	1	1	2	1	1	1	2	2	1	2
CO2	3	2	1	3	2	2	1	1	2	2	1	1	3	2	1
CO3	1	3	2	1	1	2	-	2	1	2	1	2	1	3	2
CO4	2	2	2	1	2	1	2	1	2	1	2	1	1	2	1
CO5	3	1	1	2	1	3	1	2	1	3	-	2	3	1	2
Average	**2.2**	**1.8**	**1.6**	**1.8**	**1.4**	**1.8**	**1.25**	**1.6**	**1.4**	**1.8**	**1.25**	**1.6**	**2**	**1.8**	**1.6**

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

Course Name: Applied Bacteriology (Practical)

Course Code: A804310

Semester: 3rd:

	L	T	P
Credits: 02	**0**	**0**	**4**

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

CO	Statement
CO1	Process clinical samples for culture and identification of bacterial pathogens.
CO2	Understand automation in bacterial culture detection and antimicrobial susceptibility testing
CO3	Explain preparation and standardization of inoculums.
CO4	Find means and methods adaptable for MIC and MBC of known bacteria against a known antibiotic.
CO5	Process stool sample for detection of Salmonella, Shigella and Vibrio cholera

Course Contents

Inoculation of different culture media
Isolation of pure cultures Processing of following clinical samples for culture and identification of bacterial pathogens: Blood
Throat swab
Sputum
Pus
Urine
Stool for Salmonella, Shigella and Vibrio cholerae
C.S.F. and other body fluids
Demonstration of PCR
Demonstrationof automation in bacterial culture detection and antimicrobial susceptibility testing
Antimicrobial susceptibility testing
Introduction and terms used
Preparation and standardization of in oculum
To demonstrate reference bacterial strains
To determine MIC and MBC of known bacteria against a known antibiotic
To perform antibiotic susceptibility testing of clinical isolates by using
Stokes method, Kirby-Bauer method
Collection, transportation and processing of following articles for bacteriological examination:
Water
Milk
Food and
Air

To demonstrate sterility testing of intravenous fluid with positive and negative controls
Demonstration of serotyping and bacteriocintyping
Demonstration of lyophilization and other available preservation methods

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	2	1	-	2	2	2	1	3	1	3	1
CO2	1	3	2	1	3	3	2	1	1	3	-	2	2	1	2
CO3	2	1	3	1	1	2	1	1	1	1	2	1	1	2	2
CO4	1	2	1	2	2	1	2	2	2	2	1	2	2	1	3
CO5	3	2	2	2	1	2	1	1	2	1	2	1	3	2	1
Average	**1.8**	**1.8**	**1.8**	**1.6**	**1.8**	**1.8**	**1.5**	**1.4**	**1.6**	**1.8**	**1.5**	**1.8**	**1.8**	**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: Applied Hematology (Practical)
Course Code: A804311
Semester: 3rd **L T P**
Credits: 02 **0 0 3Course**
Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Prepare smear and staining with Leishman stain.
CO2	Justify the impact of Total leukocyte count.
CO3	State physical and microscopic examination of seminal fluid including sperm count.
CO4	Understand to perform BT, CT, Hess test, PT and APTT.
CO5	Estimate the ESR test by both methods.

Course Contents

Hb Estimation Sahli's method Cyanmeth haemoglobin method Oxyhaemo globin method
Total leukocyte count
Platelets count
Absolute Eosinophil count
Preparation of smear and staining with Giemsa and Leishmanstain.
ESR (Wintrobe'sand Westergren method)
Packed cell volume(Macro & Micro)
Cytological examination of CSF and other body fluids
Physical and Microscopic examination of seminal fluid including sperm count
Perform normal DLC
Preparation of M/40 Calcium chloride
Brain Thromboplastin and standardization, Cephalin, Adsorbed plasma
Perform BT, CT, Hess test, PT and APTT

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	2	1	2	1	2	1	2	1	3	2	3
CO2	1	3	2	1	1	3	1	2	1	-	2	1	1	2	1
CO3	2	2	1	2	2	1	2	1	2	2	1	2	2	1	3
CO4	1	1	2	3	2	2	1	3	1	1	2	3	1	2	2
CO5	3	2	1	1	2	1	-	2	3	2	1	1	3	1	3
Average	**1.8**	**1.8**	**1.6**	**1.6**	**1.8**	**1.6**	**1.5**	**1.8**	**1.8**	**1.5**	**1.6**	**1.6**	**2**	**1.6**	**2.4**

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

Course Name: Analytical Clinical Biochemistry

Course Code: A804401

Semester: 4th

L T P

Credits: 03 **3 0 0**

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

CO	Statement
CO1	Illustrate the theory of spectrophotometer and colorimetry, Lambert`s law and Beer`s law.
CO2	Describe general principles of flame photometry, limitations of flame photometry.
CO3	Recognise principle, types and techniques of chromatography.
CO4	Understand principle, instrumentation, applications, and types of electrophoresis.
CO5	Acknowledge experimental techniques, application of TLC, limitations, High performance thin layer chromatography.

Course Contents

Unit 1

Spectrophotometer and Colorimetry

Introduction, Theory of spectrophotometer and colorimetry, Lambert`s law and Beer`s law, Applications of colorimetry and spectrophotometer

Unit 2

Photometry

Introduction, General principles of flame photometry, Limitations of flame photometry, Instrumentation, Applications of flame photometry, Atomic absorption spectroscopy – Principle & applications

Unit 3

Chromatography

Introduction

Types of chromatography

Paper Chromatography: Introduction, principle, types, details for qualitative and quantitative analysis, application

Thin layer chromatography: Introduction, experimental techniques, application of TLC, limitations, High performance thin layer chromatography

Column chromatography: Introduction, principle column efficiency, application of column chromatography

Gas chromatography: Introduction principle, instrumentation, application

Ion exchange chromatography: Introduction, Definition and principle, cation and anion exchangers, application

Gel Chromatography: Introduction Principle and method, application and advantages

Unit 4

Electrophoresis:

Introduction, Principle, Instrumentation, Applications, Types of electrophoresis, Paper electrophoresis, Gel electrophoresis

References:

1. Godkar, P. B. and Godkar, P. (2014).*Textbook Of Medical Laboratory Technology.* Bhalani Publishing House
2. L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).
3. Varley, H., Gowenlock, A. H., McMurray, J. R., and McLauchlan, D. M. (1988). *Varley's practical clinical biochemistry*. London: Heinemann Medical Books.
4. Siddiqi, M.A. (2006). *Principal of Biochemistry*.
5. Chatwal, G.R. and Anand, S.K. (1979).Text book of Medical Biochemistry, Himlayan publishing house.
6. Nelson, D. L., & Cox, M. M. (2017). *Lehninger principles of biochemistry* (7th ed.). W.H. Freeman
7. Voet, D., and Voet, J. G. (1995). *Biochemistry*. New York: J. Wiley & Sons.
8. Berg, J. M., Tymoczko, J. L., Stryer, L., & Stryer, L. (2002). *Biochemistry.* New York: W.H. Freeman

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	1	1	-	2	2	1	1	2	3	1	2
CO2	2	3	2	1	3	1	2	1	2	3	2	1	2	2	1
CO3	2	1	1	3	1	3	1	3	2	1	1	3	1	-	2
CO4	1	2	1	2	1	2	-	1	1	2	1	2	3	2	1
CO5	2	1	3	3	2	1	1	2	2	1	-	3	2	1	3
Average	**1.8**	**1.6**	**1.6**	**2.2**	**1.6**	**1.6**	**1.3**	**1.8**	**1.8**	**1.6**	**1.25**	**2.2**	**2.2**	**1.5**	**1.8**

