Dr. M. G. R.
EDUCATIONAL AND RESEARCH INSTITUTE
UNIVERSITY
(Declared as Deemed to be University u/s. 3 of UGC Act, 1956)
MADURAVOYAL, CHENNAI – 600 095

FACULTY OF ALLIED HEALTH SCIENCES

B.Sc. MEDICAL LABORATORY TECHNOLOGY

Regulations, Curriculum and Syllabus
2017

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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 specialty. 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 2017-2018. 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

ii) Physics, Chemistry, Botany and Zoology

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 31st December of the year of admission to the BSc .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.

7. Commencement of the Course:

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

8. 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 Pre and Para clinical subjects including Anatomy, Physiology, Biochemistry, Microbiology, Pathology, Physics , English and Communication skills, Introduction to Computers, and Pharmacology.
- At the beginning of the third semester, students will be assigned to one of the following branches of specialization as per the admission policy, and they will be offered specialized training in that specialty during the third, fourth, fifth and sixth semesters.

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

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 120working days.

11. Attendance:

The candidate shall have not less than 80 % attendance in Theory and Practical separately. 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 **MAX.MARKS**- 60 Marks **DURATION** -$2^{1}/2$ 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

(i) Theory 20 Marks

(ii) Practical 5 Marks

TOTAL **100 Marks**

Question pattern for SEMESTER III – SEMESTER VI

Duration -3hours

Theory Pattern **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 **20 marks**

- **Based on CAT Exams**

TOTAL **100 Marks**

Practicals Pattern

Max marks:80

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

Internal assessment

Max marks:20

- Based on CAT Exams
- Attendance
- 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,

(i) 40% minimum in the University End-Semester Theory examination

(ii) 40% minimum in the University End-Semester Practical examination

(iii) 40% of marks in the subject where internal evaluation alone is conducted

(iv) 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) A candidate is not normally permitted to temporarily break the study.
b) If a candidate is continuously absent from the institute for four or more weeks,
    i) Having notified the Dean/Director/Principal within this period, this absence shall be treated as “Temporary Break of Study”.
    ii) Without notifying the Dean/Director/Principal, his/her name will be removed from the institute rolls.
c) 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.
d) For condonable break of study:
    i) 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.
    ii) 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.
e) 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 ofstudy.

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.

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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	**40 hours**	**20 hours**	**20**	**5**	**60**	**15**	**100**
2	Physiology -I	**40 hours**	**20 hours**	**20**	**5**	**60**	**15**	**100**
3	Biochemistry -I	**40 hours**	**20 hours**	**20**	**5**	**60**	**15**	**100**
4	Microbiology -I	**40 hours**	**20 hours**	**20**	**5**	**60**	**15**	**100**
5	Pathology -I	**40 hours**	**20 hours**	**20**	**5**	**60**	**15**	**100**
6	English	**30 hours**	**-**	**50**	**15**	**20**	**05**	**50**

SEMESTER – II

TOTAL HOURS : 400

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	40 hours	20 hours	20	5	60	15	100
2	Physiology -II	40 hours	20 hours	20	5	60	15	100
3	Biochemistry -II	40 hours	20 hours	20	5	60	15	100
4	Microbiology -II	40 hours	20 hours	20	5	60	15	100
5	Pathology -II	40 hours	20 hours	20	5	60	15	100
6	Pharmacology	40 hours	20 hours	20	5	60	15	100
7	Physics	30 hours	-	50	-	-	-	50
8	Computer Science	30 hours	-	50	-	-	-	50

SCHEME OF EXAMNINATION

SEMESTER – III (MEDICAL LABORATORY TECHNOLOGY)

Total Hours: 420 Hrs

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.	Histipathology – Practical (UE)	-	120 hours	-	20	-	80	100
3.	Cytology – Theory (UE)	60 hours	-	20	-	80	-	100
4.	Cytology – Practicals (UE)	-	120 hours	-	20	-	80	100
5.	Medical Ethics (IE)	30 hours	-	-	-	50	-	50
6.	Psychology (IE)	30 hours	-	-	-	50	-	50

