SHRI VISHWAKARMA SKILL UNIVERSITY

(Enacted by the Act 25 of 2016, State of Haryana)

DUDHOLA, PALWAL

B.VOC. (MLT)

Session - 2022-23

B.Voc. (MLT)
SCHEME
Semester-I

Category	Subject	Subject Code	Credit			Marks							Hours		
						Theory			Practical			Total			
			T	P	To	I	E	To	I	E	To		T	P	To
General Education Component	Communication Skills	ENG501 / ENG501L	3	1	4	35	15	50	15	35	50	100	45	30	75
	Fundamentals of Medical Laboratory, Basic Techniques & BMW	MLT506 / MLT506L	3	1	4	35	15	50	15	35	50	100	45	30	75
	GEC Total		6	2	8	70	30	100	30	70	100	200	90	60	150
Skill Education Component	Fundamentals of Microbiology-I	MLT503 / MLT503L	2	2	4	35	15	50	15	35	50	100	30	60	90
	Medical Biochemistry	LSH506 / LSH506L	2	2	4	35	15	50	15	35	50	100	30	60	90
	Fundamental of Medical Sciences	LSH507 / LSH507L	2	2	4	35	15	50	15	35	50	100	30	60	90
	General Pathology	LSH503 / LSH503L	2	2	4	35	15	50	15	35	50	100	30	60	90
	Basics of Clinical Hematology-I	MLT501 / MLT501L	2	2	4	35	15	50	15	35	50	100	30	60	90
	Project Work-I	MLTPW501L	0	4	4	0	0	0	30	70	100	100	0	120	120
	SEC Total		10	14	24	175	75	250	105	245	350	600	150	420	570
Grand Total			16	16	32	245	105	350	135	315	450	800	240	580	720

Semester-II

Category	Subject	Subject Code	Credit			Marks							Hours		
						Theory			Practical			Total			
			T	P	To	I	E	To	I	E	To		T	P	To
General Education Component	MOOC-I	MOOC501	2	0	2	30	70	100	0	0	0	100	30	0	30
	Entrepreneurship	OMS501	2	0	2	30	70	100	0	0	0	100	30	0	30
	GEC Total		4	0	4	60	140	200	0	0	0	200	60	0	60
Skill Education Component	On-the-Job Training	OJT501	0	24	24	0	0	0	245	105	350	350	0	720	720
	SEC Total		0	24	24	0	0	0	245	105	350	350	0	720	720
Grand Total			4	24	28	60	140	200	245	105	350	550	60	720	780

Semester-III

Category	Subject	Credit			Marks							Hours		
					Theory			Practical			Total			
		T	P	To	I	E	To	I	E	To		T	P	To
General Education Component	Immunohematology Blood Banking Techniques	3	1	4	35	15	50	15	35	50	100	45	30	75
	Clinical Endocrinology & Tumor Markers	3	1	4	35	15	50	15	35	50	100	45	30	75
	GEC Total	6	2	8	70	30	100	30	70	100	200	90	60	150
Skill Education Component	Diagnostic Cytology	2	2	4	35	15	50	15	35	50	100	30	60	90
	Diagnostic Biochemistry-I	2	2	4	35	15	50	15	35	50	100	30	60	90
	Fundamentals of Microbiology-II	2	2	4	35	15	50	15	35	50	100	30	60	90
	Histopathology & Histotechnique-I	2	2	4	35	15	50	15	35	50	100	30	60	90
	Immunology and Serology-I	2	2	4	35	15	50	15	35	50	100	30	60	90
	Project Work-II	0	4	4	0	0	0	30	70	100	100	0	120	120
	SEC Total	10	14	24	175	75	250	105	245	350	600	150	420	570
Grand Total		16	16	32	245	105	350	135	315	450	800	240	580	720

Semester-IV

Category	Subject	Credit			Marks							Hours		
					Theory			Practical			Total			
		T	P	To	I	E	To	I	E	To		T	P	To
General Education Component	MOOC-II	2	0	2	30	70	100	0	0	0	100	30	0	30
	Value Education and Professional Ethics	2	0	2	30	70	100	0	0	0	100	30	0	30
	GEC Total	4	0	4	60	140	200	0	0	0	200	60	0	60
Skill Education Component	On-the-Job Training	0	24	24	0	0	0	245	105	350	350	0	720	720
	SEC Total	0	24	24	0	0	0	245	105	350	350	0	720	720
Grand Total		4	24	28	60	140	200	245	105	350	550	60	720	780

Semester-V

Category	Subject	Credit			Marks							Hours		
					Theory			Practical			Total			
		T	P	To	I	E	To	I	E	To		T	P	To
General Education Component	Psychology	3	1	4	35	15	50	15	35	50	100	45	30	75
	Fundamental of Computer	3	1	4	35	15	50	15	35	50	100	45	30	75
	GEC Total	6	2	8	70	30	100	30	70	100	200	90	60	150
Skill Education Component	Parasitology, Entomology ,	2	2	4	35	15	50	15	35	50	100	30	60	90
	Systemic Pathology	2	2	4	35	15	50	15	35	50	100	30	60	90
	Toxicology & Genetics	2	2	4	35	15	50	15	35	50	100	30	60	90
	Applied Bacteriology	2	2	4	35	15	50	15	35	50	100	30	60	90
	Molecular Diagnostic Microbiology	2	2	4	35	15	50	15	35	50	100	30	60	90
	Project Work-III	0	4	4	0	0	0	30	70	100	100	0	120	120
	SEC Total	10	14	24	175	75	250	105	245	350	600	150	420	570
Grand Total		16	16	32	245	105	350	135	315	450	800	240	580	720

Semester-VI

Category	Subject	Credit			Marks							Hours		
					Theory			Practical			Total			
		T	P	To	I	E	To	I	E	To		T	P	To
General Education Component	MOOC-III	2	0	2	30	70	100	0	0	0	100	30	0	30
	EVS	2	0	2	30	70	100	0	0	0	100	30	0	30
	GEC Total	4	0	4	60	140	200	0	0	0	200	60	0	60
Skill Education Component	On-the-Job Training	0	24	24	0	0	0	245	105	350	350	0	720	720
	SEC Total	0	24	24	0	0	0	245	105	350	350	0	720	720
Grand Total		4	24	28	60	140	200	245	105	350	550	60	720	780

SYLLABUS

SUBJECT: Communication Skills

SUBJECT CODE: ENG501

CREDIT: 03

Objectives

- To inculcate in students professional and ethical attitude, effective communication skills, teamwork, skills, multidisciplinary approach and an ability to understand engineer's social responsibilities.
- To inculcate in students written communication skills.

Learning Outcomes

The syllabus introduces students to have basic skill set of channelizing information, self-development, decision making and interpersonal skills.

Unit	Topic	Key Learning
I	Communication	• Meaning of Communication, Importance of Communication, Types of communication. Process of communication • Communication network in an organization • Barriers to communication, Essentials of good communication
II	Remedial English Grammar Understanding and applying Vocabulary	• Articles, agreement between verb and subject, uses of tenses, Modal and their uses, Prepositions. • One word substitutes, Synonyms and Antonyms Word formation:-Prefixes, Bases and Suffixes.
III	Listening Skills	• The process of listening, Types of listening, Benefits of effective listening • Barriers to listening, listening to announcements at work place.
IV	Reading Skills	• Process and methodologies of reading, Skimming and scanning, Levels of reading, Proofreading, Summarizing, Precise writing • Unseen comprehension passage, Note taking and reviewing • convert the given information into charts and graphs.
V	Writing Skills	• Main Forms of Written Communication: Notices, Drafting an E-mail • Correspondence: Personal and Official, Notices, • Technical Report Writing, Preparing agenda and minutes of meeting

Suggested Readings:

- Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of India, New Delhi.
- Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.
- Prasad, P. Communication Skills, S.K. Kataria& Sons.
- Bansal, R.K. and J.B. Harrison. Spoken English, Orient Language.
- Roach Peter. English Phonetics and Phonology.
- A.S. Hornby's. Oxford Advanced Learners Dictionary of Current English, 7th Edition.
- Prasad, P. The Functional Aspects of Communication Skills, Delhi.
- McCarthy, Michael. English Vocabulary in Use, Cambridge University Press.
- Rajinder Pal and PremLata. English Grammar and Composition, Sultan Chand Publication.
- Idioms & Phrases (English-Hindi), Arihant Publication (India) Pvt. Ltd.
- One Word Substitution, Dr. Ashok Kumar Singh, Arihant Publications (India) Pvt, Ltd

SUBJECT: Communication Skills Lab
SUBJECT CODE: ENG501L
CREDIT: 01

List of Experiments

1. Greeting and starting of conversation.
2. Nonverbal communication techniques during conversation.
3. Verbal communication techniques during conversation.
4. Group discussion.
5. Extempore public speaking.
6. Reading activity
7. Situational dialogues /Role play.
8. PPT presentation technique

SUBJECT: Fundamentals of Medical Laboratory, Basic Techniques & BMW
SUBJECT CODE: MLT506
CREDIT: 03

Objectives:

The purpose of the course is to provide fundamental knowledge and exposure to the concepts, theories and practices in the field of Laboratory Technology

Learning Outcomes

By the end of this course:

- The student demonstrates an understanding of the processes of Laboratory Technology.
- Identify the basic functions, and management challenges in the Laboratories.

