JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY JAIPUR

SYLLABUS

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY (B.SC MLT)

YEAR – 2016

DURATION – 4 YEAR (8 SEMESTERS)

SYLLABUS FOR:
1-8 SEMESTERS

FACULTY OF PHYSIOTHERAPY & DIAGNOSTICS

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BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY (B.Sc MLT)

Provision of Lateral Entry:
There should a provision for lateral entry for the students who has successfully completed DMLT and would like to pursue B.Sc MLT (4 Year) can directly enter into the second year or 3rd semester of B.Sc MLT (4 Year) subject to availability of vacancy on merit of entrance test.

Provision of Modular Course: There should be a provision for leaving B.Sc MLT (4 Year) with degree of Diploma in Medical Laboratory Technology (Assistant Lab. Technician) for those students who has successfully completed 5th semester (2.5 year) of B.Sc MLT (4 Year) course.

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY (B.Sc MLT)
YEAR -2016

Program Summary: I Semester

Nature of course	Name of Course	C	T	D&T	P	PS
Human Anatomy	Human Anatomy	12	9.5	1	1	0.5
Pathology	Basic pathology-I	12	8.8	1	1.2	1
Biochemistry	Basic Biochemistry	12	9	0.5	1.5	1.0
Microbiology	General Microbiology	12	9	0.5	2.0	.05
Information & Communication Technology	Information & Communication Technology	8	6	0.2	1.8	0
University Compulsory Course	English Communication	2	2	0	0	0
	Extra-Curricular Activities	1	0	0	1	0
	Community Development Activities	1	0	0	1	0
University Optional Courses	Professional activities	-	-	-	-	-
Total Credits		60	42.5	3.7	9.8	3.5

Program Summary: II Semester

Nature of course	Name of Course	C	T	D&T	P	PS
Human Physiology	Human Physiology	12	10	0.7	0.7	0.6
Pathology	Basic pathology-II	13	9	1.0	2.0	1.0
Biochemistry	Clinical Biochemistry	11	8	0.5	2.0	0.5
Microbiology	Microbial Technical Methods	15	9	1.0	4	1.0
Preventive Medicine & Health Care	Preventive Medicine & Health Care	10	8	0.5	1.0	0.5

University Compulsory Course	Extra-Curricular Activities	1	0	0	1	0
	Community Development Activities	1	0	0	1	0
University Optional Courses	Professional activities	-	-	-	-	-
	Total credits	64	44	3.7	11.7	3.6

Program Summary: III Semester

Nature of course	Name of Course	C	T	D&T	P	PS
Pathology	Clinical Hematology	16	9.5	1.0	4	1.5
Biochemistry	Metabolic & Blood Biochemistry	15	9.7	1.0	2.8	1.5
Microbiology	Bacterial Pathogens & Associated Disease	15	9.2	0.5	3.8	1.5
Immunology	Immunology	12	9.0	0.5	2.0	0.5
University Compulsory Course	WRL	1	1	0	0	0
	Extra-Curricular Activities	1	0	0	1	0
	Community Development Activities	1	0	0	1	0
University Optional Courses	Professional activities	-	-	-	-	-
	Total Credit	61	38.4	3.0	14.6	5.0

Program Summary: IV Semester

Nature of course	Name of Course	C	T	D&T	P	PS
Pathology	Histopathological Techniques	15	9.5	1.0	3.0	1.5
Biochemistry	Biochemical & Biophysical Techniques	15	9.1	1.0	3.6	1.5
Microbiology	Pathogenic Viruses	15	9.5	1.0	3.0	1.5
Pathology	Clinical pathology	15	9	1.0	3.5	1.5

University Compulsory Course	Extra-Curricular Activities	1	0	0	1	0
	Community Development Activities	1	0	0	1	0
University Optional Courses	Professional activities	-	-	-	-	-
Total Credits		62	37.1	4	15.1	6.0

Program Summary: V Semester

Nature of course	Name of Course	C	T	D&T	P	PS
Pathology	Blood Banking & Transfusion Medicine	16	9.5	1.5	3.0	2.0
Biochemistry	Diagnostic Enzymology	14	9.7	1.0	1.8	1.5
Microbiology	Clinical Mycology	15	9.8	1.0	2.7	1.5
Biostatistics	Biostatistics	10	10	0	0	0
Clinical visit	Clinical visit	2	0	0	0	
University Compulsory Course	Extra-Curricular Activities	1	0	0	1	0
	Community Development Activities	1	0	0	1	0
University Optional Courses	Professional activities	-	-	-	-	-
Total credits		59	39.0	3.5	7.5	5

Program Summary: VI Semester

Nature of course	Name of Course	C	T	D&T	P	PS
Pathology	Histo & Cytopathological techniques	15	9.5	1.0	3.0	1.5
Biochemistry	Hormones & Disorders	15	9.5	1.0	3.0	1.5
Microbiology	Clinical Parasitology	15	9.5	1.0	3.0	1.5
Research Methodology	Research Methodology	7	7	0	0	0
Medical Laws & Ethics	Medical Laws & Ethics	4	4	0	0	0

Clinical visit	Clinical visit	2	0	0	0	0
University Compulsory Course	Extra-Curricular Activities	1	0	0	1	0
	Community Development Activities	1	0	0	1	0
University Optional Courses	Professional activities	-	-	-	-	-
Total Credits		60	39.5	3.0	11.0	4.5

Program Summary: VII Semester

Nature of course	Name of Course	C	T	D&T	P	PS
Pathology	Immunopathology	15	9.5	1.0	3	1.5
Biochemistry	Advance Biochemical Techniques	15	9.5	1.0	3	1.5
Microbiology	Advance Microbial Techniques	15	9.5	1.0	3	1.5
MLT as Entrepreneur & Quality Laboratory Management	MLT as Entrepreneur & Quality Laboratory Management	10	10	0	0	0
University Compulsory Course	Environmental Studies and Disaster Management	1	1	0	0	0
	Extra-Curricular Activities	1	0	0	1	0
	Community Development Activities	1	0	0	1	0
University Optional Courses	Professional activities	-	-	-	-	-
Total credits		58	39.5	3.0	11.0	4.5

Program Summery- VIII Semester

S.N	Name of Course	C	T	D&T	P	PS
1.	Six Month Training with a Analytical Project	72	0	0	72	0
						Total credits = 72

SYLLABUS OF B.Sc MLT 1st YEAR

Program Structure – 1st Year

(1st Year consists of I & II Semester)

Motive: **1st Year Motive**: This year students will be nourished with the basic knowledge of subjects like Human Anatomy, Human Physiology, Biochemistry, Microbiology and pathology along with basics of computer. This will help students to know the basic structure and functioning of the human body.

I SEMESTER

Motive: This semester will cover the detailed knowledge of Human Anatomy, basic Biochemical molecules in the body, Microbiology and Immunology. The students will be able to apply the knowledge of subjects while studying the applied subjects in further semesters. Students will get the knowledge English Language proficiency.

Nature of Course	Name of course	C	T	D&T	P
Human Anatomy	**Human Anatomy-I**: Introduction to human body & locomotion	**4**	3	0.5	0.5
	Human Anatomy-II: Anatomy of Cardiovascular, respiratory, Digestive and urinary system.	**4**	3	0.5	0.5
	Human Anatomy-III: Introduction to nervous, Endocrine and organ of sense	**3.5**	3.5	0	0
	Practice sessions from I in University Lab/recognized hospital.	***0.5***	*0*	*0*	*5 sessions*
Pathology	**Basic pathology I –I :** Introduction to Blood and anticoagulants	**3.6**	3	0.2	0.4
	Basic pathology I –II: Introduction to stain and blood cell morphology	**4.6**	3	0.8	0.8
	Basic pathology I –III: Cell Injury and Cell death, Healing	**2.8**	2.8	0	0
	Practice sessions from I & II in University attached /recognized hospital	***1***	*0*	*0*	*10 sessions*
Biochemistry	**Basic Biochemistry-I**: Introduction to Solution and glassware	**4.4**	2	0.1	0.3
	Basic Biochemistry-II: Enzymes, Sterilization and Carbohydrates	**4.0**	3.5	0.2	0.3

	Basic Biochemistry-III: Lipid, Protein, Nucleic acid	**4.4**	3.5	0.2	0.7
	Practice sessions from II & III in University lab /recognized hospital	***1.0***	*0*	*0*	*10 sessions*
Microbiology	**General Microbiology –I:** Introductions to history & bacterial morphology	**3.6**	3.0	0.1	0.5
	General Microbiology –II: Introduction to & different media & cultivation.	**3.8**	3.0	0.2	0.6
	General Microbiology –III: Introduction to viruses , fungi & parasites	**4.1**	3.0	0.2	0.9
	Practice sessions from I & II in university attached lab/recognized hospital.	***0.5***	*0*	*0*	*5 sessions*
Information & Communication Technology	**Information & Communication Technology– I :** Basics of computer System and Number System	**2.6**	2	0	0.5
	Information & Communication Technology–II: Hard Devices and software device, CPU, Memory disks and its types.	**2**	3	0	0
	Information & Communication Technology– III: Software and MS office	**3.4**	2	0	0.5
	Practice sessions from I, II & III in University attached lab.	**1.0**	0	0	*10 sessions*
University Compulsory Course	English Communication (Level A)	**2**	2	0	0
	Extra-Curricular Activities	**1**	0	0	1
	Community Development Activities	**1**	0	0	1
University Optional Courses	Professional Activities	-	-	-	-
Total credit		**60**			

Note:

- **C represents number of credit per course**
- **T represents number of theory credit per course**
- **D&T represents demonstration & tutor in the lecture hall.**

- **P represents number of practical credits per course.**
- **PS represents number of practice sessions credit per course.**

HUMAN ANATOMY

UNIT-1 (Introduction to human body & locomotion) **(**3-0.5)

Theory **(**3credit)

1. Human body as a whole: Definition of anatomy and its divisions, Terms of location, positions and planes, Cell and its organelles, Epithelium-definition, classification, describe with examples, function, Glands- classification, describe serous & mucous glands with examples, Basic tissues – classification with examples
2. Locomotion and Support: Cartilage – types with example & histology, Bone – Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of bones, vertebral column, inter vertebral disc,, fontanel's of fetal skull, Joints – Classification of joints with examples, synovial joint), Muscular system- Classification of muscular tissue & histology, Names of muscles of the body.
3.Embryology: Spermatogenesis & oogenesis, Ovulation, Fertilization, Fetal circulation, Placenta

Lab. Experiments: Practical: (0.5credit), D&T (0.5credit)
Practice session (0.5credit)

1. Study of all bones showing parts, Joints, organs. (0.1credit)
2. Histology of serous, mucous & mixed salivary gland (0.1credit)
3. Histology of the of cartilage, epithelium, bones cell. (0.1credit)
4 .Histology of all muscles of the body. (0.1credit)
5. Histology of skeletal (TS & LS), smooth & cardiac muscle (0.1credit)

UNIT–II (Cardiovascular, Respiratory, Digestive system **)** (3-0.5)

Theory (3credit)

1. Cardiovascular System: Heart-size, location, chambers, exterior & interior, Blood supply of heart, Systemic & pulmonary circulation, Branches of aorta, Peripheral pulse, Inferior venacava, portal vein, portosystemic anastomosis, Great saphenous vein, Dural venous sinuses, Lymphatic system- cisterna chyli & thoracic duct, Histology of lymphatic tissues, Names of regional lymphatics, axillary and inguinal lymph nodes .

2. Gastro-intestinal System: Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring), Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, Radiographs of abdomen.

3. Respiratory System: Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments, Histology of trachea, lung and pleura, Names of paranasal air sinuses. Peritoneum.
4. Urinary System: Kidney, ureter, urinary bladder, male and female urethra, Histology of kidney, ureter and urinary bladder.

Lab. Experiments: **Practical:** (0.5credit), **D&T** (0.5credit)

1. Study the anatomy of parts of respiratory system. (0.1credit)
2. Study the anatomy of parts of urinary system. (0.1credit)
3. Histology of lymph node, spleen, tonsil & thymus (0.1credit)
4. Study the anatomy of the glands. (0.1credit)
5. Study the anatomy of all part of brain. (0.1credit)

UNIT–III (Nervous, Endocrine and Organ of sense**)** (3.5-0)

Theory (3.5 credit)

1. Reproductive System: Parts of male reproductive system, testis, vas deferens, epididymis, prostate .

2.Endocrine Glands: Names of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland, suprarenal glad. Parts of female reproductive system, uterus, fallopian tubes, ovary, Mammary gland-gross.

3. Nervous System: Neuron, Classification of NS, Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve, Meninges, Ventricles & cerebrospinal fluid, Names of basal nuclei, Blood supply of brain, Cranial nerves, Sympathetic trunk & names of parasympathetic ganglia.

4. Sensory Organs: Skin: Skin-histology, Appendages of skin, Eye: Parts of eye & lacrimal apparatus, Extra-ocular
muscles & nerve supply, Ear: parts of ear- external, middle and inner ear and contents.

Rcommended Text Books

1. Shembulingam, Essentials of medical physiology .
2. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book,

Suggested Reading

1. Ross and Wilson, Anatomy a & physiology

BASIC PATHOLOGY-I

UNIT-I (Introduction to blood and anticoagulants) **(**3-0.4)

Theory (3 credits)

1. Introduction to pathology. Terminologies used in pathology, introduction of haematology & its importance. Laboratory organization and safety measure in pathology Laboratory.

2. Composition, function and of blood and plasma. Normal and abnormal hemopoiesis (Erythropoiesis, Leucopoiesis and Thrombopoiesis).

3. Anticoagulants: mode of action, preparation, merit and their demerits. Collection of blood - Various methods of collection, preservation, transport and disposal of blood samples.

Lab. Experiments: Practical (0.4credits), D&T (0.2 credits)
Practice session (0.2credits)

1. Collection of blood by syringe (0.1 credit)
2. Collection of blood by finger prick (Lancet) (0.1 credit)
3. Preparation of anticoagulant vial for collection of blood. (0.1 credit)
4. Preparation of anticoagulants EDTA, Sod. Citrate anticoagulants. (0.1 credit)

UNIT-II (Introduction to stain and blood cell morphology) (3-0.8)

Theory (3 credit)

1. Romanowasky dyes: Definition Romanowasky dyes, principle of staining. Leishman stain, Geimsa stain, Field's stain, Wright stain - preparation and staining procedure. Preparation and staining procedures of blood smears.

2. Morphology of various blood cells and their identifications. Abnormal morphology of red blood cells. Haematology parameters: Normal and absolute values, physiological & pathological variations, and quality assurance in hematology.
3. Peripheral blood smear and its diagnostic significance.

Lab. Experiments: Practical (0.8credit), D&T (0.8credit)
Practice session (0.8 credits)

1. Parts of microscope; its functioning and care (0.1credit)
2. Parts of centrifuge; its functioning and care (0.1credit)
3. Collection of blood by vacationer. (0.1credit)
4. Preparation of blood smears (0.1 credits)
5. Staining of blood smears by Leishman's stain. (0.1 credit)
6. Staining of blood smears by Geimsa stain. (0.1 credit)
7. Identification of blood cells (0.1 credit)
8. To study the RBCs abnormal morphological forms - Variation in size, shape & Staining character. (0.1 credit

UNIT-III (Cell Injury and Cell death, Healing) (2.8-0)
Theory (2.8credit)

1. Cell Injury and Cellular Adaptations: Normal cell structure and function, cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling.
2. Cell death: types- autolysis, necrosis, apoptosis & gangrene.
3. Cellular adaptations-Atrophy, hypertrophy, hyperplasia & dysplasia.
4. Haemodynamic Disorders: Oedema, Hyperemia, Congestion, Haemorrage, Circulatory disturbances, Thrombosis, Ischaemia & Infarction .
5. Neoplasia : Definition, how does it differ from hyperplasia, difference between benign tumor and malignant tumor.
6. Healing: Definition, different phases of healing, factors influencing wound healing.

Recommended text books:

1. Harsh Mohan , Text book of pathology.
2. P. Godkar , Text book of medical laboratory Technology
3. V.H Talib, A hand book of Medical laboratory Technology, CBS Publishers & distributors, New Delhi.

Suggested Reading

1. Rabbins & Cotran, Pathologic Basis & Disease

BASIC BIOCHEMISTRY

UNIT-I (Introduction to Solution and glassware) (2.5-0.3)

Theory (2credit)

1. Introduction to biochemistry: History of biochemistry and chemical composition important biomolecules. Role of laboratory technologist, safety measure and biohazard.
2. Solution & glassware: Reagent, Solution, Standard solution. Mearurment of concentration of solutions & their preparation. Buffers- types, mechanism of action, criteria of selection and

preparation of buffer, biological buffer system. Composition of Glass, general glass wares in the laboratory.

3. Basic awareness of laboratory in respect to equipment: Spectrophotometer, calorimeter and flame photometere (Principle and Function). PH Measurement: Definition, methods of measurement, uses and maintainance of pH meter.

4. Basic concept: Stabilizing forces in biomelecules: Ionic bonds, Hydrogen bond, Hydrophobic interaction, van der waals foeces etc. Study of metabolic process- Primary secondry and tertiary process, Concept of steady state equilibrium. Basic principle of thermodynamics: Principle, Definitions-Entrophy, Enthalpy, Free energy, Types of reaction- Exergonic, Equilibrium, Endergonic. Thermodynamic consideration of enzymes- isothermic, exothermic and endothermic reaction.

Lab. Experiments: Practical (0.3 credits), D&T (0.1credit)

1. Introduction of Glassware (0.1credit)
2. Preparation of solution. (0.1credit)
3. Introduction of Glassware and Insturments: Balance, Hot plate and, Magnetic stirrer, Centrifuge, Incubator, Constant water bath etc. (0.1credit)

UNIT–II (Enzymes, Sterilization and Carbohydrates) (3.5-0.3-0)

Theory (3.5 credit)

1. Cellular organisation and transport mechanism: Structure and function of subcellular organells & plasma membranes. Transmport mechanism : Definitions of carrier, transporter, ionophores,uniport , symport and antiport. Transport of molecule across the biological membrane.

2. Enzymes; - Definition, Properties, classification, concept of active sites and its general properties, Modeof action of enzymes, Cofactor and coenzymes, Different specificity, Lock and key hypothesis, Kosland induced fit theory. Factor affecting enzyme activity. Inhibition of enzymes , Mechaelis- Menten equation, Mechaelis- Menten constant.

3. Carbohydrate: Introduction, classification, Structure, properties and their function of monosaccharides, disaccharids and polysaccharides. Derivatives of polysaccharides . D&L form, isomers of carbohydrates, Mutarotation, Osazone formation, Oxidation and reduction of carbohydrates.

