SRI BALAJI VIDYAPEETH

(Deemed to be University Declared u/s 3 of UGC act 1956)

Accredited by NAAC with 'A' Grade

Pondicherry – 607402.

www.sbvu.ac.in

MAHATMA GANDHI MEDICAL COLLEGE & RESEARCH INSTITUTE, PONDICHERRY

SHRI SATHYA SAI MEDICAL COLLEGE & RESEARCH INSTITUTE, KANCHEEPURAM DT

FACULTY OF ALLIED HEALTH SCIENCES

B.Sc. MEDICAL IMAGING TECHNOLOGY

2019 -2020 ONWARDS

FIRST, SECOND & THIRD YEAR SYLLABUS AND REGULATIONS

CHOICE BASED CREDIT SYSTEM (CBCS) PATTERN SYLLABUS

(As approved in the Academic Council at the meeting held on 22-05-2019)

Revisit of the syllabus and Examination pattern

(As approved in the Academic Council at the meeting held on 28-09-2020)

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FOREWORD

In recent years, several innovative and need based undergraduate courses in the realms of Faculty of Allied Health Sciences have been promulgated. These courses are primarily oriented towards augmenting the Core academic courses in the Health Care sector.

Although, Allied Health Science courses are in place at several institutes county wide, mention must be made of the fact that only a few Health Science Universities offer courses in Allied Health Sciences under a holistic umbrella. It is in the fitness of things that Allied Health Science courses are being offered in Nodal and Thrust areas at Sri Balaji Vidyapeeth starting from Certificate programme through Doctoral studies.

The Undergraduate programme of Allied Health Science courses leading to B.Sc degree has been very carefully planned taking all the three components into due consideration, namely academics, patient care and research. Competency assumes great importance as the graduates coming out of these programmes would either directly or indirectly assist the Clinicians in day to day activities.

With this in view, the thrust has been laid on a common syllabus for all B.Sc programmes during the first year of study. These subjects offered in the first year are oriented Basic Medical Sciences, besides English as a mode of communication which is vital for affording Global Placements to our successful candidates. Furthermore all programmes are designed in Choice Based Credit System (CBCS) made to suit the convenience of the students. The proficiency and competence of the Undergraduates is fortified by the promulgation of a unique internship cum research programme.

I wish all students success in their studies and career.

Prof. N. Ananthakrishnan

Dean – Faculty, SBV

POLICY ON COURSES OFFERED UNDER FACULTY OF ALLIED HEALTH SCIENCES

PREAMBLE

Sri Balaji Vidyapeeth, Deemed to be University, established under Section 3 of UGC Act, 1956, Accredited by NAAC with A Grade offers various courses under the Faculty of Medicine, Faculty of Dentistry, Faculty of Nursing Sciences and Faculty of Allied Health Sciences.

"Allied Health Professions are a distinct group of health professionals who apply their expertise to prevent disease transmission, diagnose, treat and rehabilitate people of all ages and all specialties. Together with a range of technical and support staff they may deliver direct patient care, rehabilitation, treatment, diagnostics and health improvement interventions to restore and maintain optimal physical, sensory, psychological, cognitive and social functions." - Organization of International Chief Health Professions Officers (ICHPO).

In March 2011, the Ministry of Health and Family Welfare nominated the Public Health Foundation of India (PHFI) as its technical partner and constituted the National Initiative for Allied Health Sciences (NIAHS) secretariat with a mandate to develop a framework to improve allied health training, education and regulation in the country. (Yet to be notified by Government of India).

Sri Balaji Vidyapeeth has introduced several innovative need based courses under the Faculty of Allied Health Sciences at Undergraduate and Postgraduate levels keeping in mind the initiative of Ministry of Health & Family Welfare, Government of India. In an era marked by expanding global job opportunities, these courses are bound to create an awareness among the students to suit themselves in the Health Care Team. Curricula have been designed in an objective manner and are aimed at cognitive, affective and psychomotor domains of learning. Furthermore all courses are designed in Choice Based Credit System (CBCS) made to suit the convenience of the students.

The Undergraduate courses mainly concentrate in creating professionals who form the part of the Health Care Team. The role of these professional is to ably assist the doctor in treatment as well as prognosis and in many a times form the core professional of the team. The proficiency and competence of the Undergraduates is fortified by the promulgation of a unique internship cum research programme.

The Postgraduate courses mainly aim at shaping a graduate into a full professional. Also these postgraduate courses help the graduates as well as the postgraduates to acquire specific skills on various adjunct therapies and techniques.

SUPPLY AND DEMAND

The starting of the new courses will entirely depend on

a. Demand for the course as seen by the enrolment at other institutes.
b. Employability after the qualification.

At present, the shortage of quality human resources is one of the major challenges faced by the public health domain in India. To redress the imbalance in human resources, the Working Group on Medical Education Training and Manpower Training of the Planning Commission (1984) prioritized training of para-professional and auxiliary personnel as follows:

- Training and development of auxiliary health professionals
- Training and development of para-health professionals
- Basic and pre-service/induction training in health care and health management
- Continuing education in health profession education.

Many new health occupations (Physician's Assistant, Optometrists, Medical Imaging Technologists, and Laboratory Technologists etc) have access over several common features in Allied Health Sciences including Basic Medical Sciences which are being effectively addressed. These processes have received support from administrators who are constantly searching for economic qualified and quality labor.

Service users are becoming more empowered through the consumerism of health, which has resulted in better access to information and user-consultation in service development and delivery. Each of these factors has the potential to influence the roles of existing professional groups and presents a challenge to workforce planners. In India, students are not aware of all the allied health courses available in the medical education system. Their career choices are generally influenced by their parents and peer groups, who themselves are unaware of the prospects in this area. By understanding that an entry-level position is just a first step, youth can realistically plan for their future and have a better understanding of what is needed for long-term success. This approach also benefits employers who need a steady inflow of workers at all levels of their organization.

POLICY ON ELIGIBILITY, ADMISSION, & COURSE DURATION OF UG DEGREE COURSES

At Sri Balaji Vidyapeeth, we empower the departments of all the constituent colleges to contribute to the development of innovative, need, value based and job oriented courses taking into considerations the interests of the stakeholders.

The Undergraduate Degree courses (B.Sc.) are presently being offered under the Choice Based Credit System (CBCS) mode as per the Guidelines of UGC. The duration of the course will be Three years with a compulsory internship of 1 year (Non Stipendiary) in any of the tertiary health care institute of the University/ Trust. The proficiency and competence of the Undergraduates is fortified by the promulgation mandatory for appearing at the University Examinations. The maximum time limit for completion of the course will be Six years. However, the Dean / Principal, AHS has the discretionary powers to extend the course duration on valid grounds (Health, Maternity, Natural Disaster, etc.).

The First year of B.Sc. (AHS) courses will be common for all the disciplines. Though the disciplines will be provisionally allotted at the time of admission itself, upon

successful completion of the First year the candidates may opt for a change in the discipline or the college which will be permitted depending on the vacancy and on merit based on the First year marks.

Fourth year – Internship Programme

One-year compulsory internship in various intensive care units, outpatient departments, research center under Sri Balaji Vidyapeeth during which the students get to hone the skills and knowledge acquired in the three years of study. This year ensures their readiness to approach a patient in any setting. The students should also complete a short duration project (in their areas of interest) and also maintain and submit a log book. The degree will be awarded only upon the successful completion of the course including the internship period. The one-year compulsory internship includes postings at the respective department.

Eligibility for Admission

A candidate seeking admission in the B.Sc. Allied Health Sciences courses shall be completing the age of 17 years as on December of the admission year. The candidate shall have passed the Higher Secondary Examinations conducted by the State Board or the Central Board or its equivalent. The candidate should have studied English as one of the papers and passed the same. The candidate should have had Biology, Physics & Chemistry and have passed the same in their qualifying Examinations. Mathematics as a subject is mandatory for B.Sc. Optometry, Medical Imaging Technology and Clinical Research.

The candidate should have secured 50 percent as aggregate in the subjects of English, Biology, Physics and Chemistry at the Higher Secondary Examinations. A relaxation of 5 percent in the minimum required (50%) shall be awarded to the candidates belonging to SC/ ST communities and physically challenged candidates (Disability more than 40%). The candidates seeking relaxation should necessarily submit the relevant certificates issued by the concerned Government authorities while applying for the course and mention about the same in their application.

Lateral Entry

Candidates who have Diploma of Two years in the concerned subject from a recognized University can seek Lateral Entry to the second year of the concerned courses provided that they have studied Anatomy, Biochemistry, Physiology, Microbiology and Pathology as individual papers during their Diploma Course.

Note: The candidates who have completed their Diploma Course through Distance Education modes are not eligible to seek admission through Lateral Entry mode.

Shorter intrinsic training programmes of duration few weeks to a month or so will be conducted by the departments under the Supervision of the concerned HOD / Dean / Principal.

POLICY ON CHANGE OF NAME/DATE OF BIRTH

The name and date of birth of candidates will be registered in the records of the University as given in their H.S.C. Mark Statement/Transfer Certificate only. No request will be considered later, to correct the spelling of the name of the candidates.

The parents and candidates are requested to verify and confirm these entries in the H.S.C. Mark Statement / Transfer Certificate at the time of receipt of the same. Once admitted to a course of study in the University, date of birth as furnished in the HSC/School record of student and submitted to the University at the time of admission, shall be taken as final proof and no subsequent request for change of date of birth will be entertained by the University at any time under any circumstance, either during the course of study or after the completion of such study. The student should take utmost care while entering their details in SBV GARUDA portal at the time of their registration. They are responsible for any data mismatch at later stage.

Every student shall give an undertaking to this effect duly countersigned by his/her parent or guardian at the time of admission.

PAYMENT OF TUITION AND OTHER FEES

Every student shall pay tuition fee and other fee, as prescribed by the University, within the due date notified. The fees are subject to revision as per rules of the University. All fees, once paid to the University, will not be refunded or adjusted for any other purpose under any circumstance.

RULES FOR DISCONTINUANCE FROM COURSE OF STUDY

Where any student applies for discontinuance, or without any application discontinues on his/her own, from the course to which he/she has been admitted to, for any reason, either after the cut-off date prescribed by the statutory authorities/ University for admission to the first year of the course concerned or where the seat is rendered vacant without having any chance of being filled up with any other candidate from waiting list etc., such students will have to remit the tuition fee and other applicable fees for the **'Entire/Remaining Course Period'**. Unless and until payment of all the prescribed fees for the entire/remaining course period is made to the University account, such student shall not be entitled to any certificate including transfer certificate, mark sheets etc., to be issued by the College/ University and to get back his/her original certificates deposited with the University at the time of admission. All students and parent will be required to furnish a declaration agreeing to the above said conditions at the time of admission.

POLICY ON RAGGING

Ragging is strictly prohibited in the University Campus. Sri Balaji Vidyapeeth strictly enforces anti-ragging measures and the campus is free from any form of ragging. Any violation will be dealt with according to the law in force and as per directives of the Supreme Court of India. The University has adopted the ―Medical Council of India (Prevention and Prohibition of ragging in Medical College / Institutions) Regulations, 2009 and ―UGC Regulations on curbing the menace of Ragging in Higher Educational

Institutions, 2009 and these Regulations shall be applicable to all students. These Regulations are available in the University Website.

IMPORTANT NOTE

All admissions are subject to fulfillment of all the prescribed eligibility conditions by the candidate. If it is found either at the time of admission or at a later stage, that the candidate has given false information/forged certificates or concealed material information, his/her admission shall be cancelled and the student shall be dismissed from the college immediately.