Unit	Topic	Key Learning
I	Introduction to Laboratory, Role of a laboratory Technician	Basic laboratory principles, Organization of clinical laboratory and role of medical laboratory technician
II	Code	Code of conduct of medical laboratory personnel
III	Clinical Laboratory	Organization of clinical laboratory and role of medical laboratory technician
IV	Safety measures and biomedical waste management rules	Various safety measures used in Medical Laboratory, Healthcare waste definitions, types of biomedical waste management and segregation of waste in laboratory.
V	Professional Ethics	Medical laboratory professional - professionalism in laboratory workers, code of conduct, communication between physician and lab technician

SUBJECT: Fundamentals of Medical Laboratory, Basic Techniques & BMW –Lab
SUBJECT CODE: MLT506L
CREDIT: 01

List of Practical

1. Common glassware in clinical laboratory.
2. Cleaning, care and maintenance of glassware.
3. Calibration of pipettes and other volumetric apparatus.
4. Laboratory instruments: Microscopes-Principles, parts, use, care and maintenance of Light microscope,
5. Electron microscope, Fluorescent microscope, Dark ground microscope, Phase contrast microscope etc
    a. Centrifuge
    b. Water bath
    c. Refrigerators
    d. Autoclave
6. Hot air oven
        i. Mixer
        ii. Water distillation apparatus.
7. General approach to specimen collection, transport and disposal.
8. Anticoagulants- E.D.T.A, Dipotassium salts of EDTA Double oxalate, single oxalate, sodium citrate. Sodium Fluoride.
9. Preparation of solution: Normal solution, Buffer solution, Percent solution, normal saline, Molar solution.
10. Preparation of Normal saline
11. Methods of measuring liquids, weighting solids.
12. Clinical Laboratory records.
13. Demonstration of Biomedical Waste Management.
14. Modern Laboratory set up.
15. Quality control in clinical laboratories, basic outline

Books Recommended

- Kl Mukherjee: Medical Lab Technology (Tata Mc Graw Hill)
- P.D. Godkar: Textbook of Medical Lab Technology (Balani Publishing House**)**

SUBJECT: Fundamentals of Microbiology-I
SUBJECT CODE: MLT503
CREDIT: 02

Objective

To introduce basic principles and application relevance of clinical disease for students who are in preparation for Laboratory Technicians. The content of this course includes etiological agents responsible for global infectious diseases

Learning Outcome

- The student demonstrates an understanding of the basic concepts of Microbiology.
- Identify the basic organisms and structures included in the course.

Unit	Topic	Key Learning
I	Microbiology lab	Lab organization, Laboratory Safety measures in Microbiology, Occurrence of lab infections, route of infections in laboratory, Universal precautions Prokaryotic and eukaryotic cells, Introduction, basic features and importance of bacteria, viruses, fungi, protozoa
II	Bacteria	General characters and classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pili, ribosomes. Cell size, shape and arrangement, cell-wall, composition and detailed structure of Gram-positive and Gram-negative cell walls, Staining Methods: Simple, Grams staining, Ziehl-Neelsen staining or AFB staining, capsule staining, Negative Impregnation
III	Microbes	Growth and Maintenance of Microbes: Bacterial division, Batch Culture, Continuous culture, bacterial growth- total count, viable count, bacterial nutrition, oxygen requirement, CO2 requirement, temperature, pH, light
IV	Sterilization and Disinfection	Sterilization and Disinfection: Physical agents- Sunlight, Temperature less than 1000C, Temperature at 1000C, steam at atmospheric pressure and steam under pressure, irradiation, filtration. Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide.
V	Culture Media	Culture Media: Definition, uses, basic requirements, classification, Agar, Peptone, Transport Media, Sugar Media, Anaerobic Media, Containers of Media, Forms of Media, Aseptic techniques in microbiology

Text Books

- Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
- Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
- Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
- Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition.
- Elsevier Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

SUBJECT: Fundamentals of Microbiology-I-Lab
SUBJECT CODE: MLT503L
CREDIT: 02

List of Practicals

- Unit 1: Preparation of swabs/sterile tubes & bottles.
- Unit 2: Preparation of smear.
- Unit 3: Staining: Gram & Ziehl-Neelsen staining.
- Unit 4: Identification of Culture media.
- Unit 5: Identification of common microbes

SUBJECT: Medical Biochemistry-I
SUBJECT CODE: LSH506
CREDIT: 02

Objective

Review of Chemistry as applicable to human biochemical systems: knowledge about chemical properties and standardization of various materials used in biochemical analysis. Chemistry of molecules, enzymes, laboratory safety

Learning Outcome

By the end of this course:

- The student demonstrates an understanding of the processes of Medical Biochemistry
- Identify the basic functions, and challenges in the Laboratories.

Unit	Topic	Key Learning
I	Chemistry of Lipids	Introduction, definition, classification, biomedical importance, essential fatty acids, importance and function of simple, compound and derived lipids Brief outline of metabolism: Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & its clinical significance, Lipoproteins, its type & their functions, lipid profile test, Atherosclerosis.
II	Introduction of Enzymes	Introduction, definition, properties, classification, coenzymes, cofactors, isoenzymes, metalloenzymes, measuring units of enzyme activity factors affecting enzyme action, factors responsible for abnormal enzyme level, Nucleic acids: Structure, Function and types of DNA and RNA, Nucleotides, Nucleosides, Nitrogen bases
III	Chemistry of Carbohydrates	Carbohydrates and their related metabolism - Introduction, definition, classification, biomedical importance & properties. Brief outline of metabolism: Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis (in brief), regulation of blood glucose level.
IV	Chemistry of Proteins	Chemistry of Proteins & their related metabolism - Introduction, definition, classification, biomedical importance. Metabolism: Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, Proteinuria
V	Urea	Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, Proteinuria

Text Books

- Sharma and Parashar. Dictionary of Biochemistry; CBS Publications
- Harold And Varley. Practical Clinical Biochemistry
- Laxmi Ahuja; Quick Review In Biochemistry; Asia Printograph

Reference Books

- A.C. Deb; Fundamentals Of Biochemistry; New Central Book Agency
- Varun Kumar Malhotra; Handbook Of Practical Biochemistry; Jaypee Brothers

SUBJECT: Medical Biochemistry Lab
SUBJECT CODE: LSH506L
CREDIT: 02

Learning (Practical)

Unit 1: To study general properties of the enzyme (Urease) & Achromatic time of salivary amylase.