Lab. Experiments: Practical (0.3 credit), D&T (0.2credit)
Practice session (0.5credits)

1. Qualitative tests of carbohydrates by Molisch test. (0.2credit)
2. Qualitative tests of carbohydrates by Saliwanoff's test. (0.2credit)
3. Qualitative tests of carbohydrates by iodine test & benedict test. (0.1credit)

UNIT-III (Lipid, Protein, Nucleic acid) **(**3.5-0.7)

Theory (3.5 credit)

1. Lipid: General structure and classification of lipid fatty acids, Propertie & function lipid & fatty acids. Iodin number, sufonification , Acid value and rancidity of fat. Saturated and unsaturated fatty acid, Narural fats, Phospholipid – properties and uses. Cholesterol- Structure, properties & uses.

2. Protein: Classification, structural organization and function of protein, petide and sulfide bonds, Amino acid-classification, Isoelectric point , optical activity and concept of pK value of amino acid.

3. Nucleic acids: Structure, function and types of DNA and RNA. Nucleotide, nucleoside and nitrogen bases, Role of nucleic acid, cyclic nucleotide, Synthetic nucleotides. Role of free nucleotide in biological system.

Lab. Experiments: Practical (0.7credit), D&T (0.2credit)
Practice session (0.5 credit)
1.Qualitative tests of amino acid & Proteins (0.4credit)
2.Qualitative tests of lipids (0.3credit)

Recommended Text Books

1. Vasudevan DM & Sreekumari S, Text Book of Biochemistry for Medical Students.
2. P.Godkar ,Textbook of medical lab technology by
3. Satyanarayan, Medical Biochemistry

Suggested reading

1. Lehninger, Principle of biochemistry

GENERAL MICROBIOLOGY

UNIT-I: (History & Bacterial Morphology**) (**3-0.5)

Theory (3 credit)

1.Introduction to medical microbiology: -In discovery of microorganism , contribution of Robert Koch, Antony von leeuwen hook, Louis Pasteur, Bordet , Paul eharlich, Alexander Fleming, Tyndall, Joseph lister, Karl landstainer, Needham etc.

2. Scope, relevance and safety measure of medical microbiology. Role of medical microbiology in identification and management of various infectious diseases

3. Morphology and nature of bacteria: Structure of prokaryotes cell & its components , difference between eukaryotes and prokaryotes cell. Morphological study of bacteria and its appendages-Flagella. Fimbrie, pilli, capsul Spores, cyst. Morphological and biological classification and identification of bacteria

Lab. Experiments: Practical (0.5 credit), D&T (0.1credit)
Practice session (0.1 credits)

1. To demonstrate safe code of practice for a Microbiology laboratory. (0.1credit)
2. Handling, working & care of Microscope. (0.1credit)
3. To demonstrate the different morphological types of bacteria. (0.1credit)
4. Handling, working & care equipments in microbiology lab. (0.1credit)
5. Identification of bacteria. (0.1credit)

UNIT–II (Different media & cultivation of bacteria) **(**2.7-0.6)

Theory (3 credit)

1.Culture media: Liquid and solid media and their types,common ingredients of culture media, Introduction and use of peptone water, nutrient agar, nutrient broth, blood agar, chocolate agar,

meat extract broth. Special media for neisseria, corrynebacterium, Mycobacterium and Enterobacteriacae group etc. Quality control in culture media, Automation in culture media preparation.

2. Cultivation of bacteria: Instruments used, inoculation loop, Methods of cultivation (Aerobic and anaerobic cultivation). Incubation (Aerobic and anaerobic).

3. Growth and Nutrition of bacteria**:** Typical growth curve, Nutrition of microbes, and condition required for growth. Effect of carbon nitrogen growth factors, vitamins, temperature, pH , osmotic pressure, oxygen, carbondioxide on microbial growth. Types of microbial cultures: Synchronous, Static, continuous culture. Classification of bacteria on the basis of their nutritional requirements.

Practical (0.6 credit), **D&T** (0.2credit)

Practice session (0.2credit)

1. Demonstration of commonly used cutler media, Broth, and different agars. (0.1credit)
2. Preparation of one culture media from each type. (0.1 credit)
3. Preparation of nutrient agar & broth. (0.1 credit)
4. Inoculation of the culture on media. (0.1credit)
5. To demonstrate aerobic culture . (0.1credit)
6. To demonstrate anaerobic culture. (0.1credit)

UNIT–III (Introduction to Viruses, Fungi & Parasites) (1.7-2.0)

Theory (3 credit)

1. Introduction to virology, mycology and parasitology. Morphology and classification and characteristics of virus, fungi & parasites.

2. Sterilization and disinfection: various physical method of sterilization- heat, radiation, ionizing radiation. Chemical disinfectant- phenol and its compounds, alcohol, quaternary ammonium, gaseous compound, aldehyde. Use and abuse of disinfectant.

3**.** Antimicrobial agent and antibiotics: Definitions with examples of disinfectants, antiseptics, chemotherapeutic agents, antibiotics and their effect on bacterial cell.

Lab. Experiments: Practical (0.9 credit), D&T (0.2credit)

Practice session (0.2credit)

1. Demonstration of bacteria by different simple staining. (0.1credit)
2. Identification of fungal cultures. (0.1credit)
3. To prepare cleaning agents & to study the technique for cleaning & sterilization of
4. glassware. (0.1credit)
5. To demonstrate the method of sterilization by autoclave. (0.1credit)
6. To demonstrate the method of sterilization by hot air oven. (0.1credit)
7. To demonstrate the method of sterilization of media/solution by filtration. (0.1credit)
8. Demonstration of antiseptics, spirit, cetrimide & Povidone-Iodine. (0.1credit)
9. Demonstrate the precaution while using disinfectants. (0.1credit)

Recommended Text Books

1. Anantha Narayan and Panikar, Text book of Microbiology
2. Baweja, Medical Microbiology

Suggested Reading

1. Prescotte, Microbiology
2. Practical Medical Microbiology by Mackie and McCartne. Volume 1 and 2
3. District Laboratory Practice in tropical countries Vol II Microbiology by Monica Cheesbrough

Information & Communication Technology

(Credit: 8)

Objective: To impart basic knowledge about computer with application of various packages to Business and Commerce.

Unit – I

Introduction to computers:

Definition, Characteristics and limitations of computers - Elements of Computers - Hardware - CPU - Primary and Secondary memory - Input and Output devices. IT enabled services - BPO, KPO, Call centers.

Modern communications

(Concepts only)**:** Communications – FAX, Voice mail, and information services – E Mail – Creation of email id - group communication – Tele conferencing – Video conferencing – File exchange – Bandwidth – Modem – Network Topologies – Network types LAN, MAN, WAN and their architecture – Dial up access.

Operating System and Windows: Operating Systems: Meaning, Definition, Functions and Types of Operating Systems - Booting process – Disk Operating System: Internal and External Commands – Wild Card Characters – Computer Virus, Cryptology. Windows operating system - Desktop, Start menu, Control panel, Windows accessories . **(Credit: 2)**

Unit – II:

MS Office I:

MS Word & Word Processing : Meaning and features of word processing – Advantages and applications of word processing - Parts of MS Word application window – Toolbars – Creating, Saving and closing a document – Opening and editing a document - Moving and copying text – Text and paragraph formatting, applying Bullets and Numbering – Find and Replace – Insertion of Objects, Date and Time, Headers, Footers and Page Breaks – Auto Correct – Spelling and Grammar checking – Graphics, Templates and wizards - Mail Merge :

Meaning, purpose and advantages – creating merged letters, mailing labels, envelops and catalogs- Working with Tables – Format Painter.

MS EXCEL:

Features of MS Excel – Spread sheet / worksheet, workbook, cell, cell pointer, cell address etc., - Parts of MS Excel window – Saving, Opening and Closing workbook – Insertion and deletion of worksheet – Entering and Editing data in worksheet – cell range – Formatting – Auto Fill –Formulas and its advantages – References : Relative, absolute and mixed – Functions: Meaning and Advantages of functions, different types of functions available in Excel – Templates –Charts – Graphs – Macros : Meaning and Advantages of macros, creation, editing and deletion of macros – Data Sorting, Filtering, validation, Consolidation, Grouping, Pivot Table and Pivot Chart Reports.

MS Office II:

MS Access - Data, Information, Database, File, Record, Fields - Features, advantages and limitations of MS Access – Application of MS Access – 10 parts of MS Access window – Tables, Forms, Queries and Reports – Data validity checks – (Theory with simple problems)

MS PowerPoint:

Features, advantages and application of Ms Power point – Parts of MS Power point window – Menus and Tool bars – Creating presentations through Auto content wizard, Templates and manually – slide show – saving, opening and closing a Presentation – Inserting, editing and deleting slides –Types of slides - Slide Views- Formatting –Insertion of Objects and Charts in slides- Custom Animation and Transition.

Multimedia:
Meaning, Purpose, Usage and application – Images, Graphics, sounds and music – Video presentation devices – Multimedia on web. **(Credit: 3)**

Unit- III:
Internet & E commerce:
Services available on internet - WWW - ISP.

E commerce:
Meaning, advantages and limitations, applications of E commerce - trading stocks online, ordering products / journals / books etc., online, travel and tourism services, employment placement and job market, internet banking, auctions, online publishing, advertising-Online payment system (including practicals). **(Credit 2)**
Lab Work:
PRACTICALS:
MS DOS MS WINDOWS MS WORD MS EXCEL
MS ACCESS MS POWERPOINT INTERNET & E COMMERCE.

Recommended practice session: *10 Practice Sessions of* Ms Dos Ms Windows Ms Word Ms Excel, Ms Access Ms PowerPoint Internet & E Commerce **(Credit 1)**

Recommended Text Books:
Computer Fundamentals; Pradeep K. Sinha, Priti Sinha; BPB Publications

Suggested Readings:

1. Introduction to Information Technology: Rajaraman, PHI
2. Fundamentals of Computers 4/E: Rajaraman, PHI
3. Fundamentals of Computers: P. Mohan, Himalaya
4. Information Technology: Dennis P. Curtin, McGraw Hill International
5. Fundamentals of Information Technology: Saha etal, Himalaya
6. Microsoft Office Excel 2003 step by step: Frye, PHI
7. Fundamentals of Computers: Atul Kahate, Tata McGraw Hill

ENGLISH COMMUNICATION

Credit: 2

Objective: To enable students to develop Four major skills Reading, Writing, Speaking and Listening in relevance to English culture according to time and venue.

Unit 1: Reading and Listening

- Types of passages, purpose of reading, reading strategies, vocabulary building, antonyms and synonyms and one-word substitution etc.
- Role of Listening, Barriers of Listening, Remedies to remove the barriers. Listening to Narratives, Listening to specific information or data, listening to Conversational contexts etc.

Unit 2: Writing and Speaking

- Subject- Verb Concord, Sentence Pattern (SVOCA), Time and Tenses. Different Letter Writing Formats: Application, Cover Letter, Notice, Report etc. Resume Building.
- Introduction to the sounds of English-Vowels, Diphthongs and Consonants phonetic sounds, Introduction to Stress and Intonation, Situational Dialogues / Role Play 'Just a minute' Sessions (JAM), action verbs (play way method), Describing Objects/ Situations/ People (personality), Debates (current topics), Turn Coat, Telephonic Conversation.

Recommended Books:

- Phonetics by Peter Roach, Oxford University Press 2004.
- Better English Pronunciation by J.D.O'Connor, OUP 2010.
- Accents of English by J.C.Wells, Cambridge University Press.
- English Grammar Today with CD: An A-Z of Spoken and Written
- Grammar by Ronald Carter, Michael Mac Carthy, Geraldine Mark
- Anne O'Keeffe, Cambridge University Press, 2009.
- Alred, Gerald J. . The Business Writers Handbook. 9th ed. Boston:
- Bedford/St. Martins, 2009.
- Geeta Jajivan, Kiranmai: Course Listening and Speaking Skills part 1. Foundation Books Pvt Ltd.
- Lorven: Enrich Your Communication in English

II SEMESTER

Motive: This semester along with Human physiology will also cover basics of Microbiology, pathology and biochemistry. The students will be able to apply the knowledge of these subjects while studying the applied subjects in further semesters. Students will also get knowledge of basic computer application.

Nature of Course	Name of course	C	T	D&T	P
Human physiology	**Human physiology-I**: Blood, digestive, nervous system	**4**	3.3	0.2	0.5
	Human physiology-II: Endocrine cardiovascular, Respiratory system	**3.8**	3.3	0.3	0.2
	Human physiology- III: physiology of sense, Muscle, Reproduction	**3.8**	3.4	0.2	0
	Practice sessions from I, II& III in University attached /recognized hospital.	**0.6**	0	0	6 sessions
Pathology	**Basic pathology II -I :** Haemocytometry & Haemoglobinometry	**3.5**	3.0	0.4	0.1
	Basic pathology II -II: Inflammation & infection	**4.1**	3.0	0.4	0.7
	Basic pathology II -III : FNAC &	**3.8**	3.0	0.2	0.6

	pathology of tumor				
	Practice sessions from I & II in University attached hospital /recognized hospital.	**1**	0	0	10 sessions
Clinical Biochemistry	**Clinical Biochemistry -I:** Henderson – Hassalbach equation & Biophysics technique	**2.5**	2.2	0.2	0.2
	Clinical Biochemistry -II: Biochemical examination of urine & body fluids.	**4**	2.8	0.7	0.5
	Clinical Biochemistry -III: Glycosuria, Nutrition, Micro-albuminuria	**3**	2.5	0.2	0.3
	Practice sessions from II & III in University attached Hospital /recognized hospital.	**0.5**	0	0	5 sessions
Medical Microbiology	**Microbial Technical Methods** –I: Microscopy, Stain and staining methods.	**3.2**	2.7	0.4	1.0
	Microbial Technical Methods –II: Experimental animals & AST	**3.2**	2.7	0.4	2.0
	Microbial Technical Methods –III: Introduction to Viruses, Fungi & Parasites	**3**	2.6	0.2	1.0
	Practice sessions from I & II in University attached hospital/recognized hospital.	**1.0**	0	0	10 sessions
Preventive medicine & health care	**Preventive and Social Medicine-I:** Pollution, Hygiene & Sanitation.	**3**	3	0	0
	Preventive and Social Medicine–II: Epidemiology, Immunization,	**3**	3	0	0
	Preventive and Social Medicine-III: Balance diet & introduction to nursing.	**3.5**	2	0.5	1.0
	Practice sessions from III in University attached hospital /recognized hospital.	**0.5**	0	0	5 sessions
University Compulsory Course	Extra-Curricular Activities	**1**	0	0	1
	Community Development Activities	**1**	0	0	1

University Optional Courses	Professional Activities	-	-	-	-
Total credits		**64**			

Note:

- **C represents number of credit per course**
- **T represents number of theory credit per course**
- **D&T represents demonstration & tutor in the lecture hall.**
- **P represents number of practical credits per course.**
- **PS represents number of practice sessions credit per course.**

HUMAN PHYSIOLOGY

UNIT-I (Blood, Digestive, Nervous system) **(**3.3-0.5)

Theory (3.3 credits)

1. Body temperature measurement, Physiological variation, Regulation of body temperature by physical chemical and nervous mechanisms.Role of Hypothalamus, Hypothermia and fever.
2. Blood: Composition and function of blood and plasma. Blood Volume – Normal value, determination and regulation of blood volume. Plasma Proteins- types& functions. Haemostasis –introduction of normal haemostasis, clotting factors, mechanism of clotting. Blood groups-A, B, O system, Rh system. Anaemia's– Classification, etiology, effects on body. Red cell indices. Lymph – lymphoid tissue formation, circulation, composition and function of lymph
3. Digestive System - Functions of various organs of digestive system. Salivary glands. Gastric secretion – Composition function, regulation of gastric juice. Composition, secretion & function of bile secretion. Bilirubin–formation of bilirubin and Jaundice– types. Digestion and absorption of carbohydrates, proteins & lipids.
4. Nervous system: Functions of nervous system & neurone structure. Neuroglia, nerve fiber. Conduction of impulses continuous and saltatory. Synapse & Receptors. Reflex action– unconditioned properties of reflex action. Babinski's sign. Spinal cord nerve tracts. Functions of Medulla, pons . Hypothalamic disorders. Cerebral cortex lobes and functions, Sensory cortex, Motor cortex, Cerebellum .Basal ganglion-funtions. EEG. Cerebro Spinal Fluid(CSF)- formation, circulation, properties, composition and functions. Autonomic Nervous System

Lab. Experiment: Practical (0.5credit), D&T (0.2credit)
Practice session (0.6credit)

1.Hb estimation (0.1credit)
2.Determination of Blood Groups (0.1credit)
3.Determination of body temp, Clotting Time, Bleeding Time (0.1credit)
4. Determination of total leucocyte count (0.1credit)
5.Determination of RBC count (0.1credit)

UNIT-II (Endocrine cardiovascular, Respiratory system) (3.3-0.2)

Theory (3.3 credits)

1. Cardiovascular system: Heart –Properties of cardiac muscle, Cardiac cycle, Cardiac output. Blood Pressure-clinical measurement & significance. Physiological variations, regulation of heart

rate, cardiac shock, hypotension. Pulse – Jugalar, radial pulse, Triple response. Heart sounds – Normal heart sounds, cause characteristics and signification. Electrocardiogram (ECG) – significance

2. Respiratory system: Mechanism of normal and rigorous respiration. Forces opposing and favouring expansion of the lungs. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall. Transportation of respiratory gases. Lung volumes and capacities. Mechanisms of Regulation of respiration, Respiratory centre. Applied physiology respiration-Hypoxia, Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea.

3. Endocrine System – Mode of action of hormones. Thyroid hormone – function & regulation of secretion, disorders due to thyroid hormone. Secretion, functions and regulation of hormones of Adrenal, Pituitary, Parathyroid gland & Pancreas, Functions of Adrenaline and nor adrenaline, Insulin – secretion, regulation & function.

Lab. Experiment: Practical (0.2 credit), D&T (0.3 credit)

1. Blood pressure recording (0.1credit)
2. Auscultation for Heart Sounds (0.1credit)

UNIT-III (Physiology of Sense, Muscle, Reproduction) (3.4-0)

Theory (3.4credit)

1. Special senses: Vision – structure & function of different parts of eye. Hearing structure & mechanism of hearing. Taste – Taste buds & functions. Smell –physiology, Receptors.

2. Excretory System : Nepron & Juxta Glomerular Apparatus –structure and function. Renal circulation peculiarities. Mechanism of urine formation : Ultrafiltration, Selective reabsorption , GFR, Plasma fraction, Mechanisms of reabsorption of glucose, urea, H+, Cl, aminoacids. Renal threshold % of reabsorption of different substances, Selective secretion. Properties and composition of normal urine, urine output. Abnormal constituents in urine, Mechanism of urine concentration.