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

Course Name: Applied Histopathology-I

Course Code: A804402

Semester: 4th

L T P

Credits: 03 **3 0 0**

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

CO	Statement
CO1	Perform various aspects of tissue processing.
CO2	Understand the Care and maintenance of laboratory equipment used in Histotechnology
CO3	Recognise decalcification agent, technique of decalcification.
CO4	Classify dyes, principles of Dye Chemistry sand their uses.
CO5	Learn the applications of various types of microscopes i.e. dark field, polarizing, phase contrast, interference and fluorescent microscope

Course Contents

Unit 1

Introduction to Histotechnology

Compound microscope : Optical system, magnification and maintenance

Microscopy: Working principle Applications of various types of microscopes i.e. dark field, polarizing, phase contrast,

interferenceandfluorescentmicroscopeCareandmaintenanceoflaboratoryequipmentusedinHistotechnology

Safetymeasuresinhistopathologylaboratory Basicconceptsaboutroutinemethodsofexaminationoftissues

Unit 2

Collection and Transportation of specimens for histological examination Basic concepts of fixation various types of fixatives used in a routine histopathology laboratory Simple fixatives Compound fixatives Special fixatives for demonstration of various tissue elements

Decalcification Criteria of a good decalcification agent, Technique of decalcification followed with selection of tissue, fixation and decalcification, neutralization of acid and thorough washing. Various types of decalcifying fluids: Organic & Inorganic Acid, chelating agents, Use of Ion-exchange resigns and Electrophoretic decalcification and treatment of hard tissues which are not calcified.

Unit 3

Processing of various tissues for histological examination Procedure followed by Dehydration, Clearing, and Infiltration and routine timing schedule for manual

orautomatictissueprocessing.Components&principlesofvarioustypesofautomatictissueProcessorsEmbedding: Definition, Various types of embedding media

Section Cutting Introduction regarding equipment used for sectioning Microtome Knives, Sharpening of Microtome Knives, Honing, Stropping, various types of micro to mean their applications, Freezing Micro to me and various types of Cryostats. Faults in paraffin section cutting with reason and remedy, spreading the sections and attachment or mounting of sections to glass slides.

Unit 4

Staining, Impregnation and Mountants Theory of Staining, Classifications of Dyes, Principles of Dye Chemistry, Stains and Dyes and their uses Types of Stains, Chemical Staining Action Mordents and Accentuates, Metachromesia Use of Controls in Staining ProceduresPreparationofStains,solvents,anilinewaterandbuffersetc. Commonly used Mountants in Histotechnology lab GeneralStainingProceduresforParaffinInfiltratedandEmbeddedtissue Nuclear Stains and Cytoplasmic stains EquipmentandProcedureformanualStainingandAutomaticStainingTechnique Mounting of Cover Slips, Labeling and Cataloguing the Slides Routine Staining Procedures Haematoxylin and Eosin Staining, various types of Haematoxylins 13.2Mallory's Phosphotungstic Acid, Haematoxylin(PTAH)

References:

1. Kumar, V., Abbas, A. K., & Aster, J. C. (2017). *Robbins basic pathology e-book*.Elsevier Health Sciences.
2. Bancroft, J. D., & Gamble, M. (Eds.).(2008). *Theory and practice of histological techniques*.Elsevier health sciences.
3. Culling, C. F. A., Allison, R. T., & Barr, W. T. (2014). *Cellular pathology technique*.Elsevier.
4. Mohan, H. (2015). *Textbook of pathology*.Jaypee Brothers Medical Publishers.
5. Mohan, H. (2012). *Pathology practical book*. JP Medical Ltd.
6. 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	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	1	2	1	2	2	1	2	1	2	1	2	1
CO2	2	3	1	2	1	2	1	1	2	1	2	1	2	-	2
CO3	2	2	1	2	3	3	2	2	2	3	-	2	2	1	2
CO4	3	1	2	1	1	2	-	1	1	1	2	3	1	2	3
CO5	2	3	1	2	2	3	1	2	2	2	3	1	3	1	2
Average	**2**	**2.2**	**1.6**	**1.6**	**1.8**	**2.2**	**1.5**	**1.6**	**1.6**	**1.8**	**2**	**1.8**	**1.8**	**1.5**	**2**

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

Course Name: Immunology and Bacterial serology

Course Code: A804403

Semester: 4th

	L	T	P
Credits: 03	**2**	**1**	**0**

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

CO	Statement
CO1	Clear concept of Complement fixation its components, pathways, and their mechanisms
CO2	Understand the types of antigens and determinants of antigencity.
CO3	Perform Complement fixation test, Immuno- fluorescence, ELISA,
CO4	Identify Humoral and Cellular immune responses.
CO5	Clarify complement activation pathways, Basic concepts about their mechanisms

Course Contents

Unit 1

History and introduction to immunology Immunity, Innate, Acquired immunity Widal, VDRL, ASO, CRP, and Brucella tube agglutination, Rose-Waaler Complement system: Definition, Basic concepts about its components, Complement activation pathways, and Basic concepts about their mechanisms
Unit 1Definition, types of antigens and determinants of antigencity Definition, types, structure and properties of immunoglobulin
Antigen-Antibody reactions Definition, Classification, General features and mechanisms, Applications of various antigen antibody reactions Principle, procedure and applications of under mentioned in Medical Microbiology: Complement fixation test, Immuno-fluorescence, ELISA, SDS-PAGE, Western blotting

Unit 2

Principle, procedure and interpretation of various bacteriological tests: Widal, VDRL, ASO, CRP, Brucellatube agglutination, Rose-Waaler
Complement system: Definition, Basic concepts about its components, Complement activation pathways

Unit 3

Immune response: Introduction
Basic concepts of Humoral and Cellular immune responses
Hypersensitivity: Definition, Types of hypersensitivity reactions
Basicconceptsofautoimmunityandbriefknowledgeaboutautoimmunediseases
Automation in diagnostics erology
Vaccines: Definition, Types, Vaccination schedule, Brief knowledge about Extended programme of immunization‘(EPI) in India

References:

1. Collee, J. G., Mackie, T. J., and McCartney, J. E. (1996). *Mackie & McCartney practical medical microbiology*. New York: Churchill Livingstone.
2. Ananthanarayan, R. and Paniker, C., 1980. *Textbook of microbiology*.1st ed. Orient Longman.
3. Ananthanarayan, R.; Panicker, J.K. (2005) [1978].*Textbook of Microbiology* (7 ed.)
4. L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).
5. Willey, J., Sherwood, L. and Woolverton, C. (2013).
6. *Prescott's Microbiology*: 9th revised edition. London: MCGRAW HILL

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO3
CO1	2	1	1	2	1	1	2	3	1	1	2	1	1	-	1
CO2	1	2	2	1	2	2	-	1	2	2	1	2	2	1	3
CO3	2	1	2	3	2	1	1	2	1	2	-	2	2	-	3
CO4	1	3	1	2	1	3	2	3	3	1	2	1	1	2	1
CO5	3	1	3	1	2	1	2	2	1	3	1	2	3	1	2
Average	**1.8**	**1.6**	**1.8**	**1.8**	**1.6**	**1.6**	**1.75**	**2.2**	**1.6**	**1.8**	**1.5**	**1.6**	**1.8**	**1.3**	**2**

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

Course Name: Applied Hematology-II

Course Code: A804404

Semester: 4th

	L	T	P
Credits: 03	**2**	**1**	**0**

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

CO	Statement
CO1	Collect bone marrow sample collection, processing and examination.
CO2	Identify chromosomal studies in hematological disorders.
CO3	Learn Lupus Erythematosus (L.E) cell phenomenon.
CO4	Enhanced concepts of automation in Hematology with special reference.
CO5	Process technique of aspirated bone marrow (Preparation & staining of smear).