Unit 2: Urine analysis – normal & abnormal constituents of urine; Glucose tolerance test & Glycosylated hemoglobin Unit 3: CSF Analysis - Gross & Microscopic.
Unit 4: Centrifugation: Principle, types & applications, Chromatography: Definition, types, RF value, description of paper chromatography & applications.
Unit 5: Uses, Care and Maintenance of various instruments of the laboratory

Reference Books

- Sharma and Parashar. Dictionary of Biochemistry; CBS Publications
- Harold And Varley. Practical Clinical Biochemistry
- Laxmi Ahuja; Quick Review In Biochemistry; Asia Printograph
- A.C. Deb; Fundamentals of Biochemistry; New Central Book Agency
- Varun Kumar Malhotra; Handbook of Practical Biochemistry; Jaypee Brothers

Web Links:

- http://www.colby.edu/chemistry/BC176/CH1.pdf
- https://doctorlib.info/medical/biochemistry/3.html
- https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/Medical Bio chemistry.pdf

SUBJECT – Fundamental of Medical Sciences
SUBJECT CODE: LSH507
CREDIT: 02

Objectives:

1. To enable the students to review the areas of anatomy relevant to the practice of applied life sciences.
2. Review of Chemistry as applicable to human biochemical systems:
3. The students in basic understanding of the composition of blood, waste management, instrumentation, techniques and methods of estimating different parameters
4. The student will be able to devise likely diagnoses from clinical scenarios by recognizing key manifestations of congenital, hemodynamic, inflammatory, infectious, metabolic, environmental, and neoplastic diseases.

Learning Outcomes:

1. Identify the basic functions, location, anatomical position and motion of various body parts.
2. Collect, process and preserve the blood samples can efficiently perform routine investigations in clinical haematology laboratory
3. The student demonstrates an understanding of the processes of Medical Biochemistry
4. Explain the basic nature of disease processes from the standpoint of causation, epidemiology, natural history, and the structural and functional abnormalities.

Unit	Topic	Key Learning
I	Structure of Human Body and its functions	Explain organization of body cells, tissues, organs, organ systems, membranes and glands in human body Understanding basic unit of body – Cell, understanding different types of tissues, Understanding different types of organ systems.
II	Basics of vital system	Understanding of Endocrine system, cardiovascular system and blood vessels musculo-skeletal system , Digestive system , Respiratory system, Urinary System, Nervous System and Lymphatic system in human body
III	Basic Sensitization to Hematology and Clinical Pathology	Understand blood and collection of blood sample in detail, Understand Hemoglobin (Hb)in detail. Understand reticulocytes, red blood cells, WBCs, Hemostasis & Coagulation Mechanism and testing in brief, Understand Detailed Examination of Sputum, Semen, CSF and Other Body Fluids Like Pleural Fluid, Pericardial Fluid, Peritoneal Fluid, Synovial Fluid, Ascitic Fluid.
IV	Basic Sensitization to Biochemistry and Clinical Biochemistry	Understand process of blood analysis, urine analysis and stool Analysis
V	Basic Sensitization to Bacteriology, Histopathology, Cytology, Immunology, Serology and Blood Banking	Explain basics of histopathology, cytology, microbiology immunology and Serology and Immuno- hematology

SUBJECT – Fundamental of Medical Sciences-Lab
SUBJECT CODE: LSH507L
CREDIT: 02

Learning (Practical)

1. Identification and description of all anatomical body structures.
2. The learning and demonstration of anatomy through dissected parts, slides, models and charts etc.
3. Demonstration of vital system.
4. Collection of blood sample
5. Determination of blood type
6. Determination of Hemoglobin.
7. Hemocytometer.
8. Reticulocyte Count.
9. Morphology of Cells
10. Urine routine examination
11. Stool routine examination

SUBJECT: General Pathology
SUBJECT CODE: LSH503
CREDIT: 02

Objective

The student will be able to devise likely diagnoses from clinical scenarios by recognizing key manifestations of congenital, hemodynamic, inflammatory, infectious, metabolic, environmental, and neoplastic diseases

Learning Outcome

By the end of this course, the student will be able to

- explain the basic nature of disease processes from the standpoint of causation, epidemiology, natural history, and the structural and functional abnormalities.

Unit	Topic	Key Learning
I	Introduction to pathology	Introduction to pathology, subdivisions of pathology, common terminology used in pathology Cell Injury and Cellular Adaptations: a) Normal Cell b) Cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling; c) Cell death : types- autolysis, necrosis, apoptosis & gangrene; d) Cellular adaptations- atrophy, hypertrophy, hyperplasia & dysplasia, metaplasia, necrosis and apoptosis
II	Inflammation	a) Acute inflammation - vascular event, cellular event, inflammatory cells; b) Chronic Inflammation - general features, granulomatous inflammation, tuberculoma. Phagocytosis, Acute phase proteins
III	Haemodynamic Disorders	Introduction to Oedema, hyperemia, congestion, haemorrage, circulatory disturbances, thrombosis, ischaemia & infarction
IV	Tumour	Introduction to Neoplasia, tumor, characteristics of tumor, spread of tumors, difference between benign tumor and malignant tumor Introduction and significance of tumor markers.
V	Healing	Healing: Definition, different phases of healing, factors influencing wound healing.

Reference Book

- Text Book of Pathology, Harshmohan, 7th Edition
- Text book of Pathology, Robbins,4th edition,

Web Links

- http://gonuke.org/wp-content/acad/IntroductiontoMedicalLaboratoryTechnology.pdf
- https://scholarworks.bgsu.edu/cgi/viewcontent.cgi?article=1282&context=honorsprojects

SUBJECT: General Pathology Lab
SUBJECT CODE: LSH503L
CREDIT: 02

LIST OF PRACTICALS

- Unit 1: Components & setting of the Compound microscope.
- Unit 2: Focusing of object, use of low & high power objectives of microscope
- Unit 3: Use of oil immersion lens, care and Maintenance of the microscope.
- Unit 4: Different types microscopy: Dark field microscopy, Fluorescence Microscopy
- Unit 5: Electronic Microscopy in brief

SUBJECT: Basics of Clinical Haematology-I
SUBJECT CODE: MLT501
CREDIT: 02

Objective

The curriculum of hematology aims to prepare the students in basic understanding of the composition of blood, waste management, instrumentation, techniques and methods of estimating different parameters.

Learning Outcome

By the end of this course, the students will be able to

- Collect, process and preserve the blood samples
- Can efficiently perform routine investigations in clinical hematology laboratory

Unit	Topic	Key Learning
I	Introduction	Introduction to Haematology, Organization of laboratory and safety measures, Laboratory Safety guidelines, Important equipment used in haematology lab
II	Haematopoiesis	Erythropoiesis, Leucopoiesis, Thrombopoiesis, sites of hemopoiesis, Mechanism of hemopoiesis, stages of cell development, , Blood and its composition, Anticoagulants, mechanism of action, types and uses, merits and demerits, effect of storage on blood cells
III	Sample Collection	Requirement, methods of collection, transport, preservation, and processing of various clinical Specimens, Blood collection for hematological investigations, Venipuncture, Capillary blood, Arterial blood, Precautions during collection, Vacutainer tubes, its type and uses, sample acceptance and rejection criteria.
IV	Hemoglobin	structure, function and types, Hemoglobinometry, Hemoglobin estimation by various methods, advantages and disadvantages, physiological and pathological variations on blood parameters, Hemocytometry, visual and electronic method, neubauer counting chamber, RBC count, WBC count, Platelets count, absolute eosinophil count, principle, procedure, calculation , significance, precautions involved during counting, absolute count of various WBCs. Physiological and pathological changes in values
V	Smear preparation	Preparation of thin and thick smears, staining of smears, Romanowsky dyes, preparation and staining procedures of blood smears, Morphology of normal blood cells and their identifications, differential leucocytes count by manual and automated method, physiological and pathological variations in value.

Text Books:

- Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications
- Singh Tejinder,(2014),Atlas & Textbook of Haematology,3rd edition,Avichal Publications
- Ochei J & Kolhatkar A(2000),Medical Laboratory Science: Theory & Practice, 3rd edition,Mcgraw Hill Education

Reference Books:

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

Web Links:

- http://www.colby.edu/chemistry/BC176/CH1.pdf
- https://doctorlib.info/medical/biochemistry/3.html
- https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/Medical Bio chemistry.pdf

SUBJECT: Basics of Clinical Haematology-I-Lab
SUBJECT CODE: MLT501L
CREDIT: 02

LIST OF PRACTICALS

1. To learn general laboratory safety rules
2. To demonstrate glass wares, apparatus and plastic wares used in laboratory
3. To prepare EDTA, Sod. Citrate & Sod. Fluoride anticoagulants and bulbs/vials used in laboratory
4. Demonstration of Vacutainer
5. To demonstrate method of blood collection
6. To separate serum and plasma
7. Demonstration of microscope.
8. Determination of Hemoglobin by various methods
9. Determination of TLC
10. Preparation of thick and thin smear
11. Determination of DLC
12. Determination of Total RBC
13. Determination of total platelet count
14. Determination of absolute leucocyte count

Text Books

- Sharma and Parashar. Dictionary of Biochemistry; CBS Publications
- Harold And Varley. Practical Clinical Biochemistry
- Laxmi Ahuja; Quick Review In Biochemistry; Asia Printograph

Reference Books

- A.C. Deb; Fundamentals of Biochemistry; New Central Book Agency
- Varun Kumar Malhotra; Handbook of Practical Biochemistry; Jaypee Brothers

SUBJECT: Project Work-I
SUBJCET CODE: MLTPW501L
CREDIT: 04

Project Work: (Field Work and Case Studies).
The project is meant for students to understand, perform of test and diagnosis of disease in laboratory.