3. Reproductive system: spermatogenesis & oogenesis. Endocrine functions of testes & ovary. Menstrual cycle. Physiological changes during pregnancy. Lactation – Composition of milk & factors controlling lactation.

4. Muscle & nerve physiology: Structure of skeletal muscle-Sarcomere contractile proteins. Neuromuscular junction. Transmission across the neuromuscular junction. Mechanism of muscle contraction, muscle tone, fatigue, Rigour, mortis. Skin -structure and function.

Lab. Experiment: Practical (0.0credit), D&T (0.2credit)

1. Demonstration of muscle testing. (0.1credit)
2. Demonstration of testing of hearing. (0.1credit)

Recommended Text Books

1. Shembulingam, Human Physiology
2. Choudhari (Sujith K), Concise Medical Physiology Latest Ed. New Central Book,

Suggested Reading

1. Ross and Wilson, Anatomy a & physiology

BASIC PATHOLOGY-II

UNIT-I (Haemocytometry & Haemoglobinometry) (3 - 1.0)

Theory (3 credit)

1. Haemoglobinometry: - hemoglobin and its types, various methods of estimation, errors involved and standardization of instruments.

2. Hemocytometry: - Neuboure counting chamber, Hb pipette, RBC and WBC pipette , Principle procedure and Clinical significance of Red cell count, WBC count and platelets count,
3. Red cell indices – significance and estimation. Clinical significance, principle and procedure of packed cell volume and erythrocyte sedimentation rate

Lab. Experiment: Practical (1.0 credit), D&T (0.4 credit)

Practice session: (0.5credit)

1. Hb estimation by Sahli's method &CMG method (0.2credit)
2. Total leucocyte count. (0.1credit)
3. Red Blood Count. (0.1credit)
4. Platelates count (0.1credit)
5. DLC (Differential Leucocyte Count). (0.1credit)
6. Determination of PCV (packed cell Volume) (0.1credit)
7. ESR (Wintrobe and Western green method. (0.2credit)
8. Calculation of blood indices. (0.1credit)

UNIT–II (Inflammation & Infection) (3 -0.7)

Theory (3 credit)

1. Raticulocyte count: Definition, different methods to count, Absolute reticulocyte count and IRF (Immature reticulocyte fraction) and significance of reticulocytes.
2. Pathology of inflammation in response to microbial invasion: - sign of Inflammation and Inflammatory agents, Acute and chronic inflammation. Localized and systemic infection.
4. 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)
4. Lupus Erythematosus (L.E) cell phenomenon: Definition of L.E. cell. Demonstration of L.E. cell by various methods. Clinical significance.
5. Preparation of thick and thin blood smear for malarial parasite (Leishman/Giemsa/JSB)

Lab. Experiment: Practical (0.7 credit), D&T (0. 4credit).

Practice sessions (0.5 credits)

1. Raticulocyte countby supravital staining. (0.1credit)
2. Hb estimation by CMG method (0.1credit)
3. Preparation of bone marrow smear. (0.1credit)
4. Staining of bone marrow smear by Leishman's stain. (0.1 credit)
5. Staining of bone marrow smear May Grunwald Giesma (0.1 credit)
6. Procedure for LE cell preparation and examine it. (0.1 credit)
7. Preparation of thick and thin blood smear for malarial parasite. (0.1 credit)

UNIT –III (FNAC & pathology of tumor) (3 -0.1)

Theory (3 credits)

1. Tumors: Definition, types, microbes responsible for pathogenesis of tumors and oncogenesis, mechanism of oncogenesis.
2. Pathology of specific chronic disorder: Introduction, types, pathogenesis, laboratory diagnosis of - Tuberculosis, Leprosy, Syphilis, Rheumatological disorder.
3. FNAC (Fine Needle Aspiration Cytology) for diagnosis of acute and chronic microbial infection: Introduction, Application, procedure and advantage over surgical biopsy.
4. Introduction to the blood banking: basic principle.
5. Basic concepts of automation in hematology with special reference to: Blood cell counter Coagulometer.

Lab. Experiment: Practical (0.6 credit), D&T (0.2 credit)

1. To identify begin tumor cells. (0.1 credit),
2. To identify malignant tumor cells. (0.1 credit).
3. To study instruments used for FNAC. (0.1 credit)
4. Hematological test for TB. (0.1 credit)
5. Hematological test for leprosy. (0.1 credit)
6. Hematological test for Rheumatological disorder. (0.1 credit)

Recommended Text Books

1. Medical laboratory Technology by KL Mukherjee Volume-I.
2. Harsh Mohan, Text book of pathology
3. P. Godkar, Text book of Medical laboratory Technology.

Suggested Reading

1. De Gruchy's clinical haematology in medical practice

CLINICAL BIOCHEMISTRY

UNIT-I (Acid –Base disturbance & Biophysics technique) (2.2-0.1)

Theory (2.2credit)

1. Henderson – Hassalbach equation and its clinical application. Acid –Base disturbance and their clinical significance, Acidosis & alkalosis, Biological buffer system.
2. Concept of Clinical Sensitivity, specificity and factor affecting the clinical result. Biophysics techniques: - Principle and application of osmosis, dialysis, surface tension, sedimentation and viscosity.

Lab. Experiment: Practical (0.1 credit), D&T (0.2 credit)

1. Preparation of buffer (0.1 credit)

UNIT-II (Biochemical examination of urine & body fluids) **(**2.8-0.5)

Theory (2.8credit)

1. Biochemical Examination of urine sample: -Collection of urine, physiochemical characteristics and constituent, preservation and qualitative tests of urine for- billirubin, keton body, urobilinogen, glucose, Protein, Bile Salt, Bile Pigment etc.

Bence-Jones proteinuria and their clinical significance

2. Biological variation of bio-metabolites in various body fluids & their clinical significance: CSF, Plural Fluid, Ascitic Fluid etc.
3. Chemical examination of Stool: Occult Blood.

Lab. Experiment: Practical (0.5 credit), D&T (0.7 credit)
Practice sessions (0.5 credit),

1. Qualitative tests of urine for billirubin. (0.1credit)
2. Qualitative tests of urine for ketone body. (0.1credit)
3. Qualitative tests of urine for glucose. (0.1credit)
4. Qualitative tests of urine for Protein. (0.1credit)
5. Qualitative tests of urine for Bile Salt. (0.1credit)

UNIT-III (Glycosuria, Nutrition, Micro-albuminuria,) (2.5-0.3)

Theory (2.5credit)

1. Qualitative test of glycosuria, proteinuria, micro-albuminuria. Quantitative estimation of 24 hrs urine for albumin and 17-ketosteroids with their clinical significance. Qualitative test of inorganic urinary ingredients: Chloride, phosphate, sulphur compounds, sodium, potassium, calcium, magnesium and their clinical significance.

2. Nutrition: Introduction, Importance of nutrition, Calorific values. Respiratory quotient– definition & its significance**,** Energy requirement of a person. Basal metabolic rate: Definition, Normal values, factor affecting BMR**,** Special dynamic action of food**,** Physical activities - energy expenditure for various activities. Calculation of energy requirement of a person**,** balanced diet**,** recommended dietary allowances. Role of carbohydrates in diet: Digestible carbohydrates and dietary fibers**.** Role of lipids in diet**.** Role of proteins in diet: Quality of proteins - Biological value, net protein utilization, Nutritional aspects of proteins-essential and non essential amino acids. Nitrogen balance**,** Nutritional disorders.

Lab. Experiment: Practical (0.3 credit), D&T (0.2credit)

1 .Qualitative tests for, sodium. (0.1credit)

2 .Qualitative test of albumin in urine: Esbach's method. (0.1credit)

3. Qualitative tests for chloride (0.1credit)

Recommended Text Book

1. V.H Talib, A hand book of Medical laboratory Technology, CBS Publishers & distributors
2. U.Satyanarayan, Textbook of Medical Biochemistry

Suggested Reading

1. P. Godkar , Textbook of Medical lab Technology

MICROBIAL TECHNICAL METHODS

UNIT-I (Microscopy, Stain and staining methods) **(**2.7- 1.0)

Theory (2.7credit)

1. Microscopy: - Magnification, Numerical aperture, Resolution power and component of microscope. Use of immersion oil and care of microscope and common difficulties. Study of light microscope- dark field, fluorescent, phase-contrast microscope. Electron microscope-TEM and SEM, preparation of smear for electron microscope.

2. Staining techniques in microbiology: Stain & dye, significance of staining in bacteriology. classification of staining. Principle, procedures and interpretation of the following staining techniques - Simple staining, Negative staining, Gram's staining, Albert's stain , Neisser's stain , Ziehl –Neelsen staining , capsule staining, Flagella staining, Spore staining, Fontana stain for spirochetes. Stains for amoeba, fungi,and rickettsiae.

Lab. Experiment: Practical (1.0 credit), D&T (0.4 credit)

Practice sessions (0.4 credits)

1. Demostration of use, care and mentainance of microscope. 0.1credit)
2. To prepare India ink preparation to demonstrate negative staining. 0.1credit)
3. To demonstrate reagent preparation and procedure for Gram stain. (0.1credit)
4. To demonstrate reagent preparation and procedure for Albert stain. (0.1credit)
5. To demonstrate reagent preparation and procedure for Neisser's staining, Z-N staining, Capsule staining, (0.3credit)

6. Demonstration of flagella by staining methods. (0.1credit)
7. Spore staining. (0.1credit)
8. To demonstrate spirochetes by Fontana staining procedure (0.1credit)

UNIT-II (Experimental animals & AST) **(**2.7- 2.0)

Theory (2.7 credits)

1. Antimicrobial drug sensitivity test: Requirements, Different methods of sensitivity and interpretation of result.

2. Care and management of experimental animals:- General direction for care, material inoculated, necrosis, common disease and experimental procedure- Rabbits, Mic, Rats, Hamster, Monkey and fowl- their data, cage, feeding, and handling.

3. Principle, procedures and interpretation of the following biochemical tests for identification of different bacteria: Catalase , Coagulase , Indole , Methyl Red, Voges Proskauer , Urease , Citrate , Oxidase, TSIA, Nitrate reduction , Bile solubility, H 2 S production, Demonstration of motility, Hippurate hydrolysis Nagler's reaction, Cholera-red reaction

Lab. Experiment: Practical (2.0 credit), D&T (0.4 credit)

Practice sessions (0.4 credits)

1. Antimicrobial drug sensitivity test (Preparation of media, Inoculation of antibiotics & incubation and Interpretation of result). (0.3credit)
2. To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria: Catalase, Coagulase, Indole , Methyl Red (MR) , Voges Proskauer (VP), Urease , Citrate , Oxidase, TSIA , Nitrate reduction , Bile solubility , H2S production , Demonstration and motility, Hippurate hydrolysis, Nagler's reaction. (1.5 credits)
3. To demonstrate handling of experimental animals. (0.2 credits)

UNIT-III (Instruments Used in Microbiology) (2.6- 1.0)

Thoery (2.6 credit)

1. Introduction, Principle and demonstration of instruments: Autoclave, Incubator, hot air oven, laminar air flow,

2. Introduction and demonstration of instruments: Colony counter, Mac-intos field jar, inoculator etc in microbiology lab.

3. Introduction and demonstration of instruments inoculator, hot plate, distillation plant, centrifuge, Water bath, Magnetic stirrer, water bath, Deionizer etc in microbiology lab

4. Pure culture: Definition, isolation of pure culture, maintenance and preservation of pure cultures.

Lab. Experiment: Practical (1.0 credit), D&T (0.2credit)

Practice sessions (0.2credits)

1. Demonstration of handling of Autoclave, Incubator, hot air oven, laminar air flow. (0.3credit)
2. Demonstration of handling of hot plate, distillation plant, centrifuge, Water bath, Magnetic stirrer, water bath, Deionizer. (0.7credit)

Recommended Text Books

1. R.C Dubey, D.k Maheswari, Practical microbiology
2. P. Godkar, Text book of Medical Lab Technology
3. P.C Baweja, Medical Microbiology.

Suggested Reading

1. Practical Medical Microbiology by Mackie and McCartney.
1. District Laboratory Practice in tropical countries Vol II Microbiology by Monica Cheesbrough.

PREVENTIVE MEDICINE AND HEALTH CARE

UNIT-I (Pollution, Hygiene & Sanitation.) (3-0-0)

Theory (3credit)

1. Water, air and noise pollution: The concept of safe and wholesome water, removal of hardness of water, methods of purification of water on small scale and large scale. Standards of Water quality. Air and noise pollution and their prevention.
2. Hygine and sanitation: sanitation barriers, excreta disposal and disposal of hospital waste. Incineration and disinfection
3. Infection and control: Source and agent of infection in community. Microbial pathogenesis, toxigenicity and pathogenicity & virulence. Mode of transmission of infection, control of infection/disease by physical and chemical agents. Host factors controlling infection to men
4. Bacteriological examination of water & Food: Collection of specimen, bacteriological examination and control of swimming bath, membrane filter technique and isolation of pathogen.

UNIT-II (Epidemiology, Immunization) (3-0-0)

Theory (3credit)

1. Epidemiology: Epidemiology surveillance and control of infection in community infection. Methods of prevention and control- isolation of patient, quarantine and incubation period of various infectious disease. Emergance of drug resistance.
2. Prophylactic Immunization: definition, Controlled study of prophylactic vaccines and hazards immunization. Various national immunization programs and vaccine schedule.
3. Family welfare planning and child health care programs.

UNIT-III (Balance diet & Introduction to Nursing) (2- 1.0)

Theory (2credit)

1. Definition of Health, Determinants of Health, Health Indicators of India, Health Team, Concept, National Health Policy, National Health Programmes (Briefly Objectives and scope).
2. Healthcare by balance diet and yoga: Normal constituents of diet, balance diet and factor responsible for etiology of various nutritional disorders. Carcinogens in food. Role of regular exercise and yoga prevention and management of various disease.
3. Introduction to Nursing: What is Nursing ? Nursing principles. Inter-Personnel relationships. Bandaging -Basic turms, bandaging extremities, Triangular bandages and their application. Nursing Position, Bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Lab. Experiment: Practical (1.0 credit), D&T (0.5credit)
Practice sessions (0.5credits)

1. Recording of body temperature, respiration and pulse (0.2credit)
2. Simple aseptic technique, sterlization and disinfection (0.2credit)
3. Surgical Dressing: Observation of dressing procedures (0.2credit)
4. Surgical Dressing: Observation of dressing procedures (0.2credit
5. Demonstration of CPR procedure. (0.2credit0

Recommended Text Book

1. K. Perks, Sunder Lal, Adarsh Pandey, Textbook of Preventive Social Medicine

SYLLABUS OF B.Sc MLT 2ND YEAR

Program Structure – 2nd Year

(2nd Year consists of III, IV Semester)

Motive: This year students will be nourished with the knowledge of subjects like hematology & histo/cytopathology, bacteriology/virology and associated disease, metabolic processes and related techniques. At the completion of this year the students will be able to perform test for diagnosis of hematological, bacterial/viral disease and metabolic disorders.

III SEMESTER

Motive: This semester along with clinical biochemistry and microbiology, students will also gain a detailed knowledge of hematology & cytopathology and bacteriology. This will help them in performing coagulation, biochemical test and antibody identification for microbial disease.

Nature of Course	Name of course	C	T	D&T	P
Pathology	**Clinical Haematology–I:**Coagulation, Bleeding	**6**	3.5	0.5	2.0
	Clinical Haematology–II: Anaemia, Thallacemia, lecocytosis etc.	**4.4**	3.0	0.4	1.0
	Clinical Hematology–III: leukemia and lymphomas, multiple myelomas	**4.2**	3.0	0.2	1.0
	Practice sessions from I, II & III in University attached /recognized hospital.	**1.5**	0	0	15 sessions
Clinical Biochemistry	**Metabolic & Blood Biochemistry-I:** carbohydrates metabolism, GTT	**4.9**	3.7	0.4	0.8
	Metabolic & Blood Biochemistry -II: Lipid metabolism, ketone bodies, Lipid	**4.4**	3	0.4	1.0

	profiles.				
	Metabolic & Blood Biochemistry -III: Protein metabolism, urea cycle LFT.	**4.2**	3	0.2	0.8
	Practice sessions from I, II & III in University attached hospital /recognized hospital.	**1.5**	0	0	15 sessions
Medical Microbiology	**Bacterial Pathogens & Associated Disease -I:** Normal flora & enterobacteriaceae.	**5**	3.2	0.2	1.6
	Bacterial Pathogens & Associated Disease -II: Mycobacterium , Corynebacteria, Anthrax , host parasite interaction	**4.2**	3.0	0.2	1.0
	Bacterial Pathogens & Associated Disease -III: Streptococcus, Staphylococcus,etc	**4.3**	3.0	0.1	1.2
	Practice sessions from I, II & III in University attached hospital /recognized hospital..	**1.5**	0	0	15 sessions
Immunology	**Immunology–I:** Innate immunity, compliment, phagocytosis.	**3.7**	3	0.1	0.6
	Immunology–II: Antigens and Antibodies	**3.6**	3.0	0.2	0.4
	Immunology–III: Immune responses	**4.2**	3	0.2	1.0
	Practice sessions from I, II & III in University attached hospital/recognized hospital.	**0.5**	0	0	0
University Compulsory Course	**Women Rights and Law:**	**1**	1	0	0
	Extra-Curricular Activities	**1**	0	0	1
	Community Development Activities	**1**	0	0	1
University Optional Courses	**Professional Activities**	-	-	-	-
Total credits		**61**			

Note:

- **C represents number of credit per course**
- **T represents number of theory credit per course**
- **D&T represents demonstration & tutor in the lecture hall.**
- **P represents number of practical credits per course.**
- **PS represents number of practice sessions credit per course.**

CLINICAL HEMATOLOGY

UNIT-I (Coagulation, Bleeding Disorders) (3.5-2.0)

Theory (3.5 credit)

1. Coagulation: Normal haemostasis, mechanism of coagulation, coagulation regulation, Various coagulation disorders – pathogenesis & laboratory diagnosis. Correction studies for Factor deficiency. Quantitative assay of coagulation factors – principle and procedure. Screening of inhibitors - Inhibitors against coagulation factors, APLA.

2. Bleedind disorders: types of bleeding disorders, vascular abnormalities, Role of platelets in haemostatic, platelets function test, Platelets disorders – pathogenesis & laboratory diagnosis (Qualitative and quantitative).