SEMESTER – IV (MEDICAL LABORATORY TECHNOLOGY)

Total Hours: 420 Hrs

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(Hematology & Urine Analysis) -Theory (UE)	60 hours	-	20	-	80	-	100
2.	Clinical Pathology(Hematology & Urine Analysis) -Practical (UE)	-	120 hours	-	20	-	80	100
3.	Blood Banking & Immunology – Theory (UE)	60 hours	-	20	-	80	-	100
4.	Blood Banking ℰ 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

SEMESTER –V (MEDICAL LABORATORY TECHNOLOGY)

Total Hours: 390 Hrs

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, Immunology and Systematic Bacteriology – Theory (UE)	60 hours	-	20	-	80	-	100
2.	General Bacteriology, Immunology 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.	**Community medicine (IE)**	30 hours	-	-	-	50	-	50

SEMESTER – VI (MEDICAL LABORATORY TECHNOLOGY)

Total Hours: 390 Hrs

S.No	PAPER	Hours / Semester		Evaluation (Marks)				
		Theory	Practical	Continuous Assessment (Internals)		End Semester Examination (University/ Department Exams)		
				Theory	Practical	Theory	Practical	Total
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

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**	-	-	100	-	100	-	200
2.	**Statistics and research methodology**	30 hours	-	-	-	-	50	50

SEMESTER – VII & VIII (FOR ALL SPECIALITIES)

Internship -1 year

OBJECTIVES:

Upon successful completion of the course Medical Laboratory Technologist, the student should be able to Perform routine clinical laboratory procedures within acceptable quality control parameters in Hematology, Clinical Chemistry, Immunohematology, and Microbiology under the general supervision of a Clinical Laboratory Scientist or Pathologist. They also will be able to Apply systematized problem solving techniques to identify and correct procedural errors, identify instrument malfunctions and seek proper supervisory assistance, and verify the accuracy of laboratory results obtained. They also Operate and maintain laboratory equipment, utilizing appropriate quality control and safety procedures. MLT students will perform laboratory test procedures accurately and efficiently. MLT students will analyze diverse types of information to choose an appropriate courseof action in order to perform laboratory tests and solve problems accurately and efficiently.

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)

Course description:

- A study of the anatomical structure of the human body.
- Body structure will be studied by organ systems.
- Form-function relationships with emphasis on clinically relevant anatomy.
- The laboratory study will involve observing and learning from human skeletal collections and dissected cadavers and preserved specimens.

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, subcellular 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 brachii, Triceps brachii, 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 VOCE SYLLABUS

1. **Histology** – Epithelium
2. **Axial & Appendicular Skeleton** With Names & Number Of Bones
3. **Muscles**
   a. Trapezius
   b. Lattisimusdorsi
   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 ballSS
6. **Viva Voce**
   a. Radiology – Xrays

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

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 **Ia. General Physiology**

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

Ib. Nerve and muscle

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

Ic.Blood and body fluids

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

Unit II **IIa. 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.

IIb.Excretory system

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

PRACTICAL & VIVA VOCE SYLLABUS

I. Microscope

II.Estimation of Hemoglobulin
III.RBC
IV.WBC
V.Spotters

BIOCHEMISTRY-I (UE)

Objectives:

- 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 VOCE

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
8 Spotters

Spotters:

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

- **CRYSTALS**

  - Maltosazone
  - Lactosazone
  - Glucosazone/Fructosazone

- **REAGENTS**

  - Benedict's reagent
  - Barfoeds reagent
  - Foulgers reagent
  - Seliwanoff reagent
  - Fouchets reagent

- **CHEMICALS**

  - Sodium Acetate
  - Phenylhydrazine
  - αNaphthol

- **STRUCTURES.**

  - Structure of Cholesterol
  - Structure of Glucose
  - Structure of Fructose

- **VITAMINS**

  - Carrots
  - Rickets
  - Scurvy

- Egg

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 VOCE

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

PATHOLOGY-I (UE)