Course Contents

Safety precautions in Hematology
Basic concepts of automation in Hematology with special reference to:
Blood cell counter
Coagulometer
Bone marrow examination
Composition and functions
Aspiration of bone marrow (Adults and children)
Processing of aspirated bone marrow (Preparation & staining of smear)
Brief knowledge about examination of aspirated bone marrow (differential cell counts and cellular ratios)
Processing and staining of trephine biopsy specimens

Unit 2

Red cell anomalies
Morphological changes such as variation in size shape & staining character.
Reticulocyte: Definition, different methods to count, Absolute reticulocyte count and IRF (Immature reticulocyte fraction) and significance of reticulocyte.
Lupus Erythematosus (L.E) cell phenomenon.
Definition of L.E. cell.
Demonstration of L.E. cell by various methods.
Clinical significance.

Unit 3

Correction studies for Factor deficiency
Quantitative assay of coagulation factors

Principle
Procedure
Screening of inhibitors
Inhibitors against coagulation factors
APLA

Unit 4

Karyotyping: Chromosomal studies in hematological disorders (PBLC and Bone marrow)
Cyto-chemical staining: Principles, method and significance Biomedical waste management in hematology laboratory (Other than Radioactive material)

References:

1. Godkar, P. B. and Godkar, P. (2014).*Textbook Of Medical Laboratory Technology*. BhalaniPublishing House
2. L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).
3. Soor, R. (2003) *Haematology for Students & Practitioners.* Jaypee Brothers.
4. Talib, V.H. (1985). *Hand book of Medical Laboratory Technology*(First edition).
5. Emmanuel, C. B. *Haematology* (International edition) Harwal Publisher.
6. Bain, Imelda, B. and John V. D. (2001).*Practical Haematology*. London: Churchill Livingstone
7. Christopher, A. L. (1990) *Clinical Haematology*.
8. John, B. H. (2001). *Clinical Diagnosis &Management by Laboratory methods*.
9. McDonald, G.A. (1989). *Atlas of haematology*.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	2	2	1	1	2	1	2	2	2	3	3
CO2	1	2	1	2	1	1	-	2	1	2	1	1	1	2	2
CO3	3	3	2	1	2	3	1	1	2	1	2	3	2	1	2
CO4	1	2	1	3	2	2	1	3	1	3	1	2	1	2	1
CO5	2	1	2	1	2	1	2	2	2	1	2	1	3	3	2
Average	**1.8**	**1.8**	**1.6**	**1.6**	**1.8**	**1.8**	**1.25**	**1.8**	**1.6**	**1.6**	**1.6**	**1.8**	**1.8**	**2.2**	**2**

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

Course Name: Applied Clinical Biochemistry-I

Course Code: A804405

Semester: 4th

	L	T	P
Credits: 03	**2**	**1**	**0**

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

CO	Statement
CO1	Understand hazards & safety measures in clinical Biochemistry laboratory.
CO2	Apply quality control and quality assurance.
CO3	Perform principles, procedures for estimation & assessment of Sodium, Potassium and Chloride, Iodine
CO4	Maintain quality of reagent and accuracy in the procedure of biochemical parameter analysis.
CO5	Learn the principles, procedures for estimation & assessment of Glucose Proteins, Urea, Uric acid

Course Contents

Unit 1

Hazards & safety measures in clinical Biochemistry laboratory
Quality control and quality assurance in a clinical biochemistry laboratory
Laboratory organization, management and maintenance of records

Unit 2

Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for: Glucose Proteins Urea Uricacid Creatinine Bilirubin Lipids

Unit 3

Principles, procedures for estimation & assessment of the following including errors involved and their corrections-
Sodium, Potassium and Chloride, Iodine
Calcium, Phosphorous and Phosphates

Unit 4

Instruments for detection of Radioactivity
Applications of Radioisotopes in clinical biochemistry.
Enzyme linked immune sorbent assay

References:

1. Godkar, P. B. and Godkar, P. (2014).*Textbook of Medical Laboratory Technology.* Bhalani

Publishing House
2. L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).
3. Varley, H., Gowenlock, A. H., McMurray, J. R., and McLauchlan, D. M. (1988). *Varley's practical clinical biochemistry*. London: Heinemann Medical Books.
4. Siddiqi, M.A. (2006). *Principal of Biochemistry*.
5. Chatwal, G.R. and Anand, S.K. (1979).Text book of Medical Biochemistry, Himlayan publishing house.
6. Nelson, D. L., & Cox, M. M. (2017). *Lehninger principles of biochemistry* (7th ed.). W.H. Freeman
7. Voet, D., and Voet, J. G. (1995). *Biochemistry*. New York: J. Wiley & Sons.
8. Berg, J. M., Tymoczko, J. L., Stryer, L., & Stryer, L. (2002). *Biochemistry*. New York: W.H. Freeman

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	3	2	1	1	3	2	1	1	3	2	2
CO2	1	1	2	3	2	1	2	2	2	1	2	2	3	1	1
CO3	1	2	3	1	1	2	-	2	1	2	-	2	2	1	3
CO4	2	3	1	2	3	1	2	1	3	1	2	1	1	2	1
CO5	3	1	1	2	1	3	-	2	1	3	3	2	2	1	3
Average	**1.8**	**2**	**1.6**	**1.8**	**2**	**1.8**	**1.6**	**1.6**	**2**	**1.8**	**2**	**1.6**	**2.2**	**1.4**	**2**

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

Course Name: Cytopathology

Course Code: A804406

Semester: 4th

	L	T	P
Credits: 02	**2**	**0**	**0**

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

CO	Statement
CO1	Learn about the cryostat sectioning, its applications in diagnostic Cytopathology
CO2	Understand the working of the Automation in cytology.
CO3	Diagnose the fluid cytology urine, CSF , body fluids (pleural, pericardial, ascetic)
CO4	Narrate indications & utility of the technique with special emphasis on role in FNAC
CO5	Follow Principles and preparation, Cytocentrifuge, molecular cytology, Cell Block and Immune-cytochemistry

Course Contents

Unit 1

Cryostat sectioning, its applications in diagnostic Cytopathology
Enzyme Cytochemistry:
Diagnostic applications
Demonstration of Phosphates, Dehydrogenises, Oxidase&Peroxides

Unit 2

Vital staining for Sex Chromatin
Aspiration cytology: Principle Indications & utility of the technique with special emphasis on role of cytotechnologist in FNAC clinics

Unit 3

Exfoliative cytology (Papanicolaoue technique for the staining of cervical smears)
Cervical cytology
Fluid Cytology
Urine, CSF, Body Fluids (Pleural, Pericardial, Ascetic)
Automation in cytology
Liquid based cytology: Principles and preparation, Cytocentrifuge, molecular cytology, Cell Block and Immune-cytochemistry

References:

1. Kumar, V., Abbas, A. K., & Aster, J. C. (2017). *Robbins basic pathology e-book*.Elsevier Health Sciences.
2. Bancroft, J. D., & Gamble, M. (Eds.).(2008). *Theory and practice of histological techniques*.Elsevier health sciences.
3. Culling, C. F. A., Allison, R. T., & Barr, W. T. (2014). *Cellular pathology technique*.Elsevier.
4. Mohan, H. (2015). *Textbook of pathology*.Jaypee Brothers Medical Publishers.
5. Mohan, H. (2012). *Pathology practical book*. JP Medical Ltd.
6. 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	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	1	2	-	2	1	2	1	2	1	1	2
CO2	1	1	3	3	2	1	1	1	3	3	2	1	3	1	1
CO3	2	3	1	2	1	3	2	3	1	2	1	-	1	2	1
CO4	1	2	2	1	2	2	-	1	2	1	2	2	2	2	2
CO5	2	1	2	3	3	2	1	2	2	3	3	-	3	1	3
Average	**1.6**	**1.6**	**1.8**	**2.2**	**1.8**	**2**	**1.3**	**1.8**	**1.8**	**2.2**	**1.8**	**1.6**	**2**	**1.4**	**1.8**

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

Course Name: Analytical Clinical Biochemistry (Practical)

Course Code: A804407

Semester: 4th **L T P**

Credits: 02 **0 0 4**

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

CO	Statement
CO1	Process sample for analysis of biochemical parameters in blood sample.
CO2	Understand the principle & procedure of chromatography.
CO3	Demonstrate the principle & procedure of flame photometers.
CO4	Operate principle & procedure of Electrophoresis.
CO5	Perform testing on colorimeter, working and maintenance.

Course Contents

To demonstrate the principle, working & maintenance of spectrophotometer.
To demonstrate the principle, working & maintenance of colorimeter.
To demonstrate the principle, working & maintenance of flame photometer.
To demonstrate the principle, procedure of paper chromatography.
To demonstrate the principle & procedure of Gas chromatography.
To demonstrate the principle & demonstration of TLC.
To demonstrate the principle & procedure of column chromatography.
To demonstrate the principle & procedure of Electrophoresis

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	1	2	2	1	2	1	2	1	2	1	2
CO2	2	1	1	2	3	1	1	2	1	1	2	3	1	1	1
CO3	1	3	2	1	3	2	1	1	3	2	1	3	2	1	3
CO4	3	2	2	2	1	1	2	3	2	2	1	1	3	2	2
CO5	2	1	1	2	2	1	-	3	1	1	2	2	2	1	3
Average	**1.8**	**1.8**	**1.4**	**1.8**	**2**	**1.4**	**1.5**	**2**	**1.8**	**1.4**	**1.6**	**2**	**2**	**1.2**	**2.2**

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

Course Name: Applied Histopathology-I (Practical)

Course Code: A804408

Semester: 4th

	L	T	P
Credits: 02	**0**	**0**	**4**

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

CO	Statement
CO1	Prepare various types of fixatives.
CO2	Understand embedding of given tissue in paraffin block.
CO3	Process tissue by manual and automated processor method.
CO4	Perform & practice the Haematoxylin and Eosin staining technique and special staining.
CO5	Use antiseptics, disinfectants and insecticides in a tissue culture processing laboratory

Course Contents

Demonstration of instruments used for dissection
Use of antiseptics, disinfectants and insecticides in a tissue culture processing laboratory
Reception and labeling of histological specimens
Preparation of various fixatives
Helly‘s fluid
Zenker‘s fluid
Bouin‘s fluid
Corney‘s fluid
10% Neutral formalin
Formal saline
Formal acetic acid
Pereyn‘s fluid
Testing of melting point of paraffin wax and perform embedding of given tissue in paraffin block
To process a bone for decalcification
To prepare ascending and descending grades of alcohol from absolute alcohol
Processing of tissue by manual and automated processor method
To demonstrate various part and types of microtome
To learn sharpening of microtome knife (Honing and stropping technique), and types of disposable blades in use (High and Low Profile).
To perform section cutting (Rough and Fine)
To practice attachment of tissue sections to glass slides
To learn using tissue floatation bath and drying of sections in oven (60-65C)
To perform & practice the Haematoxylin and Eosin staining technique

To perform & practice the Mallory's Phosphotungstic Acid Haematoxylin (PTAH)
To learn mounting of stained smears

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	1	2	1	3	3	1	2	1	1	2	1
CO2	2	1	2	1	3	3	1	1	1	3	1	1	3	1	2
CO3	1	2	2	1	2	1	-	1	1	2	1	3	2	1	3
CO4	2	1	3	2	2	2	1	2	2	2	2	1	3	2	1
CO5	2	1	2	2	1	2	-	2	2	1	2	3	1	1	2
Average	**1.6**	**1.4**	**2**	**1.8**	**1.8**	**2**	**1**	**1.8**	**1.8**	**1.8**	**1.6**	**1.8**	**2**	**1.4**	**1.8**

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

Course Name: Immunology and Bacterial Serology (Practical)

Course Code: A804409

Semester: 4th **L T P**

Credits: 02 **0 0 4 Course**

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

CO	Statement
CO1	Collect blood sample by vein puncture, separation and preservation of serum.
CO2	Perform Serological tests, Widal, ASO, CRP.
CO3	Demonstrate antigen/antibody determination by Immuno fluorescence (IF), Immuno diffusion, precipitation in Agarose gel.
CO4	Prepare Phosphate buffers, ASO buffer, Richardson‘s buffer.
CO5	Perform Haemolysin titration for Rose-Waaler test.

Course Contents

Collection of blood sample by vein puncture, separation and preservation of serum
Performing Haemolysin titration for Rose-Waaler test
Preparation of Phosphate buffers, Verinol buffer, ASO buffer, Richardson‘s buffer, Buffers of different pH and Molarity, Tris buffer, Standardization of cell concentration by Spectrophotometer
Performance of Serological tests i.e.
Widal,
Brucella Tube Agglutination,
VDRL (including Antigen Preparation),
ASO (Anti-Streptolysin _O‘)
C-Reactive Protein (Latex agglutination)
Rheumatoid factor (RF) Latex agglutination
Rose Waaler test,
Demonstration of antigen/antibody determination by Immuno fluorescence (IF), Immuno diffusion, precipitation in Agarose gel (Ouchterlony), CCIEP, ELISA, SDS - PAGE and Western blotting.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	1	2	2	2	1	2	2	2	1	2	3
CO2	2	2	3	1	2	1	2	1	2	1	2	1	2	1	2
CO3	2	3	2	3	3	1	1	2	3	1	1	2	3	1	1
CO4	1	2	1	2	2	2	3	3	2	2	3	3	1	2	3
CO5	2	1	3	1	1	3	2	1	2	3	2	1	2	3	3
Average	**1.6**	**2**	**2**	**2**	**1.8**	**1.8**	**2**	**1.8**	**2**	**1.8**	**2**	**1.8**	**1.8**	**1.8**	**2.4**

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

Course Name: Applied Hematology-II (Practical)

Course Code: A804410

Semester: 4th

	L	T	P
Credits: 02	**0**	**0**	**4**

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

CO	Statement
CO1	Calculate INR and determining of thromboplastin.
CO2	Perform urea clot solubility test for factor XIII
CO3	Perform Anti-cardiolipin antibodies test.
CO4	Determine morphology of normal and immature WBCs
CO5	Identify the morphology of Normal and abnormal RBCs