SUBJECT: MOOC
SUBJCET CODE: MOOC501
CREDIT: 02

SUBJECT: Entrepreneurship
SUBJCET CODE: OMS501
CREDIT: 02

Objective

The objective of this course is to develop personal creativity, entrepreneurial initiative, understanding the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures.

Learning Outcome

By the end of this course, the students will be able to

- Understand entrepreneurship concept as a whole.
- Sell both themselves and their idea or product
- Create as solid business plan.

Units	Topics	Key Learning
Unit-1	Introduction to Entrepreneurship	Introduction to Entrepreneurship, , Entrepreneurial Mindset, Characteristic of an Entrepreneur, Advantages and disadvantages of Entrepreneurship
	Recognise Opportunity	Purpose of all businesses, Types of Entrepreneurial organizations, Types of Enterprises
	Creativity & Innovation	Marketing, 4Ps of Marketing, Process of Marketing, Marketing Mix, 7Ps of Marketing
	Conception & Ideation	Business Plan and its elements, Application of Business Plan
	Are you a risk taker?	Entrepreneurs, types of Entrepreneurs, Roles and Responsibilities of Entrepreneurs, Qualities of an Entrepreneur
	Identify Your Customer	Customer segmentation, Criteria for selling customer value proposition, Customer Lifecycle
Unit-2	Self Confidence and Resilience	4 Ps of Entrepreneurship, Qualities of successful entrepreneur, Self-confidence, Positive attitude, Overcoming the fears, Recover from Failure
	Success and Failure Stories of Famous Entrepreneurs – 1	Steve Jobs Success Story, Mumbai Dabbawala delivery success Story
	Never Give Up	Importance of Focusing energy on Business, Importance of Business Networking and its advantages
	Competition Analysis	Competition Analysis, Factors affecting competition strategies, Prerequisites of successful enterprise
	Risks – Identification and Mitigation	Business Risk, Types of Business Risks, Risk Identification, Risk Mitigation,
	Getting Money for Business	Concept Of Funding, Basics terms of Accounting, Types of Funding,
Unit-3	Dream and Achieve	Vision, Mission and Goals, Business Ethics, SMART goals, entrepreneurial work ethics
	Leadership and Team Spirit	Lead by example, Importance of Embracing diversity, Role of Emotional Intelligence to be a leader.
	Success and Failure Stories of Famous Entrepreneurs – 2	
	Serving the Society	Roles of Entrepreneurs in society, Selfless Entrepreneurship,
	Taking Ownership	Taking complete ownership, taking control over the business
	Adapt to Change	Porters competition strategies, Factors affecting business,

	Discover Yourself	Qualities of the successful entrepreneur
Unit-4	Problem Solving: Introduction to Critical Thinking	Critical Thinking, Applying critical thinking, REASON Model of Critical Thinking
	Problem Solving: Introduction to Creative Thinking	Creative thinking, Importance and benefits of Creative thinking, Creative thinking in problem solving
	Problem Solving: Introduction to Decision Making	Decision making, Effective decision making process
Unit-5	4Ps of Marketing – PDF	4Ps- Product, Place, Price, Promotion, Apply 4Ps to marketing Strategy into action
	Costs in Entrepreneurship - PDF	Cost, types of Costs, Introduction to Accounting Basics, main methods of Accounting, Financial Documents, P&L statements, Working capital
	Applicable Sources of funding and Regulatory and Statutory rules – PDF	Regulatory and statutory rules for an Entrepreneur, Business Loans for startups and MSMEs by Indian Government
	Analysis of success and failure stories – PDF	Analysis of success and failure stories, Key skills involved in the successes of entrepreneurs
	Identification of one's entrepreneurial skills and knowledge - PDF	Identify various skills and characteristics o be an entrepreneur, Effective Ways to Build Entrepreneurial Skills, Develop or Improve your Entrepreneurial Skills ,
	Legal Issues	Intellectual Property Rights, patents, trademarks, copyrights, trade secrets, licensing, franchising

Text Books:

1. Dollinger, MJ, Entrepreneurship- Strategies and Resources, Pearson Education.
2. Desai,Vasant, Entrepreneurship Development, Himalaya Publishing House.
3. Gupta, C.B. and Srinivasan, P., Entrepreneurship Development, Sultan Chand & Sons.

Reference Books:

1. Charanthimath, P.M., Entrepreneurship Development and Small Business Enterprise,Pearson Education.
2. Havinal, Veerbhadrappa, Management and Entrepreneurship, 1st Edition, NewAge InternationalPublishers, 2008.

SUBJECT: Diagnostic Biochemistry-I

Objectives

This paper gives brief understanding about various types of organ function test, acidosis and alkalosis.

Learning Outcomes

- Able to memorize and enlist various organ function tests.
- Able to perform and demonstrate various tests.
- Able to compare and evaluate the test results.

Unit	Topic	Key Learning
I	Diabetic Profile and Liver Function Test	Introduction, bile pigment metabolism, jaundice and its types, Estimation of Bilirubin, Bile salt, Bile pigments, Urobilinogen, SGPT/ALT, SGOT/AST, ALP, GGT, Viral Hepatitis
II	Renal and Pancreatic Function Test	Renal Function Test: Introduction, Glomerular filtration rate, renal threshold, Urea, Creatinine, Uric Acid, Sodium, Potassium, Creatinine Clearance test, Urea clearance test, Examination of renal calculi Estimation and significance of amylase and lipase
III	Cardiac Function Test	Introduction, myocardial infarction, CHD, Biochemical markers of Heart diseases and their estimation, Role of laboratory in monitoring heart diseases, Lipid Profile Test
IV	Gastric Function Test	Introduction, gastric secretions, total and free acid, stimulation test, physical & chemical examination of gastric secretions.
V	Acid Base Balance	Acid base balance, action of buffer system, Hb buffers, respiratory and metabolic acidosis, respiratory and metabolic alkalosis, Arterial blood gas analysis, Blood gas analyzer.

Text Books

- Text book of Medical lab Technology, Praful B Godkar, IIIrd edition
- Text book of Biochemistry, D M Vasudevan,Jaypee Publishers
- Text book of Biochemistry, M N Chatterjea, RanaShinde
- Practical Biochemistry, Singh &Sahni

Reference Books

- Clinical Chemistry, Teitz

Web Links

- http://www.grsmu.by/files/file/university/cafedry/klinicheskaya-immynologiya/files/fiu/4.pdf

SUBJECT: Fundamentals of Microbiology-II

Objectives

This subject gives a general insight into the basics of microbiology, culture media preparation and various biochemical test used in microbiology, methods for recovery, culture techniques, procedures and antibiotic testing.

Learning Outcomes

- Able to recognize various culture media and its preparation method.
- Understanding of concepts of culturing methods.
- Able to perform and interpret various biochemical tests.
- Able to differentiate various microorganisms.

