



**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 SCIENCES**

**B.Sc. Radiology and Imaging Sciences**

**Technology**

**Syllabus 2020**

## **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

31<sup>st</sup>December 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.

#### **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 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** -2<sup>1</sup>/<sub>2</sub> 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

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**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) 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 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.



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 (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)				
				Continuous Assessment (Internals)		End semester Examination ( University/ Department Exams)		Total
		Theory	Practical	Theory	Practical	Theory	Practical (Viva)	
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

**FACULTY OF ALLIED HEALTH SCIENCES**

**SCHEME OF EXAMINATION**

**Semester - II**

**TOTAL HOURS – 420 HRS**

S. No	PAPER	Hours/semester		Evaluation (marks)				
				Continuous Assessment (Internals)		End semester Examination ( University/ Department Exams)		Total
		Theory	Practical	Theory	Practical	Theory	Practical (Viva)	
1.	Anatomy –II(UE)	40 hours	20 hours	20	05	60	15	100
2.	Physiology –II(UE)	40 hours	20 hours	20	05	60	15	100
3.	Biochemistry –II(UE)	40 hours	20 hours	20	05	60	15	100
4.	Microbiology –II(UE)	40 hours	20 hours	20	05	60	15	100
5.	Pathology –II(UE)	40 hours	20 hours	20	05	60	15	100
6.	Pharmacology(UE)	40 hours	20 hours	20	05	60	15	100
7.	Physics (IE)	30 hours	-	-	-	50	-	50
8.	Computer (IE)	30 hours	-	-	-	50	-	50

**UE University Exam**

**IE Internal Exam**

## SCHEME OF EXAMINATION

### SEMESTER – III (RADIOLOGY AND IMAGING SCIENCE 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.	Anatomy, Physiology, Pathology and Pharmacology related to Radiology- Theory (UE)	60	-	20	-	80	-	100
2.	Anatomy, Physiology, Pathology and Pharmacology related to Radiology – Practical (UE)	-	120	-	20	-	80	100
3.	Radiological Physics and Dark Room Techniques Theory (UE)	60	-	20	-	80	-	100
4.	Radiological Physics and Dark Room Techniques Practical (UE)	-	120	-	20	-	80	100
5.	Medical Ethics and Bio safety (IE)	30	-	-	-	50	-	50
6.	Psychology (IE)	30	-	-	-	50	-	50

**UE** University Exam

**IE** Internal Exam

**SEMESTER – IV (RADIOLOGY AND IMAGING SCIENCE 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.	Radiology equipments -Theory (UE)	60	-	20	-	80	-	100
2.	Radiology equipments- Practical (UE)	-	120	-	20	-	80	100
3.	Positioning Radiography and Contrast Procedures - Theory (UE)	60	-	20	-	80	-	100
4.	Positioning Radiography and Contrast Procedures- Practical (UE)	-	120	-	20	-	80	100
5.	Basics and Advanced Life support (IE)	30	-	-	-	50	-	50
6.	Sociology (IE)	30	-	-	-	50	-	50

**UE** University Exam

**IE** Internal Exam

## SEMESTER –V (RADIOLOGY AND IMAGING SCIENCE TECHNOLOGY)

**Total Hours: 450 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.	Basic and Advanced Ultra Sound Imaging - Theory (UE)	60	-	20	-	80	-	100
2.	Basic and Advanced Ultra Sound Imaging - Practical (UE)	-	120	-	20	-	80	100
3.	Basic and Advanced CT Scan -Theory (UE)	60	-	20	-	80	-	100
4.	Basic and Advanced CT Scan - Practical (UE)	-	120	-	20	-	80	100
5.	Environmental science and Community medicine (IE)	30	-	-	-	50	-	50
6.	Bio-Statistics and Research Methodology(IE)	30	!	!	!	50	!	50
7.	Basic Nutrition (Elective) / Advanced Diagnostic technique (Elective) (IE)	30	!	!	!	50	!	50

UE University Exam

IE Internal Exam

**SEMESTER – VI (RADIOLOGY AND IMAGING SCIENCE 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.	Basics and advanced MRI - Theory(UE)	60	-	20	-	80	-	100
2.	Basics and advanced MRI - Practical(UE)	-	120	-	20	-	80	100
3.	Interventional Radiological procedures and Basic angiography- Theory (UE)	60	-	20	-	80	-	100
4.	Interventional Radiological procedures and Basic angiography - Practical (UE)	-	120	-	20	-	80	100
5.	Healthcare and basic Principles(IE)	30	-	-	-	50	-	50
6.	Hospital Management/ Applied clinical research (Elective) (IE)	30	-	-	-	50	-	50

UE University Exam

IE Internal Exam

**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

**UE** University Exam

**IE** Internal Exam



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## **FACULTY OF ALLIED HEALTH SCIENCES**