Course Contents

Review the morphology of Normal and abnormal RBCs
Review the morphology of normal and immature WBCs
WBCs anomalies
Calculating INR and determining the ISI of Thromboplastin
Quantitative Factor assays:
Factor VIII
Factor IX
Factor VII
Factor X
Factor V
Quantification of inhibitors (Bethesda method)
APLA: Lupus Anticoagulant (LA)
Anti-cardiolipin antibodies (ACA)
Perform Euglobulin clot lysis test (ELT)
Urea clot solubility test for factor XIII.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	3	2	1	2	3	2	1	2	2	2	1
CO2	2	3	2	3	1	2	2	1	1	2	2	1	3	1	2
CO3	3	2	1	3	2	3	-	2	2	3	-	2	1	2	3
CO4	1	3	3	2	1	2	2	3	1	2	2	3	2	2	2
CO5	1	2	2	1	2	3	1	1	2	3	1	1	3	3	3
Average	**2**	**2.2**	**2.2**	**2**	**1.8**	**2.4**	**1.5**	**1.8**	**1.8**	**2.4**	**1.5**	**1.8**	**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: Applied Clinical Biochemistry –I (Practical)

Course Code: A804411

Semester: 4th **L T P**

Credits: 02 **0 0 4Course**

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

CO	Statement
CO1	Estimate serum Bilirubin from serum sample.
CO2	Check the level of serum calcium, Inorganic phosphate.
CO3	Measure electrolytes Sodium, Potassium & Chloride
CO4	Determine renal function test and various biochemical tests.
CO5	Estimate lipid profile tests in serum.

Course Contents

1. Estimation of Glucose in Urine and in Blood.
2. Estimation of Protein in Urine and Blood.
3. Estimation of Urea in blood.
4. Estimation of uric acid in blood.
5. Estimation of serum Bilirubin
6. Estimation of Total Cholesterol in blood.
7. Estimation of HDL Cholesterol.
8. Estimation of LDL Cholesterol.
9. Estimation of TG
10. Estimation of Creatinine in Blood
11. Estimation of serum calcium, Inorganic phosphate
12. To measure electrolytes Sodium, Potassium & Chloride.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	1	3	1	-	3	3	1	-	3	1	3	2
CO2	2	1	3	2	1	2	2	1	1	2	2	1	2	2	1
CO3	1	2	1	3	2	1	2	1	2	1	2	1	3	1	2
CO4	2	3	3	2	2	1	-	2	2	1	-	2	2	2	3
CO5	3	2	1	2	3	2	2	1	3	2	2	1	1	3	1
Average	**1.8**	**2**	**2**	**2**	**2.2**	**1.4**	**2**	**1.6**	**2.2**	**1.4**	**2**	**1.6**	**1.8**	**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: Applied Histopathology-II

Course Code: A804501

Semester: 5th

L T P

Credits: 03 **2 1 0**

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

CO	Statement
CO1	Demonstrate and identify minerals and pigments, removal of Pigments/artifacts in tissue sections.
CO2	Perform diagnostic applications and the demonstration of Phosphates, Dehydrogenises, Oxidase & Peroxides
CO3	Process eye ball, bone marrow, and muscle biopsy.
CO4	Demonstrate Carbohydrates, lipids, fat & fat like substances in tissue section.
CO5	Work on microtome for tissue section cutting, sharpening and honing, care and maintenance of microtome.

Course Contents

Unit 1

Cryostat sectioning, its applications in Diagnostic Histopathology. Special Staining Procedures for detection of Connective tissue elements, trichrome staining, muscle fibers, elastic, reticulin fibers, collagen fibers etc. Metachromatic staining such as Toludine blue on frozen sections Principles of metal impregnation techniques. Demonstration and identification of minerals and pigments, removal of Pigments/artifacts in tissue sections

Unit 2

Demonstration of Proteins & nucleic acids.
Demonstration of Carbohydrates, lipids, fat & fat like substances.
Demonstration of bacteria and fungi in tissue section.
Tissue requiring special treatment i.e. eye ball, bone marrow, and muscle biopsy, under calcified or unclassified bones, whole brain, and whole lungs including other large organs.

Unit 3

Enzyme histochemistry: Diagnostic applications and the demonstration of Phosphates, Dehydrogenises, Oxidase & Peroxides.
Vital staining.
Neuro-pathological techniques.
Museum techniques.

Unit 4

Electron Microscope: Working principle and its components Processing, embedding and ultra-microtomy Micrometry and Morphometry

References:

1. Kumar, V., Abbas, A. K., & Aster, J. C. (2017). *Robbins basic pathology e-book*.Elsevier Health Sciences.
2. Bancroft, J. D., & Gamble, M. (Eds.).(2008). *Theory and practice of histological techniques*.Elsevier health sciences.
3. Culling, C. F. A., Allison, R. T., & Barr, W. T. (2014). *Cellular pathology technique*.Elsevier.
4. Mohan, H. (2015). *Textbook of pathology*.Jaypee Brothers Medical Publishers.
5. Mohan, H. (2012). *Pathology practical book*. JP Medical Ltd.
6. 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	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	1	2	-	1	1	2	-	1	2	1	1
CO2	1	1	2	1	1	3	1	1	1	3	1	3	2	1	2
CO3	2	3	1	3	2	1	-	1	2	1	-	1	1	2	1
CO4	3	1	3	2	3	2	1	2	3	2	1	2	1	3	2
CO5	2	2	1	1	2	1	2	1	2	1	2	1	3	1	1
Average	**1.8**	**1.8**	**1.6**	**2**	**1.8**	**1.8**	**1.3**	**1.2**	**1.8**	**1.8**	**1.3**	**1.6**	**1.8**	**1.6**	**1.4**

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

Course Name: Advanced Hematology

Course Code: A804502

Semester: 5th

L T P

Credits: 03 **2 1 0**

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

CO	Statement
CO1	Perform laboratory diagnosis of Megaloblastic anaemia & Pernicious anaemia
CO2	Perform laboratory diagnosis of bleeding disorders.
CO3	Apply laboratory approach for investigating thrombosis.
CO4	Acquire the knowledge of Haemophilia A, B & Von-Willebrand disease.
CO5	Learn chromosomal disorders and their significance in blood didorders.

Course Contents

Unit 1

Laboratory diagnosis of Iron deficiency anemia
Laboratory diagnosis of Megaloblastic anemia & Pernicious anemia
Classification and Laboratory diagnosis of Hemolytic anemia
Definition, classification and laboratory diagnosis of Leukemia
Chromosomal studies in various hematological disorders and their significance.

Unit 2

Laboratory diagnosis of bleeding disorders with special emphasize to Hemophilia A, B & Von-Willebrand disease DIC Platelet disorder (Qualitative and quantitative) Laboratory approach for investigating thrombosis.

