



Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095



FACULTY OF ALLIED HEALTH SCIENCE

B.Sc., MEDICAL LABORATORY TECHNOLOGY

Regulations, Curriculum and Syllabus 2020

Regulations for B.Sc. (Allied Health Science) Courses

Introduction:

B.Sc. (Allied Health Science), a (3-year course work + 1-year internship) program under the **Faculty of Allied Health Sciences**, is aimed at training students who will be able to meticulously assist the doctors for providing quality patient care in selected areas of clinical speciality. This program is a taught course that covers relevant topics and specialized areas of knowledge as opted. The aim of this B.Sc. program is to provide a thorough training to the candidates through formal lectures and/or seminars and practical programs which culminate in a one year internship that finally prepares the student for the rigors of the medical world.

1. Short Title and Commencement:

These Regulations shall be called the “Regulations for B.Sc. (Allied Health Science) Course” of Dr. M.G.R Educational and Research Institute. These regulations shall come into force from the academic year 2020-2021. These regulations are subject to modifications as may be approved by the Academic Council from time to time.

2. Eligibility for Admission:

- a) A candidate desiring to join the (3-year course work + 1-year internship) program, leading to the degree B.Sc. (Allied Health Science) should have passed the HSC/CBSE/ISC or equivalent examination with one of the following subject combinations:
 - i) Physics, Chemistry, Biology (Eligible for all AHS courses)
 - ii) Physics, Chemistry, Botany and Zoology (Eligible for all AHS courses)
 - iii) Physics, Chemistry, Biology, biochemistry(Eligible for all AHS courses)
 - iv) Physics, Chemistry, Biology, nutrition dietetics (for B.Sc., Clinical nutrition only)

- v) Physics, Chemistry, Mathematics (for B. Optometry only)
- b) A candidate shall, at the time of admission submit to the Head of the Institution, a certificate of medical fitness from an authorized Medical Officer certifying that the candidate is physically fit to undergo the academic course and does not suffer from any disability or contagious disease.

3. Age limit for admission

A candidate should have completed the age of 17 years or would complete the age as on 31stDecember of the year of admission to the B.Sc .Allied Health Science Course.

4. Eligibility Certificate

Candidates, who have passed any qualifying examination other than the Higher Secondary Course examination conducted by the Government of Tamil Nadu, shall obtain an Eligibility Certificate from Dr. M.G.R Educational and Research Institute and produce the same at the time of admission.

5. Registration

A candidate admitted to the course shall register his/her name with the University by submitting the application form for registration, duly filled in along with the prescribed fee, through the Head of the Institution within the stipulated date.

6. Duration of the course

The duration of the B.Sc. (Allied Health Science) Degree Course shall be 3-year course work comprising of 6(six) semesters and one year (semesters 7 & 8) of compulsory internship. The candidate is required to pursue the course on a full time basis, and must complete the course within seven years from the date of provisional registration.

1. Commencement of the Course:

The course shall ordinarily commence by the month of August of the academic year.

2. Curriculum:

The Curriculum and syllabus for the course shall be as specified in the annexure to these regulations which are subject to modifications by the standing

Academic Board from time to time.

(i) The first three years of the course will be utilized as follows:

- The first two semesters will be spent on Basic nutrition, Applied Microbiology, Family meal management, Clinical Nutrition, Advanced Nutrition, Physiology, Allied chemistry, Physics, English and Communication skills, Introduction to Computers, and Pharmacology.
- Specialized training in the concerned speciality will be offered during the third, fourth, fifth and sixth semesters.

(ii) The fourth year of the course shall be compulsory internship in the respective speciality.

9. Medium of Instruction:

English shall be the medium of instruction for all the subjects of study and for the examination.

10. Working Days:

Each semester shall consist of not less than 100 working days and each academic year shall have a total of 200 working days or above in the first to Sixth Semesters. In the Seventh and Eighth semesters, each semester shall have a minimum of 120 working days.

11. Attendance:

The candidate shall have not less than 80% attendance in Theory and Practical separately. Each semester shall be taken as a unit for the purpose of calculating the attendance. The candidate lacking attendance in a subject shall be denied permission to appear for the University Examination in that subject.

12. Condonation of Lack of Attendance:

The discretionary power of condonation of shortage of attendance to appear for University Examination rests with the University.

Lack of attendance can be condoned up to a maximum of 10% of the minimum attendance required in the following exceptional circumstances:

- (i) Any illness/ accident (for which Medical certificate from a registered medical practitioner must be produced)
- (ii) Any unforeseen tragedy in the family (should produce the letter from the parent/guardian)
- (iii) Participation in NCC/NSS and other co-curricular activities representing the Institution / University. (Certificate from competent authority is required)

For any of the above reasons, request shall be made by the candidate with prescribed fees to the Controller of Examination through proper channel, ten days prior to the commencement of the theory examination.

13. Commencement of the examinations

There shall be two sessions of University examinations in an academic year, viz., February and August.

14. Continuous (Internal) Assessment:

Continuous (Internal) Assessment for Theory shall be the average of the best two out of three.

Continuous (Internal) Assessment for Practical shall be the average of the best two out of three.

15. Semester - End Examination (University/Department):

a. The examination in B.Sc. (Allied Health Science) shall consist of Written Theory examinations and Practical examinations. The Semester - End Examination (University/Department) shall be conducted at the end of each semester.

b. Papers for which Internal Examination is recommended by the Board of Studies and approved by the Academic Council, the date of Semester - End Examinations (Internal examinations) shall be as per the University guidelines.

16. Pattern of Semester - End Examination (University/Department):

EXAMINATION PATTERN-

SEMESTER-I AND SEMESTER-II (FOR ALL SPECIALITIES)

THEORY

MARKS- 60 Marks

DURATION -2¹/₂ Hours

PART –A (Answer any one from Two)

1. Essay (1x15=15 Marks)

PART-B (Answer all questions)

1. Short Notes (5x5=25 Marks)

PART-C (Answer all questions)

1. Short answers (10x2=20 Marks)

PRACTICAL

Practical (including Orals) 15 Marks

CONTINUOUS (INTERNAL) ASSESSMENT

Theory 20 Marks

Practical 5 Marks

TOTAL

100 Marks

Question pattern for SEMESTER III – SEMESTER VI

Duration -3hours

Theory

80 marks

Section –A (Answer any TWO from THREE)

1. Essay (2x15=30)

Section-B (Answer any EIGHT from TEN)

1. Short notes (8x5=40)

Section-C

1. Very short notes (5x2=10)

Internal assessment

Based on CAT Exams (I,II,III& Model)

20 marks

TOTAL

100 Marks

Practicals Pattern

	80 marks
1. Spotters	20 marks
2. Viva (Theory &Practicals)	20 marks
3. Charts/stations	20 marks
4. Record	20 marks

Internal assessment 20 marks

- Attendance
- Based on CAT exams
- Log book

TOTAL

100 Marks

17. Marks Qualifying for a Pass:

For passing the University/End-Semester Examination from Semester I to Semester VI, the candidate shall secure the marks as stated below,

- 40% minimum in the University End-Semester Theory examination
- 40% minimum in the University End-Semester Practical examination
- 40% of marks in the subject where internal evaluation alone is conducted

- 40% of aggregate of theory, practical and internal assessment taken together

18. Classification of successful candidates:

- a) Successful candidates who secure 75% marks and above as a course aggregate in the first appearance taking University theory, practical, and project/dissertation evaluation shall alone be awarded Distinction. This will also apply for award of University rank.
- b) Successful candidates who secure 60% marks and above as a course aggregate in the University theory, practical, project/dissertation evaluation and viva shall be awarded First Class.
- c) All others who secure 40-59% in gross percentage will be classified to have passed in Second Class.

19. Revaluation of answer papers

There shall be revaluation and retotaling of answer papers of failed candidates. Failed candidates are however, permitted to apply to the University within fifteen days of publication of the results for revaluation and retotaling.

20. Carry- over of failed subjects

- 1) A candidate has to pass in theory and practical examinations separately in each of the paper.
- 2) If the candidate fails either in theory or practical examinations, he/she has to reappear for both (theory and practical)
- 3) The student shall start the Internship training (VII & VIII semester) only after he/she clears all the papers from Semester I to Semester VI.

21. Temporary break of study

- A candidate is not normally permitted to temporarily break the study.
- If a candidate is continuously absent from the institute for four or more weeks,
 - Having notified the Dean/Director/Principal within this period, this absence shall be treated as “Temporary Break of Study”.

- Without notifying the Dean/Director/Principal, his/her name will be removed from the institute rolls.
 - If a candidate is compelled to temporarily break the study for valid reasons (such as accident or hospitalization due to prolonged ill health), he/she shall apply for condonation of the break to the Dean/Director/Principal through the Head of the Department.
 - For condonable break of study:
 - If the lack of attendance is within condonable limits as per Clause No. 12, the candidate shall be permitted to write the examination for the current semester.
 - If there is non-condonable lack of attendance, the candidate shall rejoin the program at the respective semester as and when it is offered after the break and shall be governed by the rules and regulations in force at the time of rejoining.
 - The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in Clause No.6 irrespective of the period of break of study in order that he/she may be qualified for the award of the degree.
- f) In any case, a candidate shall be permitted to temporarily break the study only once during the entire duration of the program. The candidate shall forfeit the registration in case of a second break or in case of a non-condonable break of study.
- g)** Without prejudice to the above rules, the candidate who has completed the attendance requirement for a semester, but has proceeded on a condonable break of study without appearing for the University Examination, shall be permitted to appear for the examinations without repeating the semester and thereafter continue the subsequent semester.

Dr. M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
UNIVERSITY
 (Declared u/s.3 of the UGC Act, 1956)
FACULTY OF ALLIED HEALTH SCIENCES
SCHEME OF EXAMINATION

SEMESTER-I

TOTAL HOURS :330

S.NO	Paper	Hours/ Semester		Evaluation (Marks)				
		Lecture	Practical	Continuous Assessment (Internals)		End Semester examination (University/Department Exams)		Total
				Theory	Practical	Theory	Practical	
1	Anatomy –I (UE)	40 hours	20 hours	20	5	60	15	100
2	Physiology –I (UE)	40 hours	20 hours	20	5	60	15	100
3	Biochemistry –I (UE)	40 hours	20 hours	20	5	60	15	100
4	Microbiology –I (UE)	40 hours	20 hours	20	5	60	15	100
5	Pathology –I (UE)	40 hours	20 hours	20	5	60	15	100
6	English (IE)	30 hours	-	-	-	50	-	50

UE – UNIVERSITY EXAM

IE – INTERNAL EXAM

SEMESTER – II

TOTAL HOURS: 420 HRS

S.NO	Paper	Hours / Semester		Evaluation (Marks)				
		Lecture	Practical	Continuous Assessment (Internals)		End Semester examination (University/Department Exams)		Total
				Theory	Practical	Theory	Practical	
1	Anatomy –II (UE)	40 hours	20 hours	20	5	60	15	100
2	Physiology –II (UE)	40 hours	20 hours	20	5	60	15	100
3	Biochemistry –II (UE)	40 hours	20 hours	20	5	60	15	100
4	Microbiology –II (UE)	40 hours	20 hours	20	5	60	15	100
5	Pathology –II (UE)	40 hours	20 hours	20	5	60	15	100
6	Pharmacology (UE)	40 hours	20 hours	20	5	60	15	100
7	Physics (IE)	30 hours	-	-	-	50	-	50
8	Computer Science (IE)	30 hours	-	-	-	50	-	50

UE – UNIVERSITY EXAM

IE – INTERNAL EXAM

SCHEME OF EXAMINATION
(MEDICAL LABORATORY TECHNOLOGY)

SEMESTER – III

Total Hours: 420hrs

S.NO	PAPER	Hours / Semester		Evaluation (Marks)				
		Theory	Practical	Continuous assessment (Internals)		End Semester Examination (University/ Department Exams)		Total
				Theory	Practical	Theory	Practical	
1.	Histopathology – Theory (UE)	60 hours	-	20	-	80	-	100
2.	Histopathology – Practical (UE)	-	120 hours	-	20	-	80	100
3.	Cytology – Theory (UE)	60 hours	-	20	-	80	-	100
4.	Cytology – Practical (UE)	-	120 hours	-	20	-	80	100
5.	Medical Ethics and Biosafety (IE)	30 hours	-	-	-	50	-	50
6.	Psychology (IE)	30 hours	-	-	-	50	-	50