The University reserves the right to change the curriculum, course structure and the rules relating to admission, examinations, fee structure, refunds, etc.

All disputes arising in the interpretation and implementation of the provisions will be referred to the Vice-Chancellor of Sri Balaji Vidyapeeth and Vice-Chancellor's decision shall be final and binding.

In respect of matters relating to or arising out of this prospectus the jurisdiction shall lie in Puducherry alone.

FUTURE PLANS

It is planned to conduct an informal market survey and start AHS Certificate & M.Sc courses.

OUTLINE OF THE CHOICE BASED CREDIT SYSTEM (CBCS) FOR UNDERGRADUATE DEGREE PROGRAMME

Credit System Credit System (CBCS): The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).This is to enhance the quality and mobility of the students within and between the Universities in the country and abroad.

Credit hours
16 Theory classes = 1 credit
32 Practical/Tutorial/Clinical training/Research project = 1 credit

Subjects	Credits
Each core subjects	6 Credits
Ability Enhancement Compulsory course (AECC)	2 Credits
Skill Enhancement course (SEC)	2 Credits
Generic Elective course (GE)	4 Credits
Discipline Electives (DE)	4 Credits

Core course: A Hard core course may be a Theory, Practical (lab), clinical rotation/field work or Research Project Work which are compulsory component studied by candidate to complete the requirement of their programme.

Discipline Elective (DE) Course: An elective course which is supportive or related to the discipline/subject (i.e. supportive to core course) is called a Discipline Elective (DSE) Course.

Generic Elective (GE) Course: An elective course which is unrelated to the discipline/subject (i.e. unrelated to core course) to expand their knowledge chosen by a candidate is called a Generic Elective.

Skill Enhancement Courses (SEC): This course chosen by candidate which provides additional value-based and skill-based knowledge to increase their employability.
NPTEL/ SWAYAM / MOOC/ Other value-added online courses

COLLEGES	PROGRAMMES WHICH INVOLVE CREDIT TRANSFER
Mahatma Gandhi Medical College and Research Institute & Shri Sathya Sai Medical College and Research Institute	B. Sc. (AHS)

Each Undergraduate student of B.Sc (AHS) is recommended to earn a minimum of **EIGHT credits** from the online courses offered through SWAYAM - NPTEL – MOOCs platform during their Course period. It is to be noted that the student earns the credit prior to the starting of their internship.

PROGRAMME	DESIRABLE CREDITS	NUMBER OF COURSES
B.Sc. (AHS)	Minimum - 8 credits	Minimum - 4 Maximum - 6

It is required of the Undergraduate students (B.Sc – AHS) that in addition to their curricular requirement of the programme, it is recommended for enhancing job opportunities for the student to earn minimum of prescribed credits from the online courses offered through SWAYAN - NPTEL – MOOCs platform that will be transferred
into the students' Statement of Marks, issued during the final year of their study. This has to be completed prior to the starting of their internship programme and students have to be informed that **those who do not earn the minimum credits prescribed by SBV, it will be mentioned NIL for the details on credits transferred from ONLINE courses in their FINAL year statement of marks issued by SBV.**

Credit points during Internship

For the 16 UG Internship programmes, there is a Minimum of 40 Credit points to a maximum of 45 Credit points which the students have to obtain. Credit points will be assessed based on the student's satisfactory attendance, performance in the Clinical /Camp postings / Seminars /Presentation of the logbook & Research project.

CRITERIA FOR UNIVERSITY EXAMINATIONS

Eligibility / Maximum Duration for the Award of the Degree

a) The candidates shall be eligible for the bachelor degree when they have undergone the prescribed course of study for a period of not less than four years (3 Years + 1 Year Internship) in an institution approved by the university and have passed the prescribed examination in all subjects.

b) A student who does not meet the minimum attendance requirement in a year must compensate the inadequacies before appearing examination.

To reaffirm the passing minimum in the University Examinations for all the Undergraduate courses offered under the Faculty of Allied Health Sciences.

- A candidate shall secure a minimum of 50% aggregate in University Core theory/ Elective theory Exams and Internal Assessment put together.
- A candidate shall secure a minimum of 50% aggregate in University Practical and Internal Assessment put together.
- For Skill based electives, a candidate shall secure a minimum of 50% aggregate in University Practical cum Viva Exams and Internal Assessment put together.

Retotaling / Revaluation and Grace Mark

There is no provision for **Retotaling / Revaluation for AHS programme.**

Grace marks up to a maximum of five marks may be awarded at the discretion of the university to a student who has failed and shall be distributed among the failed subjects.

SCHEME OF EXAMINATION

1) **Attendance Requirements**: 80% hours of learning in each Core Subjects / Electives / Practical's /Postings for appearing for the university exams.
2) **Minimum marks required to be eligible for University Examination**: 35% marks in the internal assessment (Theory / Practical) are required for the candidate to be eligible to appear in the University Examinations.
3) **Passing Minimum**: 50% aggregate both in theory and practical's including internal assessment marks is required for a candidate to pass in the University Examinations.
4) **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates shall not be permitted to appear for the practical examinations.

GRADING

Marks obtained by candidate	Equivalent grade letter	Grade descriptor	Grade point
85 % & above	O	Outstanding	10
75-84	A+	Excellent	9
65-74	A	Very good	8
60-64	B+	Good	7
55-59	B	Above average	6
50-54	C	Average pass	5
49 & below	F	Reappear	0
	AB	Absent	0

A student obtaining **Grade F** shall be considered failed and will be required to reappear in the examination.

Conversion formula for Percentage to CGPA
Percentage divided by 9.5 = CGPA

Award of Class

Class division will be based on CGPA grade

≥ 7.8 grade point = Distinction Division
≥ 6.8 and < 7.7 grade point = First class Division
≥ 6.3 and < 6.7 grade point = Second class Division
≥ 5.2 and < 6.2 grade point = Third class Division
< 5.2 and below – Fail

Computation of SGPA and CGPA will be in accordance with the UGC Guidelines & Recommendations. It is a measure of overall cumulative performance of a student over all exams. The CGPA is the ratio of total credit points secured by a student in various courses in all exams and the sum of the total credits of all courses in all the University exams. It is expressed up to two decimal places.

Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student over all exams. The CGPA is the ratio of total credit points secured by a student in various courses in all exams and the sum of the total credits of all courses in all the University exams. It is expressed up to two decimal places.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

Transcript: Based on the credits earned, a transcript shall be issued to all the registered students after the completion of the program indicating the hours of study and structure of the curriculum delivery as prescribed in his/her curriculum and completed by the student. The transcript will display the course details, including course code, title, and number of credits, hours and type of contact hours in a semester.

INTERNAL ASSESSMENT

1. Continuous Internal Assessment (CIA) for all AHS programs with a minimum of 4 Assessments per year.
2. Internal Assessment will be done in each subject according to the scheme of examinations. The IA marks will be on the basis of performance in the assignment, class tests and practical test in the clinical areas.

Evaluation of Clinical Rotation

Lab, Clinical cum Community postings - To conduct practical's or viva based on the Heads of the concerned department's decision and the total 100 marks to be sent to COE through proper channel to find a place in the transcript.

Question Paper Pattern

The following question paper patterns shall be followed for CBCS pattern syllabi for the candidates admitted from the academic year 2019-20 onwards.

CORE SUBJECTS

For **UG NON-SEMESTER COURSES -** Each Core Subjects University Exam carries -100 marks of 80(Theory) + 20 (IA marks) which consists of

Theory – 80 marks			
I	Essay-type questions of either / or type -(like 1.a (or) 1.b)	2 (of either / or type)	2 x 10=20
II	Short answer questions	6 (*1 choice)	5 x 6=30
II	Very Short answer questions	12 (*2 choice)	10 x 3=30

The University duration of 80 marks – 3 Hours For courses having Section A & Section B Subjects

For **Section A & Section B** Subjects University Exam carries - 50 marks for each Section consisting of 40 (Theory marks) + 10 (IA marks)

Theory – 40 marks			
I	Essay-type questions of either / or type -(like 1.a (or) 1.b)	1 (of either / or type)	1 x 10 = 10
II	Short answer questions	5 (*2 choice)	3 x 6= 18
II	Very Short answer questions	5 (*1 choice)	4 x 3 = 12

ELECTIVE SUBJECTS

For all UG NON SEMESTER **COMPULSORY, GENERIC & DISCIPLINE** Elective University Exam papers carries- 50 marks of 40 (Theory)+10 (IA marks) which consists of

Theory – 40 marks			
I	Short answer questions	5 (*3 choice)	5 x 6=30
II	Very Short answer questions	5 (*2 choice)	5 x 2=10

*** Number of choices given**

- For **SKILL BASED ELECTIVES** from 2019-20 batch onwards all UG AHS courses will have 40 marks as university Practical cum Viva examination & 10 marks as Internal Assessment = 50 marks.
- 50 marks of the **COMPULSORY, GENERIC, DISCIPLINE & SKILL BASED ELECITIVES** which will be converted to 100 marks in the transcript.

CONDONATION FOR SHORTAGE OF ATTENDANCE

Condonation of shortage of attendance in aggregate up to 10% in each Year may be granted by the college Academic Committee and as per regulations of university.

PROGRAM OUTCOME - B.SC MEDICAL IMAGING TECHNOLOGY

At the end of the 4 year of training B.Sc MIT students should be able to

MITPO1: Performs the duty as a medical technologist, mastering PRP-M Puter applications with good written & communication skills and also skilled at computer applications including E-library.

MITPO2: To gain knowledge about radiation safety precautions, biomedical waste management adhering to the environmental needs of the society, and preventing the spread of infectious diseases.

MITPO3: Understanding the structure and functions of different organs in normal human body.

MITPO4: The learning objectives of this course is to understand radiation sources, types and its properties , production and properties of X-rays, radiation quantities and units used in the industry.

MITPO5: Phlebotomists are trained to draw blood primarily by performing venipunctures (for collection of minute quantities of blood and finger pricks)

MITPO6: To study and understand about the radiographic positioning.

MITPO7: Ability to perform urinalysis, Serology, haematology, cytology, blood banking, biochemical and microbiological parameters.

MITPO8: To know the basics of reagent preparation, instrument handling and can perform common analytical in Clinical Biochemistry.

MITPO9: To equip students regarding dark room facility, X-ray cassette and lean about film artifacts.

MITPO10: To know different types of imaging modality such as MRI, PET scan, SPECT and also understand about quality assurance test, dosimetry tools

MITPO11: To practice in-vitro study in radiology (GI tract, Billary Tract, Urinary System, Reproductive System, Cardiovascular System, Venography, Central Nervous System, Respiratory System, and Miscellaneous)

MITPO12: various life style disorders and with due counseling& guidance advising the patients with proper diet, hygiene and Yoga to keep the body, mind, soul and behavior healthy.