Unit	Topic	Key Learning
I	Cultural Media	Classification, Liquid and solid Media, Synthetic media, Selective media, differential media, transport media containers for media, distribution of medias in tubes, bottles and Petri dishes, Composition and preparation of cultural media, role of ingredients of culture media, Precautions during media preparation
II	Culturing of Microorganism	Inoculation of culture media, culturing of aerobes and anaerobes Growth and Nutrition of Bacteria: various phases of growth, typical growth curve, Nutrition of microbes and physical condition required for growth. Effect of Carbon, Nitrogen, Growth factors, Vitamins, Temperature, pH, Osmotic Pressure, Oxygen and Carbon Di Oxide on microbial growth.
III	Methods of Culture Preservation	Pure culture isolation and preservation: Streaking, serial dilution and plating methods, cultivation, maintenance and preservation/stocking of pure cultures, cultivation of aerobic and anaerobic bacteria.
IV	Biochemical Test	Culturing of microorganisms and identification, Biochemical test such as Catalase, Citrate utilization test, Coagulase test, Indole test, Oxidase test, Urease test, MR-VP test, TSI slants and others biochemical test
V	Antimicrobial Sensitivity Test	Antimicrobial sensitivity test, Culture medium used for Antibiotic susceptibility testing, Preparation and standardization of inoculums, 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

Text Books

- Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
- Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
- Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

Reference Books

- Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
- Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

Web Links:http://www.grsmu.by/files/file/university/cafedry/klinicheskaya-immynologiya/files/fiu/4.pdf

SUBJECT: Histopathology & Histotechniques-I

Objectives

Students will learn about various basic of histopathology& Histotechnique, handling and processing of tissue specimens, staining procedures and application of Histotechnique.

Learning Outcomes

- Understanding of histopathology laboratory, equipments and fixation procedure.
- Identification of samples and selection of proper tissue processing techniques.
- Able to employ and demonstrate various microtomy procedures and staining method.
- Comparing and interpreting various staining procedures.
- Developing and designing of histopatholohy laboratory.

Unit	Topic	Key Learning
I	Introduction of histopathology	Introduction of histopathology & histotechniques, laboratory organization, care & maintenance of equipments used in histotechnology lab ,Safety measures in histotechnology lab Reception, Recording, Labeling and transportation of tissue specimens, Basic concepts of fixation and various types of fixative used in histopathology and cytopathology
II	Tissue and its processing	Tissue and its types, Location and function, Grossing of tissues, whole mount, sections, smears, tissue processing and its steps, manual and automated method, components & principle of automatic tissue processor Decalcification, decalcification methods, types of decalcifying fluid, Processing of bones and teeth, Embedding media, its type and properties
III	Microtomy	Microtome, its type and working, various type of microtome, Microtome knives, its type and knife sharpening,Section cutting, fault and remedies, Section adhesive Cryostat, frozen sections of fresh, fixed and unfixed tissue, freeze drying, rapid frozen sections and staining for emergency diagnosis
IV	Principles of staining	Dye chemistry, Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye, mordant, accelerators, accentuators, metachromasia, metachromatic dyes Progressive, regressive, vital, supravital staining, types of hematoxylin, Haematoxylin and eosin staining, use of control sections in tissue staining,mounting and mounting media, advantages & disadvantages
V	Application of Histotechniques	Staining of carbohydrates, Connective tissue, Demonstration and identification of lipids, Demonstration of microorganism on tissue specimens Demonstration of sex chromatin, Museum techniques Immunohistochemistry: principle, types, applications, antigen retrieval, APAAP, PAP Staining

Text Books

- Text Book of Histopathology & Histotechniques, C FA Culling
- Diagnostic Cytology, Koss& Koss
- Cytopathology, Bibbo
- Diagnostic Cytology, Naib

Reference Books

- Histopathology & Histotechniques, Bancroft,

Web Links

https://webpath.med.utah.edu/HISTHTML/HISTOTCH/HISTOTCH.html

SUBJECT: Immunology & Serology-I

Objectives

This course has been formulated to impart basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases.

Learning Outcomes

- The students will learn scientific approaches/techniques that are used to investigate various diseases.

Unit	Topic	Key Learning
I	Immune System	History and Introduction of the immune system, innate and adaptive immunity; active and passive immunity, primary and secondary immune response. Cell and organs of immune system, Phagocytosis
II	Antigens and haptens	Antigens and haptens: Properties, foreignness, molecular size, heterogeneity, B and T cell Epitopes, T dependent and T independent antigens. Antibodies: structure, function and properties of the antibodies, different classes, subclasses and biological activities of antibodies Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody
III	Major Histocompatibility Complex	Mechanism of humoral and cell mediated immune response. Introduction of Major Histocompatibility Complex, Antigen presenting cells Complement system and complement fixation test. Introduction of Hypersensitivity and its types
IV	Rheumatological diseases	Introduction to Rheumatological diseases, etiology and pathogenesis and lab investigations, Introduction to autoimmunity, autoimmune disorders and autoimmune markers such as parietal cell antibody, anti sperm antibody, lupus anticoagulants, anti mitochondrial antibody, ANA, ds DNA, HLA-B27, ASMA, anti CCP
V	Laboratory tests for demonstration of antigen	Laboratory tests for demonstration of antigen – antibody reaction such as agglutination, precipitation, precipitation in gels, ELISA, RIA, Immunofluorescence assay, WIDAL, ASO, CRP, RA, RPR, TPHA, Introduction and classification of vaccines

Text Books

- Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.
- Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition Wiley-Blackwell Scientific Publication, Oxford.
- Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

Reference Books

- Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.
- Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
- Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

SUBJECT: Immunohematology and Blood Banking Techniques

Objectives

This course has been formulated to impart basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases.

Learning Outcomes

- The students will learn scientific approaches/techniques that are used to investigate various diseases.

Unit	Topic	Key Learning
I	Blood Banking	Basic Principles of Blood Banking, Antigen, Antibody, naturally occurring antibody, Complement, ABO & Rh blood group system, Methods of blood group determination, Forward and Reverse grouping, Slide & Tube method, Gel method
II	Other Blood Group system	Other blood group system such as Lewis, MNS, Kell, Duffy etc Anticoagulants and preservative used in blood bank Donor selection criteria, Blood collection and processing
III	Testing	Transfusion transmissible infectious disease screen, Coomb'test, Cross matching, Compatibility testing, Antibody Screening & Identification, Grading of Reaction/Agglutination
IV	Blood Components	Blood components and its preparation, preservation, storage and transportation, Indications for different blood component transfusion, Blood transfusion reaction and its type, HDN Introduction of stem cell banking and bone marrow transplantation.
V	Role of different Agency	Apheresis, indications of hemapheresis, plasmapheresis, plateletspheresis, plasmapheresis, Quality control of reagents, equipments, blood components used in transfusion medicine. Role of NACO, Indian Red Cross Society, DGHS and blood transfusion services.

Text Books

- Compendium of Trasfusion Medicine, Dr R N Makroo
- Text book of Medical lab Technology, Praful B Godkar, IIIrd edition
- Text book of Medical Lab Technology, Ramnik Sood, Jaypee Publishers
- Text Book of Pathology,Harshmohan, 6th Edition
- Practical Haematology,Dacie & Lewis, 11th edition

SUBJECT: Diagnostic Cytology

Objectives

This course has been formulated to impart basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases.

Learning Outcomes

- Students would be able to perform collection, processing, staining and quality control in cytological diagnosis.

Unit	Topic	Key Learning
I	Cell Structure of Tumor	Cell: basic structure and function, cell organelles, cell cycle, Benign and Malignant tumors, Instruments used in cytology, preparation of buffers, stains,
II	Instruments and equipment used in cytology	Instruments and equipments used in cytology Fixation and Fixatives used in cytology, Adhesive and mounting media, Cell block and cytospin technique, Staining such as PAP, Diff-quick, MGG, H&E, Shorr staining, significance of PAP-HPV, Destaining and restaining of slides, Cover slipping
III	Aspiration and exfoliative cytology	Aspiration and exfoliative cytology, Patient preparation, Sample collection, Fixation, Processing and Staining FNAC: procedure, processing of sample and staining, on site quick staining procedure
IV	Pap staining	Pap staining, Progressive & Regressive, Collection, preservation, transportation and processing of cytological specimens such as sputum, BAL, CSF, Pleural, peritoneal and pericardial fluid, Gynaecologic sample
V	Immunocytochemistry	Sex chromatin demonstration, Introduction of Immunocytochemistry, different markers and its applications, Automation in cytology, Liquid based preparation & automated screening device

Text Books

- Clinical Diagnosis & Management, Henry
- Histopathology & Histotechniques, Bancroft,
- Text Book of Histopathology & Histotechniques, C FA Culling
- Diagnostic Cytology, Koss& Koss
- Cytopathology, Bibbo

SUBJECT: Clinical Endocrinology and Tumor Marker

Objectives

This paper is framed to provide basic knowledge of hormones & toxic substances with their determination techniques as well as related disorders.