UE – UNIVERSITY EXAM

IE – INTERNAL EXAM

**SCHEME OF EXAMINATION
(MEDICAL LABORATORY TECHNOLOGY)
SEMESTER – IV**

Total Hours: 420hrs

S.NO	PAPER	Hours / Semester		Evaluation (Marks)				
		Theory	Practical	Continuous assessment (Internals)		End Semester Examination (University/ Department Exams)		Total
				Theory	Practical	Theory	Practical	
1.	Clinical Pathology-Theory (UE)	60 hours	-	20	-	80	-	100
2.	Clinical Pathology-Practical (UE)	-	120 hours	-	20	-	80	100
3.	Blood Banking & Immunology Theory (UE)	60 hours	-	20	-	80	-	100
4.	Blood Banking & Immunology Practical (UE)	-	120 hours	-	20	-	80	100
5.	Basics and Advanced Life support (IE)	30 hours	-	-	-	-	50	50
6.	Sociology (IE)	30 hours	-	-	-	-	50	50

UE – UNIVERSITY EXAM

IE – INTERNAL EXAM

**SCHEME OF EXAMINATION
(MEDICAL LABORATORY TECHNOLOGY)
SEMESTER –V**

Total Hours: 450hrs

S.NO	PAPER	Hours / Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester Examination (University/ Department Exams)		Total
				Theory	Practical	Theory	Practical	
1.	General Bacteriology and Systematic Bacteriology – Theory (UE)	60 hours	-	20	-	80	-	100
2.	General Bacteriology, and Systematic Bacteriology – Practical (UE)	-	120 hours	-	20	-	80	100
3.	Virology, Mycology and Parasitology -Theory (UE)	60 hours	-	20	-	80	-	100
4.	Virology, Mycology and Parasitology - Practical (UE)	-	120 hours	-	20	-	80	100
5.	Environmental science and Community medicine (IE)	30 hours	-	-	-	50	-	50
6.	Biostatistics and research methodology (IE)	30 hours	!	!	!	50	!	50
7.	Basic Nutrition (Elective) / Advanced Diagnostic techniques (Elective) (IE)	30 hours	!	!	!	50	!	50

(MEDICAL LABORATORY TECHNOLOGY)

SEMESTER – VI

Total Hours: 420hrs

S.NO	PAPER	Hours / Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester Examination (University/ Department Exams)		Total
				Theory	Practical	Theory	Practical	
1.	Clinical Chemistry I -Theory(UE)	60 hours	-	20	-	80	-	100
2.	Clinical Chemistry I -Practical(UE)	-	120 hours	-	20	-	80	100
3.	Clinical Chemistry – II – Theory (UE)	60 hours	-	20	-	80	-	100
4.	Clinical Chemistry II – Practical (UE)	-	120 hours	-	20	-	80	100
5.	Healthcare and basic Principles(IE)	30 hours	-	-	-	50	-	50
6.	Hospital Management / Applied clinical research (Elective) (IE)	30 hours	-	-	-	50	-	50

**SEMESTER – VII (FOR ALL SPECIALITIES)
Project/Dissertation**

S.NO	PAPER	Hours / Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester Examination		Total
				Project	Viva	Project	Viva	
1.	Project/ Dissertation (UE)	-	-	100	-	100	-	200

SEMESTER – VII & VIII (FOR ALL SPECIALITIES)

Internship -12 Months

SEMESTER - I

S.No:	Subject
1.	Anatomy – I (UE)
2.	Physiology –I (UE)
3.	Biochemistry - I(UE)
4.	Microbiology - I(UE)
5.	Pathology – I(UE)
6.	English (IE)

SEMESTER - I
ANATOMY – I (UE)

Objectives:

At the end of the course the student should be able to:

- Describe the structure and functions of the organ systems of the human body.
- Describe how the organ systems function and interrelate.
- Learn basic technical terminology and language associated with anatomy.
- Develop a self-identity of what it means to be “human”.

Learning Objectives: Skills

- Identify the anatomical structure in the dissected specimen.
- Learn to correlate anatomical structures with relevant clinical conditions.

CONTENTS

Unit I

Organization of the Human Body

- Introduction to the human body
- Definition and subdivisions of anatomy
- Anatomical position and terminology
- Regions and Systems of the body
- Cavities of the body and their contents
- Levels of organization of the body

Cell

- Definition of a cell, shapes and sizes of cells
- Parts of a cell – cell membranes cytoplasm, sub cellular organelles and their main function
- Cell Division – Definition and main events that occur in different stages of mitosis and meiosis.

Tissues

- Tissues of the body

- Definition and types of basic tissues
- Characteristics, functions and locations of different types of tissues

Unit II

Systems of Support and Movement

1. Skeletal system

- Skeleton – Definition, axial and appendicular skeleton with names and number of bones, Types of bones. Parts of bones. Functions of bones. Name location and general features of the bones of the body.
- Joints – Definition and types of joints with examples. Axes and kind of movements possible. Name, location, type, bones forming, movements possible.

2. Muscular system

- Parts of the skeletal muscle. Definition of origin and insertion. Name and location of the skeletal muscles of the body. Origin, insertion, nerve supply and action of large muscles like sternocleidomastoid, pectoralis major, deltoid, Biceps brachial, Triceps brachia, gluteus, gastronemius and diaphragm.

Unit III

Control Systems of the Body

1. Nervous system

- Sub-divisions of the nervous system
- **Spinal cord** – Location, extent, spinal segments, external features and internal structure.
- **Brain** – Sub-divisions, location external features of medulla oblongata, pons, mid-brain, cerebellum and cerebrum. Meninges and spaces around them. Name and location of ventricles of brain and circulation of cerebrospinal fluid. Blood supply of the brain and spinal cord.
- **Cranial nerves** - Name, number, location and general distribution.
- **Spinal nerves** - Typical spinal nerve groups and number of spinal nerves. Name and location of cervical plexus and brachial plexus. Location and general distribution of the branches.
- **Autonomic Nervous system** –definition and functions

2. Sense organs

- Location and features of the nose, tongue, eye, ear and skin

3. Endocrine system

- Names of the endocrine glands. Location and features of pituitary, thyroid, parathyroid, suprarenal, pancreas, ovaries and testes. Names of hormones produced by each gland.

PRACTICAL & VIVA VOICE

1. **Histology** – Epithelium
2. **Axial & Appendicular Skeleton** With Names & Number Of Bones
3. **Muscles**
 - a. Trapezius
 - b. Lattisimus dorsi
 - c. Biceps
 - d. Triceps
 - e. Deltoid
4. **Nervous System**
 - a. Cerebrum
 - b. Cerebellum
 - c. Brain Stem
 - d. Spinal Cord
5. **Special Senses**
 - a. Tongue
 - b. Ear
 - c. Skin
 - d. Eye

6. **Viva Voce**
 - a. Radiology – X rays
 - b. Osteology
 - c. Charts
 - d. Models
 - e. Gluteus Muscles

Recommended books:

1. Manipal manual of Anatomy for Allied Health Sciences, Sampathmadhyastha
2. B D Chaurasia: General human anatomy

References:

1. B D Chaurasia: Regional Anatomy. Vol I, II,III
 2. Richard S. Snell: Clinical Anatomy
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PHYSIOLOGY-I

Objectives of the course:

At the end of this course the students should be able to:

- Comprehend basic terminologies used in the field of Human Physiology
- Define and describe basic Physiological processes governing the normal functioning of the human body.
- Apply this knowledge in their Allied Health Science practice.

CONTENTS

Unit 1

General Physiology

- Concept of Homeostasis
- Cell structure and functions
- Transport across membranes

Nerve and muscle

- Nerve structure, classification of nerve fibers,
- Muscles- classification , structure , Neuro-Muscular junction(NMJ).
- Muscle contraction-mechanism, types.

Blood and body fluids

- Body fluid volumes, compartments, and composition
- Blood composition and functions
- Plasma proteins
- Erythrocytes –Morphology and functions
- Leucocytes-Morphology and functions
- Platelets-Morphology and functions
- Blood groups.

Unit II

Digestive system

- Salivary glands -Nerve supply, functions of saliva.

- Gastric juice-composition & functions of gastric juice.
- Pancreatic juice- composition, functions and regulation of pancreatic juice.
- Bile- composition, functions of bile and bile salts.
- Succus entericus and small intestinal movements.
- Deglutition, vomiting, functions of large intestine.

Excretory system

1. Structure of Nephron and its blood supply, Juxtaglomerular Apparatus(JGA).
2. Formation of urine-Filtration, Reabsorption and secretion.
3. Counter-Current mechanism
4. Micturition.

PRACTICAL & VIVA VOICE

- Microscope
- Estimation of Hemoglobin
- RBC
- WBC
- Spotters

Recommended book

1. Basics of Medical Physiology (Third edition) by D. Venkatesh/ H.H. Sudhakar

Reference books

1. Medical physiology for under graduates by Indhu Khurana,
2. Text Book of Physiology by A.K. Jain for BDS.

BIOCHEMISTRY-I (UE)

Objectives:

At the end of this course the students should be able to:

- To have a knowledge about the chemistry and metabolism of various macromolecules- carbohydrate, protein and lipids
- To learn about enzymes, vitamins, minerals and nutrition
- To know the structure and function of Hemoglobins, Nucleic acids.
- To learn about the organ function tests like Liver Function Tests and Renal Function Tests.

CONTENTS

Unit I - CARBOHYDRATES

Carbohydrates:

- Classification of carbohydrates and their biological importance,
- Reducing property of sugars.

Metabolism of Carbohydrates :

- Digestion and Absorption of carbohydrates,
- Steps of Glycolysis and energetics,
- Steps of TCA cycle and energetics,
- Steps of Glycogen synthesis and breakdown,
- Significance of HMP shunt pathway,
- Definition and steps of Gluconeogenesis, Galactose metabolism
- Galactosemia.
- Diabetes mellitus ,

Bioenergetics :

- Importance of ATP, Outline of respiratory chain.

Unit II - LIPIDS

Lipids:

- Classification of lipids,
- Essential fatty acids,
- Functions of cholesterol,
- Triglycerides,
- Phospholipids

Metabolism of Lipids :

- Digestion and Absorption of lipids,
- Fatty acid synthesis & Steps of β oxidation of fatty acids,
- Types and functions of lipoprotein,
- Lipid profile, hyper cholesterolemia

Unit III - VITAMINS

Vitamins:

- Vitamins, its classification
- Vitamin A
- Vitamin D
- Vitamin E & K
- Vitamin B complex
- Vitamin C

Unit IV - ENZYMES

Enzymes:

- Definition,
- Classification,
- Coenzymes,

Factors affecting enzyme activity, Types and examples of enzyme inhibition

PRACTICAL & VIVA VOICE

1. Reactions of Glucose
2. Reactions of Fructose
3. Reactions of Maltose
4. Reactions of Lactose
5. Tests for Sucrose
6. Tests for Starch
7. Identification of unknown Carbohydrates

SPOTTERS

- **CRYSTALS**
 - Maltosazone
 - Lactosazone
 - Glucosazone/Fructosazone
- **REAGENTS**
 - Benedict's reagent
 - Barfoeds reagent
 - Foulgers reagent
 - Seliwanoff reagent
 - Fouchets reagent
- **CHEMICALS**
 - Sodium Acetate
 - Phenyl hydrazine
 - α Naphthol
- **STRUCTURES.**
 - Structure of Cholesterol
 - Structure of Glucose
 - Structure of Fructose
- **VITAMINS**
 - Carrots
 - Rickets
 - Scurvy
 - Egg

Text books Recommended :

- Textbook of Biochemistry for Paramedical Students By Dr.P.Ramamoorthy
- Essentials of Biochemistry by U. Sathyanarayana

Reference books :

- Text book of Biochemistry for Medical students by DM vasudevan, Sreekumari S, Kannan Vaidyanathan. 7th Edition
- Harper's Illustrated Biochemistry – 30th Edition.

MICROBIOLOGY – I (UE)

OBJECTIVE:

At the end of the semester the students should be able to

- Know the concepts of sterilization and disinfection procedures and their applications.
- Understand the basic principles of immunology.
- Understand the basic fundamental aspect of bacteria and study the common disease caused by them.

Contents

Unit I:

General Microbiology-History and Introduction of Microbiology, Microscopy and Morphology of bacterial cell and their function, Growth and nutrition of Bacteria, Sterilization and Disinfection , Culture media, Culture methods and Identification of bacteria.

Unit II:

Immunology-Basic concept about Infection (Source, Portal of entry and Spread), Immunity, Antigen, Antibody, Antigen-Antibody reaction, Hypersensitivity.