**SEMESTER – VII AND VIII (FOR ALL SPECIALITIES)**

**Internship -12 months**



**SEMESTER - I**

<b>S.No:</b>	<b>Subject</b>
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

# **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  $\beta$  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
- $\alpha$  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. 7<sup>th</sup> Edition
- Harper's Illustrated Biochemistry – 30<sup>th</sup> 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
- Neaubaur's chamber
- Bone Marrow Needle

**Recommended Textbook:**

1. Textbook of Pathology ,Harsh Mohan,3<sup>rd</sup> edition

**Reference book:**

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



## **ENGLISH (IE)**

### **General objectives:**

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**

<b>S.No:</b>	<b>Subject</b>
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 spermat

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

- 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. 7<sup>th</sup> Edition
- Harper's Illustrated Biochemistry – 30<sup>th</sup> 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.

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### **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.

## **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,3<sup>rd</sup> edition

### **Reference book:**

1. Harsh Mohan,3<sup>rd</sup> 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, 2<sup>nd</sup> edition
2. Pharmacology for Dental and Allied Health Sciences by Padmaja Udaykumar, 3<sup>rd</sup> edition

**Reference books:**

1. Essentials of Medical Pharmacology by KD Tripathi, 7<sup>th</sup> edition
2. Basic and Clinical Pharmacology by Bertram G Katzung, 12<sup>th</sup> 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 -  
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 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 images 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**

<b>S.No</b>	<b>SUBJECTS</b>
1	ANATOMY, PHYSIOLOGY, PATHOLOGY AND PHARMACOLOGY RELATED TO RADIOLOGY– THEORY (UE)
2	ANATOMY, PHYSIOLOGY, PATHOLOGY AND PHARMACOLOGY RELATED TO RADIOLOGY– PRACTICAL (UE)
3	RADIOLOGICAL PHYSICS AND DARK ROOM TECHNIQUES – THEORY (UE)
4	RADIOLOGICAL PHYSICS AND DARK ROOM TECHNIQUES – PRACTICAL (UE)
5	MEDICAL ETHICS (IE)
6	PSYCHOLOGY (IE)

## **SEMESTER-III**

### **ANATOMY, PHYSIOLOGY, PATHOLOGY AND PHARMACOLOGY RELATED TO RADIOLOGY–THEORY (UE)**

#### **OBJECTIVES:**

- *Expected to have basic knowledge on human anatomy, physiology, pathology and pharmacology.*
- *To develop exhaustive ideology of various pathological and Pharmacological aspects in relation to radiology*

#### **UNIT –I**

##### **Introduction and general considerations**

- General-Topographical and other general terms employed,
- Tissues- differentiation
- Bone structure, development and ossification;
- Skin- Elementary account of structure and physiology of the skin with special reference to the effects of Radiation
- Markings, thyroid gland and parathyroid, suprarenal glands, pituitary gland, thymus gland and pineal body;
- Pathology in Relation to Radiographic Applications / General Pathological Terms- Inflammation – pyrexia, ulcer, bacteria and the specific granulomata neoplasms benign, malignant, with some examples, Common pathological terms related to all systems;

#### **UNIT-II**

##### **Musculoskeletal System**

- Osseous System - Detailed description of bones and joints of the upper limb, shoulder girdle, lower limb, pelvic girdle, vertebral column, thorax, skull and their radiographic Appearance. Skull with reference to nasal bones, sinuses, temporal bone & teeth;
- The Muscular System - Voluntary and involuntary muscles with special attention to the following - Sternocleidomastoids, pectoralis major, diaphragm, iliopsoas deltoid, supraspinatus, biceps, triceps, brachialis, quadriceps femoris, erector spinae.

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#### **UNIT-III**

##### **Cardio-respiratory, Alimentary and Urinary Systems**

- The Cardiovascular System - Structure and function of heart and main vessels. Their principal relations
- Radiographic appearances of heart and aorta in various projections;
- The Respiratory System - Structure, position and function of nose, pharynx, larynx, trachea, bronchi, lungs and pleura with surface markings, anatomy and significance of the mediastinum;
- Elementary Physiology of Respiration - Radiographic appearance of the larynx, pharynx and trachea of the chest in various projections;
- The Alimentary System - position and function of the buccal cavity, tongue, salivary glands, pharynx, esophagus, stomach, small intestine, large intestine, liver, gall bladder and pancreas. Radiographic surface markings;
- The Urinary System - Structure, position and function of kidney, ureters, bladder and urethra, Radiographic surface markings.