Learning Outcomes

- Students would be able to perform collection, processing, staining and quality control in cytological diagnosis.

Unit	Topic	Key Learning
I	Hormones	Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion, Mechanism of action
II	Thyroid Function	Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T3, T4, TSH, FT3, FT4, TBG, Disorder associated with thyroid dysfunction. Hormones of Parathyroid gland and their estimation,
III	Infertility	Infertility, types of infertility, test for female and male infertility Infertility profile: LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone, DHEA-S, 17- Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test, Quadruple Test
IV	Growth Hormones	Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion
V	Tumor Markers	Tumor markers, their types, significance and estimation, Advantages and disadvantages of tumor markers

Text Books

- Text book of Biochemistry, D M Vasudevan, Jaypee Publishers
- Text book of Biochemistry, M N Chatterjea, Rana Shinde
- Clinical Chemistry, Teitz
- Clinical Chemistry, Bishop
- Text book of Medical Lab Technology, Praful B Godkar, IIIrd edition

SUBJECT: Fundamentals of Computer

Learning Objective: Course is designed to impart knowledge and skills required to learn fundamentals of computers

Learning Outcome: This subject will develop an understanding of the fundamentals of computers and its software.

Unit	Topic	Key Learnings
1	Introduction and Definition of Computer	Computer Generation, Characteristics of Computer, Advantages and Limitations of a computer, Classification of computers, Functional components of a computer system (Input, CPU, Storage and Output Unit), Types of memory (Primary and Secondary) Memory Hierarchy. Hardware: a) Input Devices- Keyboard, Mouse, Scanner, Bar Code Reader b) Output Devices – Visual Display Unit (VDU), Printers, Plotters etc. Software: Introduction, types of software with examples, Introduction to languages, Compiler, Interpreter and Assembler. Number System: Decimal, Octal, Binary and Hexadecimal Conversions, BCD, ASCII and EBCDIC Codes
2	MS – DOS	Getting Started on DOS with Booting the System, Internal Commands: CHDIR(CD),CLS, COPY, DATE, DEL(ERASE), DIR, CHARACTER, EXIT,MKDIR(MD), REM, RENAME(REN), RMDIR(RD), TIME, TYPE, VER, VOL, External Commands: ATTRIB, CHKDSK, COMMAND, DOSKEY, EDIT, FORMAT,HELP, LABEL, MORE, REPLACE, RESTORE, SORT, TREE, UNDELETE, UNFORMAT,XCOPY
3	MS Word	Starting MS WORD, Creating and formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge
4	MS Excel	Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping, Sorting data, Auto Sum, use of functions, Cell Referencing form, generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets
5	MS-POWERPOINT	Starting MS–Power Point, creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, adding a slide to presentation, navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents.

Text Books:

1. Computer Basics Absolute Beginner's Guide, Windows 10 Edition, Eighth Edition
2. CS Changeriya English Basic Computer Course Books

SUBJECT: Fundamentals of Computer

Learning Objective: Course is designed to impart knowledge and skills required to learn fundamentals of computers

Learning Outcome: This subject will develop an understanding of the fundamentals of computers and its software.

List of Practical

1. Using basic DOS commands.
2. Using external DOS commands
3. Creating a email account
4. Using web browser for searching and surfing.
5. Creating and formatting a document in MS office
6. Using autocorrect, auto text and spell check operation in MS office.
7. Create tables in MS Word.
8. Inserting different kinds of object in MS word.

Text Books:

1. Computer Basics Absolute Beginner's Guide, Windows 10 Edition, Eighth Edition
2. CS Changeriya English Basic Computer Course Book

SUBJECT: Parasitology and Entomology

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about Parasitology and Entomology, the related diseases, their prevention and control.

Learning Outcomes

1. Outline the mode of transmission, pathogenesis and identification and control of helminths and protozoa
2. Describe pathogenesis, clinical signs and symptoms and complications of parasitic infections
3. Outline the treatment for various parasitic infections, giving the methods of prevention and control of infection at individual and community levels
4. General principles of immune reactions and immunodiagnosis of parasitic infections

Unit	Topic	Key Learning
I	Parasitology	Parasitology: Introduction: Parasitology methods, Types of parasites: ectoparasites, endoparasites, obligatory, facultative, accidental, permanent, temporary, pathogenic, non-pathogenic. Types of hosts: definitive, intermediate, paratenic (transfer), reservoir, accidental. Properties of parasites: depending upon infectiousness, establishment and transmission
II	Helminths and protozoa	Helminths: Tissue and intestinal nematodes, cestodes and trematodes, Protozoa: Tissue and intestinal protozoa. Trichomonas vaginalis. Diagnosis and chemotherapy of parasitic infections, reservoir of infection, mode of transmission, factors thatfacilitate the spread of disease, clinical features, control and prevention
III	Arthropods & Mosquitoes	Arthropods; Mosquitoes; Chrysops, House flies, Sand fly, Tse tse fly, Simulium & Biting midges; Brachycera. Musca, Stomoxys & Glossina, reservoir of infection, mode of transmission, factors that facilitate the spread of disease, clinical features, control and prevention
IV	Sarcophagidae, Calliphoridae & myasis:	Fleas, Lice & Bugs; Ticks & Mites; Arthropods of Minor Medical Importance, reservoir of infection, mode of transmission, factors that facilitate the spread of disease, clinical features, control and prevention
V	Immunodiagnosis	Molecular-Based Approaches, Imaging Techniques and Endoscopy, Recent Diagnostic Advances Using Nanotechnology

Reference Book

1. Chatterjee, K. D. (2009). Medical Parasitology. 13th Edition. CBS Publishers & Distributors, New Delhi
2. Sullivan, J. T. (2009). Color Atlas of Parasitology. 8th Edition. Parasitology, San Francisco, CA
3. Despommier, D. D., Gwadz, R. W. and Hotez, P. J., Krogstad, D., Karapelou, J. W. (2012). Parasitic Diseases. 5th Edition Springer-Verlag New York, LLC
4. JANOVY, J., ROBERTS, L. S. AND NADLER, S. (2012) FOUNDATIONS OF PARASITOLOGY. 9TH EDITION. MCGRAW- HILL HIGHER EDUCATION, LONDON Service, M. (2012).
5. Medical Entomology for Students. 5th Edition. Cambridge University Press, Cambridge

SUBJECT: Parasitology and Entomology

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about Parasitology and Entomology, the related diseases, their prevention and control.

Learning Outcomes

1. Outline the mode of transmission, pathogenesis and identification and control of helminths and protozoa
2. Describe pathogenesis, clinical signs and symptoms and complications of parasitic infections
3. Outline the treatment for various parasitic infections, giving the methods of prevention and control of infection at individual and community levels
4. General principles of immune reactions and immunodiagnosis of parasitic infections

List of Practical

1. Leishman staining for malarial parasites
2. Demonstration of permanent slide of Trichuris, Ascaris and Hookworm
3. Saline wet mount for observing ova and eggs of parasites.
4. Iodine wet mount for observing ova and eggs of parasites.
5. Concentration of stool samples by floatation method
6. Zinc sulphate conc. Method for stool sample
7. Demonstration of various parasites by permanent slides.
8. Concentration of stool sample by sedimentation method
9. Serological diagnosis of Leishmania
10. Aldehyde Chopra test for Kala Azar
11. Malaria card test.

SUBJECT: Systemic Pathology

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about to understand the various diseases processes and to correlate morphological diagnostic pathology.

Learning Outcomes

1. To understand the concept of Neoplasia with respect to Etiology, gross and microscopic features, diagnosis and prognosis in different tissues and organs of the body.
2. Correlate normal and altered morphology (gross and microscopy) of different organ systems in different diseases to the extent needed of understanding of the disease processes and their clinical significance.
3. Have an understanding of the common haematological disorders and the investigations necessary to diagnose them and determine their prognosis.
4. To understand normal haemostatic mechanism, the derangements of these mechanism and the effect on human system.