I YEAR

FACULTY OF ALLIED HEALTH SCIENCES

SRI BALAJI VIDYAPEETH

(Deemed to be University)

Accredited by NAAC with 'A' Grade

COMMON SYLLABUS FOR ALL FIRST YEAR B.Sc. ALLIED HEALTH SCIENCES

CORE SUBJECTS

1. Anatomy
2. Physiology
3. Biochemistry
4. Pathology &Microbiology

ELECTIVES

Ability Enhancement compulsory course (AECC)

1. English

Skill enhancement course (SEC) – Choose any TWO

1. Culinary Skills for optimal nutrition
2. Enhancing soft skill &personality
3. Basics of Yoga &Practice
4. Speaking effectively

Generic Elective Course (GEC) – Choose any ONE

1. Basics of Hospital Administration
2. Counseling and Guidance
3. Lifestyle Disorders

SCHEME OF CREDIT BASED ACADEMIC CURRICULUM

Faculty Code	Category	Course Title	Hours					Credits				
AHS	**Core theory CCT**	**Subjects**	**Theory**	**Practical**	**Tutorials**	**Lab training**	**Total hours**	**Lecture (L)**	**Practical**	**Tutorials**	**Lab training**	**Credits**
AHS	CCT-1	Anatomy	80		32			5		1		6
AHS	CCT-2	Physiology	80		32			5		1		6
AHS	CCT-3	Biochemistry	80		32			5		1		6
AHS	CCT-4	Pathology	40		16			5		1		6
AHS		Microbiology	40		16							
AHS	Lab training CCT 1 to 4					192					6	6
AHS	AECC	English	16	34				1	1			2
AHS	SEC – 1-3	Student‘s choice	16	32				1	1			2
AHS	SEC – 1-3	Student‘s choice	16	32				1	1			2
AHS	GEC 1-3	Student‘s choice	64					4				4
			432	**98**	**128**	**192**	**850**	**27**	**3**	**4**	**6**	**40**

SCHEME OF EXAMINATION AHS - I YEAR BASIC SCIENCES

Papers	Subject	Theory		Practical		Theory	Practical	Grand Total (900)	Min marks to pass % (450)
		UE	IA	UE	IA	UIA*	UIA*		
CCT-1	Anatomy	80	20					100	50
CCT-2	Physiology	80	20					100	50
CCT-3	Biochemistry	80	20					100	50
CCT-4	Pathology	40	10					100	50
	Microbiology	40	10						
CCT -LT	Lab training Core 1 to 4						100	100	50
AECC	Ability enhancement Compulsory Course- English	80	20					100	50
SEC	Skill enhancement Course	80	20					100	50
SEC	Skill enhancement Course	80	20					100	50
GEC	Generic elective	80	20					100	50

***UIA - University Internal Assessment only for Lab Trainings (No Final University Examination).**

Passing criteria- 50 % aggregate both in theory and practical's including internal assessment marks

For all elective course, 40 marks for university theory and Practical cum Viva examination & 10 marks as Internal Assessment = 50 marks which will be converted to 100 marks in the transcript

ANATOMY

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES – ANATOMY

NAME OF THE SUBJECT PAPER	**: ANATOMY**
DURATION OF THEORY CLASSES	**: 80 Hrs**
DURATION OF TUTORIAL SESSIONS	**: 32 Hrs**
DURATION OF LAB TRAINING	**: 40 Hrs**
EXAMINATION	**: 100 Marks (80 U + 20IA)**
NO UNIVERSITY PRACTICAL EXAMINATION	
DURATION OF THEORY EXAMINATION	**: 3 Hrs**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: I YEAR**

COURSE DESCRIPTION

The course is designed to assist students to acquire knowledge of the normal structure of human body and its functions. To ensure that the students understand the alteration in anatomical structure and function in disease in the practice of accident and emergency care technology.

OBJECTIVES

At the end of the course, the student will be able to

1. Describe the anatomical terms, organization of human body and structure of cell, tissue, membranes and glands.
2. Describe the structure and functions of bones and joints.
3. Describe the structure and functions of systems in body. Have knowledge about Applied Anatomy

COURSE OUTCOMES FOR ANATOMY

At the end of the course, students will be able to...

AN-AHS-CO1: Explains the Gross and Microscopic structure of human body.

AN-AHS-CO2: Explains the normal structure and integration of the functions of the organs and systems on basis of the structure of Human body.

AN-AHS-CO3: Explains the clinical correlation of the organs and structures involved and interprets the anatomical basis of the disease presentations.

AN-AHS-CO4: Knows about the General development of human body.

AN-AHS-CO5: Outlines the knowing of the hard & soft structures of the body.

UNIT	TITLE	THEORY + TUTORIALS (80 + 32)HOURS
I	**(a) INTRODUCTION TO HUMAN BODY AS AWHOLE** • Terms of location, positions and planes • Cell and its organelles • Epithelium – Definition, classification, description with examples and functions. • Glands–Classification, description of Serous and Mucous glands with examples. • Basic tissues – Classification with examples. **(b) LOCOMOTION ANDSUPPORT** • Cartilage – Different types with examples and Histology. • Bone – Classification, Names of bone cells, parts of Long bone, Microscopy of Compact bone, Names of all bones, Vertebral column, Intervertebral disc, Fontanelles of Fetal Skull. • Joints–Classification of Joints with examples, Synovial Joints (in detail for Medical Imaging Technology students) • Muscular system: Classification of Muscular tissue and histology. • Names of the muscles of the body.	20 + 8
II	**UNIT (a) CARDIO VASCULAR SYSTEM** • Heart Size, Location, Chambers – Exterior & Interior – conducting System and Valves • Blood supply of heart • Systemic & Pulmonary circulation • Branches of Aorta, Common Carotid artery, Subclavian artery, Axillary artery, Brachial artery, Superficial Palmar arch, Femoral artery and Internal Iliac artery. • Peripheral pulse • Inferior Venacava, Portal vein and Porto systemic anastomosis. • Great Saphenous vein • Dural Venous Sinuses • Lymphatic System – Cisterna Chyli and Thoracic duct. • Names of regionally mphatics, axillary and inguinal Lymph nodes in brief. **(b) RESPIRATORY SYSTEM** • Parts of Respiratory System, Nose, Nasal Cavity, Larynx, Trachea, Lungs, Broncho pulmonary segments • Histology of Trachea, Lung and Pleura • Names of Para nasal air sinuses	20 + 5
III	**(a) GASTRO- INTESTINAL SYSTEM – (10 +5hrs)** • Parts of GIT, Oral cavity (Tongue, Tonsil, Dentition, Pharynx, Salivary glands, Waldeyer‘s ring) • Oesophagus, Stomach, Small & Large Intestine, Liver, Gall Bladder, Pancreas **(b) URINARY SYSTEM - – (5hrs)** • Kidney, Ureter, Urinary bladder, Male & Female Urethra	10 + 5

IV	**(a) REPRODUCTIVE SYSTEM – (10 +2hrs)** • Parts of Male Reproductive system, Testis, Vas deferens, Epididymis, Prostate • Parts of Female Reproductive System, Uterus, Fallopian tubes, Ovary • Mammary gland **(b) ENDOCRINE GLANDS - (5hrs)** • Names of all Endocrine glands in detail on Pituitary Gland, Thyroid Gland, Parathyroid gland and Suprarenal Gland.	10 + 5
V	**NERVOUS SYSTEM – (15 +2 hrs)** • Cerebrum, Cerebellum, Mid brain, Pons, Medulla Oblongata, Spinal cord with spinal nerve • Meninges, Ventricles and Cerebrospinal fluid • Names of Basal nuclei • Blood Supply of Brain • Cranial Nerves	10 + 5
VI	**(a) EMBRYOLOGY** • Spermatogenesis and Oogenesis • Ovulation, Fertilization • Fetal Circulation • Placenta **(b) COURSE SPECIFIC TOPICS** • Skin • Eye • Arterial System and Venous Drainage System in detail	10 + 4

LAB TRAINING (40 hrs)

- Histology of Types of Epithelium
- Histology of Serous, Mucous and Mixed Salivary gland
- Histology of the types of Cartilage
- Demo of all bones showing parts, radiographs of normal bones &Joints
- Histology of Skeletal (TS & LS), Smooth and Cardiac muscle
- Demonstration of Heart and Vessels of the body
- Histology of Large artery, Medium sized artery and vein, Large Vein
- Microscopic appearance of Large and Medium sized Artery and Vein, Large Vein
- Demonstration of all muscles of the body
- Pericardium
- Histology of Lymph node, Spleen, Tonsil and Thymus
- Demonstration of parts of Respiratory system
- Normal Chest radiograph showing Heart shadows
- Histology of Lung and Trachea
- Normal Angiograms
- Histology of Lymphatic tissues
- Radiographs of Abdomen – IVP, Retrograde cystogram
- Demonstration of parts of the Urinary system and Histology of Kidney,Ureter and Urinary bladder

- Demonstration of Male and Female Pelvis with organs in situ.
- Histology of Male and Female Reproductive organs
- Histology of Pituitary, Thyroid, parathyroid and Suprarenal glands
- Histology of peripheral nerve and optic nerve.
- Demo of all parts of brain

METHODS OF TEACHING

- Lecture cum discussion
- Demonstration
- Lab visit
- Practical work record

METHODS OF EVALUATION

- Written Test
- Laboratory observation Book
- Assignments
- Oral Presentations

REFERENCE BOOKS

- Cohen, Memmler: Structure & Function of Human Body, Lippincott Williams & Wilkins; Tenth edition(2012)
- Waugh: Ross & Wilson Anatomy & Physiology in health and illness Penguin Books Ltd(2010)
- Tortora: Anatomy & Physiology, John Wiley & Sons(2012)

B.Sc. ALLIED HEALTH SCIENCES – ANATOMY - BLUE PRINT

Unit No.	Unit	Weightage	Marks Allotted	Knowledge / Recall			Understanding			Application		
				LAQ	SAQ	VSAQ	LAQ	SAQ	VSAQ	LAQ	SAQ	VSAQ
1	I	14 %	12	…	1	1	---	---	1	---	---	---
2	II	20 %	16	1		1	1*		----	---	---	1
3	III	20 %	15	1*	1	1	--	1	----	---	---	1*
4	IV	20 %	16	--	--	1	1	1*	1*	---	----	1
5	V	14 %	12	---	1	---	---	--	1	---	---	1
6	VI	12 %	9	---	1	---	---	--	1	---	---	--

LONG ANSWER QUESTIONS

S.No	Unit wise	Type of Question	Question has to ask
1	CVS / Respiratory System / GIT	Knowledge / Understanding	2
2	Urinary system / Reproductive system / Endocrine system	Knowledge / Understanding	2

SHORT ANSWER QUESTIONS

S. No	Unit wise	Type of Question	Question has to ask
1	Unit - I	Recall	1
2	Unit - II	Understanding	-
3	Unit – III	Understanding + Recall	2
4	Unit – IV	Understanding / Recall	1
5	Unit – V	Understanding	1
6	Unit – VI	Understanding / Recall	1

VERY SHORT ANSWER QUESTIONS

S.No	Unit wise	Type of Question	Question has to ask
1	Unit – I	Understanding / Recall	2
2	Unit – II	Understanding + Recall	2
3	Unit – III	Understanding + Recall + Application	2
4	Unit – IV	Understanding + Recall + Application	3
5	Unit – V	Understanding + Application	2
6	Unit – VI	Understanding / Application	1

The duration of Examination (University) is Three (3) hours.

The total marks for the University Examination will be 100 marks.

Long Answer Questions : 2 X 10 = 20 marks (Choice 2 out of4)

Short Answer Questions : 5 X 6 = 30 marks (Choice 5 out of 6)

Very Short Answer Questions : 10 X3 = 30 marks (Choice 10 out of 12)

TOTAL = Theory 80 + IA 20 = 100 marks

MODEL QUESTION PAPER
FIRST YEAR B.Sc. ALLIED HEALTH SCIENCES
ANATOMY

Time:3 Hours **Maximum Marks:80**

Illustrate your answers with suitable diagrams where ever necessary.

LONG ANSWER QUESTIONS - (**Write any Two**) (**2 X 10 =20)**

1. (A) Explain the Gross features of Right atrium. **(OR)**
   (B) Explain the Gross features of Stomach.
2. (A) Explain the Gross features of Kidney. **(OR)**
   (B) Explain the Gross features of Thyroid gland.