3. Thrombosis & thrombohaemorrhegic disorders.

4. Karyotyping: Chromosomal studies in hematological disorders (PBLC and Bone marrow).

Lab. Experiments: Practical: (2.0credit), D&T (0.5credits)

Practice sessions (0.5 credits)

1. Determination of BT. (0.1credit)
2. 4. Determination of clotting time. (0.1credit)
3. Determination of PT and PTT. (0.1credit)
4. Determination of Partial Activated Prothrombin time. (0.1credit)
5. Determination of clot retraction time. (0.1credit)
6. Study the morphology of blood cells. (0.1credit)
7. Quantitative measurement of Fibrinogen. (0.1credit)
8. Screen inhibitors against Factor VIII and Factor IX. (0.1credit)
9. Calculating INR and determining the ISI of thromboplastin. (0.1credit)
10. Perform Euglobulin clot lysis test (ELT). (0.1credit)
11. Urea clot solubility test for factor XIII. (0.1credit)
12. Quantification of inhibitors (Bethesda method). (0.1credit)
13. Anti cardiolipin antibodies (ACA). (0.1credit)
14. APLA: Lupus Anticoagulant (LA). (0.1credit)
15. To perform various platelet function tests such as: whole blood clot retraction test, prothrombin consumption index (PCI), Platelet adhesion, aggregation test and PF3 availability test. (0.5 credit)

UNIT-II (Anaemia, Thallassemia, Lecocytosis) **(**3.0-1.0)

Theory (3.0credit)

1. Anaemias: Definition, Various types of anaemia - pathogenesis & laboratory diadgnosis. Change in blood morphology due to anaemia.

2. Hemoglobinopathy: Sickle cell anaemia and thalassemia – various type, pathogenesis laboratory diagnosis.

3. Lecocytosis, Neutropenia & pancytopania their causes and clinical significance. Infectious mononucleosis.

4. Morphologic Alterations in Neutrophils: Toxic granulation, Cytoplasmic vacuoles,Döhle bodies, May–Hegglin anomaly, Alder–Reilly anomaly, Pelger–Huët anomaly, Chédiak–Higashi syndrome.

5. Special Hematological tests. Demonstration of LE cells, Sickling tests, Osmotic fragility test, Investigation of G6PD deficiency, PNH (Proximal Nocturnal hemoglobinurea), NESTROF.

Lab. Experiments: Practical: (1.0credit), D&T (0.4credits)
Practice sessions (0.5 credits)

1. Tp prepare blood smear for investigation of anaemic condition (0.1credit)
2. To study blood smear of iron deficiency anaemia. (0.1credit)
3. To study blood smear of megaloblastic anaemia. (0.1credit)
4. To perform sickling test. (0.1credit)
5. To perform osmotic fragility test. (0.1credit)
6. Screening tests for enzymes deficiency: Pyruvate Kinase, G6PD. (0.1credit)
7. Preparation of LE cells (0.1credit)
8. Determination of Hb by CMG method. (0.1credit)
9. To demonstrate the presence of Hb-S by Sickling and solubility tests. (0.1credit)
10. Detection of Fibrin degradation products (FDPs). (0.1credit)

UNIT-III (Leukemia and Lymphomas, Multiple myelomas) (3.0-1.0)

Theory (3.0 credit)

1. Haematological malignancies: 1) Leukemias - defnition, classification, pathogenesis & laboratory diadgnosis of leukemias. 2) Lymphomas multiple myelomas - causes, pathogenesis & laboratory diadgnosis. 3) Multiple myelomas - causes, pathogenesis & laboratory diadgnosis.

3. Haematological disorders in pregnancy and their blood pictures, hematological change in AIDS, hematological aspects of Pediatric and Geriatric age group.

4. Using radioisotopes measurement of: Blood volume, Determination of Red cell volume and Plasma volume, Red cell life span, Platelet life span, Radiation hazards and its prevention, Disposal of radioactive material

Lab. Experiments: Practical: (1.0credit), D&T (0.2credits)
Practice sessions (0.5 credits)

1. Determination of TLC. (0.1credit)
2. Determination of RBC count. (0.1credit)
3. Determination of DLC . (0.1credit)
4. To study blood smear for AML. (0.1credit)
5. To study blood smear for CML. (0.1credit)
6. To study blood smear for ALL. (0.1credit)
7. To study blood smear for CLL. (0.1credit)
8. Detection of Fibrin degradation products (FDPs). (0.1credit)
9. To estimate serum iron and total iron binding capacity. (0.1credit)
10. To estimate Hb-F Hb A2 in a given blood sample. (0.1credit)

Recommended Text Books

1. Harsh Mohan, Text Book of pathology.
2. Godkar , Text book of Medical Laboratory Technology.
3. Medical laboratory Technology by KL Mukherjee Volume-I.

Suggested Reading

1. De Gruche, Clinical Hematology in medical practice.
2. Atlas of haematology (5 th edition) by G.A. McDonald

3. Clinical Diagnosis &Management by Laboratory methods (20 th edition) by John Bernard Henary.
4. Practical Haematology by JB Dacie.
5. Postgraduate Hematology by Hoffbrand.

METABOLIC & BLOOD BIOCHEMISTRY

UNIT-I (Carbohydrates Metabolism, GTT) (3.7-0.8)

Theory (3.7 credit)

1. Carbohydrete metabolism: Digestion & absorption, Glycolysis & 2, 3-BPG, TCA cycle and their clinical significance.

2.Glycogen metabolism & metabolic disorders of glycogen.

3.Glucose tolerance test, glycosylated Hb. Principle, procedure and clinical significance of glucose estimation.

4. Glyconeogenesis and its significance.

Lab. Experiments: Practical: (0.8 credit), D&T (0.4 credits)
Practice sessions (0.5 credits)

1. Estimation of plasma glucose fasting (0.1credit)
2. Estimation of plasma glucose post pendrum. (0.1credit)
3. Estimation of plasma glucose randum. (0.1credit)
4. To perform Glucose tolerance test (0.3credit)
5. Determination of glycosylated Hb (0.2credit)

UNIT-II (Lipid metabolism, Ketone bodies, and Lipid profiles) (3.0-1.0)

Theory (3.0 credits)

1. Lipid metabolism: Digestion and absorption, Beta oxidation of fatty acid. Ketone bodies-kitosis, ketogenesis, ketolysis & metabiolic change in liver during starvation.

2. Lipid profile: Triglyceride, Cholesterol, HDL, LDL & VLDL-their principle procedure & clinical significance. Electrolytes-quantitative estimation of sodium, potassium, calcium, chloride, and their clinical significance.

3. Renal function test & their clinical interpretation. Urea & creatinine clearance test, Acid base balance test, xylose absorption test & insulin tolerance test

Lab. Experiments: Practical: (1.0 credit), D&T (0.4credits)
Practice sessions (0.5 credits)

1. Estimation of serum total cholesterol. (0.1credits)
2. Estimation of serum HDL cholesterol. (0.1credits)
3. Estimation of serum triglyceride. (0.1credits)
4. Estimation of serum urea & BUN. (0.1credits)

5. Estimation of serum creatinine. (0.1credits
6. Estimation of serum sodium, potassium, calcium, chloride. (0.4credits)
7. Determination of ketone bodies (0.1credits

UNIT-III (protein metabolism, urea cycle LFT) (3-0.8)

Theory (3credit)

1. Protein metabolism: Digestion & absorption of protein, transamination & deamination, Urea cycle and their clinical significance, toxic effect of ammonia on human body.

2. Principle, procedure and clinical significance of total protein, albumin, globulins, and A/G ratio.

3. Principle, procedure and clinical significance of urea, BUN, uric acid, creatinine and bilirubin.

4. Liver function Test: formation & excretion of bilirubin, jaundice and clinical significance of LFT.

Lab. Experiments: Practical: (0.8credit), D&T (0.2 credits)
Practice sessions (0.5 credits)

1. Estimation of serum total protein, (0.1credit)
2. Estimation of serum total protein, albumin and A/G ratio. (0.1credit)
2. Estimation of serum uric acid. (0.1credit)
4. Estimation of serum ALT &AST . (0.1credit)
5. Estimation of serum total bilirubin. (0.1credit)
6. Estimation of serum direct bilirubin. (0.1credit)
7. Estimation of serum ALP. (0.1credit)
8. Determination of bile salt (0.1credit)

Recommended Text Books

1. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students
2. Satyanarayan, Medical biochemistry
3. P.Godkar, Text of Medical Laboratory technology.

Suggested Reading

1. Harper's Illustrated Biochemistry.

BACTERIAL PATHOGENS & ASSOCIATED DISEASE

UNIT-I (Normal Flora & Enterobacteriaceae) (3.2-1.6)

Theory (3.2 credit)

1. Normal microflora of human body: Skin, respiratory system & genitourinary tracts, source of infection, mode of spread, and portal of entry.

2. Systematic Bacteriology: staining, culture characteristics, selective culture media, biochemical reaction,mode of infection, incubation, virulence factors pathogenesis, pathology of Infections

and laboratory investigation of enterobacteriaceae family: 1.Escherichia coli, 2. Salmonella 3. Shigella 4. Proteous. 5. Pseudomonas 6. Klebsiella 7. Vibrio 8. Clostridia

Lab. Experiments: Practical: (1.6 credit), D&T (0.2credits)

Practice sessions (0.5 credits)

1. Identification of E.coli by culture & biochemical test . (0.2credit)
2. Identification of Salmonella by culture & biochemical test . . (0.2credit)
3. Identification of Shigella by culture & biochemical test. . (0.2credit)
4. Identification of Proteous i by culture & biochemical test. (0.2credits)
5. Identification of Pseudomonas by culture & biochemical test. (0.2credits)
6. Identification of Klebsiella by culture & biochemical test. (0.2credits)
7. Identification of Vibrio by culture & biochemical test. . (0.2credit)
8.

UNIT-II (Mycobacteria , Corynebacteria , Host Parasite Interaction) (3-1.0)

Theory (3.0)

1. Host, parasite interaction in bacterial infection, pathogenic properties of bacteria (Colonization of surface, invasion of tissue, production of exotoxin & Identification of Clostridia by culture & biochemical test. . (0.2credit)endotoxin). Antibacterial defence of host.

2.Morphology, staining, culture characteristics, selective culture media, biochemical reaction, mode of infection, incubation, Virulence factors, pathogenesis, pathology of Infections and laboratory investigation of :

1. Mycobacteria 2. Atypical mycobacteria 3. Corynebacteria, Listeria. 4. Anthrax bacillus 5. Brucella 6. Yersenia, Pasteurella & Francisella.

Lab. Experiments: Practical: (1.0credit), D&T (0.2credits)

Practice sessions (0.5 credits)

1. Identification of Mycobacteria by culture & biochemical test. (0.2credit)
2. Identification of Corynebacteria by culture & biochemical test. (0.2credit)
3. Identification of Listeria by culture & biochemical test. (0.2credit)
4. Identification of Yersenia by culture & biochemical test. (0.2credit)
5. Identification of Pasteurella by culture & biochemical test. (0.2credit)

UNIT-III (Streptococcus, Staphylococcus) (3.0-1.2)

Theory (3.0credit)

1. Nosocomial infection: Introduction, mode of transmission, factors, infection and prevention.
2. Morphology, staining, culture characteristics, selective culture media, biochemical reaction, serotyping, mode of infection, incubation, Virulence factors, pathogenesis, pathology of Infections and laboratory investigation of :1. Streptococcus,2. Staphylococcus,3. Pneumococcus, 4. Neisseria, 5. Bordetella & 6. Haemophilus

Lab. Experiments: Practical: (1.2 credit), D&T (0.1credits)

Practice sessions (0.5 credits)

1. Identification of Streptococcus by culture & biochemical test. (0.2credit)
2. Identification of Staphylococcus by culture & biochemical test. (0.2credit)
3. Identification of Pneumococcus by culture & biochemical test. (0.2credit)
4. Identification of Neisseria by culture & biochemical test. (0.2credit)

5. Identification of Bordetella by culture & biochemical test. (0.2credit)
6. Identification of Haemophilus by culture & biochemical test. (0.2credit)

Recommended Text Books

1. Anantha Narayan and Panikar, Textbook of Microbiology
2. Baweja, Medical Microbiology
3. Arora, Medical Lab Technology

Suggested reading

1. Pelczar, Microbiology.

2. Prescott, Microbiology.

IMMUNOLOGY

UNIT-I (Innate immunity, Compliment, Phagocytosis) (3-0.6)

Theory (3 credit)

1. Introduction, Innate & acquired immunity (adaptive immunity), mechanism of various types of innate immunity, phagocytosis, Opsonization.

2.Compliment system: Definition, compliment component & activation, compliment pathways- Clasical, alternate and lactin pathways. Compliment fixation test.

3. Cells and organs of immune system: Different cells of immune system and their function, primary and secondary organs of immune system.

Lab. Experiments: Practical: (0.6credit), D&T (0.1credits)
Practice session (0.1 credits)

1. Collection of blood sample by vein puncture, separation and preservation of serum. (0.1credit)
2. Demonstration of immune system via charts & videos. (0.1credits)
3. Demonstration of compliment system via charts &videos. (0.1credits)
4. Preparation of red cell suspension & sensitization. (0.1credit)
5. Demonstration of Compliment fixation test (0.1credit)
6. To perform compliment fixation test. (0.1credit)

UNIT-II (Antigens and Antibodies) (3.0-0.4)

Theory (3.0credit)

1. Antigens: Definition, general characteristics, types, hepten, carrier protein, epitopes, adjuvents,
2. Antibodies: Immunoglobulin vs antibodies, structure of antibodies, paratopes, different classes and their function.
3. Humoral Immunity: General characteristic, Antigen types, Antigen sensitization\Plasma cells.
4. Cell mediated immunity- General characteristics, antigen processing, Helper T (TH) cells, cytotoxic (killer) T (TC) cells, Natural killer (NK) cell, memory cells, lymphokine releas, superantigens.

Lab. Experiments: Practical: (0.4credit), D&T (0.2credits)
Practice session (0.2 credits)

1. Demonstration of antigen and antibody. (0.1credit)
2. Performing Haemolysin titration for Rose-Waaler test (0.1credit)
3. Demonstration of different immune cells. (0.1credit)
4. To perform antibody titration. (0.1credit)

UNIT-III (Immune Responses) (3-1.0)

Theory (3 credits)

1. Immune response: General properties of immune responses- recognition of self versus non self, clonal selection theory of B-cells, tolerance, Primary and secondary immune response against microbial invasion.
2. Antigen –Antibody reaction: stages, general properties and mechanism. Specificity, sensitivity and avidity.
3. Specific serological methods for diagnosis: Ag-Ab reaction & its feature, Measurment of antigen antibody reaction: Principle, procedure & application of agglutination, precipitation, Fluocculation. compliment fixation test, haemagglutination, Immunofluorescect assay, ELISA, RIA.
4. Introductions of Monoclonal Antibodies.
5. Factors That Modify Immune Responses: 1) Compromised host , 2) Modifying factors, Age, Stress, Diet, Exercise, Injuries, Environmental factors, Hypersensitivity reactions, Autoimmune disorders, Transplantation immunolog**y**

Lab. Experiments: Practical: (1.0 credit), D&T (0.2 credits)
Practice session (0.2 credits)

1. Demonstration of agglutination test via widal test (0.1 credit)
2. Demonstration of agglutination blood grouping (slide method) (0.1credit)
3. Demonstration of flocculation test via RPR test. (0.1credit)
4. Demonstration of precipitation test (0.1credit)
5. Demonstration of haemagglutination test (0.1credit)
6. Demonstration of ELISA test (0.1credit)
7. Demonstration of radial immuno diffusion test. (0.3credit)
8. Demonstration of Immunofluorescect assay. (0.1credit)

Recomemded Text Books

1. Anantha Narayan and Panikar , Textbook of Microbiology
2. Baweja, Medical Microbiology, Text book of Microbiology
3. P. Chakraborty, Text book of Microbiology

Suggested Reading

1. Kuby, Immunology
2. Medical Laboratory manual for tropical countries Vol II Microbiology by Monica Cheesbrough
3.Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2

WOMEN RIGHTS AND LAW

Credits-1

Objective: The paper aims at creating awareness as to importance and role of women in society through the medium of law. It also focuses on women welfare laws.

Unit – I: (Meaning of law) (0.5 Credits)

Meaning of law ,Constitutional Safeguards for Women, Right to Equality (Art-14),Life & Personal Liberty, Right to Education (Art-21,21-A), Right against Sexual Exploitation (Art-23,24), Constitutional Remedies (Writs- Art-32-35), Participation in Panchayat and Municipalities, Marriage : Conditions,Ceremonies,Registration, Restitution of Conjugal Rights, Judicial Separation, Void & Voidable Marriages, Legitimacy of Children of Void & Voidable Marriages, Punishment of Bigamy, Divorce Common Grounds for Divorce, No Petition for divorce within 1year of marriage, Divorced Person when may marry again,Maintenance: Wife, widowed daughter-in-law, Children, Amount of Maintenance , Interim Maintenance, Maintenance Provisions under Cr.PC, Adoption: Requisites of a valid adoption,Capacity of a male Hindu to take in adoption, Capacity of a female Hindu to take in adoption, Persons capable of giving in adoption, Persons who may be adopted, Effects of Adoption,.

Unit – II: (Indian Penal Code) (0.5 Credit)

Indian Penal Code, 1860 Right of Private Defence, Dowry Death, Abetment of Suicide, Cruelty by Husband or Relatives of Husband, Sex Selection & Causing Miscarriage, Hurt & Grievous Hurt, Wrongful Restraint & Confinement, Outraging the modesty of a woman, Kidnapping and Abduction, Offences regarding Prostitution, Rape, Bigamy, Adultery, Domestic Violence, Sex Determination Test -The Medical Termination of Pregnancy Act, 1971, The Pre-Conception and Pre-Natal Diagnostic Techniques Act, 1994, Reproductive Technologies: Meaning, Concept & Challenges of A.I, IVF & Surrogacy, Right of HIV/ AIDS Victims, Introduction to Consumer Protection Act , Tenancy Act, Right to Information Act, Motor Vehicles Act, Intellectual Property Rights, Act & Rules Maternity Benefits Act 1961.

Recommended Books:

1. Law relating to Women – S.R.Myneni
2. Law relating to Women – Dr. S.C. Tripathi

Suggested Readings:

1. Women and Law – Prof. Nomita Aggarwal
2. Women and Law – Dr. Manjula Batra
3. Women and Law – G.P. Reddy

IV SEMESTER

Motive: This semester along students will gain a detailed knowledge of Histo/Cytopathology technique, biochemical techniques & virology. This will help them in understanding the techniques to demonstrate microscopic anatomy of cells and tissues of diseased condition, diagnosis of viral disease and advance techniques in biochemistry for diagnosis of disease. Students will have the specific knowledge to find out the disease using various body fluid and materials, in the field of clinical pathology.