1.Introduction to cell

- Normal Cell Structure Function

2.Cell injury and Adaptation

- Types of cell injury
- Adaptation
- Necrosis
- Apoptosis
- Pathological calcification

3.Inflammation and Repair

- Acute Inflammation
- Chronic Inflammation
- Wound Healing and Repair

4.Infectious Disease

- TB
- Leprosy

5.Hemodynamic Disorder

- Edema
- Thrombosis and Embolism
- Shock

6.Neoplasia

- Classification
- Nomenclature
- Characteristics of Benign & Malignant neoplasm
- Pathogenesis of cancer
- Spread of Cancer

7.Genetic Disorders

- Down syndrome
- Klinfelter Syndrome
- Turner Syndrome

8.Radiation

- Biological Effect of Radiation

PRACTICAL & VIVA VOCE

- **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
  - Neaubaur's chamber
  - Bone Marrow Needle

SEMESTER-II

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

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

1. 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.

2. Lymphatic system

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

3. Respiratory system

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

Unit II

4. 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.

5. Urinary system

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

Unit III

6. 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.

Anatomical Regions

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

PRACTICAL & VIVA VOCE 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**
  - Saggital section – Male & Female pelvis
  - Uterus & ligaments
  - Ovary
  - Prostate
  - Seminal vesicals

- 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: Clinical Anatomy.

PHYSIOLOGY-II (UE)

Unit III Cardiovascular System

- Cardiac muscle, action potential and conductingsystem 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 -IV 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 desending tracts.

Unit -V 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,Artifical Respiration.

Unit – VI Special sense and skin

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

Unit – VIIReproductive system

- Malereproductive organs-Spermatogensis and testosterone actions.
- Female reproductive organs.
- Contraception Methods.

Unit – VIII 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 VOCE SYLLABUS

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

BIOCHEMISTRY – II (UE)

Objectives:

- 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.

Unit I - PROTEINS

Proteins :

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

Metabolism of Proteins :

- Digestion and absorption of proteins,
- Ttransamination,
- Deamination,
- Steps of urea cycle,
- Phenylketonuria,
- 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 VOCE

- 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's 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
21.

MICROBIOLOGY – II (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.

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 VOCE

I.SPOTTERS

1. Ascarislumbricoides
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)

1. CVS

-Atherosclerosis
-Ischemic heart diease
-Congenital heart diseae
-Valvular heart disease

2. RESPIRATORY SYSTEM
-Bronchial Asthma
-Emphysema
-Bronchiectasis

3. GIT
-Gastric ulcer
-Tumors of GIT

4. HEPATOBILIARY
-Hepatitis
-Liver Abscess
-Cirrhosis
-Cholecystits

5. KIDNEY AND URINARY TRACT
-Renal stones
-UTI and Pyelonephritis
-Renal cell carcinoma(RCC)
-Renal Failure

6. REPRODUCTIVE SYSTEM
-Diseases of testis, uterus, cervix and ovary

7. CNS
-Infections

8. BONES and JOINTS
-Septic Arthritis
-Osteomyelitis
-Rhematoid Arthritis

9. ANEMIA

10. AUTOIMMUNE DISEASES

PRACTICAL & VIVA VOCE

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

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
Introduction
General pharmacological principles-Definition-Routes of drug administration-Pharmacokinetics-

Unit I:

- 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:
Prep Manual for Undergraduates in Pharmacology by Tara V Shanbag, 2nd edition
Pharmacology for Dental and Allied Health Sciences by Padmaja Udaykumar, 3rd edition
Reference books:
Essentials of Medical Pharmacology by KD Tripathi, 7th edition
Basic and Clinical Pharmacology by Bertram G Katzung, 12th edition