Unit III

Systemic bacteriology- Disease caused and lab diagnosis of medically important bacteria (Staphylococcus, Streptococcus, Neisseria, Echerichia coli, Salmonella, Shigella, Vibrio, Mycobacteria, Spirochetes)

PRACTICAL & VIVA VOICE

1. Gram staining

2. Spotters:

- Disposable syringe
- Sterile cotton swab
- Bacteriological loop
- Sterile tube

- McIntosh fildes Jar
- Autoclave
- Nutrient Agar plate
- Mac Conkey agar plate
- Mac conkey with LF
- Mac conkey with NLF
- Blood agar plate
- L J Media
- RCM
- BHI broth
- Antibiotic susceptibility test
- Gram Positive Cocci in Clusters
- Gram negative bacilli
- AFB
- VDRL Slide
- Microtitre plate

RECOMMENDED BOOK:

1. Dr.C.P.Baveja- Microbiology in Nutshell (Arya Publications).

REFERENCE BOOKS:

1. Ananthanaryanan and Paniker's - Textbook of Microbiology.
2. Subhash Chandra Parija – Textbook of Microbiology.

PRACTICAL BOOK:

1. Patwardhan,Bhat,Satish Patwardhan – Handbook of Practical examination in Microbiolog

PATHOLOGY-I (UE)

Objective:

At the end of the semester the students should be able to

- To develop better understanding of pathological conditions and their causes.
- To develop knowledge on the diseases of major organs and structures.

Contents

Unit-I. Introduction to cell

- Normal Cell Structure Function

Unit-II. Cell injury and Adaptation

- Causes and Types of Cell Injury
- Cellular Adaptations- (Hypertrophy, Hyperplasia, Atrophy, Metaplasia)
- Necrosis-Definition, Causes, Types with Examples, Morphology
- Apoptosis-Definition, Causes, Morphology
- Pathological Calcification

Unit-III. Inflammation and Repair

- Inflammation-Definition, Types, Cardinal signs
- Acute Inflammation-Vascular events and Cellular events(ONLY NAMES) , Outcomes of Acute inflammation, Morphological types of Acute inflammation(ONLY NAMES), Chemical Mediators(ONLY NAMES)
- Chronic Inflammation- Causes and Granulomatous inflammation
- Wound Healing and Repair- Definition, Steps in wound healing, Factor influencing wound healing, Complications of wound healing(ONLY NAMES)

Unit-IV. Hemodynamic Disorder

- Edema- Definition, Causes and Pathogenesis
- Thrombosis-Definition, Causes and Fate of thrombus
- Embolism-Definition and Types
- Infarction-Definition and Classification
- Shock-Definition, Stages, Types of Shock, Etiopathogenesis of Septic shock

Unit-V. Infectious Disease

- Tuberculosis-Etiology, predisposing factors, primary & secondary tuberculosis and complications

- Leprosy-Etiology, classification, Lepromatous and tuberculoid leprosy

Unit-VI.Neoplasia

- Definition, Nomenclature & Classification
- Characteristics of Benign and Malignant neoplasms,
- Pathogenesis of Cancer(Only Names of Carcinogenic agents)
- Spread of Cancer(Metastasis and Pathways of spread)

Unit-VII.Genetics

- Down syndrome
- Klinefelter syndrome
- Turner syndrome

Unit-VIII. Radiation

- Effects of Radiation

PRACTICAL & VIVA VOICE

- **DIFFERENTIAL COUNT**

- Spotter

- **GROSS (SPOTTER)**

- Fatty liver
- Lipoma
- Dry gangrene foot
- Wet gangrene bowel
- CVC Spleen
- Hydatid cyst
- TB – Lung

- **INSTRUMENTS**

- Westergrens ESR tube
- Sahlihemocytometer
- Neubaur's chamber
- Bone Marrow Needle

Recommended Textbook:

1. Textbook of Pathology ,Harsh Mohan,3rd edition

Reference book:

1. Harsh Mohan,3rd edition – Text book of Pathology
2. Dr. Ramddas Nayak, Publisher: Jaypee - Text book of Pathology

ENGLISH (IE)

General objectives:

At the end of the semester the students should be able to

- To improve comprehensive and writing skills in English
- To discuss about effective communication skills
- To prevent barriers in communication.

Unit I: Grammar

- Components of a sentence
- Positive and Negative statements
- Interrogative Statement
- Parts of speech in brief
- Transformation and synthesis of sentences
- Verb and Tense forms
- Voice
- Reported Speech
- Common errors and how to avoid them

Unit II. Vocabulary

- Medical Terminology
- Words often confused or misused
- Words and expression in British and American English
- Idioms and Phrases

Unit III. Oral communication

- Importance of speaking efficiently
- Voice culture
- Preparation of Speech
- Secrets of good delivery
- Audience Psychology
- Presentation Skills
- Using non-verbal communication
- Interview technique
- Skill in arguing

Unit IV. Spoken English

- The phonetic symbols
- Stress
- Intonation
- Rhythm
- Transcription
- Using dictionaries for learning to pronounce

Unit V. Written communication

(a) Art of writing

- Rules for effective writing
- Expansion of proverbs & Ideas
- Précis writing

(b) Letter writing

- Private letters & Social letters
- Business letters
- Letter to a Bank
- Letter to a Newspaper
- Letter to Application
- Curriculum Vitae (Different models)
- Placing an order

(c) Report writing

- Guidelines to prepare a good report
- Usage of impersonal language
- Preparing lab reports

(d) Note making and Note taking

- Note making and note taking strategies
- Organizing notes
- Exercise and note making / taking

(e) Comprehension

- Listening and reading comprehension
(Exercise of prescribed short answers)

Unit VI. Reading

- What is efficient and fast reading?
- Awareness of existing reading habits
- Tested techniques for improving speed
- Improving concentration and comprehension through systematic study.

Reference Books:

1. English for Competitive Examinations by R.P.Bhatnagar, Rajiel Bhargava
2. English for college and competitive exams by Dyvadatham
3. Written Communication in English by Sarah Freeman
4. Writing with a purpose by Tickoo & Sasikumar
5. English phonetics for Beginners by P.Iyadurai
7. Empowerment through verbs & idioms by Padmini devkumar
8. High School English Grammer and Composition by Wren & Martin
9. Communication techniques for your success everywhere by Muralidharan.

SEMESTER-II

S.No:	Subject
1.	Anatomy – II (UE)
2.	Physiology –II (UE)
3.	Biochemistry – II(UE)
4	Microbiology – II(UE)
5.	Pathology – II(UE)
6.	Pharmacology(UE)
7.	Physics(IE)
8.	Computer science (IE)

SEMESTER II
ANATOMY – II (UE)

Objectives:

At the end of the course the student should be able to:

- Describe the structure and functions of the organ systems of the human body.
- Describe how the organ systems function and interrelate.
- Learn basic technical terminology and language associated with anatomy.
- Develop a self-identity of what it means to be “human”.

Unit I

Maintenance of the Human Body

a) Cardio-vascular system

- Types and general structure of blood vessels. Structure and types of arteries and veins. Structure of capillaries. Shape, size, location, coverings, external and internal features of heart. Structure of heart wall, conducting system of the heart.
- Blood supply of the heart. The systemic arteries and veins. Name, location, branches and main-distribution of principal arteries and veins.

b) Lymphatic system

- Lymph, lymphatic vessels, name, location and features of the lymphatic organs.

c) Respiratory system

- Names of organs of respiration, Location and features of nose, pharynx, larynx, trachea, bronchi, lungs and pleura.

Unit II

a) Digestive system

- Names of organs of digestion. Parts of alimentary canal and accessory organs. Location and features of mouth, pharynx, esophagus, stomach, small and large intestines. Location and features of salivary glands, pancreas, liver and gall bladder.

b) Urinary system

- Names of urinary organs, location and features of kidney, ureter, urinary bladder and urethra.

Unit III

a) Reproductive system

- Names of male and female organs of reproduction. Location and features of scrotum, testis, epididymis, vas deferens, seminal vesicle, ejaculatory duct, prostate gland, penis and spermatic cord. Location and features of uterus and its supports, uterine tube, ovary vagina vulva and breast.

b) Anatomical Regions

- Simple ideas about scalp, triangles of neck, axilla, cubital fossa, mediastinum, inguinal canal, femoral triangle, popliteal fossa.

PRACTICAL & VIVA VOICE SYLLABUS

- **Endocrine System**

- Pituitary gland
- Pineal body
- Thyroid & parathyroid gland
- Adrenal
- Pancreas
- Gonads – Ovary & Testis

- **Cardio-Vascular System**

- Heart

- **Lymphatic system**

- Spleen

- **Respiratory System**

- Lungs
- Larynx
- Trachea

- **Digestive System**

- Salivary glands
- Esophagus
- Pharynx
- Stomach
- Liver, Gall bladder
- Duodenum
- Small intestine

- Large intestine
- **Urinary system**
 - Kidneys
 - Ureter
 - Urinary bladder
- **Reproductive System**
 - Sagittal section – Male & Female pelvis
 - Uterus & ligaments
 - Ovary
 - Prostate
 - Seminal vesicles
 - Vas deferens
 - Testis
- **Viva Voce**
 - Radiology – Xrays
 - Osteology
 - Charts
 - Models

Recommended books:

1. Manipal manual of Anatomy for Allied Health Sciences, Sampathmadhyastha.
2. B D Chaurasia: General human anatomy.

References:

1. B D Chaurasia: Regional Anatomy. Vol I, II,III.
2. Richard S. Snell: Clinica

PHYSIOLOGY-II (UE)

Objectives:

- To develop vocabulary for appropriate terminologies to effectively communicate terms related to physiology of various body systems
- To identify and describe physiological functions of various structures involved in smooth functioning of the body.

Unit I Cardiovascular System

- Cardiac muscle, action potential and conducting system of the heart.
- Cardiac cycle.
- ECG, heart sounds, Heart Rate.
- Cardiac output-Definition, factors regulating cardiac output and measurement of cardiac output.
- Blood pressure-Definition, measurement, factors maintaining BP.
- Regional circulation-Coronary and cerebral.

Unit -II Nervous system

- Structure & Properties of Neuron.
- Nerve- Classification, injury.
- Types and properties of Receptors
- Synapse and synaptic transmission.
- Reflex and its properties.
- Spinal cord-Ascending & Descending tracts.
- Thalamus, Basal ganglia, Cerebellum, Cerebral cortex, Hypothalamus & Cerebrospinal fluid.
- Autonomic nervous system.
- Ascending and descending tracts.

Unit -III Respiratory system

- Structure of upper and lower respiratory tract. Muscles of respiration and Mechanism of respiration.
- Lung volumes and capacities-definition, normal values, intrapulmonary and intra pleural pressures, surfactant.
- Oxygen transport, carbon-dioxide transport.
- Neural and chemical regulation of respiration.

- Hypoxia ,cyanosis, Artificial Respiration.

Unit – IV Special sense and skin

- Vision,
- Audition,
- Olfaction,
- Gustation.

Unit – V Reproductive system

- Male reproductive organs-Spermatogenesis and testosterone actions.
- Female reproductive organs.
- Contraception Methods.

Unit – VI Endocrine system

- Hypothalamus hypophyseal inter relationship.
- Anterior pituitary hormones and their functions.
- Posterior pituitary hormones and their actions.
- Thyroid hormones, biosynthesis and functions.
- Parathyroid hormones ,functions.
- Insulin, glucagons, actions and Diabetes mellitus.
- Adrenal cortex hormones and their functions.
- Adrenal medullary hormones and their actions

PRACTICAL & VIVA VOICE SYLLABUS

1. WBC.
2. Blood pressure.
3. Bleeding time
4. Clotting time.
5. Charts and spotters.

Recommended book

- Basics of Medical Physiology (Third edition) by D. Venkatesh/ H.H. Sudhakar

Reference books

- Medical physiology for under graduates by Indhu Khurana,
- Text Book of Physiology by A.K. Jain for BDS.

BIOCHEMISTRY – II (UE)

Objectives:

At the end of the semester the students should be able

- To have a knowledge about the chemistry and metabolism of proteins
- To learn about nutrition-balanced diet and malnutrition
- To know the structure and function of Hemoglobins, Nucleic acids.
- To learn about the organ function tests like Liver Function Tests and Renal Function Tests.

Unit I - PROTEINS

Proteins :

- Classification of amino acids,
- Structure of proteins,
- Plasma proteins,
- Immunoglobulins.