Nature of Course	Name of course	C	T	D&T	P
Pathology	**Histopathological Techniques – I:** Decalcification,Fixation and various fixatives	**4.2**	3	0.2	1.0
	Histopathological Techniques –II: Microtome, Mounting and mounting media	**4.9**	3.5	0.4	1.0
	Histopathological Techniques -III: Solvent, mordents, accelerators and accentuators	**4.4**	3	0.4	1.0
	Practice sessions from I & II in University attached lab. / recognized hospitals.	**1.5**	0	0	15 sessions
Clinical Biochemistry	**Biochemical & Biophysical Techniques –I:** Chromatography, electrophoresis.	**5.3**	3.1	0.4	1.8
	Biochemical & Biophysical Techniques – II: techniques, autoanalyzer.	**4.2**	3	0.4	0.8
	Biochemical & Biophysical Techniques – III: ELISA, Bloting, RIA	**4.2**	3	0.2	1.0
	Practice sessions from I, II & III in University attached lab /recognized hospital.	**1.5**	0	0	15 sessions
Medical Microbiology	**Pathogenic Viruses -I:** General properties, classification and cultivation of viruses. Lab diagnosis of viral infections. Pox viruses, HIV.	**4.9**	3.5	0.4	1.0
	Pathogenic Viruses -II: Orthomyxoviruses, Paramyxoviruses, Picrona virus etc.	**4.2**	3	0.2	1.0

	Pathogenic Viruses -III: Hepatitis Viruses, Rhabdo, Slow and oncogenic viruses etc.	**4.4**	3.0	0.4	1.0
	Practice sessions from I, II & III in University attached hospital /recognized hospital.	**1.5**	0	0	15 sessions
Clinical Pathology	**Clinical Pathology –I:** Examination of urine,	**5**	3	0.5	1.5
	Clinical Pathology –II: Pericardial, Pleural, Peritoneal, Amniotic and Synovial CSF.	**4.2**	3.0	0.2	1.0
	Clinical Pathology–III: Sputum, Stool Examination, Semen analysis.	**4**	3.0	0.3	1.0
	Practice sessions from I, II & III in University attached /recognized hospital.	**2**	0	0	20 sessions
University Compulsory Course	**Extra-Curricular Activities**	**1**	0	0	1
	Community Development Activities	**1**	0	0	1
University Optional Courses	**Professional Activities**	-	-	-	-
Total credits		**62**			

Note:

- **C represents number of credit per course**
- **T represents number of theory credit per course**
- **D&T represents demonstration & tutor in the lecture hall.**
- **P represents number of practical credits per course.**
- **PS represents number of practice sessions credit per course.**

HISTOPATHOLOGICAL TECHNIQUES

UNIT-I (Decalcification,Fixation and various Fixatives)(3-1.0)

Theory (3credits)

1**.** Introduction to Histopathology. Safety measures in a histopathology laboratory, Histopathological specimens, Collection and transportation of specimens for histological examination. Basic concepts about routine methods of examination of tissues.

2. Care and maintenance of laboratory equipment used in histotechnology. Basic steps for tissue processing- Fixing, dehydration, clearing, impregnation, Embedding, Microtomy, Staining.

2. Fixation: introduction, criteria of a good fixative, various fixatives - Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements. Procedure for tissue processing for paraffin embedding.
4. Components & principles of various types of automatic tissue Processors. Embedding: Definition, Various types of embedding media

Lab. Experiments: Practical: (1.0 credit), D&T (0.2 credits)
Practice session (0.5 credits)
1. Reception and labeling of histological specimens (0.1 credit)
2. Preparation of various fixatives - 10% Neutral formalin, Formal saline, Formal acetic acid , Pereyn's fluid. (0.2credit)
3. Preparation of various fixatives - Helly's fluid, Zenker's fluid, Bouin's fluid , Corney's fluid. (0.2 credit)
4. To perform fixation of tissue. (0.1 credit)
5. To prepare ascending and descending grades of alcohol from absolute alcohol. (0.1 credit)
6. Processing of tissues for paraffin block by manual method. (0.1credit)
7. Demonstration of microtomes. (0.1credit)

UNIT-II (Microtome, Mounting and Mounting media) (3.5-1.0)
Theory (3.5credit)
1. 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.
2. Equipment Used For Section Cutting: 1) Microtome – components of microtome, types of microtome & application. 2) Microtome knives - types, Knives sharpening – Honing and Stropping, care & maintenance.
3. Freezing microtome and various types of Cryostats, Frozen sections. Faults in paraffin section cutting with reason and remedy, spreading the sections and attachment or mounting of sections to glass slides.
Lab. Experiments: Practical: (1.0 credit), D&T (0.4credits)
Practice sessions (0.5credits)
1. Preparation of decalcifying fluids. (0.1credit)
2. To process a bone for decalcification (0. 2credit)
3. Preparation of tissue block. (0.2credit)
4. To demonstrate various part and types of microtome. (0.1credit)
5. To learn sharpening of microtome knife (Honing and stropping technique). (0.2credit)
6. To perform section cutting (0.1credit)
7. To practice attachment of tissue sections to glass slides. (0.1credit)
8. To learn using tissue floatation bath and drying of sections in oven (60-65 ^{0} C). (0.1credit)

UNIT-III (Solvent, Mordents, Accelerators and Accentuators) (3-1.0)
Theory (3credit)
1. Solvent, mordents, accelerators and accentuators, Metachromasia and metachromatic dyes.
2. Dye chemistry procedures & Staining Methods: Theory of Staining, Classifications of dyes, Principles of Dye Chemistry. Types of stains, their preparation and uses - Hematoxylin & its various types, Eosin, Azures etc. Nuclear Stains and Cytoplasmic stains. Routine staining

procedures: H & E staining, Mallory's Phosphotungstic Acid Haematoxylin (PTAH) staining, PAP staining - Compositions, principle, procedures and applications.
3. Amyloids and pigments.
4. Mounting and mounting media
5. Museum Techniques

Lab. Experiments: Practical: (1.0credit), D&T (0.4credits)
Practice session (0.5 Credits)

1. Preparation of Haematoxylin and Eosin stain. (0.2credit)
2. To perform & practice the Haematoxylin and Eosin staining technique. (0.2credit)
3. To perform & practice the Mallory's Phospho tungstic Acid Haematoxylin (PTAH). (0.2credit)
4. To perform & practice the PAP staining. (0.2credit)
5. To learn mounting of stained smears. (0.2credit)

Recommended Text Book

1. Praful Godkar, Textbook of Medical Laboratory Technology.
2. Handbook of Histopathological Techniques by C F A Culling

Suggested Reading

1. An Introduction to Medical Lab Technology by F J Baker and Si

lverton
2. Medical Lab technology by Lynch.
3.Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft

BIOCHEMICAL & BIOPHYSICAL TECHNIQUES

UNIT-I (Chromatography, Electrophoresis) (3.1-1.8)

Theory (3.1 credits)

1. Chromatography: Thin layer chromatography, gas liquid Chromatography.
2. Electrophoresis: Paper and gel electrophoresis for hemoglobin, urinary proteins, serum, CSF and LDH.
3. Chlorimetry, spectrophotometry, atomic absorption spectroscopy, Flame photometry-Principle, instrumentation and application.

Lab. Experiments: Practical: (1.8credit), D&T (0.4 credits)
Practice session (0.5 credits)

1. To demonstrate the principle, working & maintenance of spectrophotometer. (0.1 credits)
2. To demonstrate the principle, working & maintenance of colorimeter. (0.1 credits)
3. To demonstrate the principle, working & maintenance of flame photometer. (0.1 credits)
4. To demonstrate the principle, procedure of paper chromatography. (0.1 credits)
5. To demonstrate the principle & procedure of Gas chromatography. (0.2 credits)
6. To demonstrate the principle & demonstration of TLC. (0.2 credits)
7. To demonstrate the principle & procedure of column chromatography. (0.2 credits)
8. To demonstrate the principle & procedure of reducing SDS PAGE. (0.2 credits)
9. To demonstrate the principle & procedure of reducing SDS PAGE. (0.2 credits)
10. To demonstrate the principle & procedure of continuous PAGE. (0.2 credits)
11. To demonstrate the principle & procedure of Agarose gel Electrophoresis. (0.2 credits)

UNIT-II (Immunological Reactions, Autoanalyzer) (3-0.8)

Theory (3credit)

1. Autoanalyzer: Semi-autoanalyzer, fully-automated analyzer, diluter and dry chemistry analyzer- principle, procedure and application.
2.Immunochemical, immunoprecipitation, immunofixation and radial immunodiffusion tests.
3. Osmometry: principle, procedure and application.

Lab. Experiments: Practical: (0.8credit), D&T (0.4 credits)
Practice sessions (0.5credits)

1. To demonstrate the principle & procedure of semiautoanalyser. (0.1 credits)
2. To demonstrate the principle & procedure of fully autoanalyser. (0.1 credits)
3. To demonstrate immunoprecipitation reaction test (0.2credit)
4. To demonstrate radial immunodiffusion test. (0.2credit)
5. To demonstrate immunoagglutinations (0.2credit)

UNIT-III (ELISA, RIA) (3-0.2)

Theory (3credit)

1. Coulter counters: principle, procedure and application.
2. Enzyme Linked Immunesorvent Assay: principle, procedure and application. ELISA reader.
3. Radio Immunoassay (RIA): principle, procedure and application.
4. Polymarase Chain Reaction (PCR): principle, procedure and application.

Lab. Experiments: Practical: (1.0 credit), D&T (0.2credits)
Practice sessions (0.5 credits)

1. To demonstrate the principle & procedure of Coulter counters. (0.1 credits)
2. To demonstrate the principle & procedure of ELISA reader. (0.1 credits)
3. To demonstrate the principle & procedure of sandwitch ELISA . (0.2 credits)
4. To demonstrate the principle & procedure of indirect ELISA . (0.2 credits)
5. To demonstrate the principle & procedure of PCR instrumennt . (0.1 credits)
6. To demonstrate the principle & procedure of PCT . (0.2 credits)
7. To demonstrate the principle & procedure of RIA . (0.1 credits)

Recommended Text Books

1. S.K Sawahney & Randhir singh, Introductory practical Biochemistry.
2. Text book of Medical Laboratory Technology by P. B. Godker
3. D.M vasudevan, Text book of medical biochemistry.
4. Medical Laboratory Technology by Mukherjee

Reference Books

1. Kaith Wilson, & Johnn Walker, Principle and techniques of biochemistry and Molecular biology
2. Practical Clinical Biochemistry by Harold Varley
3. Instrumental Analysis by Chatwal Anand

PATHOGENIC VIRUSES

UNIT-I (General properties, classification of viruses) (3.5-1.0)

Theory (3.5credit)

1. General properties, classification and cultivation of viruses. Lab diagnosis of viral infections. Bacteriophages
2. General properties, diseases caused, lab diagnosis and prevention of following viruses: a) Pox viruses–Small pox, vaccinia & molluscum contagiosum. b) Herpes viruses–H. simplex, zoster, CMV, IMN & burkit lymphomas.
3. General properties, diseases caused lab diagnosis and prevention of Adenoviruses and Retro viruses – HIV.
4. Staining techniques used in Virology.

Lab. Experiments: Practical: (1.0 credit), D&T (0.4credits)

Practice sessions (0.5 credits)

1. Demonstration of H. simplex antibody via ELISA Spots test, (0.2credit)
2. Demonstration of CMV via ELISA (0.2credit)
3. Demonstration of HIV 1 & 2 antigen via ELISA (0.2credit)
4. Demonstration of HIV 1 & 2 antigen by rapid test (0.2credit)
5. Demonstration of different symetri of viruses via chart/ models. (0.2credit)

UNIT-II (Orthomyxoviruses, Paramyxoviruses, Picrona virsus) (3.0-1.0)

Theory (3.0credit)

1. Orthomyxoviruses: Influenza types A, B and C etc–general properties, diseases caused, lab diagnosis and prevention
2. Paramyxoviruses: respiratory infection, mumps and measles.
3. Miscellaneous viruses: SARS, Rubella, Corona and Arena viruses– caused , lab diagnosis and prevention.
4. Picrona virus: Polio virus -Poliomylitis, Rhinoviruses- Common cold**.**
5. Collection, transportation and storage of sample for viral diagnosis.

Lab. Experiments: Practical: (1.0), D&T (0.2credits)

Practice session (0.5 credits)

1. Demonstration of sampling for H1N1. (0.1credit)
2. Demonstration of test for H1N1. (0.2credit)
3. Demonstration of sampling for H1N5. (0.1credit)
4. Demonstration of test for H1N5. (0.2credit)
5. Demonstration of sampling for SARS. (0.1credit)
6. Demonstration of test for SARS. (0.2credit)
7. Demonstration of inoculation of viruse in egg for culture. (0.1credit)

UNIT-III (Hepatitis Viruses, Rhabdo viruses, Slow viruses) (3.0-1.0)

Theory (3.0 credits)

1. Hepatitis Viruses: Infectious and serum hepatitis.
2. Arbo viruses: Chikungunya, Dengue fever.
3. Rhabdo viruses: Rabies
4. Slow and oncogenic viruses: scrapie, kuru and animal virus, tumors

5. Cell culture and observation of effect viruses on cell culture: Technique, procedure and interpretation of result.
6. Processing of samples for viral diagnosis (Egg inoculation and tissue culture)

Lab. Experiments: Practical: (1.0), D&T (0.4credits)
Practice session (0.5 credits)

1. Demonstration of Spot test for Dengue . (0.1credit)
2. Demonstration of ELISA test for Dengue. (0.2credit)
3. Demonstration of Spot test HBsAg. (0.1credit)
4. Demonstration of ELISA HBsAg. (0.2credit)
5. Demonstration of anti-HCV-Ab via ELISA. (0.2credit)
6. Demonstration of culture of viruses on cell. (0.2credit)

Recommended Text Books

1. Anantha Narayan and Panikar, Textbook of Microbiology
2. Baweja, Medical Microbiology,
3. P. Chakraborthy, Textbook of Microbiology.

Suggested Reading

1. Prescott, Microbiology

CLINICAL PATHOLOGY

UNIT-I (Examination of urine) (3-0.1.5)

Theory (3credit)

1. Introduction to clinical pathology and Laboratory organization and management.
2. Urine: Composition of urine, Collection, Transport, Preservation of urine. Urine examination for detection of abnormal constituents: Routine examination -

A. Physical Examination: Volume Specific gravity, Color, Turbidity, Odor etc. and their clinical significance.

B. Chemical examination: Qualitative test and clinical significance of – Reaction, Blood protein, albumin, Bence-Johns protein, ,reducing substances(sugar), ketone bodies, urobilinogen & urobilin, Bile, homogenistic acid, 5- hydroxyindoloacetic acid, Calcium, Cysteine, Fat, mucin, Porphyrins in urine. Strip Techology.

C. Microscopic Examination: Procedure of urine examination. Presence of various cells, Ova and parasites, various crystals and their identification, casts-their types and identification etc. in urine their clinical significance.

3. Significance of urinary finding in evaluation of kidney and kidney function test: General consideration, Test of Renal Blood Flow, Test of Glomerular Filtration- urea clearance test, Creatine clearance test. Glomerular Filtration rate (GFR) - Inuline clearance test. Test of Tubular function – Concentration and Dilution test.Test of Tubular Excretion and Reabsoption test- Indigo -Carmine test, Phenolsulfonphthalein (PSP) test.

Lab. Experiments: Practical: (1.5 credit), D&T (0.5 credits)
Practice sessions (1.0 credits)

1. To study collection of urine for routine examination. (0.1credit)
2. To perform preservation of urine for examination. (0.1credit)
3. To perform physical examination of urine. (0.1credit)
4. Microscopic examination of urine. (0.1credit)
5 .Qualitative test of protein in urine (0.1credit)
6. Qualitative test of albumin in urine (0.1credit)
7. Qualitative test of reducing substance (sugar) in urine. (0.1credit)

8. Test for ketone bodies (0.1credit)
9. Qualitative test for BJ protein. (0.1credit)
10. Qualitative test for bile salt. (0.1credit)
11. Qualitative test for blood in urine. (0.1credit)
12. To perform esbatch test. (0.1credit)
13. Qualitative test for bile pigment. (0.1credit)
14. Qualitative test for uribilin. (0.1credit)
15. Biochemical examination of urine by strip test method. (0.1credit)

UNIT-II (Pericardial, Pleural, Peritoneal, Synovial, CSF) (3.0-1.0)

Theory (3.0credit)

1. C.S.F (Cerebrospinal Fluid)**:** Introduction and normal physiology of CSF. Normal values for lumbar C.S.F in adults: Presure, volume, Specific gravity, various cells, Proteins and other various organic and inorganic constituents. Collection, transport and preservation of C.S.F.

A.Physical Examination: Appearance and colour, Formation of clot

B.Chemical Examination: Estimation of total proteins, Qualitative test for globulin, Quantitative protein estimation.

C. Microscopic Examination: Cell counts: RBC count, Total leukocyte count, DLC.

D.Bacteriological examination: smear, culture, serological test.Form of reporting on specimen of CSF fluid.

2. Gastric Analysis**:** Introduction of gastric content, chief constituents of gastric juice, Collection of gastric content.

Examination of Resting gastric contents: colour, volume, odour, mucous etc and their clinical significance.

a. Detection of blood, Detection of bile.
b. Detection and estimation of gastric acid.
c. Testing of total and free acid.
d. Test of lactic acid.
e. Test of HCL.

2. Pericardial, Pleural, Peritoneal, Amniotic and Synovial Fluids**:** Physical, Chemical examination.Cytological examination – Differential cell count, Cytological examination for tumour cells. Bacteriological Examination- Gram and ZN staining on smear from the sediment, Culture on suitable media.

Lab. Experiments: Practical: (1.0 credit), D&T (0.2credits)

Practice sessions (0.5 credits)

1. Demonstration of collection of CSF. (0.1credit)
2. To perform physical examination of CSF. (0.1credit)
3. Microscopic examination of CSF. (0.1credit)
4 . Biochemical examination of CSF. (0.1credit)
5. Demonstration of collection of gastric juice. (0.1credit)
6. Routine examination of gastric juice. (0.1credit)
7. Routine examination of pericardial, Pleural, Peritoneal, Amniotic and Synovial Fluids. (0.4 credit)

UNIT-III (Sputum, Stool Examination, Semen analysis) (3.0-1.0)

Theory (3.0 credits)

1. Seminal fluid**:** Introduction, Collection of semen.

1) Routine Examination-

a. Physical examination: Quantity, Viscosity, Colour, Reaction and their clinical significance.

b. Microscopic examination of semen: Sperm count, motility of spermatozoa, Morphological examination of spermatozoa, other various cells.

2) Form for reporting routine, semen examination.