Unit	Topic	Key Learning
I	Systemic Pathology	Introduction to systemic pathology, cardiovascular pathology, respiratory pathology, renal pathology, Pathology of Gastrointestinal tract, Liver and Billiary tract pathology, Reproductive system, Endocrine pathology
II	Immunopathology	Immunopathology • General features of the immune system: cells of immune system, cytokines, regulation of immune responses. Mechanism of Immunological tissue injury (hypersensitivity reaction): types and examples, antibodies and cell mediated tissue injury with examples, Autoimmune disorders like systemic Lupus Erythematosus •Organ transplantation: Immunological basic of reaction angraft versus host reaction, Immunolgoical deficiency syndrome and acuried immuno deficiency syndrome example: AIIDS: etiology, modes of transmission, pathogenesis, pathology, complications, diagnostic procedures and handling of infected materials and health education.
III	Circulatory disturbances	Circulatory disturbances: Oedema: pathogenesis and types, Chronic venous congestion: lung, liver, spleen, Thrombosis and embolism: formation, fate and effects, Infrarction: Types, common sites, gangrene, Shock: pathogenesis, types, morphological chances
IV	Growth disturbances	Growth disturbances: Atrophy, hypertrophy, hyperplasia, hypoplasia, metaplasia, malformation, agenesis, dysplasia, Neoplasia: causes, classification, histogenesis, biological behaviour benign and malignant, carcinoma and sarcoma, Malignant neoplasia: grades and stages, local and distant spread, Carcinogenesis; Environmental carcinogen, chemical, viral, occupational, hereditary and basics of molecular basis of cancer, Tumour and host interaction: systemic effects including para neoplastic syndrome, tumourimmunology, Laboratory diagnosis: cytology, biopsy, tumour markers.
V	Haematopathology	Haematopathology: Anaemia: classification and clinical features, Haemostatic disorders: platelet deficiency, ITP, drug induced, secondary, Coagulopathies: coagulation factor deficiency, hemophilia, DIC and anticioagulant control, Leucocytic disorders: leucocytosis, leucopoenia, leukemoid reaction, Acute and chronic leukemia: classification and diagnosis, Multiple myeloma and dysprotenemias, Blood transfusion: grouping and cross matching untoward reactions, transmissible infections including HIV and hepatitis

Reference Books

1. Textbook of Pathology - Harsh Mohan
2. Rapid Review Pathology by Edward F. Goljan
3. Robbins and Cotran Review of Pathology by Klatt and Kumar
4. Robbins Basic Pathology by Kumar, Abbas & Aster
5. BRS Pathology by Schneider & Szanto
6. Underwood's Pathology: A Clinical Approach by Simon Cross
7. Crash Course Pathology by Olivia Mckinney & Isabel Woodman
8. Pathology Illustrated by Fiona Roberts & Elaine MacDuff

SUBJECT: Systemic Pathology

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about to understand the various diseases processes and to correlate morphological diagnostic pathology.

Learning Outcomes

1. To understand the concept of neoplasia with respect to etiology, gross and microscopic features, diagnosis and prognosis in different tissues and organs of the body.
2. Correlate normal and altered morphology (gross and microscopy) of different organ systems in different diseases to the extent needed of understanding of the disease processes and their clinical significance.
3. Have an understanding of the common haematological disorders and the investigations necessary to diagnose them and determine their prognosis.
4. To understand normal haemostatic mechanism, the derangements of these mechanism and the effect on human system.

List of Practical

1. Performing a complete urine examination and detecting abnormalities and correlating with pathological changes.
2. To perform with accuracy and reliability basic Haematological estimations: TLC, DLC, peripheral smear, staining, reporting along with history.
3. To detect anaemia (acute + chronic), Hemolytic anaemia, Leukemia
4. Hb/TLC/blood grouping, staining of peripheral smear with Leishman/Giemsa.
5. Discussion of case studies (paper) clinical, gross and microscopic features and other parameters wherever applicable to learn clinico pathological correlation inclusive of autopsy studies.

Reference Books

1. Textbook of Pathology - Harsh Mohan
2. Rapid Review Pathology by Edward F. Goljan
3. Robbins and Cotran Review of Pathology by Klatt and Kumar
4. Robbins Basic Pathology by Kumar, Abbas & Aster
5. BRS Pathology by Schneider & Szanto
6. Underwood's Pathology: A Clinical Approach by Simon Cross
7. Crash Course Pathology by Olivia Mckinney & Isabel Woodman
8. Pathology Illustrated by Fiona Roberts & Elaine MacDuff

SUBJECT: Toxicology & Genetics

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about Toxicology and the related diseases, their prevention and control.

Learning Outcomes

1. To introduce the underlying principles governing the interactions of foreign chemicals (xenobiotics) with biological systems
2. To develop an understanding of the kinds of toxic manifestations that can occur as a result of chemico-biological interactions

Unit	Topic	Key Learning
I	Principles of Toxicology	Introduction of Toxicology-Basic principles: factors that affect toxicity, Toxicokinetics: absorption, distribution, excretion, and biotransformation, Toxicity testing, dose response and risk assessment
II	Occupational and industrial toxicology	Environmental carcinogenesis, Biomarkers of exposure and susceptibility factors, Persistent organic pollutants (POPs) and dioxins, Metal toxicology: mercury, cadmium, Ozone -air pollutant, Nanoparticle toxicology
III	Systemic Toxicology	Hepato and renal toxicology: basic principles and specific examples, Reproductive and developmental toxicology: basic principles and specific examples (e.g., endocrine disruptors, thalidomide), Bone marrow toxicity: benzene as a case study, Neurotoxicology
IV	Compound Poisoning	Toxicology of heavy metal, toxicology of pesticides and insecticides, Toxicology of organic solvents and dyes
V	Preventive measures	Approaches to primary and secondary prevention and effects of toxicology

Reference Books

1. Handbook of Toxicology", M.J.Derelanko & C.S.Auletta, 3rd Ed.
2. "Principles of Biochemical Toxicology" by J.A.Timbrell, 4th Ed. Informa
3. "Mechanistic Toxicology", U.A.Boelsterli, 2nd Ed. CRC Press

SUBJECT: Toxicology & Genetics

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about Toxicology and the related diseases, their prevention and control.

Learning Outcomes

1. To introduce the underlying principles governing the interactions of foreign chemicals (xenobiotics) with biological systems
2. To develop an understanding of the kinds of toxic manifestations that can occur as a result of chemico-biological interactions

List of Practical

1. To determine TSH conc. in serum sample.
2. To perform TRIPLE test.
3. Demonstration of male and female infertility test.
4. Beta HCG.
5. Estimation of Zinc.
6. Estimation of Electrolytes
7. Estimation of blood gases.
8. Estimation of plasma osmolality
9. Estimation of cholinesterase
10. Qualitative analysis of salicylates
11. Qualitative analysis of ethanol

Reference Books

1 .Handbook of Toxicology", M.J.Derelanko & C.S.Auletta, 3rd Ed.
2. "Principles of Biochemical Toxicology" by J.A.Timbrell, 4th Ed. Informa
3. "Mechanistic Toxicology", U.A.Boelsterli, 2nd Ed. CRC Press.

SUBJECT: Applied Bacteriology

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about applied aspects of bacteriology, the related diseases, their prevention and control.