#### **UNIT-IV**

##### **Nervous System ,Reproductive System and Elementary Pathology**

- The Nervous System - Spinal cord, meninges, secretion and circulation of the CSF. Radiographic appearance of the central nervous system following use of contrast media;
- Reproductive System - The uterus and tubes as shown by the injection of opaque media, Anatomy of male reproductive system;
- Elementary Pathology of Common Conditions - Benign tumors, malignant tumors, epithelial tumors, connective tissue tumors, nervous tissue tumors, tumors of the Haemopoietic and reticulo-endothelial System, leukemia.

#### **UNIT-V**

##### **Contrast Media and Patient Care**

- Contrast Pharmacology - Types of contrast media. Ionic and non-ionic contrast media, Testing of sensitivity administration of proper dose, Advantages of non-ionic contrast media, Mild to major reactions and management of the same;
- Patient Care in Radiology, Department - Care and comfort of the patient
- Handling of patient – fracture cases lifting of injured patients; Records of patients - Temperature, pulse and needles
- Higginson's syringe – catheters, tourniquets etc) treatment of shock – surgical – electrical, first aid for such occurrences as fainting, vomiting, epilepsy, etc, common medical and surgical terms.
- handling of fracture cases – stretcher and bed patient – method of dealing with helpless patients – ventilation and temperature of x-ray room and cross infection, general hygiene – organization to avoid delay – waiting and rest rooms

### **Text Books:**

1. Human Anatomy , B.D.Chaurasia, Vol 1,2, 3, Sixth edition, CBS Publishers & Distributors, 2013
2. Textbook of physiology, A.K.Jain, Fifth edition, Avichal Publishing Company , 2014
3. Text book of pathology, Harsh Mohan, Second Edition, Jaypee Brothers Publishers, 2013

### **Reference Books:**

2. Human Anatomy , B.D.Chaurasia, Vol 1, 2, 3, Sixth edition, CBS Publishers & Distributors, 2013
3. Textbook of physiology, A.K.Jain, Fifth edition, Avichal Publishing Company , 2014
4. Essentials of medical pharmacology, Tripathi, 7th edition, Jaypee Brothers Medical Publishers, 2013

### **Specific Learning Outcome (SLO):**

- Will be able to explain anatomy of various organs with better knowledge on terminologies.
- Will be able to explain to physiological processes with understanding during an emergency and trauma.
- Will be able to provide better support during radiological examinations with knowledge of pharmacological aspects.

# **ANATOMY, PHYSIOLOGY, PATHOLOGY AND PHARMACOLOGY RELATED TO RADIOLOGY**

## **PRACTICALS(UE)**

### **CONTENTS**

- Radiological surface anatomy
- Contrast agents
- Spotters
- Skeletal anatomy
- Film discussion
- Charts

### **Specific Learning**

#### **outcomes (SLO):**

- Will be able to express anatomical terminologies with clarity.
- Will be able to recognize improper physiological functions.
- Will gain competency in handling patients for Radiological examinations with knowledge on Pharmacological aspects.

# **RADIOLOGICAL PHYSICS AND DARK ROOM TECHNIQUES – THEORY (UE)**

## **OBJECTIVES**

- *Expected to have basic knowledge on Medical Physics and Electronics.*
- *To provide an introduction to concepts in radiation physics, radiation instrumentation, radiation safety*
- *To elaborate on operations of radiation detectors and radiographic film processing.*

## **UNIT-I**

### **Radiation Physics X-Rays**

Electromagnetic radiations, waves and quanta, rectilinear propagation, inverse square law, general electromagnetic, spectrum, production and properties of X-rays; X-ray Spectrum: characteristic radiation and bremsstrahlung radiation. Effects of variations in the Tube potentials.

## **UNIT-II**

### **X – Rays and Matter**

Elementary outline of absorption of x-ray by matter, secondary electron emission, Compton & photoelectric absorption of x-rays by light elements variations with wave length, scattering of x-rays, practical aspects of these phenomenon in radiology. Ionization by x-rays. The definitions of the roentgen.

## **UNIT-III**

### **Radiation Protection**

Principles of protection in x-ray department, measurements of stray radiation. Radiation units. ICRP and AERB recommendations. Biological effects of ionizing radiation, TDS, ALARA, Radiation safety, X-ray room design.



## **UNIT-IV**

### **X – Rays Measurements**

Methods of measuring x-rays ionization measurement – realization of line roentgen parallel plate chamber. Principles of integrating, direct reading and condenser dosimeters half value layer Pocket dosimeter, chemical dosimetry, Scintillation detectors, solid state detectors, Film dosimetry, TLD, GM counter ionization chamber, proportional counter.

## **UNIT-V**

### **Dark Room Techniques**

Ideal dark room-construction-accessories-safelight, wet bench, dry bench, types of films, types of hangers, Automatic film processor-analysis the various parts of the unit maintenance, required chemicals and monitoring, Manual film processing-contents of developer and fixer-need of water bath, rinsing and various methods of drying, Types of films, manufacture of films, storage of films, film definition-density and contrast, characteristic curve, image defects, artifacts, film cassettes types of intensifying screens, Artifacts in Radiography.