1. Sputum: Introduction, collection of specimen of semen.

1) Routine Examination:

a. Physical examination : Quantity, Appearance and consistency and etc.

b. Microscopic Examination: a) A wet or coverslip preparation-Elastic fibre, crystals, fungi, parasite, cells etc., b)Stained smear- leishman or Giemsa, Gram and ZN staining.

Special methods for detaction of Mycobacterium tuberculosis- Fluorescence microscopy, concentration method.

2) Exfoliative cytology on sputum.

3) Form for reporting routine, semen examination.

2. Stool**:** Introduction, Collection of specimen for stool examination. Normal appearance and composition.

1. Physical examination: Amount, Form and consistency, colour, odour, reaction, mucous and their significance.
2. Chemical examination: Occult blood, Bilirubin, Stercobilin, urobilinogen, fat and nitrogen etc.
3. Microscopic Examination: Intestinal parasites/ova/cyst, pathogenic bacteria, cellular exudates and Erythrocytes etc.

a) Preparation- saline and iodine preparation

b) Examination: presence of Intestinal parasites/ova/cyst, pathogenic bacteria, cellular exudates and Erythrocytes etc

4. Concentration Techniques: Concentrated saline floatation, Formal Ether Concentration

Lab. Experiments: Practical: (1.0credit), D&T (0.3credits)

Practice sessions (0.5credits)

1. Physical examination of semen. (0.1credit)
2. Biochemical examination of semen. (0.2credit)
3. Microscopic examination of semen. (0.4credit)
1. Wet preparation of Sputum. (0.1credit)
2. Preparation and examination of stool. (0.1credit)
3. Qualitative test for occult blood in stool. (0.1credit)

Recommended Text Book

1. V.H Talib, A hand book of medical laboratory technology.

Suggested Reading

1.P.Godkar, A text book of medical laboratory technology.

SYLLABUS OF B. Sc MLT 3RD YEAR

Program Structure – 3rd Year

(3rd Year consists of V, VI Semester)

3rd Year Motive: This year students will be nourished with the knowledge of subjects like Transfusion medicine, Enzymology, Mycology, Biostatistics, Histopathology, Endocrinology, & Research Methodology. At the completion of this year the students will be able to perform all the relevant lab tests for specific pathological tests and will also be able to perform research work in the laboratories and analyze their outcome.

V– SEMESTER

Motive: In this semester students will gain the knowledge of transfusion medicine (blood banking), biochemistry of hormone & their role in diagnosis, pathogenic fungi & biostatistics. Students will get outlines of environmental studies and disaster management.

Nature of Course	Name of course	C	T	D&T	P
Pathology	**Blood Banking & Transfusion Medicine – I:** Blood group system, Blood grouping techniques, ABO discrepancies	**4.5**	3	0.5	1.0
	Blood Banking & Transfusion Medicine – II: Principle of transfusion, Blood donation, Donor screening	**4.5**	3	0.5	1.0
	Blood Banking & Transfusion Medicine – III: Blood components, Compatibility Testing, Transfusion Reactions	**5**	3.5	0.5	1.0
	Practice sessions from I, II & III in University attached hospital/recognized hospital.	**2.0**	0	0	20 sessions
Clinical Biochemistry	**Diagnostic Enzymology-I:** Classification of enzymes, Enzyme specificity, Enzyme inhibition	**4**	4	0	0
	Diagnostic Enzymology-II: Isoenzymes, Significance & estimation of diagnostic enzymes	**4.5**	3	0.5	1.0
	Diagnostic Enzymology-III: Calculi, Electrolytes & Vitamins	**3.5**	2.2	0.5	0.8
	Practice sessions from I & II in University attached /recognized hospital.	**1.5**	0	0	15 sessions
Medical Microbiology	**Clinical Mycology-I:** Introduction to mycology, classification & characteristics of fungi.	**4.7**	3.2	0.5	1.0
	Clinical Mycology -II: Superficial Mycoses, Subcutaneous Mycoses & Systemic Mycoses	**4.2**	3.3	0.2	0.7
	Clinical Mycology-III: Introduction & Lab Diagnosis of Miscellaneous Microbes	**4**	3.3	0.3	1.0
	Practice sessions from I & II in University attached /recognized hospital.	**1.5**	0	0	15

					sessions
Biostatistics	**Biostatistics-I:** Introduction, Tabulation of data, Measure of Central Tendency	**3.5**	3.5	0	0
	Biostatistics-II: Measure of Variability, Probability, Correlation & Regression	**3.5**	3.5	0	0
	Biostatistics-III: Chi-square test, Analysis of variance & covariance, Sampling	**3**	3	0	0
	Practice sessions from I, II & III in University attached lab. /recognized hospital.	**0**	0	0	0
University Compulsory Course	**Extra-Curricular Activities**	**1**	0	0	1
	Community Development Activities	**1**	0	0	1
University Optional Courses	**Professional Activities**	**-**	**-**	**-**	**-**
Total credits		**59**			

Note:

- **C represents number of credit per course**
- **T represents number of theory credit per course**
- **D&T represents demonstration &tutor in the lecture hall.**
- **P represents number of practical credits per course.**
- **PS represents number of practice sessions credit per course.**

BLOOD BANKING & TRANSFUSION MEDICINE

UNIT-I (Blood group system, Blood grouping techniques, ABO discrepancies) (3-1.0)

Theory (3 credits)

1. Blood group system: Introduction, human blood group system, ABO grouping antigens on red cell, antibodies to ABO antigens. Rh System: Rh antigens & Rh antibodies & its aignificances. Antisera used in ABO grouping procedures. Red cells preparation & significance.

2. Blood grouping techniques: Principal of blood grouping, Antigen-antibody reaction: agglutination, haem agglutination, latex agglutination precipitation and flocculation. Forward and reverse ABO grouping & significance. Slide & tube method methods for ABO grouping. Use of gel & beads techniques in blood grouping.

3. D^u antigen & significance, Difficulties & discrepancies in ABO grouping. Rouleaux formation & its interference with blood grouping, Auto agglutinins. Haemolytic disease of newborn (HDN) & its prevention. Inheritance of the blood groups. Medical applications of Blood groups.

Lab. Experiments: Practical (1.0 credit), D& T (0.5credits)

Practice sessions (1.0 credits)

1. Forward blood grouping and Rh typing by slide method. (0.1credit)
2. Preparation of 5% A, B & O red cell's suspension (0.1credit)
3. Forward grouping by tube method. (0.1 credit)
4. Preparation of A-cell, B-cell & O-cell reagent. 0.1 credit)
5. Reverse blood grouping by tube method. (0.1credit)
6. Du test for detection of Du antigens. (0.2 credit)
7. Demonstration of blood group by gel technique. (0.2 credit)
8. Demonstration of blood group by gel technique. (0.1 credit)

UNIT-II (Principle of transfusion, Blood donation, Donor blood screening) (3-1.0)

Theory (3 credits)

1. Blood Transfusion: Introduction of transfusion medicine & principle of blood transfusion. Guide lines for the use of blood in transfusion. Blood bank organization, Significance of standard operating procedures (SOP) for uses. Objectives of quality assurance in blood transfusion services and quality control in the blood bank.

2. Blood donation: Introduction & types of donor, Blood donor requirements, Criteria for selection & rejection of donor, Health checks before donating blood. Blood Collection: Techniques of collecting blood from a donor, Blood bags & anticoagulants, Instructions given to the donor before & after blood donation. Adverse donor reactions & their remedies.

3. Testing of Donor Blood: Antibodies screening - Coomb's test, AHG reagent. Screening of transfusion transmitted infection (TTI). Bacterially contaminated blood. Storage of blood. Changes in donor blood after storage. Criteria for transportation of blood & its components. Autologous blood transfusion practices.

Lab. Experiments: Practical (1.0 credit), D& T (0.5credits)
Practice sessions (0.5 credits)

1. Direct coomb's test for antibodies in donor blood. (0.2 credit)
2. Indirect coomb's test for antibodies in donor blood. (0.2 credit)
3. Testing of donor's blood for HIV. (0.1 credit)
4. Testing of donor's blood for HBsAg. (0.1credit)
5. Testing of donor's blood for syphilis. (0.1 credit)
6. To study screening of donor. (0.1 credit)
7. Demonstration of adverse donor reactions. (0.1 credit)
8. To study to check bacterially contaminated blood bags. (0.1 credit)

UNIT-III (Blood components, Compatibility Testing, Transfusion Reactions) (3.5 -1.0)

Theory (3.5 credits)

1. Blood components:Collection of blood components for fractional transfusion. Preparation, storage, Quality control and use of PRC (Packed Red Cell), FFP (Fresh Frozen Plasma), PRP (Platelet Rich Plasma & RDPC (Random Donor Platelets Concentrate) etc. Cryo-preparation and its significance.

2. Compatibility Testing: Introduction, Cross matching-principle, procedure and its significance. Factors including auto antibodies, plasma expenders, multiple myeloma affecting cross-matching, Difficulties in cross-matching & their remedies.

3. Blood Transfusion Reactions: Investigation of a transfusion reaction. Various transfusion reactions, Actions to take on transfusion reaction. Aphaeresis: Introduction, Types & donor selection, principle, procedure & significance of uses.

Lab. Experiments: Practical (1.0 credit), D& T (0.5credits)
Practice sessions (0.5 credits)

1. Demonstration of collection of blood from donor. (0.1 credit)
2. Demonstration of packing of blood bag for separation in centrifuge. (0.1 credit)
3. Demonstration of component separation. (0.1 credit)

4. To perform Minor cross matching. (0.3 credit)
5 . To perform Major cross matching. (0.3 credit)
6. Demonstration of apharesis techniques. (0.1 credit)

Recommended Text Book.

1.Godkar, Text book of Medical Laboratory Technology.

Suggested Reading

1. Hillyer, Silberstein , Blood Banking & Transfusion Medicine(Basic Principle & Practice)
2. Transfusion Science by Overfield, Hamer

DIAGNOSTIC ENZYMOLOGY

UNIT-I (Classification of enzymes, Enzyme specificity, Enzyme inhibition**) (**4-0)

Theory (4 credits)

1. Introduction to enzymology. Structure & properties of enzymes-Apoenzyme, cofactor, coenzyme & prosthetic group, holloenzyme. Active & allosteric sits on enzyme. Classification of enzymes.
2. Enzyme specificity, Kosland induced fit theory, Lock & key hypothesis. Principle of enzymatic action. Factor affecting enzyme activities-temperature, substrate concentration, product concentration, pH, presence of inhibitors & activators etc.

3. Mechaelis-Menten equation, Km value& its significance. Determination of Km value. Enzyme inhibition: Reversible- competitive, non competitive, uncompetitive, irreversible & feedback inhibition.

UNIT-II (Isoenzymes, Significance & estimation of diagnostic enzymes) (3-1.0)

Theory (3credits)

1. Introduction to isoenzymes, Methods of identification of isoenzymes. Unit for expression of enzyme activity, Mechanism responsible for abnormal enzyme level in serum.
2. Principle of assay, procedure and clinical significance of Serum glutamate oxaloacetate transaminase (AST), Serum glutamate pyruvate transaminase (ALT), Lactate dehydrogenase, Alkaline phosphatase and Acid phosphatase,
3. Principle of assay, procedure and clinical significance of Amylase, Lipase, Aldolase, Creatine phosphokinase & creatine phosphokinase-MB & Amino peptidase, Gamma glutamyle transfarases & G6PD etc. in serum.

Lab. Experiments: Practical (1.0 credit), D& T (0.5credits)
Practice sessions (1 credits)

1. Estimation of serum SGOT (AST), SGPT (0.2cedit)
2. Estimation of serum estimation. (0.1cedit)
3. Estimation of serum alkaline phosphatase. (0.1cedit)
4. Estimation of serum LDH. (0.1cedit)
5 Estimation of serum CK-MB. (0.1cedit)
6. Demonstration of serum lipas estimation. (0.1cedit)
7. Ddemonstration of serum amylase, aldolase, gamma GT estimation. (0.3 credit)

UNIT- III (Calculi, Electrolytes & Vitamins) (2.2-0.8)

Theory (2.2credits)

1. Method of assay & significance of myoglobin. Calculi-formation and analysis of renal, biliary and prostatic stone.
2. Electrolytes: Principle procedure & significance of sodium, potassium, calcium, chloride etc in serum.
3. Vitamins: sources, functions, requirements, biochemical disorders associated to vitamins and methods of analysis.

Lab. Experiments: Practical (0.8 credit), D& T (0.5credits)
Practice sessions (0.5credits)

1. Estimation of sodium in serum. (0.1cedit)
2. Estimation of potassium in serum. (0.1cedit)
3. Estimation of calcium in serum. (0.1cedit)
4. Estimation of calcium in serum. (0.1cedit)
5. Demonstration of vit. B12 estimation. (0.2 cedit)
6. Demonstration of Vit. D estimation. (0.2 cedit)

Recommended Text book

1. D.M vasudevan, Text book of medical biochemistry.
2. P. Godkar, Text book of Medical Laboratory Technology
3. MN Chatterjee, Text book of medical biochemistry
4. U.Satyanarayan, Textbook of Medical Biochemistry

Suggested Reading

1. Palmer's, Enzymology
2. Murrey, Harper's Illustrated Biochemistry.

CLINICAL MYCOLOGY

UNIT-I (Introduction to mycology, classification & characteristics of fungi) (3.2-1.0)

Theory (3.2 credits)

1. Introduction to mycology, characteristics of fungi, fungi different from bacteria. Classification- taxonomical & morphological classification of fungi with their characteristics. Nutrition and cultivation of fungi.
2. Reproduction and sporulation of fungi: Sexual & asexual reproduction method of fungi, Types, structure of fungal spores & their characteristics, formation of fungal spore. Classification

of fungal diseases: superficial, subcutaneous & systemic & opportunistic mycoses with characteristics

3. Common laboratory diagnosis of mycoses: Direct microscopy- KOH preparation, KOH with colcofluor white, gram staining, lacto phenol cotton blue, Indian ink preparation. Culture method- colony characteristics on special media. Examination of tissues section for fungal infections.

4. Culture media used in mycology. Morphological, cultural characteristics of common fungal laboratory contaminants. Direct microscopy in Medical mycology laboratory. Preservation of fungal cultures.

Lab. Experiments: Practical (1.0 credit), D& T (0.5credits)

Practice sessions (0.5 credits)

1. Preparation of culture media used routinely in mycology. (0.1cedit)
2. Inoculation of fungal culture on media for colony characterization. (0.1cedit)
3. KOH preparation of fungal culture. (0.1cedit)
4. Identification of fungal cultures (0.1cedit)
5. Lactophenol cotton blue staining on a fungal culture. (0.1cedit)
6. To perform all the staining techniques for identification of fungi as mentioned in theory Syllabus. (0.5cedit)

UNIT-II (Superficial Mycoses, Subcutaneous Mycoses & Systemic Mycoses) (3.3-0.7)

Theory (3.3 credits)

1. Morphology, life cycle, culture characteristics, pathogenesis, infection, clinical feature and laboratory diagnosis of Superficial Mycoses- surface & cutaneous infection:
   a. Dermatophytes- classification, characteristics &disease caused by them with diagnosis.
   b. Pityriasis versicolor (Tinea versicolor), Tinea nigra, Piedra

2. Morphology, life cycle culture characteristics, pathogenesis, disease, clinical feature and laboratory diagnosis of Subcutaneous Mycoses:
   a. Actinomycetes& filamentous fungi – causative agent of mycetoma
   b. Dematiaceae family fungi- causative agent of chromomycosis
   c. Sporothrix schenckii- causative agent of sporotricosis
   d. Rhinosporidium seeberi- causative agent of Rhinosporidiosis

3. Morphology, life cycle culture characteristics, pathogenesis, disease, clinical feature and laboratory diagnosis of Systemic Mycoses:
   a. Histoplasma capsulatum- causative agent of Histoplasmosis.
   b. Blastomyces dermatititis- causative agent of Blastomycoses.
   c. Paracoccidioides brasiliensis- causative agent of Paracoccidioidomycosis
   d. Coccidioides immitis- causative agent of Coccidioidomycosis
   e. Cyptococcus neoformance- causative agent of Cyptococcosis

4. Methods for identification of yeasts and moulds. Dimorphism in fungi. Use of laboratory animal for diagnosis of fungal infections. Antifungal susceptibility tests.

Lab. Experiments: Practical (0.7 credit), D& T (0.2credits)

Practice sessions (0.5credits)

1. Preparation of culture media used for fungus growth. (0.1cedit)
2. Indian ink preparation preparation of fungal culture. (0.1cedit)
3. Inoculation of dermatophytes culture on media for colony characterization. (0.1cedit)
4. Inoculation of Cyptococcus neoformance culture on media for colony characterization. (0.1cedit)

5. Inoculation of Histoplasma capsulatum culture on media for colony characterization. (0.1cedit)
6. To demonstrate dimorphism in fungi. (0.1cedit)
7. Demonstration of fertilized hen egg. (0.1cedit)

UNIT-III (Introduction & Lab Diagnosis of Miscellaneous Microbes) (3.3-0.3)

Theory (3.3credit)

1. Morphology, life cycle culture characteristics, pathogenesis, disease, clinical feature and laboratory diagnosis of Opportunistic Mycoses:
   a. Candida albicans- causative agent of Candidiasis
   b. Aspergilli- causative agent of Aspergillosis
   c. Penicillium species- causative agent of Penicillosis, Otomycosis, Keratomycosis

2. Morphology, life cycle, culture characteristics, pathogenesis, disease, clinical feature and laboratory diagnosis of spirochetes: Treponema species.
   a. Clamaydia, Nocardia, Donovania & Rickettsia, Mycoplasma

3. 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.Routine myco-serological tests and skin tests

Lab. Experiments: Practical (1.0 credit), D& T (0.3credits)
Practice sessions (0.5 credits)

1. Inoculation of Candida albicans culture on media for colony characterization.(0.1cedit)
2. Inoculation of Aspergilli culture on media for colony characterization. (0.1cedit)
3. Inoculation of Penicillium, Cyptococcus neoformance culture on media for colony characterization. (0.1cedit)
4. To process clinical samples for laboratory diagnosis of fungal infections i.e. Skin , Nail , Hair , Body fluids and secretions. (0.6 credits)

Recommended Text Book

1. Anand Narayan and Panikar, Textbook of Microbiology
2. Baweja, Medical Microbiology

Suggested Reading

1. Practical Medical Microbiology by Mackie & Mac. Cartney Volume 1 and 2.
2. Medical Laboratory manual for tropical countries Vol. II Microbiology by Monica Cheesbrough
3. Medical Mycology by Dr Jagdish Chander.