Unit 3

Using radioisotopes measurement of:
Blood volume
Determination of Red cell volume and Plasma volume
Red cell life span

Unit 4

Platelet life span
Radiation hazards and its prevention
Disposal of radioactive material

References:

1. Godkar, P. B., &Godkar, D. P. (2003). *Textbook of medical laboratory technology*.Bhalani.
2. Mukherjee, K. L. (2017). *Medical laboratory technology*.McGraw-Hill Education.
3. Lewis, S. M., Bain, B. J., Bates, I., Dacie, J. V., &Dacie, J. V. (2006). *Dacie and Lewis practical haematology*. Philadelphia: Churchill Livingstone/Elsevier.
4. John Bernard HenryClinical Diagnosis and Management by Laboratory Methods, 20th ed., Philadelphia: WB Saunders, 2001, 1512

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	3	2	1	3	1	2	1	3	2	1	3
CO2	3	1	2	1	1	3	2	1	1	-	2	1	1	2	1
CO3	1	2	2	3	2	1	1	2	2	1	1	2	2	1	2
CO4	2	1	3	2	1	2	-	1	1	2	-	1	3	1	3
CO5	1	2	1	1	2	1	-	2	2	1	1	2	1	2	1
Average	**1.6**	**1.6**	**1.8**	**1.6**	**1.8**	**1.8**	**1.3**	**1.8**	**1.4**	**1.5**	**1.25**	**1.8**	**1.8**	**1.4**	**2**

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

Course Name: Applied Clinical Biochemistry-II

Course Code: A804503

Semester: 5th

L T P

Credits: 03 **2 1 0**

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

CO	Statement
CO1	Perform Glucose tolerance test, Insulin tolerance test, Xylose excretion test.
CO2	Estimate and assess creatinine clearance test for renal function.
CO3	Learn the principles, Clinical significance and Procedures for estimation of enzymes.
CO4	Evaluate chemical examination of Cerebrospinal fluid.
CO5	Know about rapid techniques in clinical biochemistry.

Course Contents

Unit 1

Automation in clinical biochemistry

Method of estimation and assessment for: Glucose tolerance test, Insulin tolerance test, Xylose excretion test.

Unit 2

Gastric analysis. Clearance test for renal function. Qualitative test for: Urobilinogens Barbiturates, T3, T4 and TSH, Ketosteroids

Unit 3

Enzymes: Principles, Clinical significance and Procedures for estimation- Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine transaminase Creatine phosphokinase.

Unit 4

Qualitative analysis of renal calculi. Chemical examination of Cerebrospinal fluid. Brief knowledge about rapid techniques in clinical biochemistry

References:

Godkar, P. B. and Godkar, P. (2014).*Textbook Of Medical Laboratory Technology.* Bhalani Publishing House

L Mukherjee, K., Swarajit. G. (2010).Medical Laboratory Technology (Volume I).

Varley, H., Gowenlock, A. H., McMurray, J. R., and McLauchlan, D. M. (1988). *Varley's practical clinical biochemistry*. London: Heinemann Medical Books.

Siddiqi, M.A. (2006). *Principal of Biochemistry***.**

Chatwal, G.R. and Anand, S.K. (1979).Text book of Medical Biochemistry, Himlayan publishing house.

Nelson, D. L., & Cox, M. M. (2017). *Lehninger principles of biochemistry* (7th ed.). W.H. Freeman

Voet, D., and Voet, J. G. (1995). *Biochemistry*. New York: J. Wiley & Sons.

Berg, J. M., Tymoczko, J. L., Stryer, L., & Stryer, L. (2002). *Biochemistry.* New York: W.H. Freeman

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	1	2	1	1	2	2	1	1	2	1	3	1
CO2	1	2	2	1	3	2	3	1	3	2	3	1	2	1	3
CO3	3	1	1	3	1	3	1	3	1	3	1	3	2	2	1
CO4	1	2	1	2	2	1	3	2	2	1	3	2	1	1	2
CO5	2	1	3	1	3	1	2	1	3	1	2	1	3	2	2
Average	**1.8**	**1.4**	**2**	**1.6**	**2.2**	**1.6**	**2**	**1.8**	**2.2**	**1.6**	**2**	**1.8**	**1.8**	**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: Blood Banking & Genetics

Course Code: A804504

Semester: 5th

	L	T	P
Credits: 02	**2**	**0**	**0**

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

CO	Statement
CO1	Perform Compatibility test in blood transfusion.
CO2	Learn about the collection of blood for cross matching from a blood bag.
CO3	Prepare various fractions of blood for transfusion and therapeutic purposes.
CO4	Understand bacterial cell and eukaryotic cell; parallelism between genes and chromosomes.
CO5	Maintain the record of blood bank – data of issuing and receiving blood and coppnents.

Course Contents

Unit 1

Introduction to Blood Banking History and discovery of various blood group systems ABO blood group system Rh and other major blood group system Sources of error in blood grouping and their elimination. ABO grouping: Forward and reverse grouping. Causes of discrimination between forward and reverse grouping Rh grouping

Unit 2

Compatibility Test in Blood Transfusion

Collection of blood for cross matching from a blood bag
Major cross matching
Minor cross matching
Use of enzymes in blood bank specially Papain

Unit 3

Complications and Hazards of Blood Transfusion

Laboratory investigations of transfusion reactions and mismatched blood transfusion.
Precautions while procurement and storage of grouping antisera
Various anticoagulants used to collect blood for transfusion purposes
Selection of donor and procedure for collection of blood from a healthy donor
Preparation of various fractions of blood for transfusion and therapeutic purposes such as:
Packed red cells, washed red cells and FROZEN Red cells
Platelet Rich Plasma (PRP), Platelet concentrate and frozen platelets.
Fresh plasma (FP), Fresh Frozen Plasma (FFP) and cryoprecipitate

Unit 4

Brief Introduction of blood substitute/artificial blood
Hemaphaeresis: pertaining to Leucocytes, platelets and plasma.
Quality control in blood bank
Continuity of life-heredity, variation; Mendel's laws of inheritance,
Chromosomal basis of inheritance; other patterns of inheritance- incomplete dominance, multi parallelism, quantitative inheritance.
Chromosomes - bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination;
Molecular genetics: DNA as a genetic material- its structure and replication; structure of RNA and its role in protein synthesis, Vectors, plasmids
Human Genetics
Microbial genetics

References:

1. Lewis, S. M., Bain, B. J., Bates, I., &Dacie, J. V. (2001). *Dacie and Lewis practical haematology*. London: Churchill Livingstone
2. Lawicki, S., Covin, R. and Powers, A., 2017.The Kidd (JK) Blood Group System. *Transfusion Medicine Reviews*, 31(3), pp.165-172.
3. Lazarus, H. and Schmaier, A., 2012. *Concise guide to hematology*.Chichester, West Sussex, UK: Wiley-Blackwell, pp.77-81.
4. Overfield, J., Dawson, M. and Hamer, D., 2008. *Transfusion science*.Bloxham, Oxfordshire: Scion.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	2	1	2	1	2	1	2	1	2	3	3
CO2	1	2	2	1	1	3	-	1	1	3	-	1	1	2	1
CO3	3	2	1	1	3	2	1	2	3	2	1	2	3	1	2
CO4	3	1	2	3	2	1	-	-	2	1	2	3	2	1	3
CO5	2	3	1	2	3	1	2	2	3	1	-	2	1	2	2
Average	**2.2**	**1.8**	**1.4**	**1.8**	**2.2**	**1.6**	**1.6**	**1.5**	**2.2**	**1.6**	**1.6**	**1.8**	**1.8**	**1.8**	**2.2**

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

Course Name: Medical Mycology & Virology

Course Code: A804505

Semester: 5th

L T P

Credits: 02 **2 0 0**

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

CO	Statement
CO1	Collect, transport and storage of sample for viral diagnosis.
CO2	Process samples for viral culture (Egg inoculation and tissue culture).
CO3	Assess rapid diagnosis of viral infections with special reference to HIV, HBV and HCV
CO4	Learn Taxonomy ,classification and general characteristics of various medically important fungi
CO5	Processing of clinical samples for diagnosis of fungal infections

Course Contents

Unit 1

Virology:

Introduction to medical virology

Introduction to medically important viruses

Structure and Classification of viruses.