SHORT ANSWER QUESTIONS - (Write any Five) **(5 x 6=30)**

1. Discuss the Classification of joints with its examples.
2. Discuss the boundaries and contents of superior Mediastinum.
3. Discuss the gross features of Right lung.
4. Discuss the external & internal features of 2nd part of Duodenum.
5. Discuss the location, external features of urinary bladder.
6. Discuss the supports of uterus.

VERY SHORT ANSWER QUESTIONS - (Write any Ten) **(10 x3 =30)**

1. Write a note on Sesamoid bone.
2. Trace the conducting system of Heart.
3. List out the paranasal air sinuses.
4. Write a note on Pancreatic duct.
5. List out the parts & functions of extra hepatic biliary apparatus.
6. Write a note on Trigone of urinary bladder.
7. Enumerate the Ovarian follicles.
8. Enumerate the hormones of Adrenal gland.
9. Enumerate the layers of Scrotum.
10. List out the meningeal layers & its modifications.
11. Structure of thin skin.
12. Write a note on Fertilization

PHYSIOLOGY

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES – PHYSIOLOGY

NAME OF THE SUBJECT PAPER	**: PHYSIOLOGY**
DURATION OF THEORY CLASSES	**: 80 Hrs**
DURATION OF TUTORIAL SESSIONS	**: 32 Hrs**
DURATION OF LAB TRAINING	**: 38 Hrs**
THEORY EXAMINATION	**: 100 Marks (80 U + 20IA)**
UNIVERSITY PRACTICAL EXAMINATION	**: NIL**
DURATION OF THEORY EXAMINATION	**: 3 Hrs**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: I YEAR**

COURSE DESCRIPTION

The course is designed to assist students to acquire the knowledge of the normal physiology of various human body systems and understand the alternation in physiology in disease and practice of accident and emergency care technology

COURSE OBJECTIVES

At the end of the course, the student will be able to

- Describe the physiology of cell, tissues, membranes and glands.
- Describe the physiology of blood and functions of heart.
- Demonstrate blood cell count, coagulation, grouping, Hb; BP and Pulse monitoring
- Describe the physiology and mechanism of respiration.
- Demonstrate Spirometry
- Describe the physiology of Excretory system

COURSE OUTCOMES FOR PHYSIOLOGY

At the end of the course, students will be able to...

PHY-AHS-CO1: Understand normal structure and functioning of the organs and organ systems of the body

PHY-AHS-CO2: Understand the regulatory mechanisms in normal and physiological variations.

PHY-AHS-CO3: Understand age-related physiological changes in the organ functions that reflect normal growth and development.

PHY-AHS-CO 4: Understand the physiological basis of diseases.

PHY-AHS- CO 5: Interpret laboratory data pertaining to normal function of organ and organ system.

UNIT	TITLE	THEORY + TUTORIALS (80+32) HOURS
I	**a. General physiology (5 + 2hrs)** • Structure and functions of cell and cell organelles • Transport across cell membrane • Homeostasis: definition and feedback mechanisms **b. Hematology (10 + 2hrs)** • Composition and function of blood and body fluids • Plasma proteins and their functions • RBC: morphology, production, functions and fate • Anemia: etiological & morphological classification • Immunity : Types, mechanism of immune response • Hemostasis and anticoagulants • Blood groups: Types, cross matching and clinical importance	15 +4
II	**Cardiovascular physiology (10 + 5 hrs)** • Functional anatomy • Conductive system of heart: origin, spread of cardiac impulse • Properties of cardiac muscle • ECG: leads, principles of normal recording. Normal waves and interpretations • Cardiac cycle • Heart sounds, Physiological basis of murmur • Cardiac output: definition, factors affecting, factors regulating and its measurement • Blood pressure: total pressure, lateral pressure, importance of different pressure, measurements, factors controlling BP • Shock: definition & types.	10 + 5
III	**Respiratory physiology (10 + 5 hrs)** • Functional anatomy • Mechanism of respiration • Lung volumes and capacities: definition, normalvalues, measurements and clinical importance • Transport of gases: oxygen and carbon dioxide • Control of respiration: neural and chemical regulation. • Dyspnoea, Asphyxia, cyanosis, periodic breathing • Hypoxia : definition and types	10 + 5
IV	**a. Gastro-intestinal physiology (5 hrs)** • GI secretions: saliva, gastric juice, pancreatic juice, liver & gallbladder • GI motility: deglutition, gastric motility and emptying,	15 + 3

	intestinal motility • GI hormones: Gerstein, Secretin, CCK – PZ, motilin, Inhibin **b. Renal physiology (10 + 3 hrs)** • Nephrons: structure, types and functions • Juxta glomerular apparatus • RBF: definition, normal values, factor affecting • GFR: definition, normal values factor affecting and factors regulating, measurement. • Renal handlings of solutes : Na+ , Cl- ,Glucose, water (diuretics, diuresis), H+, ammonia • Renin-angiotensin- aldosterone mechanism • Concentration of urine – countercurrent multiplier and countercurrent exchanger. • Micturition • Renal dialysis	
V	**a. Endocrine physiology (10 + 3hrs)** • Pituitary gland: hormones secreted and their functions, applied: dwarfism, gigantism, Diabetes Insipitus. • Thyroid gland: hormones secreted and their functions, applied: hypothyroidism, hyperthyroidism • Parathyroid gland: hormones secreted and their functions • Adrenal gland: hormones secreted and their functions • Pancreas: hormones secreted and their functions, applied: Diabetes Mellitus **b. Reproductive physiology (5 + 2hrs)** • Male reproductive system: spermatogenesis ,endocrine functions of testis • Female reproductive system: oogenesis, ovulation, functions of estrogen and progesterone. • Menstrual cycle: ovarian cycle, uterine cycle, hormonal changes, abnormalities of menstruation • Contraception	15 + 5
VI	**a. Nerve-Muscle physiology (5 + 5 hrs)** • Neurons: structure, types, properties, degeneration and regeneration • Neuromuscular junction: transmission of impulse and its clinical applications • Skeletal muscle: structure , muscle proteins, contraction& relaxation, types of contraction **b. Central nervous system (5 + 3hrs)** • Organization of nervous system • Synapse: types, functions • CSF :functions • Cerebral cortex: Broca`s area and their functions • Cerebellum: lobes &function • Basal ganglia: nucleus & functions, Parkinsonism	15 + 10

	• Hypothalamus: functions **c. Special senses (5 + 2 hrs)** • Vision: Errors of refraction, visual pathway and effects of lesion • Hearing: functions of middle ear, Conductive deafness and nerve deafness. • Smell and taste: receptors and pathways	

LAB TRAINING (38 hrs)

- Hemoglobinometry
- White Blood Cell Count
- Red Blood Cell Count
- Determination of Blood Groups
- Leishman's Staining and Differential WBC Count
- Determination of Packed Cell Volume
- Erythrocyte Sedimentation Rate(ESR)
- Determination of Clotting Time, Bleeding Time
- Recording of Blood pleasure
- Auscultation for Heart sounds
- Artificial Respiration
- Determination of Vital capacity.

METHODS OF TEACHING

- Lecture cum discussion
- Demonstration
- Lab visit
- Practical work record

METHODS OF EVALUATION

- Written Test
- Laboratory observation Book
- Assignments
- Oral Presentations

REFERENCE BOOKS

1. Basics of Medical Physiology D.Venkatesh /H.H.Sudhakar Wolters Kluwer Third Edition.
2. Waugh: Ross & Wilson Anatomy & Physiology in health and illness Penguin Books Ltd (2010).
3. Principles of Physiology, Singh (H).

PHYSIOLOGY - BLUEPRINT

Unit	Systems	Marks	Weightage (%)	Question type		
				LAQ (2 out of 4)	SAQ (5 out of 6)	VSAQ (10 out of 12)
I	General physiology	15	19%			2+1*
	Hematology			1*	1	1
II	Cardiovascular physiology	16	20%	1	1	
III	Respiratory physiology	16	20%	1	1	
IV	Gastro-intestinal physiology	12	15%		1	1+1*
	Renal physiology			1*		1
V	Endocrine physiology	12	15%		1	1
	Reproductive physiology					1
VI	Nerve-Muscle physiology	09	11%			1
	Central nervous system				1*	1
	Special senses					1
Note: * represents question of choice						

- The duration of Examination (University) is Three (3) hours.
- The total marks for the University Examination will be 100marks.

  Long Answer Questions : 2 X 10 = 20 marks (Choice 2 out of4)

  Short Answer Questions : 5 X 6 = 30 marks (Choice 5 out of 6)

  Very Short Answer Questions : 10 X3 = 30 marks (Choice 10 out of 12)

  TOTAL = Theory 80 + IA 20 = 100mark

MODEL QUESTION PAPER
FIRST YEAR B.Sc. ALLIED HEALTH SCIENCES
PHYSIOLOGY

Total marks: 80 **Duration: 3hours**

LONG QUESTION ANSWER **(2 X 10 =20)**

1. a) Define Erythropoiesis? Describe its stages. Mention the factors influencing it. **(OR)**
   b) Define blood pressure. Write its normal range. Briefly explain short term regulation mechanism of blood pressure.
2. a) Explain how oxygen is transported in blood. Explain oxygen dissociation curve. List the factors shifting this curve to right&left. (OR)
   b) Define Glomerular filtration rate (GFR). Write its normal value. Explain the factors affecting it.

SHORT QUESTION ANSWER – Answer any 5 **(5 X 6 =30)**

1. Define hemostasis. Briefly explain blood clotting mechanism.
2. Define cardiac output. Give its normal value. Describe the factors regulating it
3. Draw normal spirogram indicating static lung volumes and capacities.
4. Briefly explain the mechanism of HCl secretion in stomach.
5. Name the anterior pituitary hormones. Briefly explain functions of growth hormones.
6. Briefly describe stages of Spermatogenesis.

VERY SHORT ANSWER – Answer any 10 **(10 X 3=30)**

1. Write the functions of Golgi apparatus
2. Briefly explain osmosis
3. Briefly describe the function of Na^+ K^+ ATPase pump
4. What are anticoagulants? Name any two.
5. Write any 3 functions of saliva
6. Name any two GI hormones. Write any one function of them.
7. Name the cells of Juxta glomerular apparatus & mention their function
8. List the 3 functions of thyroid hormone
9. Name natural contraceptive methods
10. Classify muscle proteins
11. Classify glial cell. Write any two functions of it.
12. What is myopia? How it is corrected

BIOCHEMISTRY

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES – BIOCHEMISTRY

NAME OF THESUBJECTPAPER	**: BIOCHEMISTRY**
DURATION OF THEORY CLASSES	**: 80hrs**
DURATION OF TUTORIAL SESSIONS	**: 32hrs**
DURATION OF LAB TRAINING	**: 38Hrs**
THEORY EXAMINATION	**: 100 marks (80 U + 20IA)**
UNIVERSITY PRACTICAL EXAMINATION	**: Nil**
DURATION OF THEORY EXAMINATION	**: 3 hrs**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: IYEAR**

COURSE DESCRIPTION

The course is designed to assist students to acquire the knowledge of the normal biochemical functioning of human body and alterations.

OBJECTIVES

At the end of the course, the student will be able to

1. Identify the basic principles of biochemistry.
2. Synthesize the knowledge of these principles in various situations.

COURSE OUTCOMES FOR BIOCHEMISTRY

At the end of the course, students will be able to...

BIO-AHS-CO1: Correlate the integration of various aspects of biomolecules and its lab diagnosis

BIO-AHS-CO2: Explain biochemical basis and rationale of clinical laboratory tests for inborn errors of metabolism, and interpret the results.