BIOSTATISTICS

UNIT-I (Introduction, Tabulation of data, Measure of Central Tendency) **(**3.5-0)

Theory (3.5 credits)

1. Introduction: characteristics of statistics, Branches of statistics. Importance of the study of statistics in health science. Parameters and estimates, Descriptive and inferential statistics, Variables and their types.

2. Tabulation of Data, Raw data, the array, frequency distribution. Basic principles of graphical representation. Types of diagrams - histograms, frequency polygons, smooth frequency polygon. Commulative frequency curve, ogive, normal probability curve.

3. Measure of Central Tendency: Need for measures of central tendency. Definition and calculaton of mean- ungrouped and grouped with significance. Meaning, interpretation and calculation of median ungrouped and grouped with significance. Meaning and calculation of mode. Comparison of the mean, and mode. Guidelines for the use of various measures of central tendency.

UNIT–II (Measure of Variability, Probability, Correlation & Regression) (3.5-0)

Theory (3.5 credits)
1. Measure of Variability: Need for measure of dispersion. The range, the average deviation. The variance and standard deviation, Calculation of variance and standard deviation ungrouped and grouped. Properties and uses of variance and SD. Coefficient of variation.
2. Probability and Standard Distributions: Meanings of probability of standard distribution. The Binominal distribution. The normal distribution. Divergence from normality-skewness, kurtosis.
3. Correlation & Regression: Significance, correlation coefficient, linear regression & regression equation. Testing of hypothesis-Level of significance, Degrees of freedom.

UNIT–III (Chi-square test, Analysis of variance & covariance, Sampling) (3-0)

Theory (3 credits)
1. Chi-square test with significance, Test of goodness of fit with significance, Student t-test with significance, f- test with significance, z- test with significance. Concept of six Sigma.
2. Analysis of variance & covariance: Analysis of variance (ANOVA), ANOVA, Basic principle of ANOVA, ANOVA technique, Analysis of Co-variance (ANACOVA).
3. Sampling: Definition, Types- simple, random, stratified, cluster and double sampling. Need for sampling - Criteria for good samples, Application of sampling in community, Procedures of sampling and sampling designs errors.

Recommended Text Books
1. S.P Gupta, Business Biostatistics.

Suggested Reading
1. P.N Arora & P.K malhan, Biostetistics

VI SEMESTER

Motive: In this semester students will gain the knowledge of subjects' histopathology, hormones & associated disorders in the field of diagnosis, parasitic infection and their diagnosis and brief of research methodology.

Nature of Course	Name of course	C	T	D&T	P
Pathology	**Histo & Cytpathological techniques -I:** Tissues, Enzyme histochemistry, Microorganisms in tissue.	**4.5**	3	0.5	1.0

	Histo & Cytopathological techniques -II: Normal cytology, Cytopathology of systems, Flow cytometry.	**4.3**	3	0.3	1.0
	Histo & Cytopathological techniques -III: Tissue culture, Cytogenetic, Immuno histochemistry, FNAC.	**4.2**	3	0.2	1.0
	Practice sessions from I, II & III in University attached hospital/recognized hospital.	**1.5**	0	0	15 sessions
Clinical Biochemistry	**Hormones & Disorders-I**: Classification of hormones, Diagnosis of hormonal disorder.	**4.2**	3	0.2	1.0
	Hormones & Disorders-II: Infertility profile, Thyroid hormones, Thyroid disorders.	**4**	3	0.4	1.0
	Hormones & Disorders-III: Pancreatic Hormones, Diabetes Mellitus, Cardiovascular disorders.	**4.9**	3.5	0.4	1.0
	Practice sessions from I, II& III in University attached hospital /recognized hospital.	**1.5**	0	0	15 sessions
Medical Microbiology	**Clinical Parasitology -I:** Host parasite interaction, Pathogenic protozoa & associated disease.	**4**	3.2	0.5	0.3
	Clinical Parasitology -II: Introduction to Helminthology, Round worms, Intestinal Nematodes.	**4**	3.2	0.5	0.3
	Clinical Parasitology -III: Introduction to Platyhelminths, Class cestoda, Class Trematoda.	**4.2**	3.2	0.5	0.5
	Practice sessions from I, II & III in University attached hospital/recognized hospital.	**1**	0	0	10 sessions
Research Methodology	**Research Methodology -I:** Introduction, Research Problem, Research problem.	**2.5**	2.5	0	0
	Research Methodology-II: Research design, Measurement & scaling techniques.	**2.5**	2.5	0	0

	Research Methodology-III: Methods of data collection, Computer technology in research.	**2**	2	0	0
	Practice sessions from I & II in University attached computer lab. /recognized	**0**	0	0	0
Medical Laws & Ethics	**Medical Laws & Ethics**	**4**	4	0	0
Clinical Visit	**Clinical Visits**	**2**	0	0	0
University Compulsory Course	**Extra-Curricular Activities**	**1**	0	0	1
	Community Development Activities	**1**	0	0	1
University Optional Courses	**Professional Activities**	-	-	-	-
Total credits		**60**			

Note:

- **C represents number of credit per course**
- **T represents number of theory credit per course**
- **D&T represents demonstration & tutor in the lecture hall.**
- **P represents number of practical credits per course.**
- **PS represents number of practice sessions credit per course.**

HISTO & CYTPATHOLOGICAL TECHNIQUES

UNIT-I (Techniques for study of Pathology, Histochemistry, Microorganisms in tissue) (3-1.0)

Theory (3credit)

1. Techniques for the Study of Pathology: Introduction to autopsy pathology, Introduction to surgical pathology & surgical pathology protocol. Types of tissue: Connective tissue, epithelial tissue, Glandullar tissue, benine and malignant tumor tissue etc. Handling of fress histological specimen (tissue), Cryo/ frozen section of fress & red tissue, freeze drying. Tissue requiring special treatment- Eyeball, B.M biopsy& undercalsified bone.
2. Histochemistry: Introduction to histochemistry, Special stain and procedure in Surgical Pathology. Enzyme histochemistry - demonstration of phosphatase, dehydrogenase, oxidase & peroxidase etc in tissue. Nuclic acid: DNA and RNA identification and demonstration in tissue. Neuropathological technique. Microorganisms in tissue - various staining technique for their demonstration. Lipid identification and demonstration.

Lab. Experiments: Practical (1.0 credit), D& T (0.5credits)
Practice sessions (0.5credits)

1. Staining of RNA & DNA. (0.2credit)

2. Staining of lipid in tissue(0.2credit)
3. Stainng of frozen section. (0.2credit)
4. Demonstration of phosphatase in tissue. (0.2credit)
5. Demonstration of dehydrogenase etc. in tissue. (0.2credit)

UNIT-II (Normal cytology, Cytopathology of Systems, Flow cytometry) (3-1.0 credit)

Theory (3credits)

1. Cytology: Normal cell structure, functions, cytological criteria of malignancy. Types of specimens, methods of collection & preparation of cell blocks. Staining techniques - principle, preparation and procedure of Papanicoloau's stain, May Grunwald Giemsa stain, Shorr's stain & Aceto orcin stain etc.
2. Female Genital tract: Normal cytology. Techniques of collection of specimen for cervical cytology study. Hormonal assessment and cytological techniques. Cervical cytology screening for malignant and pre-malignant conditions. Cytology in Ovarian cancers,
3. Respiratory tract, Gastro intestinal tract and Urinary tract: Collection of sample, preparation of smears and staining. Cytology of normal, nonmalignant & malignant conditions.
4. CSF and Effusions: Cytology of CSF in inflammatory, nonmalignant & malignant Conditions. Cytology of effusions in nonmalignant and malignant conditions. Glands – Breast, Thyroid, Salivary glands and Lymph nodes: Cytological features in nonmalignant and malignant conditions of different glands and nipple discharges'
5. Automation in Cytology: Microscopy- light microscope- dark ground & phase contrast, electron microscope, fluorescent microscope. Flow cytometry - Image Analysis & Principles, Equipments, procedures & evaluation.

Lab. Experiments: Practical (1.0 credit), D& T (0.3credits)
Practice sessions (0.5credits)

1. Preparation of various cytology smears and fixation (0.1cedit)
2. Papanicoloau's staining (0.2cedit)
3. May Grunwald Geimsa staining (0.1cedit)
4. H & E staining (0.1cedit)
5. To study the normal and abnormal cytology of Female Genital tract. 0.2cedit)
6. To study the normal and abnormal cytology of Respiratory tract. 0.2cedit)
7. Demonstration of flowcytometry. (0.1cedit)

UNIT-III (Tissue Culture, Cytogenetic, Immunohistochemistry, FNAC) (3-1.0)

Theory (3 credits)

1. Tissue culture**:** Equipments for Tissue culture studies- Laminar air flow equipment**,** Carbon dioxide incubator**,** Inverted, microscopy. Derivation of culture from tissue-enzymatic digestion of tissue using collaginase & protease, Plating in tissue culture media, Observation of cells in Invertoscope, Subculturing & derivation of cell line. Characterization of cell lines-Determination of biochemical markers in cells, Chromosomal & DNA content of cells, Immunological properties of cells. Preservation of Immortalized cell lines- Storage in Glycerol, in Liquid Nitrogen, Storage in Dimethyl sulfoxide in liquid nitrogen.
2.Cytogenetics: Introduction to cytogenetics, terminology , classification and nomenclature of human chromosomes. Methods of karyotypic analysis: (a) Culture of bone marrow cells, peripheral blood lymphocytes (b) solid tumors & skin fibroblasts (c) Direct preparation from

tumor materials. Characterization of human chromosomes by various banding techniques. Sex chromatin identification. Chromosomes in neoplasia and oncogenes.

3.Immunohistochemistry: Basics concepts, monoclonal antibodies & their preparation**,** Flurescence reactions, Techniques & application of IHC.

Aspiration cytology-principle, indication, and utility of technique with special emphesis on the cytotechnician in FNAC clinics.

Lab. Experiments: Practical (1.0 credit), D& T (0.2credits)
Practice sessions (0.5credits)

1. Demonstration of instruments used in tissue culture. (0.1 credit)
2. Demonstration of chromosomeal structure. (0.1 credit)
3. Demonstration of routine cytogenetic technique. (0.2 credit)
4. Demonstration of G-banding technique. (0.1 credit)
5. Demonstration of karyotyping technique. (0.1 credit)
6. Demonstration of FISH technique. (0.2 credit)
7. Demonstration of immunohistochemistry technique. (0.2 credit)

Recommended Text Book

1. Praful Godkar, Textbook of Medical Laboratory Technology

Suggested Reading

1. Culling, Histopathology techniques.
2. Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft
3. Medical Lab technology by Lynch
4. An Introduction to Medical Lab Technology by F J Baker and Silverton

HORMONES & DISORDERS

UNIT-I (Classification of hormones, Diagnosis of hormonal disorder) (3-1.0)

Theory (3 credits)

1. Endocrinology: Introduction, classification of hormones, general mechanism of action & function of hormones.

2. Introduction, source, function, mode of action, methods of estimation and clinical significance of GH (Growth hormone), ACTH (Adrenocorticotropic hormone), Aldosteron, PTH (Parathyroid Hormone). Disorders associated to above hormones- introduction, causes, sign & symptoms.

3. Introduction, source, mode of action, methods of estimation and clinical significance of Cortisol, 17- hydroxyprogestron, TSH (Thyroid stimulating hormone) and Sex hormone binding Globulin. Disorders associated to above hormones- introduction, causes, sign & symptoms.

Lab. Experiments: Practical (1.0 credit), D& T (0.2credits)
Practice sessions (0.5credits)

1. Etimation of GH in serum. (0.2credit)
2. Estimation of PTH in serum. (0.2credit)
3. Estimation of TSH. in serum. (0.2credit)
4. Estimation of ACTH in serum. (0.2credit)
5. Etimation of Aldosteron in serum. (0.2credit)

UNIT-II (Infertility profile, Thyroid hormones, Thyroid disorders) (3-1.0)

Theory (3 credits)

1. Infertility profile: Introduction to infertility causes of infertility in male & female. Formation of sperm & ovum, menstruation cycle. Hormones of infertility profile: source & synthesis, function, mode of action, methods of estimation of FSH, LH, Testosterone, Estrogen, Progesterone, prolactine, DHEA-Sulphate & TSH etc..

2. Thyroid hormones: Formation & secretion, mode of action and function of thyroid hormones. Thyroid function test: T_3 & T_4, free T_3 & T_4. TSH, Protein bound Iodine (PBI), Thyroglobulin and LATES with source, mode of action, significance & methods of estimation.

3. Thyroid disorders: Causes, clinical feature and laboratory diagnosis of Goitre, Myxodema, Autoimmune thyroiditis, Tumors of the thyroid gland, hyperthyroidism, Hypotyroidism & Graves disease.

Lab. Experiments: Practical (1.0 credit), D& T (0.4credits)
Practice sessions (0.5credits)

1. Etimation of T_3 in serum. (0.2credit)
2. Estimation of Testosterone in serum. (0.2credit)
3. Etimation of T_4 in serum. (0.2credit)
4. Etimation of FSH in serum. (0.2credit)
5. Etimation of Estrogen & progesteron in serum. (0.2credit)

UNIT- III (Pancreatic Hormones, Diabetes Mellitus, Cardiovascular disorders) **(**3.5-1.0)

Theory (3.5 credits)

1. Pancreatic Hormones: Insulin - Introduction, formation and excretion, functions, mode of action of insulin, metabolic effects of insulin on carbohydrates, fats & protein, C- peptide & its significance, methods of estimation of insulin, insulin associated disorders. Glucagon- functions, methods of estimation & its metabolic disorders.

2. Diabetes Mellitus- Introduction, types, causes, clinical features & laboratory diagnosis of Gestation diabetes mellitus, Hypoglycemia & Hyperglycemia, Complication & prevention of diabetes mellitus. Diabetes insipidus- cause, clinical feature & lab. diagnosis.

3. Cardiovascular disorders: Atherosclerosis, myocardial infarction, Coronary artery disease, Hypertension, Angina etc. - causes, sign symptoms, pathogenesis, lab, diagnosis and management. Pattern of cardiac enzymes in heart diseases.

Lab. Experiments: Practical (1.0 credit), D& T (0.4credits)
Practice sessions (0.5credits)

1. To perform laboratory test for diagnosis of diabetes mellitus. (0.3 credits)
2. Estimation of insulin in serum. (0.2 credit)
3. To perform laboratory test for diagnosis of cardiovascular disease. (0.3 credits)
4. Estimation of enzymes in heart diseases. (0.2 credit)

Recommended Text book

1. D.M vasudevan, Text book of medical biochemistry.
2. P. Godkar, Text book of Medical Laboratory Technology
3. MN Chatterjee, Text book of medical biochemistry.
4. U.Satyanarayan, Textbook of Medical Biochemistry.

Suggested Reading

1. Murrey, Harper's illustrated biochemistry.

CLINICAL PARASITOLOGY

UNIT-I (Host parasite interaction, Pathogenic protozoa & associated disease) (3.2-0.3)
Theory (3.2 credits)

1. Introduction to parasitology, terminologies-parasitism, host, Vectors, incubation, commensalism etc. Classification of parasites. Host parasite interaction. Laboratory diagnosis of common parasitic infections. Protozology - Introduction to protozoa, Common characteristic & classification of protozoa.

2. Pathogenic protozoa: Introduction & morphology, life cycle, mode of transmission, pathogenesis, disease with sign & symptoms & lab.diagnosis of: Intestinal Amoebae - E. Histolytica. Malarial Parasites - Plasmodium vivax, P. malaria, P. falcipaum & P.ovale.

3. Pathogenic protozoa: Introduction & morphology, life cycle, mode of transmission, pathogenesis, disease with sign & symptoms & lab. diagnosis of: Flagellates of intestine/genital - Giardia lamblia, Trichomonas vaginalis, Balantidium coli, Leishmania donovani, Toxoplasma.

Lab. Experiments: Practical (0.3 credit), D& T (0.5credits)
Practice sessions (0.3credits)

1. Stool examination for identification of different ova & cysts. (0.1 credit)
2. Saline mount & Iodine mount of stool for parasitic morphology. (0.2 credit)
3. Preparation of thick blood smears for malarial parasites. (0.2 credit)

UNIT-II (Introduction to Helminthology, Round worms, Intestinal Nematodes) (3.2-0.3)
Theory (3.2credit)

1. Helminthology: Introduction to Helminthology, Common characteristic & classification of Helminths.

2. Nematohelminths: Introduction & morphology, life cycle, mode of transmission, pathogenesis, disease with sign & symptoms & lab. diagnosis of:

a. Round worms,
b. Intestinal Nematodes - Ascaris, Ancylostoma duodenale (Hook worm) & Enterobius vermicularis (Thread worm)
c. Tissue Nematodes - W. Bancrofti
d. Trichuris, Trichinella, Filarial worms.

Lab. Experiments: Practical (0.3 credit), D& T (0.5credits)
Practice sessions (0.3credits)

1. Demonstration of of W. Bancrofti. (0.1 credit)
2. Demonstration of Hook worm morphology. (0.1 credit)
3. Demonstration of Round worms. (0.1 credit)

UNIT-III (Introduction to Platyhelminths, Class cestoda, Class Trematoda) (3.2-0.3)
Theory (3.2credits)

1. Platyhelminths: Introduction & morphology, life cycle, mode of transmission, pathogenesis, disease with sign & symptoms & lab. diagnosis of: Class cestoda -

a. Taenia solium,
b. T. saginata ;
c. E. granulosus.

2. Platyhelminths: Introduction & morphology, life cycle, mode of transmission, pathogenesis, disease with sign & symptoms & lab. diagnosis of: Class Trematoda –

a. Schistosoma,
b. Fasciola,

c. S. haematobium &
d. F. hepatica.

3. Diagnostic procedures: Examination of stool for parasites – 1) For intestinal protozoal infections: Collection of stool samples, Preparation of material for unstained and stained preparations, Staining methods i.e. Iodine staining and permanent staining microscopic examination of stool samples. 2) For Helminthic infections : direct smear preparation and examination, Concentration techniques, Flotation and sedimentation techniques, Egg counting techniques

Lab. Experiments: Practical (0.5 credit), D& T (0.5credits)
Practice sessions (0.4credits)

1. Demonstration of Taenia solium. (0.2 credit)
2. Demonstration of Fasciola. (0.2 credit)
3. Demonstration of S. haematobium. (0.2 credit)

Recommended Text book

1. V.H Talib, Text book of medical laboratory technology.

Suggested Reading

1. P. Godkar, Text book of Medical Laboratory Technology

Research Methodology

UNIT-I (Introduction, Research Problem, Research problem) (2.5-0)
Theory (2.5credits)

1. Research methodology: Introduction & meaning of research, Objectives of research, motivation in research. Types of research & research approaches. Research methods vs. methodology, Criteria for good research.
2. Research problem: Statement of research problem, Statement of purpose and objectives of research problem, Necessity of defining the problem.