Multiplication of viruses

Collection, transportation and storage of sample for viral diagnosis

Unit 2

Staining techniques used in Virology

Processing of samples for viral culture (Egg inoculation and tissue culture)

Rapid diagnosis of viral infections with special reference to HIV, HBV and HCV

EIA

Immuno fluorescence

PCR

Unit 3

Mycology:

Introduction to Medical Mycology

Basic concepts about superficial and deep Mycoses

Taxonomy and classification and general characteristics of various medically important fungi

Normal fungal flora

Morphological, cultural characteristics of common fungal laboratory contaminants

Culture media used in mycology

Direct microscopy in Medical mycology laboratory

Unit 4

Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids
Techniques used for isolation and identification of medically important fungi
Methods for identification of yeasts and moulds
Dimorphism in fungi
Antifungal susceptibility tests
Preservation of fungal cultures
Routine myco-serological tests and skin tests

References:

1. Collee, J. G., Mackie, T. J., and McCartney, J. E. (1996). *Mackie & McCartney practical medical microbiology*. New York: Churchill Livingstone
2. Ananthanarayan, R. and Paniker, C., 1980. *Textbook of microbiology*.1st ed. Orient Longman.
3. Murray, P. R., Rosenthal, K. S., &Pfaller, M. A. (2013). *Medical microbiology.*
4. Chander, J. (2017). *Textbook of medical mycology*. JP Medical Ltd.

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

PO/PSO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	2	2	1	2	2	1	-	1	2	1	2
CO2	1	2	1	2	1	1	2	1	1	2	1	2	1	2	1
CO3	1	1	2	3	1	2	1	2	1	1	2	3	1	3	2
CO4	3	2	3	1	3	1	-	-	3	2	1	1	3	2	3
CO5	2	1	2	3	1	2	3	1	2	1	2	3	2	1	2
Average	**1.8**	**1.4**	**2**	**2**	**1.6**	**1.6**	**1.75**	**1.5**	**1.8**	**1.4**	**1.5**	**2**	**1.8**	**1.8**	**2**

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

Course Name: Research Methodology & Biostatistics

Course Code: A804506

Semester: 5th

	L	T	P
Credits: 03	**3**	**0**	**0**

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

CO	Statement
CO1	Learn methods, identifying research problem, Ethical issues in research,Research design.
CO2	Overview types of Data, Research tools and Data collection methods, Sampling methods.
CO3	Understand data representation in biostatistics, How to get relevant data, Relation between data & variables.
CO4	Summarize data on the pretext of underlined study, Understanding of statistical analysis
CO5	Understand how & where to get relevant data, Relation between data & variables

Course Contents

Unit 1

Research Methodology: Introduction to research methods, identifying research problem, Ethical issues in research, Research design.

Unit 2

Basic Concepts of Biostatistics Types of Data, Research tools and Data collection methods, sampling methods, develops a research proposal.

Unit 3

Biostatistics: Need of biostatistics, what is biostatistics: beyond definition, Understanding of data biostatistics, how& where to get relevant data, Relation between data & variables

Unit 4

Type of Variables: defining data set Collection of relevant data: sampling methods Construction of study: population, sample, normality and its beyond (not design of study, perhaps) Summarizing data on the pretext of underlined study, Understanding of statistical analysis (not methods)

References:

Armitage, P., Berry, G., & Matthews, J. N. S. (2008). *Statistical methods in medical research*.John Wiley & Sons.

Mahajan, B. K. (1997). Methods in Biostatistics for medical students and research workers.

Pagano, M., &Gauvreau, K. (2000). *Principles of biostatistics*. Australia: Duxbury.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	3	2	1	-	1	2	3	-	1	2	1	2
CO2	1	2	1	2	1	3	1	2	1	2	1	3	1	2	1
CO3	1	1	2	1	2	1	-	2	2	1	2	1	1	2	2
CO4	2	3	3	2	3	2	1	1	3	2	-	2	2	1	1
CO5	1	2	1	2	1	3	1	2	1	2	1	3	3	1	3
Average	**1.4**	**1.8**	**1.8**	**2**	**1.8**	**2**	**1**	**1.6**	**1.8**	**2**	**1.3**	**2**	**1.8**	**1.4**	**1.8**

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

Course Name: Applied Histopathology-II (Practical)

Course Code: A804507

Semester: 5th

	L	T	P
Credits: 01	**0**	**0**	**2**

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

CO	Statement
CO1	Cut frozen section and stain for Haematoxylin and Eosin.
CO2	Prepare Schiff‘s reagent in the lab and do Periodic Acid Schiff‘s (PAS) stain on a paraffin section.
CO3	Stain Decalcified paraffin embedded section for the presence of calcium salts.
CO4	Demonstrate the presence of bacteria and fungi in paraffin embedded sections using the following staining procedures.
CO5	Stain a paraffin section for the demonstration of smooth muscle by Van Gieson‘s Stain

Course Contents

To cut frozen section and stain for Haematoxylin and Eosin, Metachromatic stain Toludine blue-_o‘ and Oil Red _O‘ staining for the demonstration of fat
To prepare Schiff‘s reagent in the lab and do Periodic Acid Schiff‘s (PAS) stain on a paraffin section
To prepare ammonical silver bath in the laboratory and stain paraffin embedded section for the demonstration of reticulin fibers.
To stain a paraffin section for the demonstration of smooth muscle by Van Gieson‘s Stain
To perform Masson‘s trichrome stain on a paraffin section for the demonstration of collagen fiber, muscle fiber and other cell elements.
To stain the paraffin section for the demonstration of the elastic fibers (EVG).
To stain Decalcified paraffin embedded section for the presence of calcium salts (Von Kossa‘s method).
To stain a paraffin section for the following Mucicarmine, Alcian blue.
To stain a paraffin section for the demonstration of iron (Perl‘s stain)
To demonstrate the presence of bacteria and fungi in paraffin embedded sections using the following staining procedures:
Gram‘s staining
AFB staining (Ziehl Neilson‘s staining) for M. tuberculosis and leprae
Grocott‘s stain for fungi
Schmorl‘s reaction for reducing substances (melanin)
To stain for nucleic acid (DNA and RNA)
Feulgen Staining
Methyl Green-Pyronin Staining
Enzymatic methods

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	1	2	1	1	1	2	1	2	2	1	2
CO2	3	1	2	1	3	2	-	1	3	2	-	3	2	2	3
CO3	2	1	1	2	2	1	2	2	2	1	2	1	1	2	1
CO4	1	2	1	2	1	2	1	3	1	2	1	2	2	1	2
CO5	2	3	2	1	1	3	2	2	2	1	2	1	1	2	1
Average	**1.8**	**1.8**	**1.4**	**1.8**	**1.6**	**2**	**1.5**	**1.8**	**1.8**	**1.6**	**1.5**	**1.8**	**1.6**	**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: Advanced Hematology (Practical)

Course Code: A804508

Semester: 5th

	L	T	P
Credits: 02	**0**	**0**	**4**

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

CO	Statement
CO1	Estimate serum iron and total iron binding capacity.
CO2	Identify plasma and urine Hemoglobin in the given specimens.
CO3	Perform various platelet function tests such as whole blood clot retraction test, prothrombin consumption index.
CO4	Count Peripheral Blood Lymphocyte Culture for chromosome studies in Leukemia.
CO5	Study and interpretation of Histogram of Automated Blood cell counter.