PRACTICAL & VIVA VOCE

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
Students Discussion	Syringes: Tuberculin
Insulin I.V cannula Scalp. Vein set	
Students Discussion	Enema can Inhalers
Spacers Nebulizers	
Students Discussion	Tablets – Enteric coated, Sustained release, Sub-lingual
Students Discussion	Capsules, Spansules, Pessary, Suppository

Students Discussion	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 2rd edition Padmaja Udaykumar
- Pharmacology for dental students Tara V shanbhag, Smita Shenoy, Veena Nayak
- Principles of pharmacology 2rd edition H.L.Sharma & KK Sharma

PHYSICS

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 -99mTc 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 Biopotential signals – Working principles of bio potential recording systems – Electrocardiography – Electroencephalography – Electromyography.

Computer Science

1. 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

2. System:

- Hardware,
- Software,
- system definition,
- Fundamentals of Networking,
- Internet,

- Performing searches and working with search engines,
- types of software and its applications

3. 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.

4. 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.

5. Programming in C language,

- Data types, identifiers, functions and its types, arrays, union, structures and pointers
- 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 Optometry

SEMESTER III

S.No	SUBJECTS
1	Histopathology – Theory
2	Histipathology – Practical
3	Cytology – Theory
4	Cytology – Practicals
5	Medical Ethics
6	Psychology

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- Receipt and dispatch of biopsy material Documentation.

UNIT II

Fixation & Grossing, Tissue processing (Dehydration, clearing, impregnation, embedding) (Decalcification)

UNIT – III

Microtomy, Knives & Knife sharpening, Tissue sectioning, mounting etc.

UNIT – IV

Principles of staining, Staining techniques – Routine & special.

UNIT – V

Filling, indexing and preservation of blocks. Frozen section (cryostat), museum techniques.

Text Books:

1. Wheater'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, Iain R.
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. Perls stain
4. PAS stain
5. Giemsa stain
6. Ziehl – Neelsen stain
7. Reticulin stain
8. Van Gieson 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. Waterbath
7. Diamond pencil
8. Cover slip
9. Formalin
10. Chloroform
11. Alcohol
12. Xylene

CHARTS/PHOTOGRAPHS

1. Histokinette
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 to FNAC & Exfoliative cytology :Fixation of smears, Coating fixatives, Polyethylene glycol solution, Diaphane solution, Rehydration of air dried smears, Mailing of unstained smear, Preservation of fluid specimens prior to processing - Fresh material, Specimens with a high mucous content, Specimens with a high protein content, Specimens with a low mucous or protein content, Specimens with low PH ,Pre fixation of material, Ethyl alcohol (50% solution), Sacromannos fixative, Mucolex,Preparation of fluid smears for microscopic examination, Direct or sediment smears on glass slides (fresh / clotted / bloody / prefixed)

UNIT- II

Processing of fluids- Sputum, bronchial aspirates, bronchial washings, gastric washings, Urine & other watery fluids, Cerebrospinal fluid.

UNIT- III

Cytocentrifuge preparations - Shandon's cytospin, Unloading the machine, Operation, Comments; Preparation with membrane filters, Materials needed, Specimen requirements, Method of filtration; Preparation of cell blocks, Fixed sediment method, Bacterial agar method Plasma thrombin clot method.

UNIT-IV

Preparations of stains and solutions used in the Papanicolau staining method - Graded alcohols, Bluing solutions, Preparation of Harris, Mayer, Lillie Mayer and Gill Haematoxylins, EA50, EA 36, EA 65 and Orange G; Stains for hematologic material and air dried smears, Wright stain, Giemsa stain, Wright Giemsa stain, Modified May Grunwald Giemsa stain.