Metabolism of Proteins :

- Digestion and absorption of proteins,
- Transamination,
- Deamination,
- Steps of urea cycle,
- Phenyl ketonuria,
- Alkaptonuria,
- Transmethylation,
- Products derived from Glycine and tyrosine

Unit II -- NUCLEIC ACIDS

Nucleic acids:

- Structure & Function of DNA,
- Structure, Its types & Functions of RNA
- Nucleic Acid Metabolism

Unit III - HAEMOGLOBIN

Haemoglobin:

- Structure & Function of Haemoglobin
- Haemoglobin Metabolism

Unit IV-- MINERALS

Minerals:

- Macro & Minor Minerals & Metabolism

Unit V -- NUTRITION

Nutrition:

- BMR, SDA & Glycemic Index
- Dietary Fibers & Balanced Diet
- Protein Energy Malnutrition

Unit VI -- ORGAN FUNCTION TEST

- RFT

Unit XI - ACID BASE BALANCE

Acid Base Balance:

- pH Homeostasis
- Buffers
- Buffers
- Acidosis
- Alkalosis

PRACTICAL & VIVA VOICE

- Non- Protein Nitrogenous Substances
- Analysis Constituents of normal urine
- Analysis Constituents of abnormal urine
- Identification of abnormal constituents in urine
- Estimation of Glucose in blood
- Estimation of Urea in blood.

Spotters

Spotters: The student must identify the spotter and write some important uses of the spotter.

1. Urinometer

2. Lactometer
3. Centrifuge
4. Spectroscope
5. Colorimeter
6. pH meter
7. Ryles' Tube
8. Chromatography apparatus
9. Electrophoresis apparatus
10. Micropipette
11. Fluorosis
12. Inborn Errors of Metabolism
13. Protein Energy Malnutrition
14. Benzidine powder
15. Sulphur powder
16. Fouchet's Reagent
17. Structure of t RNA
18. Egg White
19. Jaundice
20. Gout

Text books Recommended:

- Textbook of Biochemistry for Paramedical Students By Dr.P.Ramamoorthy
- Essentials of Biochemistry by U. Sathyanarayana

Reference books:

- Text book of Biochemistry for Medical students by DM vasudevan, Sreekumari S, Kannan Vaidyanathan. 7th Edition
- Harper's Illustrated Biochemistry – 30th Edition.

MICROBIOLOGY – II (UE)

OBJECTIVE:

At the end of the semester the students should be able to

- Explain general and specific mechanisms by which an infectious agent like viruses, fungi and parasites causing diseases.
- Explain interventions employed to prevent infectious diseases including infection control measures and vaccines.

Unit-I

Virology: Introduction to virology, List of medically important viruses and diseases (AIDS, Hepatitis, Rabies, Polio) and Lab diagnosis of viral infections

Unit - II

Mycology: Introduction to Mycology, List of medically important fungi and diseases (Candidiasis, Cryptococcosis, Dermatophytes, Aspergillosis and Mucor mycosis) and Lab diagnosis of fungal infections.

Unit - III

Parasitology: Introduction to Parasitology, List of medically important parasites and diseases (E.histolytica, Plasmodium, W.bancrofti, Ascaris, Ancylostoma) and Lab diagnosis of parasitic infections

Unit - IV

Applied Microbiology-Collection and transport of clinical specimen, Sexually transmitted disease, Hospital acquired infection, Urinary tract infection, Skin and Soft tissue infection, Anaerobic infection, Respiratory tract infection and Bloodstream infection, Immunoprophylaxis, Biomedical Waste Management and standard precautions.

PRACTICAL & VIVA VOICE

I.SPOTTERS

1. Ascaris lumbricoides
2. Taenia
3. Gram stained smears showing Candida
4. Universal container
5. Vaccine-OPV
6. BCG
7. Hepatitis
8. DPT
9. TT
10. MMR
11. Virology –Embryonated egg
12. Tissue culture
13. Rhabdovirus
14. Polio virus
15. HIV

II. Clinical case discussion with charts

1. Skin and soft tissue infections
2. Ring worm/ Tinea infections
3. Food poisoning
4. Gastroenteritis

RECOMMENDED BOOK:

1. Dr.C.P.Baveja- Microbiology in Nutshell (Arya Publications).

REFERENCE BOOKS:

1. Ananthanaryanan and Paniker's - Textbook of Microbiology.
2. Dr.C.P.Baveja – Textbook of Microbiology.

PRACTICAL BOOK:

1. Patwardhan, Bhat, SatishPatwardhan – Handbook of Practical examination in Microbiology.

PATHOLOGY- II (UE)

UNIT-1: CARDIOVASCULAR SYSTEM

- Ischemic Heart Disease
- Myocardial Infarction-Definition, Etiopathogenesis and Morphology
- Valvular Heart Disease
- Rheumatic Heart Disease- Definition, Etiopathogenesis and Morphology
- Infective Endocarditis- Definition , Etiopathogenesis and Morphology
- Congenital Heart Diseases- Only Names
- Hypertension- Definition, causes, Morphology and Complications
- Atherosclerosis- Definition, Etiopathogenesis, Morphology and Complications

UNIT-2: RESPIRATORY SYSTEM

- Pneumonia- Definition, Etiopathogenesis and Morphology
- COPD-(Emphysema, Chronic Bronchitis, Bronchial Asthma) - Definition, Etiopathogenesis and Morphology
- Bronchiectasis- Definition, Etiopathogenesis and Morphology

UNIT-3: GASTROINTESTINAL SYSTEM

- Gastritis and Peptic ulcer disease- Definition, Etiopathogenesis, Morphology and Complications
- Tumors of GIT
- Gastric carcinoma-Etiology and Morphology

UNIT-4: HEPATOBILIARY SYSTEM

- Liver Abscess
- Amoebic liver abscess
- Alcoholic Liver Disease and Liver Cirrhosis- Definition, Etiopathogenesis , Morphology and Complications, Jaundice- Definition, Pathophysiology, Types and Causes
- Viral Hepatitis- Definition, Etiology and Morphology
- Cholecystitis

UNIT-5: RENAL AND URINARY SYSTEM

- Renal Calculus- Etiology, Types and Complications
- UTI and Pyelonephritis – Causes, Etiopathogenesis , Morphology and Complications
- Renal Cell Carcinoma- Causes and Names of Tumors

- Renal Failure
- Acute Glomerulonephritis/Nephritic syndrome and Nephrotic syndrome- Definition, Causes, Clinical Presentation and Complications

UNIT-6: REPRODUCTIVE SYSTEM

- Diseases of Testis, Uterus, Cervix, Ovary- Only Names

UNIT-7: CENTRAL NERVOUS SYSTEM

- Infection
- Meningitis- Definition, Causes and CSF Findings

UNIT-8: DISEASES OF BONES & JOINTS

- Septic Arthritis
- Osteomyelitis-Definition, Causes, Morphology and Complications
- Rheumatoid Arthritis- Definition, Etiopathogenesis and Morphology
- Bone Tumors- Only Names

UNIT-9: ANEMIA

- Anemia- Definition, Classification
- Iron deficiency and Megaloblastic Anemia- Etiology and Morphology

UNIT-10: AUTOIMMUNE DISEASES

- Definition and Names of common autoimmune diseases

PRACTICAL & VIVA VOICE

INSTRUMENT TEST

- RBC Pipette
- WBC Pipette
- Sahli's Pipette
- Wintrobe's PCV tube
- Hb Estimation
- Blood grouping

SPECIMEN

- Chronic Pyelonephritis
- RCC
- SCC – Foot
- Leiomyoma – Fibroid uterus

- Gall stones
- Appendicitis
- Liver abscess

Recommended Textbook:

1. Textbook of Pathology ,Harsh Mohan,3rd edition

Reference book:

1. Harsh Mohan,3rd edition – Text book of Pathology
2. Dr. Ramddas Nayak, Publisher: Jaypee - Text book of Pathology
Dr.Ramddas Nayak, Publisher: Jaypee – Text book of Pathology and Genetics

PHARMACOLOGY (UE)

COURSE OBJECTIVES:

- To understand the terminologies and basic principles of pharmacokinetic and pharmacodynamic involved in the use of drugs.
- To understand the pharmacological action and mechanism of action of common drugs used for different disease conditions.
- To know the therapeutic uses and adverse effects of common drugs used for different disease conditions

Unit I: Introduction

- General pharmacological principles-Definition-Routes of drug administration-Pharmacokinetics-
- Pharmacodynamics-Adverse drug effects
- Drugs acting on Autonomic Nervous System, Peripheral Nervous System and Drugs acting on Central Nervous system

Unit II

- General considerations-Cholinergic system & drugs-Anticholinergic drugs-Adrenergic drugs-antiadrenergic drugs-Drugs acting on autonomic ganglia.

Unit III:

- Skeletal muscle relaxants-Local anaesthetics,General anaesthetics-Ethyl & Methyl alcohol-Sedatives-Hypnotics-Antiepileptics-Antiparkinsonian drugs-Drugs used in mental illness-Opioid analgesics and Non opioid Analgesics-Nonsteroidal Antiinflammatory drugs

Unit IV

- Cardiovascular drugs , Drugs affecting Blood & Blood formation and Drugs on Respiratory system
- Cardiac glycosides,Antiarrhythmic drugs, Antianginal drugs,Antihypertensives and Diuretics,Haematinics,Erythropoietin,,Drugs affecting-coagulation,Fibrinolytic and Antiplatelet drugs,Treatment of cough and antiasthmatic drugs.

Unit V

- Antimicrobial drugs

- General consideration-Antibiotics-Antibacterial agents-Antitubercular drugs-Antifungal-Antileprotic-Antiviral-Antimalarial-Antiamoebic-Antiprotozoal drugs-Cancer Chemotherapy, Antiseptic-Disinfectant-others.

Unit VI

- Hormones & related Drugs, Drugs used in Gastrointestinal diseases & Miscellaneous drugs
- Corticosteroids, Antithyroid drugs and Drugs for Diabetes Mellitus, Treatment of Vomiting, Constipation, Diarrhoea and Treatment of peptic ulcer
- Vitamins, Vaccines, Sera and chelating agents.

Recommended books:

1. Prep Manual for Undergraduates in Pharmacology by Tara V Shanbag, 2nd edition
2. Pharmacology for Dental and Allied Health Sciences by Padmaja Udaykumar, 3rd edition

Reference books:

1. Essentials of Medical Pharmacology by KD Tripathi, 7th edition
2. Basic and Clinical Pharmacology by Bertram G Katzung, 12th edition

PRACTICAL & VIVA VOICE

Learning Objective

This module is intended to discuss the various modalities of drug delivery and instruments relevant to it.

- Instruments
- Needles
 - Intravenous
 - Intrathecal
 - Spinal
 - Intra arterial
- Syringes:
 - Tuberculin
 - Insulin
 - I.V cannula
 - Scalp. Vein set
- Students Discussion
 - Enema can

- Inhalers
- Spacers
- Nebulizers
- Tablets –
 - Enteric coated,
 - Sustained release,
 - Sub-lingual
- Students Discussion
 - Capsules
 - Spansules
 - Pessary
 - Suppository
 - Topical Preparation
 - Ointment,
 - Lotion,
 - Powder,
 - Drops – eye / ear
- Charts:
 - Mechanism of action of drugs, adverse effects, toxicology
- Spotters:
 - drugs

Text books suggested for reading:

- Text book of pharmacology for Dental & Allied Health Science 2nd edition Padmaja Udaykumar
- Pharmacology for dental students Tara V shanbhag, Smita Shenoy, Veena Nayak
- Principles of pharmacology 2nd edition H.L.Sharma & KK Sharma

PHYSICS (IE)

Unit 1: Basic concepts

Basic Units, Heat, Acoustics etc. Basic concepts of power, work, force, energy Einstein's formula Electronics, Electricity & Magnetism, electromagnetic waves Units and measurements temperature and heat SI units of above parameters Atomic structure Nucleus Atomic Number, Mass Number electron orbit and energy levels Periodic table Isotopes Isobars Ionization and excitation Radioactivity, Natural and artificial radioactivity alpha decay beta decay.

Unit 2: Electromagnetic induction

Electric charges electric induction electric potential capacitance and capacitors. Electrical energy and power unit of current resistance and Ohm's law circuit laws heating effect of current sources of electrical energy E.M.F. Magnetism, Magnetic effect of an electric current application of magnetic field. Electromagnetic induction, laws of mutual induction and self-induction. Alternating current transformers theory and losses practical aspects reactance – resonance impedance and power factors.

Unit 3: Laser

Nature of light-Reflection-Refraction-Total internal reflection- Optical fibers- Applications in Medicine - Laser-Principles-Action-Types of laser, Basic principles of laser in Medical application - Argon-Iron laser photo coagulator-Photo thermal-Photochemical application - Applications of laser in Medicine- Laser hazards and safety measures.