BIO-AHS-CO3: Correlate the results of these investigations with the primary disorders of each human body system.

BIO-AHS-CO4 Follow good clinical laboratory practice as well as to handle the biological samples collected

BIO-AHS-CO5: Learn how to collect the samples and to process it for diagnostic purposes

UNIT	TITLE	THEORY + TUTORIALS (80 +32) HOURS
I	**(i) INTRODUCTION TO BIOCHEMISTRY** • Biophysical aspects of Biochemistry: Theory of acids and bases, Ionization of acids, Dissociation of water, Hydrogen ion concentration and concept of pH, Dissociation of acids and bases, Basic concepts in Acidosis and Alkalosis (Respiratory and Metabolic) • Concept of buffering, Definition of buffers and Buffering Capacity, Chemical and Physiological buffers, Henderson Hassel Balch equation and pH – pK relationship, • Glass electrode and determination of pH, Acid Base titration. **ii) PROTEINS** • Proteins: Chemistry, Classification, properties and biomedical importance of Proteins. • Hydrolytic products of proteins • Classification of Amino acids and important properties **iii) ENZYMES** • Definitions of Catalyst, Enzymes, Apo enzyme, Coenzyme, Holoenzyme, Cofactors and prosthetic group • Active site • Systematic classification of Enzymes • Factors influencing Enzyme kinetics • Enzyme units	18 + 6
II	**i) CARBOHYDRATES** • Carbohydrates: Chemistry, Classification, properties and biomedical importance of carbohydrates. **ii) NUCLEOPROTEINS** • Purine and Pyrimidine bases • Ribose and Deoxy Ribose • Definition of Nucleosides and Nucleotides • Structure of DNA • Types of RNA • Biologically significant Nucleotides	15 + 5
III	**LIPIDS** • Definition of Fats and Oils • Classification of Lipids • Saturated and Unsaturated Fatty acids • Properties of Lipids • Biomedical importance of Lipids with special reference to Phospho Lipids, Glycolipids and Cholesterol.	15 + 7
IV	**ENGERY METABOLISM AND NUTRITIONAL BIOCHEMISTRY** • Calorific value, Respiratory Quotient, Resting Metabolic expenditure, Specific dynamic action • Energy requirements • Complex Carbohydrates and Role of Dietary fiber • Essential Fatty acids • Essential amino acids	20 + 6

	• Positive and Negative Nitrogen balance • Protein Energy Malnutrition • Biochemical functions of Vitamins • Biochemical functions of major and trace elements	
V	**(i) CLINICAL CHEMISTRY** • Serum Osmolality: Significance and measurement • Electrophoresis: Principles, Methodology and Diagnostic significance • Principles and applications of Patrician Chromatography • Simple tests to identify Carbohydrates, Lipids and Proteins in biological fluids • Qualitative estimation of Glucose, Proteins, Cholesterol, Urea, Creatinine and Uric acid and their diagnostic significance **(ii) ENVIRONMENTALCHEMISTRY** • Definition of Pollutants • Impact of Terrestrial, Water and air pollutants • Bio pesticides Chemistry, Metabolic Transformation in the living system and role in Chemical Pathology • Influence of Non-Biodegradable domestic utility items and its role in metabolic disorders • Carcinogens and mutagens: qualitative and molecular pathology involved in mutagenesis and carcinogenesis • Plastics and its impacts on Society • Biomedical Waste and its management	12 + 8

LAB TRAINING (38 hrs)

- Simple Color reactions of Carbohydrates and Proteins
- Qualitative estimations of Glucose, Urea, Creatinine, Total Protein and Cholesterol
- Normal constituents of Urine
- Abnormal(pathological)Urine
- Glucose Tolerance Test and its significance
- Demonstration of Electrophoresis and Interpretation of important clinical conditions based on Electrophoresis appearance
- Demonstration of Paper Chromatography and its utility in the diagnosis of inborn errors of metabolism

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Lab visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

REFERENCE BOOK

1. Essential of Biochemistry for B.Sc. Nursing Students Harbanslal, first edition.
2. Biochemistry U.Sathya Narayana, U.Chakrapani, fifth edition

B.Sc. ALLIED HEALTH SCIENCES – BIOCHEMISTRY (I Year) BLUE PRINT

Unit No.	Weightage	Marks Allotted	Knowledge/ Recall			Understanding			Application		
			LAQ (10)	SAQ (6)	VSAQ (3)	LAQ (10)	SAQ (6)	VSAQ (3)	LAQ (10)	SAQ (6)	VSAQ (3)
I	30 %	25		1	1	1	1				
II	20%	19	1		2			1			
III	15%	12	1*	1	2						
IV	15 %	9	1*	1*	2			1			
V	20%	15		1	1 + 1*		1	1*			

The duration of Examination (University) is Three (3) hours.
The total marks for the University Examination will be 80 marks.

Long Answer Questions : 2X 10 marks = 20 marks (Choice 2 out of 4)

Short Answer Questions : 5X 6 marks = 30 marks (Choice 5 out of 6)

Very Short Answer Questions : 10 X 3 marks = 30 marks (Choice 10 out of12)

TOTAL = Theory 80 + IA 20 =100marks

MODEL QUESTION PAPER
FIRST YEAR B.Sc. ALLIED HEALTH SCIENCES
BIOCHEMISTRY

TIME: 3 HOURS **MAXIMUM MARKS:80**

A. Long answer question **(2 X10=20)**

1. a) Write in detail about the Hetero polysaccharides and mention its importance.

(Or)

b) How is acid base balance maintained in the body?

2. a) Define and classify Lipids with suitable examples.

(Or)

b) Write in detail about the RDA, dietary sources, and biochemical role and deficiency manifestations of folic acid.

B. Short answer questions -Answer any 5 questions **(5X 6=30)**

1. Mention dietary sources and functions of cholesterol
2. Define Chromatography & write any4applications
3. Classify Carbohydrates with a suitable example
4. Classify Enzymes systematically by providing one example under each class.
5. Define carcinogen and name any three agents that cause carcinogenesis.
6. List down the sources, regulation and functions of Calcium

C. Very Short answer questions –Answer any10 questions **(10 x 3=30)**

1. Define Respiratory quotient
2. Define buffer
3. List any two functions of trace elements.
4. List any two impacts of plastics on society
5. Mention the essential fatty acids and its importance
6. List any 2 functions of phospholipids
7. Name one test to identify plasma proteins and urea.
8. Define osmolality
9. Mention any one cardiac glycoside with its function
10. Draw a neat labeled diagram of DNA
11. Define mutarotation
12. List any two functions of Fat soluble vitamin

GENERAL MICROBIOLOGY

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES – GENERAL MICROBIOLOGY

NAME OF THE SUBJECT PAPER	**: GENERAL MICROBIOLOGY**
DURATION OF THEORY CLASSES	**: 40 hrs**
DURATION OF TUTORIAL SESSIONS	**: 16 hrs**
DURATION OF LAB TRAINING	**: 38 Hrs**
EXAMINATION	**: 50 marks (40 U+10 IA)**
NO UNIVERSITY PRACTICAL EXAMINATION	
DURATION OF THEORY EXAMINATION	**: 1 ½ hrs**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: I YEAR**

COURSE DESCRIPTION

The course is designed to assist students to acquire understanding of fundamentals of microbiology and identification of microorganisms. It also provides opportunities for practicing infection control measures in hospital setting.

COURSE OBJECTIVES

At the end of the course, the student will be able to:

1. Identify common disease producing microorganisms
2. Explain the basic principles of microbiology and their significance in health and disease. Demonstrate skill in handling specimens.
3. Explain various methods of disinfection and sterilization
4. Identify the role of the nurse in hospital infection control system.

COURSE OUTCOMES FOR GENERAL MICROBIOLOGY

At the end of the course, students will be able to...

MIC-AHS-CO1: Sterilize the articles with physical and chemical methods

MIC-AHS-CO2: Perform with suitable culture media, methods for growth of the bacteria and perform staining techniques for identification of bacteria

MIC-AHS-CO3: Learn the structure, function of immune system and immunity by its antigen-antibody reactions

MIC-AHS-CO4: Learn the how to collect & process the specimen for the diagnostic purposes

MIC-AHS-CO5: Learn about the identification of fungal infections from clinical specimens and various antifungal agents used for the fungal infections.

MIC-AHS-CO6: Learn the laboratory diagnosis of Parasitic and Viral infections

MIC-AHS-CO7: Learn about the treatment and post exposure prophylaxis (PPE) of viral infections

UNIT	TITLE	THEORY + TUTORIALS (40 +16) HOURS
I	**GENERAL BACTERIOLOGY** ▫ Historical introduction Classification of Microorganisms based on size, shape and structure ▫ Anatomy & Physiology of Bacteria : Nutrition, Growth ▫ Microscopy, staining techniques & Culture media, culture methods ▫ Sterilization (physical &chemical methods) Infection	8 +2
II	**IMMUNOLOGY** ▫ Immune response ▫ Immunity ▫ Hyper sensitivity, Autoimmunity ▫ Complement ▫ Antigen antibody reactions	7 + 2
III	**SYSTEMATIC BACTERIOLOGY** ▫ Introduction : Collection transport & processing of bacteriological clinical specimen in general ▫ Pyogenic cocci ▫ Spore baring bacilli Clostridium +Bacillus ▫ Enterobacteriaceae- E.coli, Klebsiella, Salmonella, Shigella ▫ Vibrio, Pseudomonas **MYCOLOGY** ▫ Introduction, classification of fungi, laboratory diagnosis in general ▫ Fungi of medical importance-Opportunistic fungi	8 + 3
IV	**BASICS OF PARASITOLOGY** ▫ Introduction to Parasitology, Classification, Protozoa-I – Entamoeba histolytica ▫ Protozoa-II, Plasmodium spp. ▫ Cestodes: general, T.solium &T.saginata, E.granulosus ▫ Nematodes: Introduction &Classification - Intestinal -Ascaris, Ancylostorma, Strongyloides - Tissue-W.bancrofti	7 +3
V	**VIROLOGY** ▫ Classification & General properties of Viruses, Virus Host interactions & Lab diagnosis in general ▫ DNA Viruses : Pox viruses & Adenoviruses, Herpes viruses ▫ Hepatitis virus, HIV ▫ Rabies , Polio, Arbo viruses common in India – Dengue, Chickenkuniya , Japanese encephalitis, KFD	6 + 4
VI	**HOSPITAL INFECTION AND CONTROL** ▫ Causative agents and methods of transmission ▫ Systematic investigation of hospital infection ▫ Prevention and control of Hospital infections ▫ Environmental Hazards resulting from biomedical waste and preventive measures.	4 + 2

LAB TRAINING (38 hrs)

- Introduction & visit to microbiology lab + Morphology of bacteria + Identification of bacteria (Culture plates & Basic biochemical reactions)
- Gram stain, Acid fast Stain
- Spotters , Instruments, Culture media inoculated &un inoculated
- Applied Immunology (Bacterial)
- Serological tests – CRP, ASO, RPR, Widal Applied Immunology (Virology) Serological tests: HIV, HBsAg(Rapid Tests)
- Stool Examination for eggs + Parasitology specimens

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Lab visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory Observation Book
3. Assignments
4. Oral Presentations

REFERENCE BOOKS

1. Ananthnarayan R: Textbook of Microbiology.(2017)
2. Pommerville J. C: Fundamentals of Microbiology. Jones and Bartlett learning(2013)
3. ApurbaSastry, SandhyaBhat. Essentials of Microbiology.
4. Text book of Concise Microbiology by C.P.Baveja, Latest edition

BLUE PRINT - B.Sc ALLIED HEALTH SCIENCES –GENERAL MICROBIOLOGY (I Year)

Unit No.	Unit	Weightage (%)	Marks Allotted	Knowledge/ Recall			Understanding			Application		
				LAQ (10)	SAQ (6)	VSAQ (3)	LAQ (10)	SAQ (6)	VSAQ (3)	LAQ (10)	SAQ (6)	VSAQ (3)
I	GENERAL BACTERIOLOGY	8	3	1*								1
II	BASICS OF IMMUNOLOGY	15	6			1*		1				
III	SYSTEMATIC BACTERIOLOGY	25	10				1				1*	
IV	BASICS OF PARASITOLOGY& MYCOLOGY	22	9					1				1
V	VIROLOGY	22	9		1							1
VI	HOSPITAL INFECTION AND CONTROL	8	3		1*				1			
	TOTAL	**100**	**40**									

The duration of Examination (University) is One and Half (1 ½) hours.
The total marks for the University Examination will be 40marks.