UNIT – V

Important factors influencing staining results, Maintenance of solutions and stains, Dipping slides, Intensity of staining reaction, Contamination control, Important factors influencing the staining results of filters, Destaining slides, Timing, Dye solubility and impurities, Total dye content, Stains with special purpose depending on category, use

stain and fixative; Mounting the cell sample, Mounting medium, Dissolving nuclear pore filters prior to staining, Dissolving nuclear pore filters after staining, Cover slips, Cover slipping the entire sample, Method of cover slipping glass slides and filters, Cooling slides; Stains used in hormonal evaluation; Stains used in the identification of sex chromatin.

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

SPOTTERS

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

CHARTS

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

PSYCHOLOGY

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, Latha Sathish, "**Psychology for Effective Living"**, Department of Psychology, University of Madras.

6. Coleman, James. 1980. "**Abnormal Psychology and modern life"**. New Delhi: Tata McGraw Hill Ltd.

MEDICAL ETHICS

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; Workers 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.

SEMESTER IV

S.No	SUBJECT
1	Clinical Pathology(Hematology & Urine Analysis) -Theory
2	Clinical Pathology(Hematology & Urine Analysis) -Practical
3	Blood Banking & Immunology - Theory
4	Blood Banking & Immunology - Practical
5	Basics And Advanced Life Support
6	Medical Sociology

SEMESTER IV

Clinical Pathology(Hematology & Urine Analysis) -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, Haematopoietic system of the body, Specimen collection for haemotological 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, Cytochemical tests and other investigations; 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, PTT, APTT, Plasma recalcification time, thrombin time, Lab diagnosis of bleeding disorders.

UNIT – V

Urine analysis with manual & strip methods, CSF analysis, Analysis of serous fluids, synovial fluids, gastric juice, Semen analysis

Text Books:

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

REFERENCE BOOKS

1. Dacie and Lewis Practical Haematology, Bain, 11th Edition, Elsevier Health Sciences, 2012.

CLINICAL PATHOLOGY
HEMATOLOGY & URINE ANALYSIS
PRACTICAL (UE)

OBJECTIVES

1. To inculcate thorough knowledge on life support 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. Sickle cell
19. Chronic myeloid leukemia
20. LE cel

BLOOD BANKING AND IMMUNOLOGY – THEORY (UE)

OBJECTIVE

1. To provide an introduction to Blood grouping, antibody screening, cross matching
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 Immunohematology-

Introduction to immunohematology, 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, Rroutine testing procedures in immunohematology 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 Immunohematology - Pageburst E-Book on VitalSource, Kathy D Blaney, Paula R Howard, Elsevier Health Sciences, 2008.

Reference Books:

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

BLOOD BANKING & IMMUNOLOGY – PRACTICAL (UE)

OBJECTIVES

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

CONTENTS

EXERCISE:

1. Blood grouping & Rh typing
2. Cross matching
3. Direct Coombs test
4. Indirect Coombs test
5. TTI rapid tests
6. Antisera affinity & avidity

SPOTTERS:

7. Antisera
8. Gel cards
9. Pasteur pipette
10. Elisa plates
11. Antiglobulin reagents
12. TTI rapid test rate
13. Blood bags – single, double, triple
14. Fresh frozen plasma
15. Platelet concentrate
16. Leukodepletion filters

BASIC AND ADVANCED LIFE SUPPORT

- BLS
- TRIAGE
- Primary survey
- Secondary survey
- Airway & Ventilatory management
- Shock
- Central & peripheral venous access
- Thoracic trauma – Tension pneumothorax
- Other thoracic injuries
- Abdominal trauma – Blunt injuries
- Abdominal trauma – Penetrating injuries
- Spine and spinal cord trauma
- Head trauma
- Musculoskeletal trauma
- Electrical injuries
- Thermal burns
- Cold injury
- Pediatric trauma
- Trauma in pregnant women
- Workshop BLS
- Workshop cervical spine immobilization
- Imaging studies in trauma
- The universal algorithm for adult ECC
- Ventricular fibrillation/Pulseless ventricular tachycardia algorithm
- Pulseless electrical activity (PEA) / asystole algorithm
- Bradycardia treatment algorithm
- Tachycardia Treatment algorithm
- Hypotension / Shock
- Acute myocardial infarction
- Pediatrics Advanced life support
- Defibrillation