Unit 4: Radiation Physics

Introduction to nuclear physics and radioactivity, Radioactive radiations - X-ray, production of x-ray, Properties of x-ray radiations - Biological effects of radiation, Radiation damage in matter, Radiation protection principles, radiation detection and measurement - Ultrasound and generation of ultrasound.

Unit 5: Introduction to Imaging Technique

Principles of Microscope: Simple microscope and compound microscope - Radiography: Making an X-ray image –Fluoroscopy-. CT Scans, MRI - Ultrasonography: Ultrasound picture of Body-A-Scan-B-Scan-M-Scan-Ultrasound diathermy-Phonocardiography - Radio

isotopes: Uses of radio isotopes -^{99m}Tc Generator- Scintillation detectors - Application of scintillation detectors - Gamma Camera - Positron Camera.

Unit 6: Semiconductor devices

Principles of diodes and Transistors – Integrated circuits – Amplifiers – Basic configuration and types – differential and operational amplifiers– Waveform generators – Timer – A/D and D/A converters – Active filters – Transducers – Basic configuration and types.

Unit 7: Biopotential Recording Systems

Introduction to bioelectric potential – Electrodes and surfaces – Biopotential amplifier – Frequency ranges of various Bio potential signals – Working principles of bio potential recording systems – Electrocardiography – Electroencephalography – Electromyography.

Recommended books:

1. New Understanding physics for advanced level-JimBreithaupt.
2. Advanced Physics for you by Keith Johnson, Simmon shewett, Sueholt,Johnmiller
3. Christensen's Physics of diagnostic Radiology by Thaomas S.CurryIII, M.D., Robert C Murry, Jr. PhD., Dow Dey, PhD.
4. Applied Electronics, A. Subramanyam, The National Publishing co., Madras(1996).

Computer Science (IE)

Unit-I. History of computers,

- Definition of computers, Input devices, Output devices, Storage devices, Types of memory and units of measurement, Range of computers, Generations of computers, Characteristics of computers

Unit-II. System:

- Hardware, Software, system definition, Fundamentals of Networking, Internet, Performing searches and working with search engines, types of software and its applications

Unit-III. Office application suite

- Word processor, spreadsheet, presentations, other utility tools, Fundamentals of Linux / Windows operating system, functions, interfaces, basic commands, working with the shell and other standard utilities.

Unit-IV. Language

- Comparison chart of conventional language, Programming Languages, Generations Of Programming Languages, Compilers and Interpreters, Universal programming constructs based on SDLC, Variable, constant, identifiers, functions, procedures, if while, do – while, for and other Structures. Programming in C language, Data types, identifiers, functions and its types, arrays, union, structures and pointers

Unit-V. Introduction to object oriented programming with C++:

- Classes, Objects, Inheritance Polymorphism and Encapsulation. Introduction to databases, and query languages, Introduction to Bioinformatics.

Practicals:

1. Various browsers, search engines, email
2. Text document with mages with multiple formatting options using a specified office package
3. Spreadsheet using a specified office package
4. Presentation on a specified topic using the specified locations
5. Shell programming-parameters
6. Shell program- regular expressions

7. C program- functions
8. C program – file handling
9. C program demonstrating the usage of user defined variables
10. Databases
11. Applications in allied health sciences

Text Books:

1. Peter Norton., Introduction to Computers. 7th Edition, Tata McGraw Hill Education Private Limited 2010.
2. Gary B. Shelly, Thomas J. Cashman, Misty E. Vermaat., Microsoft Office 2007. 1stEdition, Delmar Cengage Learning 2010

Reference Books:

1. C programming tutorial (K&R version 4) Author(s) Mark Burgess
2. Red hat Linux 9 bible by Christopher Negus May 2003

SEMESTER-III

S.NO	SUBJECTS
1	Histopathology – Theory
2	Histopathology – Practical
3	Cytology – Theory
4	Cytology – Practical
5	Medical Ethics and Biosafety (IE)
6	Psychology(IE)

SEMESTER-III

HISTOPATHOLOGY – THEORY

OBJECTIVE

1. To develop in depth knowledge on histopathological aspects in laboratory for diagnosis.
2. To develop exhaustive ideology of various techniques used in histopathology.

CONTENTS

Unit-I

Introduction of histopathology & biotechniques, laboratory organization, care & maintenance of equipment's used in histotechnology lab, Safety measures in histotechnology lab Reception, Recording, Labelling and transportation of tissue specimens, Basic concepts of fixation and various types of fixative used in histopathology and cytopathology

Unit-II

Tissue and its types, Location and function, Grossing of tissues, whole mount, sections, smears, tissue processing and its steps, manual and automated. De-calcification, decalcification methods, types of decalcifying agent.

Unit-III

Microtome, its type and working, various type of microtome, Microtome knives, its type and knife sharpening, Section cutting.

Unit-IV

Cryostat, frozen sections of fresh, fixed and unfixed tissue, freeze drying, rapid frozen sections and staining for emergency diagnosis

Dye chemistry, Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye, mordant, accelerators, accentuators, metachromasia, metachromatic dyes

Unit- V

Progressive, regressive, vital, supravital staining, types of hematoxylin, Hematoxylin and eosin staining, special stains use of control sections in tissue staining, mounting and mounting media, advantages & disadvantages, refractive index, Frozen Section and Cryostat, Museum Techniques

Text Books:

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications
2. Harsh Mohan (2017), Textbook of Pathology, 7th edition, Jaypee Publications
3. Gadkari B. Praful, (2016) Textbook of MLT, 3rd edition, Bhavani Publications
4. C F A Culling, (1974), Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques, 3rd edition, Butterworths Publishers
5. Wheatear's Basic Pathology: A Text, Atlas and Review of Histopathology, Young, 5th edition, Elsevier Health Sciences, 2009

Reference Books:

1. Histopathology Specimens: Clinical, Pathological and Laboratory Aspects, Derek C. Allen,
2. Cameron, 2nd edition, Springer Science & Business Media, 2012.

HISTOPATHOLOGY

PRACTICAL (UE)

OBJECTIVE

1. To develop in depth knowledge on histopathological aspects in laboratory for diagnosis.
2. To develop exhaustive ideology of various techniques used in histopathology.

CONTENTS

PRACTICALS

1. Tissue sectioning and H & E Staining
2. Special staining
3. Perl's stain
4. PAS stain
5. Giemsa stain
6. Ziehl-Nelsen stain
7. Reticulin stain
8. Van-Gilson stain
9. Embedding
10. Frozen-sectioning

SPOTTERS

1. Lab materials – Name & application of each:
2. Tissue cassette
3. Paraffin wax
4. Disposable blade for microtome
5. DPX
6. Water-bath
7. Diamond pencil
8. Cover slip
9. Formalin
10. Chloroform
11. Alcohol
12. Xylene

CHARTS/PHOTOGRAPHS

1. knife
2. Microtome
3. Cryostat
4. Embedding station

CYTOLOGY THEORY (UE)

OBJECTIVES

1. To provide an introduction to concepts in cytology
2. To elaborate on preparation techniques of various stains and their importance in cytology.

CONTENTS

UNIT- I

Introduction of cytology, Cell-basis structure and function, benign and malignant tumors, microscopy- light, compound, and fluorescence.

UNIT- II

Fixation and fixatives used in cytology, preservation of specimen, fluid cytology- transudate & exudate, Processing of fluids- urine, Sputum, bronchial aspiration cytology, Cerebrospinal fluid.

UNIT- III

Aspiration and exfoliative cytology, patient preparation, sample collection, fixation processing, methods and staining FNAC, Cell block techniques- aim, principle, procedure and methods.

UNIT-IV

Papanicolaou staining- principle, sample collection, patient preparation, methods, staining procedure, Bethesda system for reporting cervical cytology, MGG staining- principle, methods, preparation of staining solution, H&E staining- aim, principle, preparation of staining solution.

UNIT – V

Important factors influencing staining results, sex chromatin demonstration, Introduction of immunocytochemistry, Liquid based cytology preparation & automated screening device.

Text Books:

1. Medical Laboratory Technology: Methods and Interpretations Vol – 1, RAMNIK SOOD, 6th edition, Jaypee Brothers Medical Publishers, 2009

Reference Books:

1. A Textbook of Experimental Cytology, Gray, Cambridge University Press, 2013.

CYTOLOGY PRACTICAL

OBJECTIVES

1. To provide an introduction to concepts in cytology
2. To elaborate on preparation techniques of various stains and their importance in cytology.

CONTENTS

EXERCISE

1. Pap staining (1x10 = 15marks)
2. Any one of the following: (1x10 = 15marks)
3. Centrifuging fluid, making smear out of it and staining it with MGG (or) Leishman (or) Wright-Giemsa stain
4. Preparation of Cytotec smear and staining it with MGG (or) Leishman (or) Wright- Giemsa stain

SPOTTERS

5. Lab materials – Name & application of each:
6. cassette
7. Pasteur pipette
8. Kopplin jar
9. Diamond pencil
10. Mention two applications of the following: (Any one) (1x2 = 2marks)
11. 95% ethanol
12. Absolute methanol
13. Xylene

CHARTS

14. Pap smear - normal
15. Pap smear - malignancy

MEDICAL ETHICS & BIOSAFETY (IE)

UNIT-I

Definition and key Concepts; philosophical considerations; epistemology of science; ethical terms; principles and theories; relevance to health care; ethics and the law issues: genetic engineering, stem cells, cloning, medical techniques, trans-humanism, bio-weapons.

UNIT-II

Define negligence, malpractice & liability; iatrogenic harm; Influence of ethics in general practice; Describe primary and secondary ethical principles; Hippocrates' oath; Professional codes of ethics; Describe the moral basis of informed consent and advance directives; research ethics – animal rights, ethics of human cloning, and stem cell research; ICMR guidelines.

UNIT-III

Genetic testing, genetic screening, Fertility and birth control, sex determination and sex selection, Reproductive control: assisted reproduction and ethics, pre-natal genetic counseling, pre-implantation genetic diagnosis, Ethical issues in applied medicine; Worker compensation.

UNIT-IV

Euthanasia and physician-assisted dying; end-of-life care; Physicians, patients and other: autonomy, truth telling & confidentiality; emerging issues: impact of medical advances on society; Use of genetic evidence in civil and criminal court cases; Challenges to public policy – to regulate or not to regulate; improving public understanding to correct misconceptions.

UNIT-V

Introduction to Biosafety; biological safety cabinets; containment of biohazard; precautions for medical workers; precautions in patient care; Biosafety levels of microorganisms; mitigation of antibiotic resistance; radiological safety; measurement of radiation; guidelines for limiting radiation exposure; maximum reasonable dose; precautions against contamination; Institutional Biosafety committee.

PSYCHOLOGY (IE)

UNIT 1: Basic Concepts of Psychology

Definition of Psychology, Origin of Psychology - Philosophical roots of psychology, Schools of Psychology –Structuralism – Gestalt – Functionalism – Behaviorism - Psychoanalysis – Humanistic. Fields of Psychology - Work of a psychologist – Applications of psychology.

UNIT 2: Learning principles and methods

Definition of learning, Factors in The Process of Learning Classical conditioning - Operant Conditioning – The principle of reinforcement and Punishment. Theory of learning. Cognitive learning- Latent learning, Insight learning, and Imitation.

UNIT 3: Motivation, Emotion, Memory and forgetting

Motivation - Definition of motivation – Theories of motivation - Physiological basis of motivation – Motivational factors in aggression – Self-actualization motivation. Emotion – Emotional expression –Theories of emotions. Kinds of remembering – Retrieval processes – The nature of forgetting – Two process theories of memory – Improving memory –Language and thought – Symbols and concepts – Structure – Forms of thought - Thinking and reasoning – Concept formation.

UNIT 4: Development, Sensory Processes and Perception.

Erikson's stages of psychosocial development Lawrence Kohlberg's stages of moral development Freud's Stages of Psychosexual Development Physiological basis of behavior – The brain and nervous system –The sensory process, Some general characteristic of senses – Five senses, Perception: Organization – The role of learning in perception – Perception and attention – Perceptual process.

UNIT 5: Intelligence & Personality

Theories of intelligence – Measuring Intelligence – Kinds of intelligence tests – Ability – Formation of aptitude and attitude – Aptitude tests –Creativity and its tests. Personality – Definition of Personality – Theories of Personality – Assessment of Personality. Social Factors Influencing Personality.