Long Answer Questions : 1X10mark = 10 marks (Choice 1 out of2)
Short Answer Questions : 3X6marks = 18 marks (Choice 3 outof5)
Very Short Answer Questions : 4 X3 marks = 12marks (Choice 4 out of5)
TOTAL = 40 marks

MODEL QUESTION PAPER
FIRST YEAR B.Sc. ALLIED HEALTH SCIENCES
GENERAL MICROBIOLOGY

Time: 1½Hours **Maximum Marks: 40**

Illustrate your answers with suitable diagrams wherever necessary.

(A) Long answer questions **(1 X 10=10)**

1. Describe the commonly used chemical disinfectants and their applications in the hospital.

(OR)

2. Classify Mycobacterium. Give an account on pathogenesis and laboratory diagnosis of pulmonary tuberculosis. Add a note on BCG vaccine.

(B) Short answer questions -Answer any 3 questions marks **(3 X6=18)**

1. Define immunity. Describe acquired immunity.
2. Types of HAI & mention the causative agents.
3. Name the UTI cause bacteria. How to collect urine & laboratory diagnosis of *E.coli*.
4. Life cycle of malaria parasite in human.
5. Write about Modes of transmission of HIV.

(C) Very Short answer questions –Answer any 4 questions **(4 x3 =12)**

1. Mention different color coded bags for biological waste management used in hospital with the viruses.
2. Prophylaxis of hepatitis B.
3. List FOUR bacteria causing wound infection.
4. Name the opportunistic fungi.
5. Name four arbo viral diseases common in India.

GENERAL PATHOLOGY

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES – GENERAL PATHOLOGY

NAME OF THE SUBJECT PAPER : GENERAL PATHOLOGY

DURATION OF THEORY CLASSES : 40hrs

DURATION OF TUTORIAL SESSIONS : 16hrs

DURATION OF LAB TRAINING : 38Hrs

EXAMINATION : 50 marks (40 U + 10IA)

NO UNIVERSITY PRACTICAL EXAMINATION

DURATION OF THEORY EXAMINATION : 1 ½hrs

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : IYEAR

COURSE DESCRIPTION

To make the student to understand pathology laboratory reports, the normal ranges of investigations, severity and specificity of disease conditions which will help him perform International Classification of diseases to clinical pertinence.

COURSE OBJECTIVES

On completion of this subject, the student will be able to:

- Differentiate between symptoms and diseases
- Understand the needs of mandatory diagnostic procedures
- Demonstrate an understanding of the pathology of common diseases
- Understand various pathology laboratory reports
- Know about the possibilities and consequences of nosocomical infections, needle prick injuries etc., in a health care facility

COURSE OUTCOMES FOR GENERAL PATHOLOGY

At the end of the course, students will be able to...

PAT-AHS-CO1: Learns the pathophysiology of disease and its causes and progression

PAT-AHS-CO2: Learns the etiologies, the pathogenesis, and the host response specific to a particular organ system

PAT-AHS-CO3: Learn about lab investigations and techniques in Hematology.

PAT-AHS-CO4: Learns to perform cross matching, coombs test, blood grouping and TTI

PAT-AHS-CO5: Learns the diagnosis of disease based on the laboratory analysis of bodily fluids

UNIT	TITLE	THEORY + TUTORIALS (40 +16) HOURS
I	**GENERAL PATHOLOGY (12 +3 HOURS)** Basic Concepts in Cellular Adaptions • Cell injury and Cell death • Over view of Cellular adaption Basic Principles in Inflammatory Process • General features of acute and Chronic inflammation repair. • NEOPLASIA • Definition of Neoplasia • Differences between Benign and Malignant tumors • Nomenclature	10 + 5
II	**HAEMATOLOGY** **Structure and functions of Blood cells** • Objective use of anticoagulants • Mechanisms of Haemostasis • Tests to monitor Coagulation • Blood Grouping and Blood Bank (Basic aspects on Blood Components) • Basic concepts in Anemia • Basic Concepts of Leukemia	10 + 3
III	**BIOMEDICAL WASTE MANAGEMENT AND ENVIRONMENTAL PATHOLOGY** • Biomedical waste management from perspectives of Pathology • Environment and Disease – Smoking hazards, Asbestosis and Silicosis Occupational Exposure	5 + 2
IV	**CLINICAL PATHOLOGY** • Collection, transport, preservation and processing of Clinical Specimen • Clinical Pathology of specialized Body Fluids(CSF), Synovial fluid, Pleural Fluid • Urine Examination(Urinalysis)	5 + 2
V	**OVERVIEW OF SYSTEMIC PATHOLOGY** • Rheumatic Heart Disease ineffective endocarditic, atherosclerosis, IHD – Basic Concepts. • Lungs : Pneumonia, COPD, Asthma, ARDS – Basic Concepts • Gastrointestinal tract – Peptic Ulcer, Carcinoma Stomach, Carcinoma Colon –Basic Concepts. • Liver: Hepatitis, Cirrhosis, Gall Bladder –basic	10 + 4

	Concepts. • Brain Tumor. • Kidney – Renal Calculi, Hydronephrosis, renal Tumor – Basic Concepts. • FGT – Leiomyoma, Endometrial hyperplasia, Endometrial Cancer, Cervical Cancer –Basic Concepts. • FGT – Ovarian Tumor classifications – Basic Concepts. • Breast – Benign and Malignant tumors – Basic Concepts • Bone Tumors – Basic Concepts	

LAB TRAINING (38 hrs)

1. Blood Grouping and Rh typing
2. Urine Routine
3. Hb, TLC,DLC
4. Gross Specimens
5. Slides

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Lab visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

REFERENCE BOOK

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Todd & Sanford Clinical Diagnosis by laboratory method
4. Dacie & Lewis – Practical Haematology
5. RamanicSood, Laboratory Technology (Methods and interpretation) 4thEd.

B.Sc. ALLIED HEALTH SCIENCES – PATHOLOGY (I Year)-BLUE PRINT

Unit No.	Unit	Weightage	Marks Allotted	Knowledge/ Recall			Understanding			Application		
				LAQ (10)	SAQ (6)	VSAQ (3)	LAQ (10)	SAQ (6)	VSAQ (3)	LAQ (10)	SAQ (6)	VSAQ (3)
I	a) BASIC CONCEPTS IN CELLULARADAPTIONS b) BASIC PRINCIPLES IN INFLAMATORY PROCESS c) NEOPLASIA	37.5%	15	1*	2	1	-	1*	1*	-	-	-
II	HAEMATOLOGY	22.5%	9	-	1	1	-	-	-	-	-	-
III	BIOMEDICAL WASTE MANAGEMENT AND ENVIRONMENTAL PATHOLOGY	7.5%	3	-	-	-	-	-	1	-	-	-
IV	CLINICAL PATHOLOGY	7.5%	3	-	1*	1	-	-	-	-	-	-
V	OVERVIEW OF SYSTEMIC PATHOLOGY	25%	10	1	-	-	-	-	-	-	-	-

The Duration of Examination (University) is One and Half hours (1 ½) hours.

The total marks for the University Examination will be 40 marks.

Lon Answer Questions : 10X1marks = 10 marks (Choice 1 out of 2)

Short Answer Questions : 3 X6marks = 18 marks (Choice 3 out of5)

Very Short Answer Questions : 4 X3marks = 12 marks (Choice 4 out of5)

TOTAL = 40 marks

MODEL QUESTION PAPER
FIRST YEAR B.Sc. ALLIED HEALTH SCIENCES
GENERAL PATHOLOGY

Time: 1½Hour **Maximum Marks: 40**

Illustrate your answers with suitable diagrams wherever necessary.

(A) Long Answer Questions **(1X10=10)**

1. Mention the types of necrosis with examples

(Or)

2. Describe about Myocardial infarction

(B) Short Answer Question **(3X6=18)**

Answer any THREE of the following

1. Tabulate the difference between Benign and Malignant tumors
2. Define anemia. Mention types of anemia, on the basis of Etiology.
3. Explain the mode of spread of tumors in brief.
4. Explain granulomatous inflammation with a neat labeled diagram
5. Describe the method of collection, transport and preservation of CSF

(C) Very Short Answer Questions **(4X3=12)**

Answer any FOUR of the following

1. Define Apoptosis.
2. Enumerate two colors coding for various biomedical waste disposal with examples.
3. Define cross matching
4. Mention two types of Necrosis.
5. Define Pneumonia.

I YEAR ELECTIVE COURSES

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES
ABILITY ENHANCEMENT COMPULSORY COURSE (AECC) - ENGLISH

NAME OF THE SUBJECT PAPER	**: ENGLISH**
DURATION OF THEORY CLASSES	**: 16hrs**
DURATION OF PRACTICAL SESSIONS	**: 34hrs**
EXAMINATION	**: 100 marks (80 U + 20 IA)**
NO UNIVERSITY PRACTICAL EXAMINATION	
DURATION OF THEORY EXAMINATION	**: 1 ½ hrs**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: I YEAR**

COURSE OUTCOMES FORENGLISH

ENG-CO1: Speak and write grammatically correct sentences in English

ENG-CO2: Develop effective writing skills needed for clinical task

ENG-CO3: Build fluency in English needed for clinical tasks

SYLLABUS
(THEORY& PRACTICALS = 16 +34 Hours)

COURSE DESCRIPTION

This course is designed to build spoken and written English competency of the students needed to function effectively in academic setup.

OBJECTIVES

On completion of this subject, the student will be able to:

1. Speak and write grammatically correct sentences in English.
2. Develop effective writing skills.
3. Build fluency in English

UNIT: I GRAMMAR

1. Remedial Grammar : Parts of speech; Types of sentences, question tags
2. Modal verbs;
3. Tenses
4. Concordance

UNIT: II VOCABULARY

1. Word formation – prefixes and suffixes
2. Medical terminology
3. Words often misused or confused
4. Idioms and phrases

UNIT: III WRITING SKILLS

1. Letter writing - permission, leave and other official letters
2. Note making methods
3. Jumbled sentences -cohesion
4. Paragraph Writing

UNIT: IV SPOKEN COMMUNICATION

1. Pronunciation of commonly mispronounced words
2. Day today conversation
3. Telephonic conversations
4. Group Discussions

UNIT: V LISTENING AND READING SKILLS

1. General Listening and reading comprehension

Textbook Recommended

1. Effective English Communication by Krishna Mohan and Meenakshi Raman, Tata McGraw – Hill Publishing Company Limited, New Delhi.
2. English for Colleges and Competitive Exams by Dr. R. Dyvadatham, Emerald Publishers.