Course Contents

Study and interpretation of Histogram of Automated Blood cell counter
To estimate serum iron and total iron binding capacity.
Screening tests for enzymes deficiency: Pyruvate Kinase, G6PD
To estimate Hb-F, Hb-A2 in a given blood sample.
To estimate plasma and urine Hemoglobin in the given specimens.
To demonstrate the presence of Hb-S by Sickling and Solubility tests.
Perform Hb electrophoresis (alkaline)
Perform osmotic red cell fragility.
Detection of Fibrin degradation products (FDPs)
To perform various platelet function tests such as whole blood clot retraction test, prothrombin consumption index (PCI) Platelet adhesion, aggregation and PF3 availability test.
Estimation of Protein C, S Peripheral Blood Lymphocyte Culture for chromosome studies in Leukemia

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	2	3	1	1	1	3	1	1	3	2	2
CO2	2	2	1	2	2	1	2	2	3	1	2	2	1	1	1
CO3	1	2	2	1	1	2	-	1	2	2	-	1	1	2	1
CO4	2	3	2	3	1	1	2	3	1	1	1	2	2	1	2
CO5	3	1	1	2	3	2	1	1	2	1	-	2	2	1	3
Average	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.5**	**1.6**	**1.8**	**1.6**	**1.3**	**1.6**	**1.8**	**1.4**	**1.8**

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

Course Name: Applied Clinical Biochemistry-II (Practical)

Course Code: A804509

Semester: 5th **L T P**

Credits: 02 **0 0 4Course**

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

CO	Statement
CO1	Estimate and assess Glucose tolerance test, Insulin tolerance test, Xylose excretion test.
CO2	Perform estimation of hormones-T_3, T_4 and TSH.
CO3	Assess enzyme estimation of lactate dehydrogenase.
CO4	Check the chemical examination of urine.
CO5	Determine Serum Insulin tolerance test (ITT).

Course Contents

Estimation of Glucose tolerance test (GTT).
Estimation of Insulin tolerance test (ITT).
Determination of Uric acid in Urine.
Determination of Creatinine clearance.
Determination of Urea clearance.
Determination of Serum acid phosphatase.
Determination of Serum Alkaline phosphatase.
Determination of Serum Lactate dehydrogenase.
Determination of T3, T4 and TSH

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	1	2	2	2	1	-	2	1	2	1
CO2	2	1	3	1	2	1	1	-	2	1	1	3	2	1	3
CO3	1	2	1	2	1	2	2	2	1	2	2	2	1	2	1
CO4	1	2	2	3	2	1	1	1	2	1	1	1	2	1	2
CO5	3	1	1	2	3	3	2	2	3	3	2	2	1	2	1
Average	**1.8**	**1.6**	**1.6**	**2**	**2**	**1.6**	**1.6**	**1.75**	**2**	**1.6**	**1.5**	**2**	**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: Blood Banking & Genetics (Practical)

Course Code: A804510

Semester: 5th **L T P**

Credits: 02 **0 0 4**

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

CO	Statement
CO1	Prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions
CO2	Assess screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV
CO3	Perform Direct and Indirect Coomb's test
CO4	Determine the ABO & Rh grouping.
CO5	Find out Rh grouping and determination of Du in case of Rh negative.

Course Contents

To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions
Screening of blood donor: physical examination including medical history of the donor
Collection and preservation of blood for transfusion purpose
Screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV
To determine the ABO & Rh grouping
Direct or preliminary grouping
Indirect or proof grouping
Rh grouping and determination of Du in case of Rh negative
To perform Direct and Indirect Coomb's test
To perform cross matching
Major cross matching
Minor cross matching
Preparation of various fractions of blood.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	3	2	1	2	1	2	1	2	1	3	1	3
CO2	3	2	1	2	3	1	1	2	3	1	1	2	1	2	1
CO3	1	1	3	1	1	2	1	3	1	2	-	3	1	2	2
CO4	2	2	2	1	2	3	-	1	2	3	2	1	2	1	2
CO5	1	3	1	3	2	1	1	2	2	1	1	2	2	2	3
Average	**1.8**	**2**	**1.6**	**2**	**2**	**1.6**	**1.25**	**1.8**	**2**	**1.6**	**1.5**	**1.8**	**1.8**	**1.6**	**2.2**

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

Course Name: Medical Mycology & Virology (Practical)

Course Code: A804511

Semester: 5th

	L	T	P
Credits: 02	**0**	**0**	

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

CO	Statement
CO1	Prepare KOH, Gram stain, Potassium Hydroxide - Calcofluor White method, India Ink, Modified Kinyoun Acid Fast Stain for Nocardia, LCB preparation.
CO2	Identify given yeast culture by performing various identification techniques
CO3	Collect and process clinical samples for laboratory diagnosis of fungal infections
CO4	Perform Giemsa stain, Seller‘s stain, immune fluorescent staining procedures for diagnosis of viral infections
CO5	Identify given mould culture by performing various identification techniques

Course Contents

To prepare culture media used routine lyin mycology
To perform KOH preparation, Gram stain, Potassium Hydroxide- Calcofluor White method, India ink preparation, Modified Kinyoun Acid Fast Stain for No cardia, LCB preparation.
To identify given yeast culture by performing various identification techniques studied in theory.
To identify given mould culture by performing various identification techniques studied in theory.
To demonstrate dimorphismin fungi
To collect and process clinical samples for laboratory diagnosis of fungal infections i.e.
Skin
Nail
Hair
Body fluids and secretions
To demonstrate structure of viruses and their multiplication from charts etc.
To perform Giemsa stain, Seller‘s stain, immune fluorescent staining procedures for diagnosis of viral infections
Demonstration offer utilized hen egg
Demonstration of various in oculation routes in fertilized hen egg

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	2	1	2	1	2	1	2	1	2	1
CO2	1	2	3	1	2	1	-	1	2	1	2	1	2	1	2
CO3	1	3	1	2	1	2	1	2	1	2	1	2	3	2	3
CO4	3	2	2	1	3	3	1	1	3	3	-	1	1	3	1
CO5	1	1	2	3	1	2	1	2	1	2	1	2	2	1	3
Average	**1.6**	**1.8**	**2**	**1.6**	**1.6**	**2**	**1**	**1.6**	**1.6**	**2**	**1.25**	**1.6**	**1.8**	**1.8**	**2**

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

Course Name: Professional Training/ Internship

Course Code: A804601

Semester: 6th

	L	T	P
Credits: 20	**0**	**0**	**0**

Course Outcomes: On successful completion of this course, the students will 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 and Interpret laboratory test data for clinical significance.
CO3	Maintain the records of diagnostic lab.
CO4	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 Students have to carry out a research project (on any topic related to laboratory) under the supervision of a faculty. The project report has to be prepared on the basis of the research work carried out. The assessment is done on the basis of the work done and the presentation and viva.

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

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	2	1	1	2	2	1	1	2	1	1	3
CO2	2	1	1	3	1	3	2	1	1	3	2	1	2	2	1
CO3	1	3	3	2	2	1	-	2	2	1	1	2	3	1	2
CO4	3	2	1	1	3	2	2	2	3	2	-	2	1	2	3
CO5	2	1	2	2	1	3	1	1	1	3	1	1	3	2	1
Average	**1.8**	**1.8**	**1.6**	**2**	**1.8**	**2**	**1.5**	**1.6**	**1.8**	**2**	**1.25**	**1.6**	**2**	**1.6**	**2**

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

Total Number of Course	**56**
Number of Theory Course	**31**
Number of Practical Course	**25**
Total Number of Credits	**130**

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.