UNIT 6: Social Psychology

Definition, Nature, Subject Matter and Scope of Social Psychology-Applications and Importance of Social Psychology, Groups: Definition and Type- Primary and Secondary Groups Social Interaction, Social and Inter-Personal Relations. Inter-personal attraction – Love and Companionship. Prosocial-behavior. Modes of empathy: self – other differentiation and development of empathy. Social influence: attitude and conformity. Definition - Characteristics and Classification of Crowd. Leadership: Definition and characteristics, Defense Mechanisms,

frustration and conflict, sources of frustration and conflict, types of conflicts. Aggression and Types of aggression.

UNIT 7: Health Psychology

Definition of Health Psychology -Relating Health Psychology to other fields Clinical Health Psychology, Public Health Psychology, Community Health Psychology, Critical Health Psychology

Abnormal Psychology: Concepts of normality and abnormality, causation of mental illness, neuroses, psychoses, psychosomatic disorders, measures to promote mental health.

Stress - Definitions- Models of Stress – Theories of Stress - Stress reactions – Coping and Stress Management techniques, Pain and its management - Psychological reactions of a patient to loss – Stages of Acceptance by Kubler-Ross.

REFERENCES:

1. Clifford T. Morgan, Richard a. King, John R. Weis and John Schopler, “**Introduction to Psychology**” – **7th Edition**. Tata McGraw Hill Book Co. New Delhi, 1993.
2. Baron, R. A., & Byrne, D (2006), “**Social psychology**”, New Delhi: Prentice Hall of India private limited.
3. Elliot Aronson, Timothy D. Wilson, Robin M. Akert, Samuel R. Sommers “**Social psychology**” **9th edition** published by Pearson education, Inc., 2006
4. Shelley E. Taylor. “**Health Psychology**” **Third Edition**. McGraw Hill International Editions, 1995.
5. Swaminathan, V.D, Latah Sathish, “**Psychology for Effective Living**”, Department of Psychology, University of Madras.

Coleman, James. 1980. “**Abnormal Psychology and modern life**”. New Delhi: Tata McGraw Hilled.

SEMESTER- IV

S.NO	SUBJECT
1	Clinical Pathology -Theory (UE)
2	Clinical Pathology -Practical(UE)
3	Blood Banking & Immunology – Theory(UE)
4	Blood Banking & Immunology – Practical(UE)
5	Basics And Advanced Life Support (IE)
6	Sociology (IE)

SEMESTER IV
Clinical Pathology-Theory

OBJECTIVES

1. To develop in depth knowledge on pathological aspects in relation to hematology.
2. To develop exhaustive ideology of techniques involved in urine analysis.

CONTENTS

UNIT – I

Components of blood and their functions, Hematopoietic system of the body, Specimen collection for hematological studies, Discarding procedures, Cleaning of laboratory glassware in hematology, Determination of Hb concentration, Calculation of blood cell indices - MCV, MCH & MCHC, Estimation of erythrocyte sedimentation rate, Estimation of packed cell volume.

UNIT – II

Peripheral smear examination–staining, interpretation, normal & abnormal cells, parasites, Reticulocyte count, Counting on hemocytometer, Automated systems in hematology.

UNIT – III

Approach to the diagnosis of anemia, Screening for sickle cell anemia, Estimation of fetal Hb, Hemoglobin electrophoresis, Osmotic fragility test, Heinz body preparation, Lupus erythematosus (LE) cell preparation; Approach to the diagnosis of leukemias, Preparation of bone marrow smears for microscopic-examination.

UNIT – IV

Haemostasis, Mechanism of blood coagulation, Fibrinolysis, Bleeding time determination, Whole blood clotting time, Thrombin time, Clot retraction and lysis time, Preparation of blood samples for coagulation test, PT, APTT, Plasma recalcification time, thrombin time, Lab diagnosis of bleeding disorders.

UNIT – V

Urine analysis with manual & strip methods, CSF analysis, Semen analysis

Text Books:

1. Hematology, Larry, Waterbury, 3rd sub edition, Lippincott Williams & Wilkins, 1988.

Reference Books

1. Dacia and Lewis Practical Hematology, Bain, 11th Edition, Elsevier Health Sciences, 2012.

CLINICAL PATHOLOGY PRACTICAL (UE)

OBJECTIVES

1. To inculcate thorough knowledge on life supports skills.
2. To elaborate on various first aid techniques and triage

CONTENTS

EXERCISE:

1. Smearing peripheral blood, staining with Leishman stain and differential counting
2. Urine physical & chemical examination for the presence of reducing sugar, protein, blood, ketone – manual method
3. Urine physical & chemical examination for the presence of reducing sugar, protein, blood, ketone – strip method
4. Hb estimation by colorimeter
5. Estimation of ESR
6. Total count on hemocytometer
7. Staining of reticulocytes
8. Semiautomated PT
9. Semiautomated APTT
10. Urine microscopic examination
11. Fluid – Physical examination, Total count
12. Fluid – Differential count on a stained smear

SPOTTERS:

1. Lab materials – Name & application of each:
2. Vacutainer - Lavender / Blue / Green / Grey topped
3. ESR tube
4. Cuvette
5. PCV tube
6. Pasteur pipette
7. Micropipette
8. RBC pipette
9. WBC pipette
10. Neubauer chamber
11. Bone marrow needle
12. Lancet

SLIDE IDENTIFICATION

13. Malaria
14. Iron deficiency anemia
15. Charts:
16. Microfilaria
17. Reticulocyte
18. Sick cell
19. Chronic myeloid-leukemia
20. LE cell

BLOOD BANKING AND IMMUNOLOGY – THEORY (UE)

OBJECTIVE

1. To provide an introduction to Blood grouping, antibody screening, crossmatching
2. To enable the students to understand the basic concepts in Immunology.

UNIT I

Immunology-

Introduction to immunology, Cells of Immune System, complement pathway, Cytokines, Hypersensitivity reactions, HLA and Tissue typing, Blood group genetics, Elisa, Western blot.

UNIT II

Introduction to Immunoematology-

Introduction to immunoematology, Characteristics of antigens – antibodies, Factors influencing antigen – antibody reactions, Principles of antibody potentiators, Direct antiglobulin test, Indirect antiglobulin test, Sources of error in antiglobulin test, Blood banking reagents, Routine testing procedures in immunoematology laboratory, ABO blood group system, Rh blood group system, other blood groups.

UNIT- III

Blood Banking Technology

Blood donor selection, Blood donor reactions, Blood collection, Blood component preparation and storage, Blood component uses, Pretransfusion testing, Blood administration, Adverse reactions of blood transfusion.

UNIT-IV

Transfusion Transmitted Diseases and safety precautions

Transfusion transmitted diseases, HIV, HBs Ag, HCV, Syphilis and Malaria, Testing for TTI, Universal precautions

UNIT-V

Quality Assurance and Regulation of Blood Bank Industry

1. Blood bank licensing issues, good manufacturing practices, Blood bank safety programs

Text Books:

1. Basic & Applied Concepts of Immunoematology - Page burst E-Book on VitalSource, Kathy D Blaney, Paula R Howard, Elsevier Health Sciences, 2008.

Reference Books:

1. Basic Clinical Laboratory Techniques, Barbara Eastridge, Anna Reynolds, Cengage Learning, 2011.

BLOOD BANKING & IMMUNOLOGY

PRACTICAL (UE)

OBJECTIVES

1. To provide an introduction to Blood grouping, antibody screening, crossmatching
2. To enable the students to understand the basic concepts in Immunology.

CONTENTS

EXERCISE:

1. Blood grouping & Rhtyping
2. Cross matching
3. Direct Coombstest
4. Indirect Coombstest
5. TTI rapidtests
6. Antisera affinity &avidity

SPOTTERS:

7. Antisera
8. Gelcards
9. Pasteurpipette
10. ELISA plates
11. Antiglobulinreagents
12. TTI rapid testrates
13. Blood bags – single, double, triple
14. Fresh frozen plasma
15. Platelet concentrate
16. Leukodepletion filters

BASIC AND ADVANCED LIFE SUPPORT (IE)

1. BLS
2. TRIAGE
3. Primary Survey
4. Secondary Survey
5. Airway & Ventilatory management
6. Shock
7. Central & peripheral venous access
8. Thoracic trauma–Tension pneumothorax
9. Other thoracic injuries
10. Abdominal trauma– Blunt injuries
11. Abdominal trauma–Penetrating injuries
12. Spine and spinal cord trauma
13. Head trauma
14. Musculoskeletal trauma
15. Electrical injuries
16. Thermal burns
17. Cold injury
18. Pediatric trauma
19. Trauma in pregnant women
20. Workshop BLS
21. Workshop cervical spine immobilization
22. Imaging studies in trauma
23. The universal algorithm for adult ECC
24. Ventricular fibrillation/ Pulseless ventricular tachycardia algorithm
25. Pulseless electrical activity(PEA)/asystole algorithm
26. Brady cardia treatment algorithm
27. Tachy cardia Treatment algorithm
28. Hypotension/Shock
29. Acute myocardial infarction
30. Pediatrics Advanced life support
31. Defibrillation
32. Drugs used in ACLS
33. Emergency cardiac pacing
34. AED
35. Techniques for oxygenation and ventilation

SOCIOLOGY (IE)

UNIT 1: NATURE AND SCOPE OF SOCIOLOGY

Definition, Historical background, subject matter of sociology, Nature and scope, Importance, Sociology of India, Relationship of sociology with other social sciences

UNIT 2: FUNDAMENTAL CONCEPTS OF SOCIOLOGY

Society and Individual, Community, Social structure and functions of Institutions, Association, Organization, Social system, social order, social control, social groups, Social Process, Social change,

UNIT 3: CLASSICAL THINKERS AND THEIR CONTRIBUTIONS

Auguste comet, Emile Durkheim, Karl Marx, Max Weber, Herbert Spencer

UNIT 4: SOCIOLOGY OF INDIA

Characteristics of Indian society, Racial linguistic, Religious and demographic, Hindu social organization-ashramas, varnas, dharma and karma, purusha, Caste system, Problems of SC&ST, Sanskritization, Westernization and Modernization,

UNIT 5: ANTHROPOLOGY AND CULTURAL ANTHROPOLOGY

Definition of anthropology, Subfield of anthropology, Cultural Anthropology yesterday and today, Anthropological Perspectives, Early Anthropologist

Environment and culture, Kinship, Clan Ethne methodology, Gender, Subsistence and Exchange, Social Organization and evolution of political system.

Reference:

1. Bottomore.T.B., Sociology: A guide to problems and Literature,1971, Random House
2. Gisbert P. Fundamentals of sociology,3rd Edition,2004, OrientLongman publications
3. Neil J. Smelser,Handbook of sociology, 1988.sagepublication
4. Johnson R.M, Systematic Introduction to Sociology,1960, Allied Publishers
5. Cultural Anthropology, BarbaraD. Miller,2006 Pearson/Allyn and Banco
6. C.N. ShankarRao., Introduction to Sociology, 2008, S. CHAND&Company Publications.
- 7.. C.N. ShankarRao., Sociology of India, S. CHAND& Company Publications

SEMESTER-V

S.NO	SUBJECT
1	General Bacteriology and Systematic Bacteriology -THEORY
2	General Bacteriology and Systematic Bacteriology -Practical
3	Virology, Mycology And Parasitology -Theory
4	Virology, Mycology And Parasitology - Practical
5	Environmental Science and Community Medicine (IE)
6.	Biostatistics and Research methodology (IE)
7.	Basic Nutrition/Advanced Diagnostic tech (Elective) (IE)

SEMESTER V

GENERAL BACTERIOLOGY AND SYSTEMATIC BACTERIOLOGY – THEORY (UE)

OBJECTIVES

1. To develop in depth knowledge on Bacteriology.
2. To develop exhaustive ideology of immunology and its importance in diagnosis.

CONTENTS

UNIT- I

General bacteriology

Morphological classification of bacteria, Bacterial cell structure- cell wall, cytoplasmic membrane, cytoplasm, flagella, fimbriae, nucleic acids, capsule, spore (diagram of bacterial cell structure), Definition of sterilization and disinfection, classification of physical and chemical methods of sterilization, autoclave, hot air oven, filtration, chemical agents of sterilization- alcohol, aldehydes, halogens, phenol, gaseous method of sterilization, surface active agents, quality controls for sterilization procedures.

UNIT- II

Culture media & methods

Culture Media –Types –simple media, enriched media, enrichment media, selective media, indicator media, sugar media, transport media, anaerobic media (suitable examples); Culture Methods-Aerobic culture method- streak culture, lawn culture, stroke culture, stab culture, inoculation in liquid culture, Anaerobic culture media and methods Robertson's cooked meat media, thioglycolate medium, Anaerobic jar.