### **Text Books:**

1. X-ray Equipments for Radiographers,D. Noreen Chesney, Muriel O. Chesney, CBS publishers & distributors, third edition, 2005
2. Christensen's Physics of Diagnostic radiology, Thomas Curry, 4th edition, Lippincott Williams & Wilkins, 1990

### **Reference Books:**

3. First Year Physics for Radiographers – George Hay, 2nd edition, Baillière Tindall, 1978.
4. Equipment in Diagnostic Radiology, E. Forster, Springer science and Business media, 2012.
5. X-ray Equipments for Radiographers, Noreen Chesney & Muriel Chesney, 3rd edition, Blackwell Scientific Publications, 1984.

### **Specific Learning Outcome (SLO):**

- Gain knowledge on radiations and their interactions with matter.
- Gain knowledge on radiation safety and dose levels.
- Gain expertise on the dark room techniques and films for conventional radiography

# **RADIOLOGICAL PHYSICS AND DARK ROOM TECHNIQUES – PRACTICAL (UE)**

## **CONTENTS**

- Radiation survey
- Leakage radiation test
- Manual Film Processing
- Automatic film processing
- Effect of temperature on film processing
- Effect of pH on film processing

### **Specific learning outcomes (SLO):**

- Will be able to perform various radiation surveys.
- Will be able to demonstrate competency in interpretation image artefacts.
- Will be able to recognize variations in images based on the effect of parameters involved in film processing

# **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, Factors Affecting 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. Crowd Audience and Rumor, Definition - Characteristics and Classification of Crowd and Audience Leadership: Definition of leader and leadership and characteristics, Types and Emergence of Leadership in a Group Attitude: Meaning, Types and

Formation of Attitude Concept of adjustment and maladjustment, 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**” **9<sup>th</sup> 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 AND BIO SAFETY(IE)**

- Definition & key terms – ethics Vs law
- Define Negligence, Malpractice & Liability
- Influence of Ethics on general practice
- Professional codes of Ethics
- Describe primary & Secondary Ethical principles
  - 6. Describe the Moral basis of Informed consent & advance directives
- Euthanasia and physician – assisted suicide
- Physicians, patients and other: autonomy, Truth Telling & Confidentiality
- Reproductive control: Assisted reproduction and Ethics
- Workers compensation
- Ethical issues in applied medicine
- Fertility & Birth control
- Genetic testing genetic screening.
- Research Ethics

**SEMESTER IV**

<b>S.No</b>	<b>SUBJECT</b>
1	RADIOLOGY EQUIPMENTS – THEORY(UE)
2	RADIOLOGY EQUIPMENTS – PRACTICAL(UE)
3	POSITIONING RADIOGRAPHY AND CONTRAST PROCEDURESTHEORY (UE)
4	POSITIONING RADIOGRAPHY AND CONTRAST PROCEDURESPRACTICAL (UE)
5	BASICS AND ADVANCED LIFE SUPPORT (IE)
6	SOCIOLOGY(IE)

## **SEMESTER IV**

### **RADIOLOGY EQUIPMENTS – THEORY(UE)**

#### **OBJECTIVES:**

- Expected to have basic knowledge on medical physics and electronics
- To develop in depth knowledge on radiological physics
- To develop exhaustive ideology of instrumentation and controls involved in radiology equipment

#### **UNIT-I**

##### **Radiological Physics, Apparatus**

Introduction to general properties of radiation and matter. Fundamentals of nuclear physics and radioactivity, Film characteristics, Contrast, Interaction of x-rays and gamma rays with matter and their effects on irradiated materials.

Radiation protection, Quality assurance, Miniature radiography, macro radiography and magnification techniques; Distribution of electric power; Mains-compensators-stabilizers-single phase-three phase mobile supply cable capacity, voltage drop-main switches, fuses earthing-effects of frequency Variations

#### **UNIT-II**

##### **Transformers, Control of output**

Construction and working of transformer , types of transformer transformers losses, Functions of core-losses and regulations copper losses, iron losses-hysteresis and inherent regulations. high insulation transformers-condenser effect; Resistance control of primary transformer control of primary (acute transformer) dual control-continuous central

#### **UNIT-III**

##### **HT General Circuits and Distribution, X-ray Tubes**

Rectifier, types of rectifier- Valve and metal rectifiers-mechanical

rectifiers-self-suppression

types of generators radiographic half- phases condenser-therapeutic  
pulsating, HT distribution-bus bars stress shield chokes,