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES
SKILL BASED ELECTIVE COURSE (SBEC) – CULINARY SKILLS FOR OPTIMAL NUTRITION

NAME OF THE SUBJECT PAPER : CULINARY SKILLS FOR OPTIMAL NUTRITION

DURATION OF THEORY CLASSES : 16 Hrs

DURATION OF PRACTICAL SESSIONS : 32Hrs

PRACTICAL EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY THEORY EXAMINATION

DURATION OF EXAMINATION : 1 ½ Hrs

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT: I YEAR

COURSE OUTCOMES

NUTRI-CO1: Understand the basic food groups, their nutrient composition and function for balanced healthy diet for people of all ages & patients on dietary management for healthy life.

THEORY & PRACTICALS (DURATION 16 + 32 Hours)

UNIT-I INTRODUCTION TO FOODS AND NUTRITION

- Food-Definition of foods, nutrition and nutrients characteristics of good health
- Relation of nutrition to good health-optimal nutrition, malnutrition and over nutrition
- Classification of foods based on major nutrient content
- Food selection-factor responsible for food selection

UNIT-II FOODS GROUPS

- Basic four and five food groups-cereals, millets pulses, fruits and vegetables, fats and oils, sugar and jaggery.
- Foods and nutrients, Functions of food- energy yielding, body building and protective foods, balanced diet, vegetarian and non-vegetarian foods
- Functional Foods-Dietary supplements
- Food Adulterations-Common adulterants and method of identification, nutrition labeling and food standards

UNIT-III METHODS OF COOKING, PRESERVATION AND SENSORY EVALUATION

- Principles and techniques of sensory evaluation, Interpretation tools
- Cooking methods-moist heat, dry heat advantages and disadvantages, changes during cooking, nutrient preservation while cooking
- Preservation techniques advantages and disadvantages

UNIT-IV NUTRITIONAL REQUIREMENTS AND MEAL PLANNING

- Basic nutritional requirements through different stages of life cycle, basic principles of meal planning, revisiting concept of balanced diet.

PRACTICALS

- Introduction to cutlery and crockery
- Introduction to weights and measures
- Art of table setting
- Market survey on food labeling
- Preparation of few commonly consumed cereal preparation
- Preparation of few commonly consumed pulse dishes
- Vegetable cooking without nutrient loss
- Preparation and display of fruits salads
- A day‘s menu for an adult sedentary worker
- A day‘s menu for an 8-montholdinfant
- Nutritious snacks for preschooler
- Nutritious lunch for school going boys and girl
- Consistency modified menu foran80-year-old
- Simple test to identify food adulteration
- Sensory evaluation of prepared items

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Lab visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

Reference book

1. Srilaksmi.B. : Food science; seventh edition(2012)
2. Jacqueline B .Marcus :Culinary Nutrition: The science and practice of healthy cooking:(2014)

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES
SKILL BASED ELECTIVE COURSE (SBEC) – ENHANCING SOFT SKILL & PERSONALITY

NAME OF THE SUBJECT PAPER : Enhancing soft skill & personality

DURATION OF THEORY CLASSES : 16Hrs

DURATION OF PRACTICAL SESSIONS : 32Hrs

PRACTICAL EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY THEORY EXAMINATION

DURATION OF EXAMINATION : 1 ½ Hrs.

YEAR : I YEAR

COURSE OUTCOMES

ESSP-CO1: Foster healthy attitude and develop effective inter and intra personal skills to be an effective team worker in both academic and professional setup.

LEARNING OBJECTIVES

This course is designed to equip the students with essential soft skills needed for workplace and improve personality.

SYLLABUS

UNIT: I ASPECTS OF COMMUNICATION

1. Importance of communication, Process, Barriers
2. Nonverbal Communication

UNIT: II SPEAKING

1. Opening and Closing conversations
2. Introductions and Address Systems
3. Expressing Courtesy
4. Giving Compliments and replying to Compliments
5. Presentation Skills
6. Telephonic conversation and telephone etiquette

UNIT – III PRESCRIBED READING

1. White washing the Fence – Episode from Tom Sawyer by Mark Twain
2. Bacon's Essays: - Of Goodness and goodness of nature

UNIT – IV WRITING

1. Letter writing - Letter of Complaints, Inviting and Declining an invitation
2. Memos and Email
3. Editing- Grammar, Spelling & Punctuation, Use of Dictionary &Thesaurus.

UNIT – V SOFT SKILLS

1. Active Listening Skills
2. Assertive Skills
3. Negotiation and Persuasive Skills
4. Interview Skills

Reference Books

1. Communication Skills for Engineers and Scientists by Sangeeta Sharma and Binod Mishra, PHI Learning Private Limited, New Delhi.
2. English and soft skills by S.P. Dhanavel, Orient Black Swan
3. Effective English Communication by Krishna Mohan and Meenakshi Raman, Tata McGraw –Hill Publishing Company Limited.
4. Technical Communication – Principles and Practice, by Meenakshi Raman and Sangeetha Sharma, II edition, Oxford University Press.

Learning Outcome

This course is designed to help the students to

- Foster healthy attitude.
- Develop effective inter and intra personal skills to be an effective team worker.
- Communicate effectively in both academic and professional setup

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES
SKILL BASED ELECTIVE COURSE (SBEC) – SPEAKING EFFECTIVELY

NAME OF THE SUBJECT PAPER : SPEAKING EFFECTIVELY

DURATION OF THEORY CLASSES : 16Hrs

DURATION OF PRACTICAL SESSIONS : 32Hrs

PRACTICAL EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY THEORY EXAMINATION

DURATION OF EXAMINATION : 1 ½ Hrs.

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT: I YEAR

COURSE OUTCOMES

SPEAK-CO1: Speak and write grammatically correct sentences in English and Build fluency in English needed for clinical tasks.

LEARNING OBJECTIVES

- Advance the students intellectual curiosity, competency and skills in preparation for employment
- Develop critical thinking, creativity and effective communication

SYLLABUS

1. Communication Skills

- Importance of Communication skills in Public health; Communication process; Methods of communication; Types of communication: Verbal and Non-verbal; Impediments to effective communication; Feedback

2. Oral Presentation Skills

- Preparation and planning; Structure; Audio-visual aids; Creating interest and establishing a relationship with the audience; Body language; Voice and pronunciation; Review

3. Writing skills

- Writing a scientific paper; Writing a proposal; Structure of an article; References and literature review; Peer-review process-Publication bias; International guidelines for publication in journals; Professional Ethics

4. Leadership in Public health

- Leadership styles and trait; Motivation skills; Interpersonal communication skills; Problem solving skills; Decision making skills; Management skills; Communication Skills

5. Manuscript writing

- Writing introduction, objectives, methodologies, major finding, discussion, conclusion and recommendation

6. Seminar presentations

- Use of computers present data and information on recent topics

LEARNING OUTCOMES

At the completion of the course, the students will-

- Develop good written and oral communication abilities
- Develop an understanding of team building and leadership skills
- Develop knowledge regarding capacities needed to work independently within diverse work environments

TEXT BOOKS

1. Professional Writing Skills, A self-paced training Programme by Janis Fisher Chan and Diane Lutovich.

2. Speaking Your Mind: Oral Presentation and Seminar Skills By Rebecca Stott, Tory Young, Cordelia Bryan Contributor Rebecca Stott, Tory Young, Cordelia Bryan.

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES
SKILL BASED ELECTIVE COURSE (SBEC) – BASICS OF YOGA AND PRACTICE

NAME OF THE SUBJECT PAPER : BASICS OF YOGA AND PRACTICE

DURATION OF THEORY CLASSES : 16Hrs

DURATION OF PRACTICAL SESSIONS : 32Hrs

PRACTICAL EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY THEORY EXAMINATION

DURATION OF EXAMINATION : 1 ½ Hrs

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : I YEAR

SYLLABUS & COURSE OUTCOMES FOR BASICS OF YOGA & PRACTICE (YOGA)

YOGA CO1: Understand the respiratory system, types of breathing and benefits of meditation.

Unit	TIME(HRS)	CONTENT
1	1	Introduction to Yoga philosophy, psychology and life style
2	1	A brief outline of the history of Yoga.
3	1	Cultivation of correct psychological attitudes
4	1	Asanas : Definition, Types, scope and limitations of Asanas
5	1	Pranayamas and their significance in Yogic curriculum, Types & phases of Pranayama.
6	1	Dharna and Dhyana as the keys to unlocking human potential.
7	1	Study of various aspects of Yoga: Kriyas, Bandhas, Mudras
8	1	Yoga defined as —Integration and —Harmony
9	1	Meaning of the term —Positive Health
10	1	Yoga, a tool to restore homeostasis
11	1	Integration of Yoga into Health Professions Education
12	1	Order of teaching the Yogic practices; Do‘s and Dont‘s of specific Yoga techniques.
13	2	Applied aspects of Yoga in various human activities like therapeutics, education and sports
14	2	Introduction to yogic concept of health and disease

Unit 15: Introduction to Yogic techniques: Methods and practices (32 hours)
Asanas (26 hrs):

- Aruna Surya Namaskar
- Ardha – Padmasana/Padmasana
- ArdhakatiChakrasana
- PadaHasta
- PavanaMuktasana
- Trikona
- Navasana
- Ardha –Shalabhasana
- Shalabhasana
- Makarasana
- Bhujangasana
- Dhanurasana
- Vakrasana
- Vrikshasana
- Ushtrasana
- Gomukasana
- Yoga Mudra.
- Natarajasana
- Chakrasana
- Sarvangasana
- Matsyasana
- Halasana
- Shavasana

Pranayama (6 hrs)

- Vibhaga Pranayama
- Pranava Pranayama
- Savitri Pranayama
- Chandra and SuryaNadi Pranayama
- Nadi–Shuddhi
- Sheetali and Sitkari

TEXT BOOKS

- Dayanidy G and Bhavanani AB. CYTER Practical Book. Pondicherry, India: Dhivyananda Creations;2016.
- A primer of Yoga Theory – Dr Ananda Balayogi Bhavanani, Dhivyananda Creations,Pondicherry-13
- Fundamentals of Yoga History- Compilation by Meena Ramanathan
- Basic Hatha Yoga lessons (Tamil) – Dr Ananda Balayogi and Meena Ramanathan, Puducherry

BOOKS RECOMMENDED FOR STUDIES AND REFERENCE

1. A yogic approach to stress-Dr Ananda Balayogi Bhavanani, Ananda Ashram, Pondicherry
2. Asana, Pranayama, Mudra and Bandha. Swami Satyananda, Bihar School of Yoga,Monger
3. ASANAS : WHY? AND HOW? – byShri. O.P. Tiwari.Kaivalyadhama,Lonavla.
4. Hatha Yoga practices of the Gitananda tradition by Dr Ananda Balayogi Bhavanani
5. Ramanathan Meena. Applied Yoga: Applications of Yoga in Different Fields of Human Activities. 3rdEd; Pondicherry, India: Sri Balaji Vidyapeeth;2018
6. PRANAYAMA – by Swami Kuvalayananda. Kaivalyadhama, Lonavla.
7. Yoga and sports- Swami Gitananda and Meenakshi Devi, Ananda Ashram, Pondicherry.