UNIT- III

Identification of bacteria- staining techniques – gram's staining, acid fast staining. Biochemical reactions - sugar fermentation and IMViC tests; Antibiotic susceptibility testing- Kirby Bauer disc diffusion test.

UNIT- IV

Systemic Bacteriology

Staphylococcus, Streptococcus, – morphology, culture characteristics, Laboratory diagnosis; Neisseria-Gonococcus and meningococcus- morphology, culture characteristics, Gram negative bacilli – Escherichia coli, Klebsiella species, Proteus species, Pseudomonas species, Salmonella species, Shigella species, Vibrio species.

UNIT- V

Hospital acquired infections- definition, types, source and mode of spread of infection, hospital infection control, Biomedical waste management- definition, segregation, management, Universal precautions.

Text Books:

1. Laboratory Directions for Beginners in Bacteriology, Varanus A. Moore, Ad lard Coles Nautical Books, 2007.

Reference Books:

1. Lippincott's illustrated reviews immunology, Doan T., 2nd edition, LWW, 2012.

GENERAL BACTERIOLOGY, AND SYSTEMATIC BACTERIOLOGY – PRACTICAL (UE)

OBJECTIVE

1. To develop in depth knowledge on Bacteriology.
2. To develop exhaustive ideology of immunology and its importance in diagnosis.

CONTENTS

General Bacteriology

1. Microscope- Structure, operation, maintenance
2. Staining techniques- simple staining, Gram staining, Acid fast staining
3. Detection of motility by hanging drop.
4. **Sterilization** – Autoclave -Principle, working, maintenance
Hot air oven -Principle, working, maintenance
5. Chemical disinfectants –sodium hypochlorite, lysosome, phenols, glutaraldehyde-uses

Culture Media & Culture methods

1. Culture Media –Types –simple media, enriched media, enrichment media, selective media, indicator media, sugar media, transport media, anaerobic media –Preparation, sterilization and uses
2. Culture methods-Aerobic and anaerobic culture methods -Techniques
3. Identification of bacteria- biochemical reactions preparation and inoculation and interpretation
4. Antibiotic susceptibility testing- Kirby Bauer disc diffusion test
5. Serological tests- agglutination tests – Latex agglutination, tube agglutination.
6. Immunochromatography - Rapid card tests.
7. ELISA (Enzyme linked immunosorbent assay)

Systemic Bacteriology

1. Staphylococcus, Streptococcus– Microscopy, colony morphology, identification
2. Neisseria-Gonococcus and meningococcus-Microscopy
3. Gram negative bacilli – Escherichia coli, Klebsiella species, Proteus species, Pseudomonas species, Salmonella species, Shigella species, Vibrio species – Microscopy, colony morphology, identification
4. Mycobacterium tuberculosis- Microscopy, colony morphology, identification

Applied Microbiology

1. Hospital acquired infections- definition, types, source and mode of spread of infection, hospital infection control-charts
2. Biomedical waste management- spotters & charts
3. Universal precautions- spotters & charts.

VIROLOGY, MYCOLOGY AND PARASITOLOGY –
THEORY (UE)

OBJECTIVE

1. To inculcate knowledge on virology in detail.
2. To elaborate on mycology and parasitology.

CONTENTS

UNIT- I

General virology:

General properties of viruses –Basic structure of the virus, classification of viruses, viral multiplication, Cultivation of viruses- Animal inoculation, embryonated eggs, tissue cultures, Laboratory diagnosis of viral infections- Briefly on Microscopy, detection of viral antigens and antibodies, isolation of virus, molecular diagnosis, Viral vaccines- Live and killed viral vaccine routinely administered.

UNIT- II

Medically important viruses I

Mode of transmission, clinical manifestations, and preventive measures - Herpes simplex viruses (HSV I&II), Influenza virus, Polio virus, Measles.

UNIT- III

Medically important viruses II

Mode of transmission, clinical manifestations, and preventive measures, Dengue, Japanese B encephalitis, Chikungunya, Hepatitis, HIV

UNIT- IV

Medically important fungi

Morphology & infections caused by -Candida species, Dermatophytes, Aspergillus species, Mucor & Rhizopus, Culture media and staining methods used in identification of fungi.

UNIT- V

Medically important parasites

Etiology, mode of transmission, sample to be collected - Amebiasis, malaria, tape worms, round worm hook worm and filarial worm infections, Stool examination, Peripheral blood smear examination.

Text Books:

1. Textbook of Virology, Vinod Singh, 1st edition, Bic Publishers,2010.
2. Textbook of Mycology, Sandeep Saxena,1st edition, Somali Publications, 2012.

Reference Books:

1. Clinical Parasitology: A Practical Approach, Zebibit, 2nd edition, Elsevier Health Sciences, 2012.

VIROLOGY, MYCOLOGY AND PARASITOLOGY – PRACTICAL (UE)

OBJECTIVE

1. To inculcate knowledge on virology in detail.
2. To elaborate on mycology and parasitology.

CONTENTS PRACTICALS/DEMONSTRATORS

1. Sample collection –blood collection, serum separation, collection of other required specimens
2. Rapid card tests & ELISA for detection of antigens and antibodies.
3. Fungal media preparation and inoculation –SDAgar, Corn mealagar.
4. Staining techniques- LPCB mount,KOHmount
5. Stool concentration techniques, identification of ova cyst in stool samples by saline andiodine mount,
6. Peripheral blood smear -Preparation, Leishman’s staining.

ENVIRONMENTAL SCIENCE AND COMMUNITY MEDICINE (IE)

Natural Resources:

Introduction, Multi-disciplinary nature of environmental studies, Earth Resources and Man, Renewable and Non-Renewable Resources, Water Resources, Mineral Resources: Food Resources: Effects of modern agriculture, Fertilizer/ pesticide problems, Water logging, and salinity, Energy Resources.

Ecosystems:

Concept of an Ecosystem, Structure and Functions of an Ecosystem, Producers, Consumers and Decomposers, Cycles in The Ecosystem

Biodiversity:

Introduction, Definition: Genetic, Species, Ecosystem Diversity, India as a Mega Diversity Nation, Hotspots of Biodiversity Threats to Biodiversity. Poaching of Wildlife, Man-Wildlife Conflicts, Endangered and Endemic

Pollution:

Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear hazards, Solid Waste Management role of Individuals in Pollution Prevention.

Social Issues Human, Population and Environment:

From Unsustainable to Sustainable Development, Urban Problems Related to Energy, Water Conservation, Rain Water Harvesting, global warming, acid rain, ozone layer depletion, nuclear accidents and nuclear holocaust

Concept of health & disease

Concept of health, Definition of health, Philosophy of health- Dimension of health - Concept of well-being, Spectrum of health, Responsibility of health - Determinates of health & Indicators of health - Concepts of disease & Concepts of cessation - Determinates of health & Indicators of health - Concepts of disease & Concepts of cessation - Determinates of health & Indicators of health - Concepts of disease & Concepts of cessation - Modes of Intervention, Changing pattern of disease.

Epidemiology:

Definition & Explanation, Aims, Epidemiologic approach, Basic measurement in epidemiology & tools of measurement – of Mortality, Epidemiologic methods – Descriptive epidemiology – Analytical epidemiology - Cohort study – Experimental epidemiology – RCT- Association & Causation Uses of epidemiology

(Criteria for judging causality) – Infection disease epidemiology Definitions Dynamic of disease transmission & Mode of Transmission – Disinfection – Definitions Types Agents used Recommended disinfection procedures – Investigation of an epidemic.

Environmental & health:

Definition & Components (environment sanitation environmental sanitation) Water: Safe & Whole some water Requirements Uses source of water supply (sanitary well) – Purification (1). Large scale purification, (2). Small scale purification – Water quality – Special treatment of water Air: Composition the air of occupied room discomfort.

Air pollution & its effects. Prevention & Control of air pollution

Ventilation: Definition Standards of ventilation Types of Ventilation. Light, Noise & Radiation, Meteorological environment, Housing, Disposal of waste Excreta disposal

BIostatistics & Research Methodology (IE)

INTRODUCTION

What is statistics – Importance of statistics in behavioral sciences – Descriptive statistics and inferential statistics – Usefulness of quantification in behavioral sciences. Measurements – Scales of measurements – Nominal, Ordinal, Interval and Ratio scales. Cumulative frequency curve – Drawing inference from graph. Measures of central tendency – Need – types: Mean, Median, Mode – Working out these measures with illustrations. Measures of variability – Need – Types: Range, Quartile deviation, Average deviation, Standard deviation, Variance – Interpretation. Normal distribution – General properties of normal distribution – Theory of probability – Illustration of normal distribution – area under the normal probability curve.

Variants from the normal distribution – skewness – Quantitative measurement of skewness – kurtosis – measurement of kurtosis – factors contributing for non-normal distribution.

RESEARCH METHODS:

Research Meaning- Scope and Objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis

DATA COLLECTION AND SAMPLING:

Data collection – Classification of data – Class intervals – Continuous and discrete measurements – Drawing frequency polygon – types of frequency polygon – Histogram. Aspects of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statistical package (Sigma STAT, SPSS for student t-test, ANOVA, etc.), hypothesis testing. Correlation – historical contribution – meaning of correlation – types: Product, moment, content correlation, variation of product, movement correlation, rank correlation, Regression analysis.

Tests of significance- need for – significance of the mean – sampling error – significance of differences between means – interpretation of probability levels – small samples – large samples.

BASIC NUTRITION (ELECTIVE) (IE)

UNIT 1 – NUTRITIONAL ASSESSMENT

Nutritional anthropometric measurements, Nutritional biochemical assessment, Clinical signs & symptoms, Dietary assessment

UNIT 2 – NUTRITION THROUGH LIFE CYCLE

Diet during infancy, Diet during preschool, Diet during school, Diet during adolescence, Diet during adulthood, Diet during geriatrics, Diet during special needs- Pregnancy and lactation

UNIT 3 – THERAPEUTIC NUTRITION 1

Dietary management in underweight, Dietary management in obesity, Dietary management in diabetes, Dietary management in hypertension.

UNIT 4 – THERAPEUTIC NUTRITION 2

Dietary management in cardiovascular diseases, Dietary management in renal diseases, Dietary management in cancer

ADVANCED DIAGNOSTIC TECHNIQUES (ELECTIVE) (IE)

Unit I

Volumetric analysis, Balancing & Weighing, Concepts of solute & solvent, Units of measurement. Specimen Collection & Processing: Specimen collection (Blood, urine, spinal fluid, saliva synovial fluid, Amniotic fluid), Preservation, transportation

Unit II

Clinical Enzymology: Principle of diagnostic enzymology, Digestive enzyme, miscellaneous enzyme. General Function Tests: Liver function test, Cardiac Function Test, Renal Function Test, Thyroid Function test, Reproductive endocrine function test

Unit III

Immunodiagnosics: Introduction, Antigen-Antibody Reactions, Conjugation Techniques, Antibody Production, Enzymes and Signal Amplification Systems, Separation and Solid-Phase Systems, Studies related to bacterial, viral and parasitic infections.

Unit IV

Product Development: Immunoassay Classification and Commercial Technologies, Assay Development, Evaluation, and Validation, Reagent Formulations and Shelf Life Evaluation, Data Analysis, Documentation, Registration, and Diagnostics Start-Ups.

Unit V

DNA based diagnostics: PCR, RFLP, SSCP, Microarrays, FISH, In-situ hybridization, Studies related to bacterial, viral and parasitic infections, Cell based diagnostics: Antibody markers, CD Markers, FACS, HLA typing, Bioassays.

SEMESTER VI

S.NO	SUBJECT
1	Clinical Chemistry – I – Theory (UE)
2	Clinical Chemistry – I -Practical (UE)
3	Clinical Chemistry – II – Theory (UE)
4	Clinical Chemistry – II – Practical (UE)
5	Healthcare And Basic Principles (IE)
6.	Hospital Management (Elective) (IE)
7.	APPLIED CLINICAL RESEARCH (ELECTIVE)

SEMESTER VI

CLINICAL CHEMISTRY-I - THEORY (UE)

OBJECTIVE

1. To inculcate knowledge on various chemical aspects involved in laboratory diagnosis.
2. To elaborate on various instrumentation and procedures in clinical chemistry for laboratory diagnosis.

CONTENTS

UNIT- I

Role of a lab technician in Clinical Biochemistry lab

Lab utensils: Beaker, Funnels, graduated cylinders, Flasks, Volumetric flasks, Syringes, Pipettes, Micro pipettes, multi-Channel pipettes, Dilutors & Dispensers. Quality control of micropipettes, Quality control validation for performance of pipettes; Lab plastic & Glass ware composition and cleaning; Laboratory safety: Guidelines of OSHA, General safety (Fire, Electrical safety), Chemical Hygiene plan, Storage of chemicals, Labelling & Handling requirements, Waste generation & disposal.