## **UNIT-IV**

### **Instruments and Controls, Accessories**

Milliammeters – milliamperere - second meter-kilovolt meters-direct and pre reading layout of control desk contractor automatic and interlocked controls-exposure switches (clock work electronics, synchronous electric photoelectric). Mammography, Digital radiography, OPG, craniostat, Mobile X-ray, X-ray equipment for operation theaters, Dual energy X-ray absorptiometry; Moving grids, stationary grids curved and flat grids-focused and non-focused grids. Bucky tables, stands and pedestals, screening stands, serial devices, diaphragms, cones and applicators

## **UNIT-V**

### **Fluoroscopy**

Basic principle-assembly image intensifiers-camera-filters, magnification DSA-the angiographic room-the generators-the X-ray tube-image intensifier-cine camera and associated optics-the television chain-cine film selection-processing and viewing digital fluoroscopy- Theatre radiography-introduction to C-arm image intensifier-exposure and training.



**Text Books:**

1. X-ray Equipments for Radiographers, D. Noreen Chesney, Muriel O. Chesney, CBS publishers & distributors, third edition, 2005
2. Christensen's Physics of Diagnostic radiology, Thomas Curry, 4th edition, Lippincott Williams & Wilkins, 1990

**Reference Books:**

3. First Year Physics for Radiographers – George Hay, 2nd edition, Baillière Tindall, 1978.
4. Equipment in Diagnostic Radiology, E. Forster, Springer science and Business media, 2012.

X-ray Equipments for Radiographers, Noreen Chesney & Muriel Chesney, 3rd edition, Blackwell Scientific Publications, 1984.

**Specific Learning Outcome (SLO):**

- Will be able to explain first aid techniques for various emergency conditions.
- Will be able to explain triage during an emergency outcome.
- Will be able to provide better support during a lifesaving condition with knowledge on life support and resuscitation.

## **RADIOLOGY EQUIPMENTS - PRACTICAL (UE)**

### **CONTENTS**

- Testing X-ray beam and light beam alignment.
- Magnification techniques with constant SID
- Magnification Techniques with constant OID
- Focal spot test
- Grid alignment test
- Chart/ Spotters

### **Specific Learning outcomes (SLO):**

- Will be able to gain hands on training on life support techniques.
- Will be able to recognize Triage levels during an emergency outcome.
- Will be able to show competency in handling emergency and trauma patients with knowledge on first aid and resuscitation methods.

### **OBJECTIVES:**

- Expected to have basic knowledge on anatomy, physiology, and pathology.
- To develop understanding of various positioning methods for imaging a structure.
- **To introduce the importance of positioning and procedures involved in Radiology.**

## **POSITIONING RADIOGRAPHY AND CONTRAST PROCEDURES** **THEORY (UE)**

### **UNIT-I**

#### **Practice on the patient**

Age, subject types and sex, anatomical landmarks-postural variations-erect and horizontal technique- respiratory movement and diaphragm level-regional densities-preparations-and immobilization of patient- pathological conditions-injuries, fractures and dislocations  
Congenital, localized views-periodic examinations-use of dry bones-positioning terminology identification systems; The position of the patient, the relative position of the tube to the patient and to all the exposure factors. special apparatus for children.

### **UNIT-II**

#### **Upper limb, Lower limb and Pelvic Girdle**

Techniques for hand-fingers-thumb-wrist joint-forearm-elbow joint-humerus - shoulder joint and sterno- clavicular joint; Techniques for foot-calcaneum-ankle joint-leg-knee joint-patella-and femur (lower two thirds); Techniques for pelvic-iliac fossa-ischium and sacro iliac joint.- fractures immobilized

### **UNIT-III**

#### **Vertebral column, Bones of Thorax and skull**

Techniques for Atlanto-occipital articulation, cervical vertebrae, cervico-thoracic thoracic junction, vertebrae, lumbar vertebrae, lumbosacral articulation, sacrum, coccyx; Techniques for sternum, ribs (upper and lower); Techniques for cranium, facial bones, sella turcica, temporal Bone and optic foraminae sinuses, mandible and temporo mandible joint. vertebral injuries- skull injuries

### **UNIT-IV**

#### **Abdomen**

Routine and radiographs on acute condition; Bedside radiography-techniques for acute chest conditions- intestinal obstruction, abdominal perforations- Abdominal injuries

### **UNIT-V**

#### **CONTRAST PROCEDURE**

Barium swallow-Barium meal series-Barium enema-double contrast barium enema, small bowel enema, double and single contrast, sialograms, fistulograms, mammograms, IVU, retrograde pyelogram, MCU, AUG, Opposing Urethrogram. Sialogram, dacrocystogram, HSG, T-Tube cholangiogram, operative cholangiogram (on table in theatre), Radiographic image processing.