- Drugs used in ACLS
- Emergency cardiac pacing
- AED

Techniques for oxygenation and ventilation

MEDICAL SOCIOLOGY

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 comte, 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, purushartha, Caste system, Problems of SC&ST, Sanskritisation, 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 Ethno 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,Orient Longman publications

3. Neil J.Smelser,Handbook of sociology,1988.sage publication

4. Johnson R.M,Systematic Introduction to Sociology,1960,Allied Publishers

5. Cultural Anthropology,Barbara D.Miller,2006 Pearson/Allyn and Bacon Co

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, IMMUNOLOGY AND SYSTEMATIC BACTERIOLOGY - THEORY
2	GENERAL BACTERIOLOGY, IMMUNOLOGY AND SYSTEMATIC BACTERIOLOGY - PRACTICAL
3	VIROLOGY , MYCOLOGY AND PARASITOLOGY -THEORY
4	VIROLOGY , MYCOLOGY AND PARASITOLOGY - PRACTICAL
5	ENVIRONMENTAL SCIENCE AND COMMUNITY MEDICINE

SEMESTER V
GENERAL BACTERIOLOGY, IMMUNOLOGY 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, thioglycollate medium, Anaerobic jar; Identification of bacteria- staining techniques – grams staining, acid fast staining. Biochemical reactions - sugar fermentation and IMViC tests; Antibiotic susceptibility testing- Kirby Bauer disc diffusion test.

UNIT- III

Immunology

Sources and spread of infections, Immunity – definition ,types of immunity with examples, vaccines, antibodies- types and functions, Antigen antibody reactions- precipitation, agglutination, ELISA, immunochromatography, Hypersensitivity- definition, types, anaphylaxis.

UNIT- IV

Systemic Bacteriology

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

UNIT- V

Mycobacterium tuberculosis-

Morphology, culture characteristics & Laboratory diagnosis, 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, Veranus A. Moore, Adlard Coles Nautical Books, 2007.

Reference Books:

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

GENERAL BACTERIOLOGY, IMMUNOLOGY 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, lysoformin, phenols, gluteraldehyde- 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

Immunology

1. Serological tests- agglutination tests – Latex agglutination, tube agglutination.
2. Immunochromatography - Rapid card tests .
3. ELISA (Enzyme linked immunosorbent assay)

Systemic Bacteriology

1. Stahpylococcus, Streptococcus– Microscopy, colony morphology, identification
2. Niesseria-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 - Ameobiasis, 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, Ibdc Publishers, 2010.

2. Textbook of Mycology, Sandeep Saxena,1st edition, Sonali Publications, 2012.

Reference Books:

1. Clinical Parasitology : A Practical Approach, Zeibig, 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 –Sabouraud's Dextorse Agar, Corn meal agar.
4. Staining techniques- LPCB mount ,KOH mount
5. Stool concentration techniques, identification of ova cyst in stool samples by saline and iodine mount,
6. Peripheral blood smear -Preparation, Leishman's staining.

ENVIRONMENTAL SCIENCE AND COMMUNITY MEDICINE

UNIT-I

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, nd salinity, Energy Resources.

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

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 – Natural history of disease – Iceberg phenomenon-concept of control- concept of prevention-Modes of Intervention, Changing pattern of disease.

Epidemiology: Definition & Explanation, Aims, Epidemiologic approach, Basic measurement in epidemiology & tools of measurement – of Mortality , Epidemiologic methods – Descripitive epidemiology – Analytical epidemiology -Cohort study – Expiremental epidemiology – RCT-Association & Caution 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

SEMESTER VI

S.No	SUBJECT
1	CLINICAL CHEMISTRY – I - THEORY
2	CLINICAL CHEMISTRY – I - PRACTICAL
3	CLINICAL CHEMISTRY – II - THEORY
4	CLINICAL CHEMISTRY – II - PRACTICAL
5	HEALTHCARE AND BASIC PRINCIPLES

SEMESTER VI

CLINICAL CHEMISTRY - 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), Chemicel 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 - maintenances 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 - siorage & 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, Nephlometer try, turbidimetry & reflectance photometry, Enzymes definition, action, and kinetics.