UNIT- II

Units of measurement

Measurement of mass - basic quantities and units of SI. SI derived units used in medicine. Types of balances - maintenance of balance; Basic calculations in Laboratory. Normality, Molality, Molarity, Dilutions - per cent concentration (wt./w, v/v, w/v), pH, pK, buffer preparation; Water as Reagent - Reagent grade water - purification process - Grade of water purity - storage & handling of reagent water - suggested uses of reagent water - Quality control - system documentation & record keeping.

UNIT-III

Instrumentation

Centrifuges - principles of centrifugation - centrifuge types, components, maintenance and quality assurance Water bath, Oven, Incubator - thermometer, calibration and maintenance, Photometry - principles of photometry. Components & applications of colorimeter. Spectrophotometer, Flame photometer, Nephelometer, turbidimetry & reflectance photometry, Enzyme's definition, action, and kinetics.

UNIT-IV

Electrochemistry: Principles and measurements of electrochemistry & electro analytical chemistry. Potentiometry, Voltammetry, coulometry methods - Principles, components, usage, advantages & disorder; Electrophoresis - Principles, components, procedure, types, clinical application & interpretation of the data

UNIT- V

Chromatography - Principles, components, procedure, types, clinical application; Immunochemistry techniques - Principles of immunochemistry, detectors needed sensitivity & specificity- Elisa, Chemiluminescence, fluorescence assays; Semi-automatic, Automatic - Overview, Principles and methodologies used.

Text Books:

1. Textbook of Biochemistry, Sree Kumari Vasudevan, 5th edition, Jaypee Brothers Medical Publishers (p) Ltd, 2007.

Reference Books:

1. Principles of Biochemistry, Voet D 4th edition, John Wiley & Sons Inc. 2012

SEMESTER- VI

CLINICAL CHEMISTRY -I- PRATICAL (UE)

OBJECTIVE

1. To inculcate knowledge on various chemical aspects involved in laboratory diagnosis.
2. To elaborate on various instrumentation and procedures in clinical chemistry for laboratory diagnosis.

CONTENTS

PRACTICALS/DEMONSTRATIONS

1. Pipetting & Weights and Measurements: Principles of weighing, usage of pipettes, pipetting
2. practice - principles of weight - preparation of solutions, Normality -- molality - molarity - Dilution-
3. Percentage (V/V, W/V, V/W)
4. pH and Buffers -Preparation of different buffers - measurements of pH (pH paper, pHmeter)
5. Standardization of Biochemical substances - Glucose, Urea, Creatinine
6. Electrophoresis - Agar gel Electrophoresis - serum Protein Electrophoresis Identification and interpretation
7. Chromatography - Circular paper chromatography - separation of Amino acids & Sugars and calculation of Rf values

Charts / Spotters /Case Studies

- 1) Lab safety
- 2) Grading of reagent water
- 3) Conversion of Units
- 4) Calculation in Biochemistry
- 5) Waste generation Disposal
- 6) pH
- 7) Buffer
- 8) Standardization curve
- 9) Serum Protein Electrophoresis 10) instrumentation -Identification

SEMESTER-VI
CLINICAL CHEMISTRY –II- THEORY (UE)

OBJECTIVE

1. To inculcate knowledge on various chemical aspects involved in laboratory diagnosis.
2. To elaborate on various instrumentation and procedures in clinical chemistry for laboratory diagnosis.

CONTENTS

UNIT- I

Pre – Analytical-

Blood Collection -Types of blood sample - Preservatives & anti-coagulants - Errors related to it Vacutainer system procedures to decrease phlebotomy related variables - Patient identification sample collection - sample transportation - Procedure to minimize sample transportation errors - use of mechanical transporters - sample processing - procedures - Pre analytical variables in urine collections - pre-analytical variables in other body fluids- Criteria for rejection of specimens

UNIT- II

Analytical-

Overview of glucose homeostasis, Definition of Diabetes, overview of pathophysiology, Type I, II, GDM, Pre-Diabetes. Methodologies, comparison of methodologies, reference level. Diagnostic guidelines - Glucose, Insulin, C- Peptide, Glucose Tolerance test Determination, usage of HbA1C methodology to estimate;

Lipid Profile: Definition of lipid, Over view of types of lipids, distribution, Estimation of Total Cholesterol, Triglycerides, HDL Cholesterol, LDL Cholesterol, VLDL Cholesterol - Methodology - Reference level

Liver Profile - Overview of Liver damage and the tests to identify it - total protein, Albumin, Bilirubin (Total & Direct), ALT, AST, ALP & GGT - Methodology - Reference level;

Renal Profile - Overview about Renal function, GFR, tubular function tests; Minerals: Role of minerals in health- estimation of calcium, phosphorus, Magnesium, Iron, copper - Methodology - Reference level - interpretation of data.

Vitamins: Estimation of Folic acid, Vitamin B12, Vitamin C, Vitamin D, Vitamin K - methodology - Reference level - interpretation of data

UNIT- III

Special investigations: Hormones

Thyroid Gland Regulation, Test to Identify Thyroid disorder (T3, T4, FT3, FT4, TSH), Methodology and interpretation, Role of PTH in our Body, Tests to identify parathyroid disorder, PTH (free and Intact) Interpretation, Tests for Infertility LH, FSH, Prolactin, Estradiol, Testosterone (Free & total), B HCG interpretation.

UNIT-IV

Other Special Investigations

Tumor markers - Investigation for Myocardial Infraction - Investigation for acute Pancreatitis - Acid - base abnormality - Anion Gap, Nutritional assessment - Negative Nitrogen Balance - Positive Nitrogen Balance

UNIT-V

Quality Control:

Sensitivity - Specificity - Linearity - Accuracy & Precision, Primary Standard, Secondary standard, Calibration - Internal Quality control indicators, External Quality control Program, test utilization and turnaround time, Regulation's tor Lab (by Indian Govt Internetwork: Guidelines). Hospitalmanagement structure - organization of clinical Lab, Communication within the total hospital, communication within the lab, Personal Management, Work Scheduling, Continuous Quality improvement - Continuing education - Resource management (Lab staff, reagents, supplies & capital equipment).

Text Books:

1. Textbook Of Biochemistry, Sree Kumari Vasudevan, 5th edition, Jaypee Brothers Medical Publishers (p) Ltd, 2007.

Reference Books:

1. Principles of Biochemistry, Voet D 4th edition, John Wiley & Sons Inc.2012.

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Reference Books:

1. Principles of Biochemistry, Voet D 4th edition, John Wiley & Sons Inc.2012.

SEMESTER- VI

CLINICAL CHEMISTRY -II- PRATICAL (UE)

OBJECTIVE

1. To inculcate knowledge on various chemical aspects involved in laboratory diagnosis.
2. To elaborate on various instrumentation and procedures in clinical chemistry for laboratory diagnosis.

CONTENTS

PRACTICALS/DEMONSTRATIONS

1. Estimation of Glucose, Urea, Creatinine, total protein, Albumin

2. Estimation of Bilirubin, Cholesterol, Triglycerides, Uric Acid, Calcium, Phosphorus
3. Estimation of Enzymes amylase, Alkaline Phosphatase, Lipase

CHARTS / SPOTTERS /CASE STUDIES

1. Preservatives
2. Anti-coagulants
3. Types of Samples
4. Vacutainers
5. Blood Collection
6. Reference interval
7. Glucose Tolerance test graphs
8. Interpretation of Routine tests
9. QC materials
10. Guideline for regulation of Lab

HEALTH CARE MANAGEMENT & BASIC PRINCIPLES (IE)

1. Concept of Health Care and Health Policy

- Health in Medical Care
- Indigenous systems of Health Care & their relevance
- Framework for Health Policy Development

2. Health Organization

- Historical development of Health Care System in the third world & India
- Organization & Structure of Health Administration in India
- Type of Health Organization including International Organizations
- Private & Voluntary Health care provider
- Distribution of Health Care Services
- Health Care System in Public Sector Organization
- Health systems of Various Countries

3. Health Policy and National Health Program

- National Health Policy
- Drug Policy
- National Health Programs (Malaria, T.B., Blindness, AISTech.)
- Evaluation of Health Programs (Developing indicators for evaluation)
- Medical Education & Health Manpower Development

4. Health

Economics Fundamentals of Economics

- Scope & Coverage
- Demand for Health Services
- Health as an Investment
- Population, health of Economic Development

5. Methods & Techniques of Economic Evaluation of Health Program

- Cost Benefit & Cost-Effective Methods

6. Household & Health

Health Expenditure & Outcome

- Rationale for Government action
- Household capacity, income and schooling

7. Economics of Health

- Population based health services
- Economics of Communicable and Non-Communicable diseases

8. Health Insurance

HOSPITAL MANAGEMENT (ELECTIVE) (IE)

Objectives:

- To promote awareness of health care among all sections of the Indian people
- To promote awareness among functionaries involved in Health and Hospital Management.
- To promote research in the field of Health and Hospital Management. in order to improve the efficiency of Health Care delivery Systems.
- To promote the development of high-quality hospital services and community health care.
- To promote a forum for the exchange of ideas and information among health and hospital planners, academicians, administrators, various statutory bodies and the general public for the improvement of Hospital and Health Care delivery Systems
- **To develop norms and standards for accreditation of the Health Care Organization and adopt means of evaluation of such institutions, so as to improve the quality of health care in the community**
- To provide opportunities for training and research in all aspects of Hospital Services Health Care Delivery System and Health Care Administration.
- To update the knowledge and skill of the Health & Hospital Administrators and other personnel involved in the management of health care organization through continuous education and research.

UNIT – I

Introduction to Management: Introduction, concept, Characteristics and nature, scope, Principles of Management, Functions and techniques.

UNIT II

Planning: Principles, Characteristics, Essential of good planning, advantages and limitations, Classifications.

UNIT – III

Staffing: Importance, Norms and activities, PCS, Types of PCS, Duty Roaster.

Human resource management: HR planning, Recruitment, selection process, Placement, Orientation of new staff and training, Staff development, staff promotion.

UNIT – IV

Budgeting and material management: Purpose, Types, Principles, Function, cost benefit analysis, Auditing.

Principles of MM, process, supply and equipment, Inventory control, Procurement.

UNIT- V

Controlling-Quality management: Essential of effective control system, Importance of controlling, TQM.

Hospital and patient care, ward management. Legal Issues.

UNIT - VI

Staff development and welfare:

Importance of staff development, Training Vs Education, Function. Staff welfare. Inservice education,

Continuing education and career Opportunities-Component, manager role.

APPLIED CLINICAL RESEARCH (ELECTIVE) (IE)

UNIT I: Introduction to clinical research

Basic pharmacology and drug development process, clinical research definition, Basic terminology used in clinical research, preclinical studies, Introduction to Pharmacoeconomics, Types of clinical trials, Good Clinical Practices, and Scope of Clinical Research.

UNIT II: Clinical trials

New drug discovery process- purpose, main steps involved in new drug discovery process, timelines of each step, advantages and purposes of each step, pre-clinical toxicology: General principles, Systemic toxicology, animal toxicity requirements, Phase-I, II, III, IV trials: Introduction and designing, Various phases of clinical trials, Termination of trial, Safety monitoring in clinical trials

UNIT III: Ethics & Regulations in Clinical research

Ethical Theories and Foundations, Ethics Review Committee and Informed Consent Process, Integrity & Misconduct in Clinical Research Clinical Trial Application in India Import & Export of Drug in India, Investigational New Drug application (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA), Post Drug Approval Activities, PMS, FDA Audits and Inspections EU Regulatory Affairs

UNIT IV: Principles of controlled clinical trials

Clinical trial design (observational and interventional) protocol, consent in clinical trials, placebo, bias and methods to prevent bias, ethics in clinical trials, monitoring, problems and solutions of controlled clinical trials.

UNIT V: Biostatistics and data management

Preparation of a successful clinical study, Study management, Project management Documentation, Monitoring, Audits and Inspections Pharmacovigilance Training in clinical research Budgeting in clinical research, Supplies and vendor management.

SEMESTER-VII & VIII

SL.NO	SUBJECT
1	Project/Dissertation

SEMESTER – VII (FOR ALL SPECIALITIES)

Project/ Dissertation

SEMESTER – VIII (FOR ALL SPECIALITIES)

INTERNSHIP -1 YEAR