**Text Books:**

1. Clark's Positioning in Radiography, A. Stewart Whitley, Charles Sloane, Graham Hoadley, Adrian D. Moore, 12th edition, CRC Press, 2010.
2. Diagnostic Radiography, Glenda Bryan, 4th edition, SPCK Publishing, 1991.

**Reference Books:**

1. Clark's Positioning in Radiography, A. Stewart Whitley, Charles Sloane, Graham Hoadley, Adrian D. Moore, 12th edition, CRC Press, 2010.
2. Diagnostic Radiography, Glenda Bryan, 4th edition, SPCK Publishing, 1991.

**Specific Learning Outcome (SLO):**

- Learn the basics and principles of radiographic techniques and positioning of the patients.
- Learn the consequences of specific procedures adopted during radiographic examinations
- Learn about different procedures/indications/contraindications for various radiographic examinations

## **POSITIONING RADIOGRAPHY AND CONTRAST PROCEDURES – PRACTICAL (UE)**

### **OBJECTIVES:**

Expected to have basic knowledge on anatomy, physiology and pathology.

1. To inculcate knowledge on various radiographic anatomy based on disease conditions.
2. To elaborate on various procedures and positioning involved in radiologic imaging.

1. Contrast procedures
2. Film Criticism
3. Handling patient
4. Pre-medication and post-medication
5. Crash cart
6. Spotters / Chart
7. Radiographic materials

### **Specific Learning Outcomes (SLO):**

- Develop practical skills of positioning the patient for various procedures in radiology.
- Demonstrate competency to identify and explain the anatomical structures from radiographs.
- Will be able to identify and utilize equipment during an emergency or trauma.
- Will be able to demonstrate competency in anaphylaxis management in support to a physician.

## **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

# **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 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**

<b>S.No</b>	<b>SUBJECT</b>
1	BASIC AND ADVANCED ULTRASOUND IMAGING – THEORY(UE)
2	BASIC AND ADVANCED ULTRASOUND IMAGING – PRACTICAL(UE)
3	BASIC AND ADVANCE COMPUTED TOMOGRAPHY- THEORY(UE)
4	BASIC AND ADVANCE COMPUTED TOMOGRAPHY- PRACTICAL(UE)
5	ENVIRONMENTAL SCIENCE AND COMMUNITY MEDICINE(IE)
6.	<b>BIO-STATISTICS AND RESEARCH METHODOLOGY(IE)</b>
7.	<b>BASIC NUTRITION (ELECTIVE) / ADVANCED DIAGNOSTIC TECHNIQUE (ELECTIVE) (IE)</b>



## **SEMESTER-V**

### **BASIC AND ADVANCED ULTRASOUND IMAGING – THEORY (UE)**

#### **OBJECTIVES:**

Expected to have basic knowledge on human anatomy , physiology and Basic Positioning in radiography

- To develop in depth knowledge on physics involved in Ultrasound imaging.
- To develop exhaustive ideology of various advanced techniques for ultrasound imaging.

#### **UNIT-I**

**Ultrasound physics:** Ultrasound units, characteristic of sound wave, Piezo-electric effect, interaction of ultrasound with matter, Transducer techniques for imaging different Anatomic areas, Different types of Transducer, display modes, ultrasound knobology,

#### **UNIT-II**

Ultrasound anatomy, Patient Preparation, Biologic effects and safety, Contrast agents in Ultrasound , Quantities ultrasound densitometry. Ultrasound artifacts..

#### **UNIT-III**

Doppler physics- -doppler techniques- Doppler artifacts , patient preparation for Doppler, tissue harmonic imaging, seascape imaging-Hybrid Imaging-Thermography

#### **UNIT-IV**

3D and 4D Ultrasound Imaging, , Vascular sonography, interventional sonography, intra- operative sonography

#### **UNIT-V**

Musculoskeletal sonography, basic echocardiography,. Obstetrics and gynecology sonography, PCPNDT act

**Text Books:**

1. Diagnostic Ultrasound, Carol M. Rumack, 4<sup>th</sup> edition, Elsevier/Mosby, 2011.
2. Clinical Doppler Ultrasound Paul L. Allan, 3<sup>rd</sup> edition, Elsevier Health Sciences, 2013.

**Reference Books:**

1. Diagnostic Ultrasound, Carol M. Rumack, 4<sup>th</sup> edition, Elsevier/Mosby, 2011.
2. Clinical Doppler Ultrasound Paul L. Allan, 3<sup>rd</sup> edition, Elsevier Health Sciences, 2013.

**Specific Learning Outcome (SLO):**

- Learn the basics of ultrasound, principles, tools and accessories and advancements in ultrasound techniques and imaging
- Learn the advanced techniques used for ultrasound imaging of various organs.
- Acquire knowledge on troubleshooting of the ultrasound imaging equipment.