Learning Outcomes

1. To understand clearly about applied bacteriology and the related diseases, their prevention and control.
2. To be able to define various diagnostics for testing of various microbial infections.
3. To understand mode of transmission and hospital acquired infections prevalent .
4. To be able to specify utilization of antimicrobial drugs in treatment and control of infections

Unit	Topic	Key Learning
I	Bacteriology	Bacteriology Introduction: Gram positive - streptococcus, staphylococcus, bacillus, mycobacterium, corynebacterium, Gram negative - E-coli, Klebsiella, Salmonella, shingela, Vibrio, Pseudomonas
II	Diagnostic & Systemic Bacteriology	Diagnostic & Systemic Bacteriology: Staphylococcus, Streptococcus, spirochaetes, mycoplasma, rickettsiae etc, Systematic grouping of pathogenic bacteria , Laboratory identification of infectious agents, Diagnosis of anaerobic infections , idenifying characteristics of common pathogenic bacteria,Antimicrobial susceptibility test. IMViC, Urease, catalase, geletine liquification, coagulase, oxidase, sugar fermentation, antibiotic sensitivity test
III	Mode of Microbial Infections	Mode of Microbial Infections: Microbial adherence, Passive Penetration into body, Active Penetration into body, Events in Infection following penetration, Microbial virulence factors, Hospital acquired infections.
IV	Antimicrobial Drugs	Antimicrobial Drugs: General characteristics of antimicrobial drugs, Determining level of antimicrobial activity, Mechanism of action of antimicrobial agents, factors influencing the effectiveness of antimicrobial drugs, Antibacterial drugs viz. sulfonamides, Quinolones, Penicillins, Cephalosporins, Tetracyclines, Erythromycin, Chloramphenicol, Drug Resistance.
V	Pathogenic Microbes, Diagnosis, Prevention and Control	Pathogenic Microbes, Diagnosis, Prevention and Control: Introduction to important diseases caused by Streptococcus, Pneumococcus, Neisseria, Corynebacterium, Bacillus, Ciostridium, enterobacteriaceae (Proteus, Shigella, Salmonella), Vibrio, Yersinia, Hemophilus, Mycobacterium, The operative pathogenic mechanisms, laboratory diagnosis, prevention and control of these diseases.

Reference Books

1. Fundamental Principles of Bacteriology Salle, S.J.
2. Medical Bacteriology Peter Hawkey
3. General Microbiology by Stanier
4. Hospital Acquired Infections by Dr. V. Muralidhar
5. Companion to Microbiology by Alan Bull and Paulin Meadow
6. Microbiology by Pelczar
7. Microbiology by Prescott
8. Pharmaceutical Microbiology by Hugo
9. Practical Medical Microbiology - (Volume I and II) Mackie & MacCartney

SUBJECT: Applied Bacteriology

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about applied aspects of bacteriology, the related diseases, their prevention and control.

Learning Outcomes

1. To understand clearly about applied bacteriology and the related diseases, their prevention and control.
2. To be able to define various diagnostics for testing of various microbial infections.
3. To understand mode of transmission and hospital acquired infections prevalent.
4. To be able to specify utilization of antimicrobial drugs in treatment and control of infections.

List of Practical

1. Stainings – Gram's, Alberts,Study of acid fast bacilli by ZNCF(hot stain)staining
2. Isolation and Maintenance of Pure Cultures.
3. Physiological characteristics of bacteria and its use for their identification.
4. Assay of antimicrobials.
5. Preparation of serum/plasma.
6. Sterilization – Introduction to autoclave, hot air oven, filter sterilization.
7. Demonstration of bacterial capsule by negative staining. (india ink method)
8. Demonstration of bacterial motility by hanging drop preparation
9. Isolation of microorganism by streak method
10. To perform biochemical test 1.IMVic test 2.Catalase test 3.Coagulase test 4.Oxidase test 5.Gelatin liquefaction test 6.Urease test
11. Identification of organism from urine sample.
12. Identification of organism from pus sample.
13. Antibiotic sensitivity test from stalk culture or biological specimen using commercial plates and discs
14. Identification of ova/cyst from given stool sample. 1.iodine preparation 2.saline preparation
15. Identification of malarial parasite by using blood smear.
16. To perform widal test-by tube method or slide method
17. To perform VDRL test/RPR
18. To perform RA test by latex agglutination

Reference Books

1. Fundamental Principles of Bacteriology Salle, S.J.
2. Medical Bacteriology Peter Hawkey
3. General Microbiology by Stanier
4. Hospital Acquired Infections by Dr. V. Muralidhar
5. Companion to Microbiology by Alan Bull and Paulin Meadow
6. Microbiology by Pelczar
7. Microbiology by Prescott
8. Pharmaceutical Microbiology by Hugo
9. Practical Medical Microbiology - (Volume I and II) Mackie & MacCartne

SUBJECT: Psychology

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about Psychology, the related genetic disorders and diseases.

Learning Outcomes

1. Demonstrating an ability to understand and distinguish major theoretical perspectives and methodological approaches in human development.
2. Developing an ability to identify the milestones in diverse domains of human development across life stages.
3. Understanding the contributions of socio-cultural context toward shaping human development.
4. Acquiring an ability to decipher key developmental challenges and issues faced in the Indian societal context.

Unit	Topic	Key Learning
I	Introduction to psychology	Introduction: Definitions of Psychology, Perspectives in Psychology; Research Methods of Psychology; Subfields of Psychology
II	Sensation and perception	Perception: Perception and Cultural Influences on Perception: Perceptual Processing, Perceptual Sets; Role of Attention; Perceptual Organization; Perceptual Constancies; Depth Perception; Illusions
III	Conditioning and Learning	Learning: Learning, Principles and Applications of Classical Conditioning, Operant Conditioning, and Observational Learning; Cognitive Influences on Learning
IV	Memory	Memory: Definition of Memory, Models of Memory: Levels of Processing, Parallel Distributed Processing, Information Processing; Reconstructive Nature of Memory; Forgetting; Improving Memory; Culture and Memory
V	Psychological Disorders	Depression, bipolar disorder, schizophrenia and other psychoses, dementia, and developmental disorders including autism

Reference Books

1. Baron, R. & Misra.G. (2016). Psychology. 5th Edition. New Delhi: Pearson.
2. Ciccarelli, S. K., White, N.J., & Misra, G. (2017). Psychology, 5 th Edition.
3. South Asian Edition. New Delhi: Pearson Education. Galotti, K.M. (2014).
4. Cognitive Psychology: In and Out of the Laboratory, 5th Edition. New Delhi: Sage.
5. Passer, M.W. & Smith, R.E. (2010). Psychology: The science of mind and behaviour. New Delhi: Tata McGraw-Hill

SUBJECT: Molecular Diagnostic Microbiology

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about Molecular Diagnostic Microbiology, the related disorders/diseases.

Learning Outcomes

1. Provides an understanding of which techniques are used in diagnosis at the molecular level
2. Explains the basic principles of molecular biology and their application in the clinical diagnosis of diseases.

Unit	Topic	Key Learning
I	Nucleic acids and their synthesis	Nucleic Acids, DNA, RNA, composition, structure, types, denaturation and renaturation of DNA, chemistry of DNA synthesis, general principles of replication, enzyme involved in DNA replication – DNA polymerases, DNA ligase, primase, telomerase and other accessory proteins
II	Process of protein synthesis	Basic transcription apparatus, Initiation, elongation and termination of transcription, Eukaryotic Transcription of mRNA, tRNA and rRNA, types of RNA polymerases, transcription factors, Introduction of translation
III	Diagnostic Molecular Biology	Nucleic acid amplification testing, PCR, Principle, Types, applications, Thermal cycler, RT PCR, reverse transcriptase PCR, Nested PCR.
IV	Blotting techniques and Karyotyping	Blotting techniques, southern blotting and Western blotting Introduction to chromosomes, its structure and disorder, Karyotyping, Chromosomal studies in hematological disorders (PBLC and Bone marrow), FISH
V	Blood Cell Indices	Radioisotopes and its application in measurement of blood volume,determination of red cell volume and plasma volume, red cell lifespan, platelet life span, radiation hazards and its prevention disposal of radioactive material , Introduction and applications of Flow cytometry, Stem cell banking, Prenatal Diagnosis.

Reference Books

1. Clinical Chemistry, Teitz
2. Clinical Chemistry, Bishop
3. Laboratory Procedure of Biotechnology, Sambro

SUBJECT: Molecular Diagnostic Microbiology
CODE: MLT704L
Credit:

Objectives

Course is designed to impart knowledge and skills required to learn various aspects and concepts about Molecular Diagnostic Microbiology, the related disorders and diseases.

Learning Outcomes

1. Provides an understanding of which techniques are used in diagnosis at the molecular level
2. Explains the basic principles of molecular biology and their application in the clinical diagnosis of diseases.

List of Practical

1. Isolation of DNA
2. Separation of DNA by Agarose gel electrophoresis
3. Demonstration of thermal cycler and PCR.
4. HIV test by Western Blotting
5. To perform karyotyping
6. Demonstration of PCR HLA B-27
7. Demonstration of PCR HIV
8. Demonstration of PCR MTB

Reference Books

1. Clinical Chemistry, Teitz
2. Clinical Chemistry, Bishop
3. Laboratory Procedure of Biotechnology, Sambro