UNIT-II (Research design, Measurement & scaling techniques.) (2.5-0)
Theory (2.5credits)

1. Research design: Meaning of research design, Need for research design, Features for good design, Different research designs, Basic principles of research design.
2. Measurement & scaling techniques: Measurement in research- Measurement scales, sources of error in measurement, Technique of developing measurement tools, Meaning of scaling, its classification, important scaling techniques.

UNIT-III (Methods of data collection, Computer technology in research) **(**2-0)
Theory (2credits)

1. Methods of data collection: collection of primary data, collection data through questionnaires& schedules, Difference between questionnaires & schedules.
2. Computer technology: Introduction to computers, computer application in research computers & researcher.

Recommended Text book

1. C.R. Kothari, Research methodology (Method & Technique).

Suggested Reading

1. Ranjit kumar, Research methodology- A step guide for bingers.

MEDICAL LAW AND ETHICS

(Credit – 4.0)

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice". 27 Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum. Few of the important and relevant topics that need to focus on are as follows:

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics – Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records -
other various aspects.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

SYLLABUS OF B.Sc MLT 4TH YEAR

Program Structure – 4th Year

(4th Year consists of VII & VIII Semester)

4th Year Motive: This year students will be nourished with the knowledge of subjects like research methodology, Quality laboratory management and automation and Biostatistics. At the completion of this year the students will be able to perform all the relevant lab tests for specific pathologies and will also be able to perform research work in the laboratories and analyze their outcome.

VII SEMESTER

Motive: In this semester students will gain the knowledge of subjects like immunopathology, tumor markers & their diagnostic techniques, advance techniques in medical microbiology in the field of diagnosis and MLT as entrepreneur & laboratory management.

Nature of Course	Name of course	C	T	D&T	P
Pathology	**Immunopathology-I:** Antigens & Antibodies, Structure of immune system, Immunity.	**4.4**	3.2	0.2	1.0
	Immunopathology-II: Cancer immunology, Diseases of immunity, Autoimmune diseases.	**4.6**	3.2	0.4	1.0
	Immunopathology -III: HLA system, Stem cells & stem cell therapy, Diagnostic molecular pathology.	**4**	3.2	0.4	0.1
	Practice sessions from I, II in University attached hospital /recognized hospital.	**1.5**	0	0	15 sessions
Clinical Biochemistry	**Advance Biochemical Techiques-I**: Tumor, Tumor markers & their diagnosis.	**4.2**	3.2	0.2	1.0
	Advance Biochemical Techiques -II: Oncofoetal antigens, Biomarkers, Toxicology.	**4.6**	3.2	0.4	1.0
	Advance Biochemical Techiques -III: Drug abuse, Radioisotopes and its application.	**4.6**	3.2	0.4	1.0
	Practice sessions from I, II in University attached hospital /recognized hospital.	**1.5**	0	0	15 sessions
Medical Microbiology	**Advance Microbial Techniques -I:** Microbiological study of sample, Isolation, Preservation of mo's.	**4.2**	3	0.2	1.0
	Advance Microbial Techniques -II: Specific Serological Methods for Diagnosis.	**4.4**	3	0.4	1.0
	Advance Microbial Techniques -III: Nosocomial Infection, TORCH Profile,	**4.4**	3	0.4	1.0
	Practice sessions from I, II & III in University attached hospital /recognized hospital.	**1.4**	0	0	14 sessions
MLT as Entrepreneur & Quality	**MLT as Entrepreneur & Quality Laboratory Management-I:** Collection center, Establishment of polyclinics,	**3**	3	0	0

Laboratory Management	Sperm banking.				
	MLT as Entrepreneur & Quality Laboratory Management-II: Blood Donation, Kidney & Liver Donation.	**3**	3	0	0
	MLT as Entrepreneur & Quality Laboratory Management-III: QA, QC, Laboratory Management.	**4**	4	0	0
	Practice sessions from I, II & III in University attached hospital/recognized hospital.	**0**	0	0	0
University Compulsory Course	**Environmental Studies and Disaster Management**	**1**	1	0	0
	Extra-Curricular Activities	**1**	0	0	1
	Community Development Activities	**1**	0	0	1
University Optional Courses	**Professional Activities**	-	-	-	-
Total credits		**58**			

Note:

- **C represents number of credit per course**
- **T represents number of theory credit per course**
- **D&T represents demonstration & tutor in the lecture hall.**
- **P represents number of practical credits per course.**
- **PS represents number of practice sessions credit per course.**

IMMUNOPATHOLOGY

UNIT-I (Antigens & Antibodies, Structure of immune system, Immunity) (3.2-0.1.0)

Theory (3.2 credits)

1. Antigens & Antibodies: Introduction, Types, Heptan & adjuvant, properties of antigens, Antigenic determinants. Antibody - structure & types of antibodies.

2. Structure of immune system: a) Organs of immune system – i) Primary lymphoid organs-thymus & Bone marrow, ii) Secondary lymphoid organs-Lymph nodes Spleen, MALT (Mucosa-Associated Lymphoid Tissue located in the respiratory tract and GIT). b) Cells of immune system- Lymphocytes, monocytes and macrophages, mast cells and basophils, neutrophils, eosinophils.

3. Immunity: Introduction, innate immunity with type & mechanism/component, adaptive immunity-cellular & humoral immune response, primary & secondary immune response.

Lab. Experiments: Practical (1.0 credit), D& T (0.2credits)

Practice sessions (0.5credits)

1. Demonstration of agglutination reaction. (0.4 credit)
2. Demonstration of precipitation reaction. (0.4 credit)
3. Demonstration of flocculation reaction. (0.2 credit)

UNIT-II (Cancer immunology, Diseases of immunity, Autoimmune diseases) (3.2-1.0)

Theory (3.2 credits)

1. Cancer immunology and tumour markers.

2. Diseases of immunity: Allergy (Hypersensitivity): Immediate & delayed type, Types of hypersensitivity-etiology, pathogenesis and laboratory diagnosis of Type I: Anaphylactic (Atopic) Reaction, Type II: Cytotoxic(Cytolytic) Reaction, Type III: Immune Complex Mediated (Arthus) Reaction, Type IV: Delayed Hypersensitivity (Cell-Mediated). Immunodeficiency disorders: AIDS - etiology, pathogenesis, clinical features, immune response, laboratory diagnosis of AIDS.

3. Autoimmune diseases: Introduction to autoimmunity, Immune tolerance, pathogenesis (theories) of autoimmunity & types and examples of autoimmune diseases. Etiology, pathogenesis, clinical features & laboratory diagnosis of Systemic Lupus Erythematosus (SLE), Scleroderma (Progressive Systemic Sclerosis), Sjögren's Syndrome, Polymyositis-Dermatomyositis, Reiter's Syndrome.

Lab. Experiments: Practical (1.0 credit), D& T (0.4credits)

Practice sessions (0.5credits)

1. Direct coomb's test. (0.2 credit)
2. Indirect coomb's test. (0.2 credit)
3. Demonstration of LE phenomenon. (0.2 credit)
4. HIV Test. (0.2 credit)
5. Allerft test. (0.2 credit)

UNIT-III (HLA system, Stem cells & stem cell therapy, Diagnostic molecular pathology) (3.2-0-1.0)

Theory (3.2 credits)

1. HLA system and Major Histocompatibility Complex: Introduction to HLA and MHC complex. MHC classes & their role. Role of HLA complex. Transplant rejection: Types of grafts, Mechanisms of graft rejection, Types of rejection reactions, techniques of HLA/Tissue typing & their significance. Kidney and bone marrow transplantation.

2. Stem cells & stem cell therapy: Introduction to stem cells and stem cell therapy, significance and recent research in stem cell therapy.

3. Diagnostic molecular pathology: Hybridisation techniques-in situ hybridisation, filter hybridisation. Radio-isotopes and its application: Principle, definition of units, measurement of radiation standards, crystal counting, Resources and applications.

4. Modern aids in diagnostic pathology: Methods for cell proliferation analysis. Speech recognition system - Introduction & application of Image analyser and morphometry, DNA microarrays, Laser microdissection, Telepathology and virtual microscopy.

Lab. Experiments: Practical (1.0 credit), D& T (0.4credits)
Practice session (0.5 credit)

1. Determination of ABO/ Rh. (0.2credit)
2. Determination of Anti Rh antobody titre. (0.2credit)
3. Demonstration of HLA typing. (0.6credit)

Recommended Text book

1. Harse Mohan, Pathology
2. Hillyer, Silberstein, Blood Banking & Transfusion Medicine(Basic Principle & Practice)

4. Suggested Reading

1. Robins Basic pathology

ADVANCE BIOCHEMICAL TECHIQUES

UNIT-I (Tumour, Tumour markers & their diagnosis) (3.2-0.3)

Theory (3.2 credits)

1. Tumors: Introduction to oncogene & carcinogens & tumour, molecular basis of development of cancer (carcinogenesis). Characteristics of growing tumor cells-general and morphological & biochemical changes.

2. Tumour Markers: Introduction & types of tumour markers. Clinical applications and methods of estimation of following tumor markers :

a. Enzymes as tumor markers: Alkaline Phosphatase (ALP), Creatine kinase (CK), Lactate dehydrogenase (LDH), Prostatic acid phosphatase (PAP), Prostate specific antigens (PSA).
b. Hormones as tumor markers.
c. Carbohydrate markers - CA 15.3, CA 125.
d. Blood group antigen - CA 19.9, CA 50, CA 72.4, CA 242.
e. Bladder cancer markers - Bladder tumor antigen (BTA).

Lab. Experiments: Practical (1.0 credit), D& T (0.2credits)
Practice sessions (0.5credits)

1. Estimation of ALP as a tumour marker (0.2 credit)
2. Estimation of CA 125 as a tumour marker. (0.2credit)
3. Estimation of CA 19.9 as a tumour marker. (0.2 credit)
4. Estimation of CA 50, CA 72.4, CA 242, BTA. (0.4 credit)

UNIT-II (Oncofoetal antigens, Biomarkers, Toxicology) (3.2-1.0)

Theory (3.2 credits)

1. Oncofoetal antigens: Introduction, clinical significance and methods of estimation of Alpha feto protein (AFP), Carcino embryonic antigen (CEA), Squamous cell carcinoma (SCC) antigen, Human Chorionic Gonadotropin (HCG).

2. Biomarkers still in research – Introduction to the biomarkers. Telomeres, TRAP assay, hyaluronic acid and Hyaluronidase.

3. Toxicology: Introduction to toxicology, effect of toxins on human health. Source, mode of action, doses of toxicity, biochemical and clinical effect on human health and laboratory investigation of Alcohol, Heavy metals- Arsenic, zinc, murcury, lead, salicylate, lead & cadmium etc. toxicity.

Lab. Experiments: Practical (1.0 credit), D& T (0.4credits)
Practice sessions (0.5credits)

1. Estimation of CEA as a tumour marker (0.2 credit)
2. Estimation of AFP as a tumour marker. (0.2 credit)
3. Determination of Alcohol for its toxicity. (0.2 credit)
4. 4. Demonstration of estimation of heavy metal toxins. (0.4 credit)

UNIT-III (Drug abuse, Blotting techniques, Radioisotopes and its application) (3.2-01.0)

Theory (3.2credit)

1. Drug abuse: Introduction to drug abuse. Source, clinical effect and methods estimation of drugs used in drugs abusing: Alcohol, Cocaine, Cannabis, heroin, Amphetamines, lysergic acid etc.

2. Blotting techniques & Radioisotopes: Clinical significance, principle & procedure of different blotting techniques. Radioisotopes and its application: Decay of radioisotopes, units of measurement, Autoradiography, Measurement of radiation standards, Crystal counting, Resources and Biomedical applications.

Lab. Experiments: Practical (1.0 credit), D& T (0.4 credits)
Practice sessions (0.5 credits)

1. To demonstrate the screening of commonly abused drugs. (0. 7 credits)
2. To perform western blotting technique (0. 3 credits)

Recommended Text book

1. P. Godkar, Text book of Medical Laboratory Technology
2. MN Chatterjee, Text book of medical biochemistry.
3. Sharma and Pandey, Pharmacology and Toxicology.

Reference Books

1. Wilson & Walker. Biomolecular techniniques.

ADVANCE MICROBIAL TECHNIQUES

UNIT- I (Microbiological study of sample, Isolation, Preservation of mo's) **(**3-1.0)

Theory (3credit)

1. Laboratory organization, recording of result and quality control in medical microbiology. Preparation of container and swab for collection of specimens for microbial examination. Collection, transport and processing of clinical samples - urine, sputum, pus, stool & body fluid and throat swab etc. for microbiological studies.

2. Common bacterial staining techniques, Culture methods, methods employed to identify the unknown organism. Flowchart of diagnostic procedure in microbiology laboratory. Total and viable count.

3. 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

Lab. Experiments: Practical (1.0credit), D& T (0.2credits)
Practice sessions (0.5credits)

1. Preparation of swab (0.1credit)
2. Collection and processing and identification mo's from Blood, Throat swab, Sputum, Pus Urine , Stool for Salmonella, Shigella and Vibrio cholera, C.S.F. and other body fluids (1.4 credits) (0.9credit)

UNIT- II (Specific Serological Methods for Diagnosis) **(**3-1.0)

Theory (3credits)

2. Bacteriology of milk, water and air: 1) Examination of water - Collection and transportation of water sample , Presumptive coliform count, Eijkman test, Introduction and importance of other bacteria considered as indicators of fecal Contamination, Membrane filtration tests, Interpretation of results. 2) Examination of Milk - Basic Concepts regarding gradation of milk, Various tests for Bacteriological examination. 3) Examination of Air - Significance of air bacteriology in healthcare facilities, Settle plate method, Types of air sampling instruments .

3. Immunology & Sero-diagnosis: Principle, procedure & clinical application of WIDAL Test, VDRL Test, RA Test, CRP Test, ASLO, Pregnancy Test. Diagnosis of HIV & hepatitis.

Lab. Experiments: Practical (1.0 credit), D& T (0.4credits)
Practice sessions (0.4credits)

1. Widal test qualitative & quantitative . (0.2credit)
2. RPR & RA test (0.2credit)
3. Rapid test by one strip method for CRP Test. (0.1credit)
4. Rapid test by one strip method for HIV & Hepatitis B. (0.2credit)
5. Pregnancy test, Malaria antigen test by one step method. (0.1credit)
6. Demonstration of ELISA. (0.2credit)

UNIT- III (Nosocomial Infection, TORCH Profile, Blotting techniques) **(**3-0.5)

Theory (3 credits)

1. Sterility testing of I.V fluids and processing of various samples for various hospital infections - Collection, transportation and processing of I/v fluids for bacterial contamination. Recording the result and interpretation.
2. Microbial diagnostic techniques: TORCH profile and their significance. Myco dot. IgG, IgM, IgA and IgE testing. Australia antigen (HBsAg) test. Blotting techniques- principle techniques and significance.
3.Vaccination: Introduction to vaccine, types of vaccines & its schedule. Prophylactic mass immunization, Active & passive immunization.

Lab. Experiments: Practical (1.0 credit), D& T (0.4credits)
Practice sessions (0.5credits)

1. Sterility testing of Air, water, I.V fluids from hospital. (0.2credit)
2. Australia antigen (HBsAg) test (0.1credit)

3. Antibacterial sensitivity test. (0.2credit)
4. Isolation of organism from soil, water, milk. (0.3credit)
5. Demonstration of TORCH profile. (0.2credit)

Recommended Text Book

1. P. Godkar, Text book of medical laboratory technology.
2. P.C Baweja, Text book of medical laboratory technology.
3. R.C Dubey & d.k Maheshwary , Practical microbiology.
4. Anantha narayan panikar, text book of microbiology

Reference Book

1. Philip A Thomas, Clinical Microbiology
2. Prescott, Microbiology.

MLT AS ENTREPRENEUR AND QUALITY LABORATORY MANAGEMENT

UNIT-I (Collection Center, Establishment of polyclinics, Sperm banking) (3-0-0)

Theory (3credit)

MLT as Entrepreneur:

1.Collection Center of reputed Hospital/Diagnostic centre: Guidelines for taking franchise.

3.Establishment of polyclinics: - Management, Development, Promotion and Financial management

4.Eye banking: Management, Development, Promotion and Financial management.

5.Sperm banking: sreaning and storage of healthy sperms,Management, Development, Promotion and Financial management

UNIT-II (Blood Donation, Kidney & Liver Donation) (3-0-0)

Theory (3credit)

MLT as Entrepreneur:

1. Blood Donation: Providing donor for blood donation to the individual in case of emergency need.

2. Kidney & Liver Donation: Providing donor for kidney & liver donation to the individual in case of emergency need.

UNIT-III (QA, QC, Laboratory Management) **(**4-0-0)

Theory (4 credit)

Quality laboratory management: Introduction to Quality control,

1. Terminology in QC:
   a. Accuracy
   b. Precision
   c. Specificity
   d. Sensitivity
   e. Limits of error allowable in laboratory
   f. Percentage error
2. Quality control charts, Levy- Jennings and Cusum charts
3. Total quality management framework
4. Quality laboratory processes, Quality assurance, Quality assessment, Quality control,
5. Quality planning and Quality improvement
6. Costs of conformance and non conformance, appraisal costs, prevention costs
7. Internal quality control, basic steps, sources of error and their correction methods
8. CAPA - corrective action & preventive action
9. Sources of variation in laboratory results
10. External quality control
11. Quality control programme, intrinsic and extrinsic and random errors
12. Current trends in laboratory accreditation, ISO certificate, NABL certificate and CAP certificate,West guard Rules
13. Demonstration of various methods of quality control/.

VIII SEMESTER

Motive: In this semester students will undergo training with project in the university attached hospital, recognized hospitals/ nursing home's laboratories.

Nature of Course	Name of Course	C	T	D&T	P	PS
Training & Project	Six Month Training with a Analytical Project	72	0	0	72	0
Total credits		72				

Training – minimum 720 hours (calculated based on 8 hours per day, if 90 working days in a 6 months)

- **The students will undergo six month training along with an additional project in all departments like hematology, biochemistry, blood bank, histopathology, microbiology, clinical pathology, genetics, of the same laboratory of university attached hospital / recognized hospitals/nursing homes.**

- **At the end of training, students have to submit a hard copy of training certificate to the department of examination, JVWU, given by hospital/nursing home to her against the training completion.**

- **At the end of last semester, she has to submit two hardcopy of their project report to the department of examination of JVWU with a presentation on the project report completed over the time of project.**

- **Students will be awarded with a degree of Bachelor of Science in Medical laboratory Technology (B.Sc MLT) only after submission of a training certificate, project report to the university.**