## **BASIC AND ADVANCED ULTRASOUND IMAGING PRACTICAL (UE)**

### **OBJECTIVES:**

Expected to have basic knowledge on anatomy, pathology and basic physics of ultrasound imaging

- To inculcate knowledge on various ultrasound imaging techniques.
- To elaborate on Advanced Ultrasound imaging techniques.

### **CONTENTS:**

- USG abdominal imaging.
- USG Neck imaging
- Doppler evaluation
- Advanced Ultrasound Imaging
- Spotter / Image discussion

### **Specific Learning Outcome (SLO):**

- Learn various skills in ultrasound imaging techniques
- Acquire competency in handling patients for Doppler studies.
- Learn the importance of quality assurance and troubleshooting Ultrasound equipment

# **BASIC AND ADVANCED COMPUTED TOMOGRAPHY**

## **THEORY (UE)**

### **OBJECTIVES:**

Expected to have basic knowledge on human anatomy, physiology and basic positioning in radiography.

- To inculcate knowledge on Physics and instrumentation of CT.
- To elaborate on various procedures and protocols in CT imaging.

### **UNIT-I**

- Basic principle of CT scan, Generation of CT, Image formation in CT, image reconstruction in CT , Image quality, Hounsfield
- Detectors used in CT, X-ray tube.
- Patient preparation, Imaging techniques for Head, Chest, Abdomen and other parts

### **UNIT-II**

- Contrast media in CT scan, , Image documentation, Safety regulation- CT room construction

### **UNIT-III**

- Basics of spiral CT scan, advantages of spiral CT scan, Electron beam CT, patient preparation-CT ( aortogram, selective angiogram head, neck and peripheral angiography).

### **UNIT-IV**

- 3D processing and multi planar reconstruction -Different Rendering mode used in 3D Reconstruction-HRCT-image documentation-image filing-documental maintenance Artifacts in CT.

**Text Books:**

1. Computed Tomography: Physical Principles, Clinical Applications, and Quality Control, Euclid Seeram, 4th edition, Elsevier Health Sciences, 2015

**Reference Books:**

2. Computed Tomography - Essentials of medical imaging series, Stewart C. Bushong, illustrated edition, McGraw Hill Professional, 2000

**Specific Learning Outcome (SLO):**

- Learn the physics and instrumentation involved in CT imaging.
- Acquire competency in handling patients for various CT imaging studies.
- Gain knowledge of advanced techniques in CT imaging.

## **BASIC AND ADVANCED COMPUTED TOMOGRAPHY – PRACTICAL (UE)**

### **OBJECTIVES:**

Expected to have basic knowledge on anatomy, pathology and Positioning.

- To inculcate knowledge on basic CT imaging protocols and parameters involved.
  - To elaborate on the CT imaging techniques and protocols to diagnose various diseases.
1. Brain scanning Protocol
  2. CT Chest scanning Protocol
  3. CT Abdomen scanning Protocol
  4. CT Angiography Protocol
  5. Image processing in workstation
  6. CT Biopsy Protocol

### **Specific Learning Outcome (SLO):**

- Learn instrumentation, physics and handling of the CT equipment.
- Demonstrate competency in handling patients in various CT imaging protocols.
- Learn to support in diagnosis based on post processing the CT images.

# **ENVIRONMENTAL SCIENCE AND COMMUNITY MEDICINE (IE)**

## **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, and 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 – 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 & Wholesome 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. Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statically 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 BASIC NUTRITION (ELECTIVE) (IE)**

### **Unit I**

Volumetric analysis, Balancing & Weighing, Concept 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**

<b>S.No</b>	<b>SUBJECT</b>
1	BASICS AND ADVANCED MRI - THEORY(UE)
2	BASICS AND ADVANCED MRI - PRACTICAL(UE)
3	INTERVENTIONAL RADIOLOGICAL PROCEDURES AND BASIC ANGIOGRAPHY – THEORY (UE)
4	INTERVENTIONAL RADIOLOGICAL PROCEDURES AND BASIC ANGIOGRAPHY – PRACTICAL(UE)
5	HEALTHCARE AND BASIC PRINCIPLES(Ie)
6.	HOSPITAL MANAGEMENT/ APPLIED CLINICAL RESEARCH (ELECTIVE)(IE)

## **SEMESTER-VI**

### **BASICS AND ADVANCED MRI - THEORY (UE)**

#### **OBJECTIVES:**

Expected to have basic knowledge on human anatomy , physiology and Basic Positioning in radiography

- To inculcate knowledge on Physics and instrumentation of MRI.
- To elaborate on various procedures and protocols in MR imaging.

#### **UNIT-I**

Basic principle and concepts of MRI, Role of hydrogen in MR Imaging Advantages and disadvantages of MRI,

#### **UNIT-II**

MRI architecture, magnet system, RF system- coils and gradient system

#### **UNIT-III**

Patient screening before scanning, MR contrast agent. MR safety.