UNIT-IV

Electrochemistry: Principles and measurements of electrochemistry & electro analytical chemistry. Putenticrnetry, Voltametry, coulometry methods - Principles, components, usage, advantages & disorder; Eiectrophoresis - 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, Chemiluminscence, 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 – 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, pH meter)

5. Standardisation of Biochemical substances - Glucose, Urea, Creatinine

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

Charts / Spotters /Case Studies

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

SEMESTER VI

CLINICAL CHEMISTRY - 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 - Past collection cause - 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- Blood collection for inborn errors of Metabolism - 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 lipid, distribution, their role in the L6L' - Estimation of Total Cholesterol, Triglycerides, HDL Cholesterol, LDL Cholesterol, VLDL Cholesterol - Methodology - Reference level - Diagnostic guidelines; 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 D, Vitamin K, Vitamin B, b6 -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, Methodologies existing, Hormone analysis

UNIT-IV

Other Special Investigations

Tumour 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 Qualtiy control Program, test utilization and turn around time, around time , Regulations tor Lab (by Indian Govt Internatior: Guidelines). Hospital

management structure - organisation of clinical Iab,Communication within the total hospital, ccmrnurticaticn 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.

SEMESTER- VI

CLINICAL CHEMISTRY – 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 Bilirubin, Cholesterol, Triglycerides, Uric Acid, Calcium, Phosphorus
2. Estimation of Enzymes amylase, Alkaline Phosphatase, Lipase
3. Electrophoresis - Agar gel Electrophoresis - serum Protein Electrophoresis Identification and interpretation
4. Chromatography - Circular paper chromatography - separation of Aminoacids & Sugars and calculation of Rf values

CHARTS / SPOTTERS /CASE STUDIES

1. Preservatives
2. Anti-coagulants

3. Types of Samples
4. Vaccutainers
5. Blood Collection
6. Reference interval
7. Glucose Tolerance test graphs
8. Interpretation of Routine tests
9. QC materials
10. Guideline tor regulation of Lab

HEALTH CARE MANAGEMENT

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 Programme

- National Health Policy
- Drug Policy
- National Health Programs (Malaria, T.B., Blindness, AIDS etc.)
- 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

SEMESTER VII

S.No	SUBJECT
1	PROJECT AND DISSERTATION
2	STATISTICS AND RESEARCH METHODOLOGY

SEMESTER-VII
BIO-MEDICAL STATISTICS AND RESEARCH METHODOLOGY

1. What is statistics – Importance of statistics in behavioral sciences – Descriptive statistics and inferential statistics – Usefulness of quantification in behavioral sciences.

2. Measurements – Scales of measurements – Nominal, Ordinal, Interval and Ratio scales.

3. Data collection – Classification of data – Class intervals – Continuous and discrete measurements – Drawing frequency polygon – types of frequency polygon – Histogram.

4. Cumulative frequency curve – Ogives – Drawing inference from graph.

5. Measures of central tendency – Need – types: Mean, Median, Mode – Working out these measures with illustrations.

6. Measures of variability – Need – Types: Range, Quartile deviation, Average deviation, Standard deviation, Variance – Interpretation.

7. Normal distribution – General properties of normal distribution – Theory of probability – Illustration of normal distribution – area under the normal probability curve.

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

9. Correlation – historical contribution – meaning of correlation – types: Product, moment, content correlation, variation of product, movement correlation, rank correlation, Regression analysis.

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

SEMESTER – VII (FOR ALL SPECIALITIES)

Project/ Dissertation

SEMESTER – VIII (FOR ALL SPECIALITIES)

Internship -6 months