#### **UNIT-IV**

Different types of pulse sequence, fourier transformation and K space imaging Image formation in MRI with & without gating image, image quality in MRI,

#### **UNIT-V**

MR diffusion, perfusion, MR Angiography, (dynamic contrast MR angiography, phase contrast and TOF) Functional MRI, MR Spectroscopy, MRI artifacts. Recent advances in MRI

**Text Books:**

1. MRI in Practice, Catherine Westbrook, Carolyn Kaut Roth, John Talbot, 4th edition, John Wiley & Sons, 2011.

**Reference Books:**

2. Magnetic Resonance Imaging, Volume 1, David D. Stark, William G. Bradley, 3rd edition, Mosby, 1999.

**Specific Learning Outcome (SLO):**

- Learn in detail about MRI physics and instrumentation.
- Demonstrate competency in handling patients for various MR imaging studies at an advanced level.
- Acquire research ideas in MR imaging with knowledge of advanced techniques in MR imaging.

## **BASICS AND ADVANCED MRI - PRACTICAL (UE)**

### **OBJECTIVES:**

Expected to have basic knowledge on anatomy, pathology and positioning.

1. To inculcate knowledge on Physics of MR imaging systems.  
To elaborate on the MR imaging techniques and protocols to diagnose various
2. diseases.
  - MRI Brain screening Protocol demonstration
  - MRI Spine screening Protocol
  - MRI Angiography Protocol
  - MRI Musculoskeletal screening Protocol
  - Image processing in work station.
  - MR Advanced imaging Protocol

### **Specific Learning Outcome (SLO):**

- Learn to identify the MRI equipment structure, physics and handling.
- Demonstrate the competency in handling patients in various MRI imaging protocols.
- Learn to support in diagnosis based on MRI imaging protocols.

## **INTERVENTIONAL RADIOLOGICAL PROCEDURES AND BASIC ANGIOGRAPHY – THEORY (UE)**

### **OBJECTIVES:**

Expected to have basic knowledge on Radiological anatomy, physiology and Basic Positioning in radiography

- To introduce the importance of Patient care and responsibilities of Technologist in Healthcare industry.
- To introduce various interventional radiology techniques and protocols.

### **UNIT-I**

Procedure of image guided biopsies and drainage procedure, Angiographic x-ray tube DSA techniques, Navigation techniques, Angiographic room layout.

### **UNIT-II**

Invasive Angiography and Venography, 4 Vessel DSA, Aortogram, Selective Angiogram, Venogram

### **UNIT-III**

Seldinger technique Invasive Monitoring, Cardiac resuscitation measures, Plethysmography, Interventional Procedures, PTBD, ERCP, Management of shock, PTA + Stenting, Vascular Stent Stent graft, TIPS.

### **UNIT-IV**

Embolisation, Vertebroplasty, Kyoplasty Laser guided procedures, Adult and Pediatric Invasive Cardiology.

### **UNIT-V**



Basics of cardiac catheterization, Coronary angiogram, Cardiac interventional procedures

**Reference Books:**

- Interventional Radiology: A Practical Guide Radcliffe Series, Anthony F. Watkinson, Andy Adam, illustrated edition,
- Radcliffe Publishing, 1996

**Specific Learning Outcome (SLO):**

- Learn to handle patients with care and responsibilities.
- Develop competency and support radiologist in various interventional radiology protocols.

Acquire knowledge in assurance of quality in cathlab with basic knowledge of various safety considerations and quality assurance test

**INTERVENTIONAL RADIOLOGICAL PROCEDURES AND  
BASIC ANGIOGRAPHY – PRACTICAL (UE)**

**OBJECTIVES:**

Expected to have basic knowledge on Radiological anatomy, physiology and Basic Positioning in radiography

- To introduce the importance of Patient care and responsibilities of Technologist in Healthcare industry
- To introduce various interventional radiology techniques and protocols.
  - Catheter Intervention Procedures Protocol
  - Equipment handling
  - Image guided interventional procedure Protocol
  - Image processing in work station

**Specific      Learning**

**Outcome (SLO):**

- Learn to handle patients with care and responsibilities in a cathlab.
- Demonstrate competency in supporting radiologists in various interventional radiology techniques.
- Learn to express support in diagnosis and treatment based on interventional radiology protocols.

# **HEALTH CARE MANAGEMENT (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 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**

## **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 steps, advantages and purposes of each steps, 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 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.

## **HOSPITAL MANAGEMENT BASIC NUTRITION (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.

**SEMESTER VII**

<b>S.No</b>	<b>SUBJECT</b>
1	PROJECT AND DISSERTATION