SYLLABUS FOR I YEAR

B.Sc. ALLIED HEALTH SCIENCES

GENERIC ELECTIVE COURSE (GEC) – BASICS OF HOSPITAL ADMINISTRATION

NAME OF THE SUBJECT PAPER : BASICS OF HOSPITAL ADMINISTRATION

DURATION OF THEORY CLASSES : 64Hrs

THEORY EXAMINATION : 50 Marks (40U+10 IA)

NO UNIVERSITY PRACTICAL EXAMINATION

DURATION OF THEORY EXAMINATION : 1 ½ HRS

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : IYEAR

COURSE OUTCOMES

HSM CO1: To familiarizes students with the basics concepts, policies of hospital management regarding the occupational safety, organizational behavior & quality management.

COURSE OBJECTIVES

- To provide orientation about the hospital functions
- To familiarize students with the basics concepts of hospital management

THEORY (DURATION 64 Hours)

UNIT: I ORGANISATION OF A HOSPITAL AND ITS DEPARTMENTS

1. Organogram
2. Vision, Mission &Values, Logo
3. Patient Service Points – Clinical & Non-Clinical (OPD‘s, A&E, MHC, Wards, ICU‘s, OT‘s, etc.)
4. Scope of Services (Medical &Supportive Services)

UNIT: II HOSPITAL POLICIES & PROCEDURES

1. Registration Process
2. OP/IP Billing
3. Admission Process
4. Discharge Process
5. Financial counseling
6. Visitors Policy
7. Feedback forms.

UNIT: III MEDICAL RECORS MANAGEMENT/LEGAL ASPECTS

1. Types of Medico legal cases 2.SOP‘s for handling MLC

3. Medical Records -Forms, consents, registers used in hospitals

UNIT: IV QUALITY MANAGEMENT

1. Quality – Brief Introduction
2. Code of Conduct for health care professionals
3. Patient rights &responsibilities
4. Incident Reporting
5. Quality indicators
6. List of Licenses to be obtained to run a Hospital College
7. Accreditation–ISO/NABH/JCI

UNIT: VOCCUPATIONAL SAFETY

1. Biomedical Waste Management
2. Hospital Spill Management
3. Usage of PPE
4. Emergency Codes
5. Fire Safety Management
6. Hospital Infection Control

UNIT: VI ORGANISATIONAL BEHAVIOUR

1. Communication with patients/health care professionals
2. Grooming standards
3. Time Management
4. Grievance Handling, Interdisciplinary Committee
5. Leadership

LEARNING OUTCOMES

Students will have an overview of hospital functions, processes and patient management.

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES
GENERIC ELECTIVE COURSE (GEC) – COUNSELING AND GUIDANCE

NAME OF THE SUBJECT PAPER	**: COUNSELING AND GUIDANCE**
DURATION OF THEORY CLASSES	**: 64Hrs.**
EXAMINATION	**: 50 Marks (40 U +10IA)**
NO UNIVERSITY PRACTICAL EXAMINATION	
DURATION OF THEORY EXAMINATION	**: 1 ½ Hrs.**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: I YEAR**

COURSE OUTCOMES

CG CO1: To assess a person's needs and understand their personal characteristics that will help in personal growth, wellbeing and improving their relationships with others.

LEARNING OBJECTIVES

- To understand theoretical foundations of counseling psychology
- To examine briefly the major perspectives of Counselling and to apply based on the client's needs
- To assess ones own needs and motivations and personal characteristics that will help in personal growth and well being.
- To understand basic counseling skills as practiced by an effective counsellor.
- To discuss special settings and populations where Counselling could be effectively used.
- To explore ethical and legal issues for the practice of counseling profession.

SYLLABUS

UNIT I:

Introduction and definition of Counselling and Guidance, Counsellor Preparation, Qualifications, Qualities, Legal and Professional ethics

UNIT- II:

Different approaches to counselling, goals in counselling, role and functions of the counsellor.

UNIT- III:

Micro skills in Counselling- relationship building strategies and methods: Opening techniques, attending skills- verbal and non-verbal communication, Listening skills:

Open questions and closed questions, Encouragement, Paraphrasing, Reflection, Summarization, influencing skills-Reframing, genuineness and Self-disclosure.

UNIT-IV:

Macro skills in Counselling, empathy, advanced empathy, Confrontation & challenging, Resistance, transference and counter-transference

UNIT-V:

Counselling situations and Counselling across life-span.

Learning Outcome

At the end of this course, the students will be able to:

Demonstrate basic knowledge in counseling (concepts, theories, ethical issues, basic skills, etc.)

SYLLABUS FOR I YEAR
B.Sc. ALLIED HEALTH SCIENCES
GENERIC ELECTIVE COURSE (GEC) – LIFESTYLE DISORDERS

NAME OF THE SUBJECT PAPER : LIFESTYLE DISORDERS

DURATION OF THEORY CLASSES : 64Hrs

EXAMINATION : 50 Marks (40 U +10IA)

NO UNIVERSITY PRACTICAL EXAMINATION

DURATION OF THEORY EXAMINATION : 1 ½ Hrs.

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : I YEAR

COURSE OUTCOMES

LD CO1: To understand the relevance, significance and implications of lifestyle disorders for the betterment of human life quality.

THEORY (64 Hours)

UNIT I Modern Life style disorders

Desk bound and sleeping habits, junk food, anxiety. Food poisoning, Acidity.

UNIT II Dietary disorders

Food groups and concept of a balanced diet, obesity, metabolic syndrome, hypertension- their causes and prevention through dietary and lifestyle modifications

UNIT III Social health problems

Smoking, alcoholism, drug dependence and Acquired Immune Deficiency Syndrome (AIDS).

UNIT IV Gastrointestinal disorders

Stomach disorders-Gastritis, Ulcer, Amoebiasis, Constipation, piles
Common ailment- cold, cough, fevers, diarrhea, constipation- their causes and dietary

LEARNING OUTCOMES

To understand the relevance, significance and implications of lifestyle disorders for the betterment of human life quality

Text Books

1. Text book of Clinical Biochemistry-Carl.A. Burtis and EdwardR.Ashwood
2. Text Book of Medical Biochemistry–Dr.M.N.Chatterjee and Rane Shinde

Reference Books

1. P. Singh MD. Textbook of Nutrition and Health; First Ed; 2008; Academic Excellence Biochemistry with Clinical Correlation- Thomas M.Devl

II YEAR

B.Sc – MEDICAL IMAGING TECHNOLOGY
FACULTY OF ALLIED HEALTH SCIENCES
SRI BALAJI VIDYAPEETH
(Deemed to be University)
Accredited by NAAC with 'A' Grade

II-YEAR

CORE SUBJECTS

1. Radiological Physics
2. Radiographic Positioning
3. Ultrasound Imaging and Mammography
4. Interventional Procedure and Dental Radiography

ELECTIVES

Ability Enhancement compulsory course (AECC)

1. Environmental studies

Skill enhancement course (SEC) – Choose any TWO

1. Good Clinical Laboratory practice
2. Computer Applications
3. Library and E-resource
4. Public Health and Hygiene

Generic Elective Course (GEC) – Choose any ONE

1. Basic Psychology
2. Sociology
3. Entrepreneurship essentials

AHS Course Content Second year B.Sc. Medical Imaging Technology (MIT)

Faculty code	Category	Course title		Hours				Credits				
AHS	**Core theory MIT**	**Subjects**	**Theory**	**Practical**	**Tutorials**	**Clinical training**	**Total hours**	**Lecture**	**Practical**	**Tutorials**	**Clinical training**	**Total credits**
AHS	MIT -5	Radiological Physics	64	64				4	2			6
AHS	MIT -6	Radiographic Positioning	80		32			5		1		6
AHS	MIT -7	Ultrasound Imaging and Mammography	80		32			5		1		6
AHS	MIT -8	Interventional Procedure and Dental Radiography	80		32			5		1		6
AHS	MIT-CT 1	Clinical Training MIT 5 to 8				192					6	6
AHS	AECC	Environmental Science	16	32				1	1			2
AHS	SEC – 1-3	Student‘s choice	16	32				1	1			2
AHS	SEC – 1-3	Student‘s choice	16	32				1	1			2
AHS	GEC - 1-3	Student‘s choice	64					4				4
			416	**160**	**96**	**192**	**864**	**26**	**5**	**3**	**6**	**40**

SCHEME OF EXAMINATION

Papers	Subject	Theory		Practical		Theory	Practical	Grand total 1000	Min marks to pass % (500)
		UE	IA	UE	IA	UIA*	UIA*		
MIT -5	Radiological Physics	80	20	80	20			200	100
MIT -6	Radiographic Positioning	80	20					100	50
MIT -7	Ultrasound Imaging and Mammography	80	20					100	50
MIT -8	Interventional Procedure and Dental Radiography	80	20					100	50
MIT-CT 1	Clinical Training MIT 5 to 8						100	100	50
AECC	Ability enhancement Compulsory Course – Environmental Science	80	20					100	50
SEC	Skill enhancement Course	80	20					100	50
SEC	Skill enhancement Course	80	20					100	50
GEC	Generic elective	80	20					100	50

For all elective course, 40 marks for university theory and Practical cum Viva examination & 10 marks as Internal Assessment = 50 marks which will be converted to 100 marks in the transcript.

RADIOLOGICAL PHYSICS

PAPER MIT 5: RADIOLOGICAL PHYSICS

NAME OF THE SUBJECT PAPER	**: RADIOLOGICAL PHYSICS**
DURATION OF THEORY CLASSES	**: 64 HOURS**
DURATION OF PRACTICAL CLASSES	**: 64 HOURS**
UNIVERSITY THEORY EXAMINATION	**: 100 MARKS (80 U+ 20 IA)**
UNIVERSITY SPRACTICAL EXAMINATION	**: 100 MARKS(80U+20 IA)**
DURATION OF THEORY EXAMINATION	**: 3 HOURS**

COURSE DESCRIPTION

This course provides introduction to basic physics of radiology and medical imaging modalities. It also focuses on the working principles of various radio diagnostic instruments in the past and present.

OBJECTIVES

- To understand basics of atomic physics and radiological physics.
- To study the processes involved in production of x-ray and the construction of a x-ray unit.
- To study the conventional radiological image acquisition method as well as the recent advances in the acquisition.
- To study the conventional radiological image processing method as well as the latest developments in the processing method.
- To know about the role of various radiation dosimetry used in the radiology department.

PROGRAM OUTCOMES

At the end of the 4 year of training B.Sc MIT students should be able to

MITPO1: Performs the duty as a medical technologist, mastering PRP-MPuter applications with good written & communication skills and also skilled at computer applications including E- library.

MITPO2: To gain knowledge about radiation safety precautions, biomedical waste management adhering to the environmental needs of the society, and preventing the spread of infectious diseases.

MITPO3: Understanding the structure and functions of different organs in normal humanbody.

MITPO4: The learning objectives of this course is to understand radiation sources, types and its properties , production and properties of X-rays, radiation quantities and units used in theindustry.

MITPO5: Phlebotomists are trained to draw blood primarily by performing venipunctures (for collection of minute quantities of blood and fingerpricks)

MITPO6: To study and understand about the radiographic positioning.

MITPO7: Ability to perform urinalysis, Serology, haematology, cytology, blood banking, biochemical and microbiological parameters.

MITPO8: To know the basics of reagent preparation, instrument handling and can perform common analytical in Clinical Biochemistry.

MITPO9: To equip students regarding dark room facility, X-ray cassette and lean about filmartifacts.

MITPO10: To know different types of imaging modality such as MRI, PET scan, SPECT and also understand about quality assurance test, dosimetrytools

MITPO11: To practice in-vitro study in radiology (GI tract, Billary Tract, Urinary System, Reproductive System, Cardiovascular System, Venography, Central Nervous System, Respiratory System, and Miscellaneous)

MITPO12: various life style disorders and with due counseling& guidance advising the patients with proper diet, hygiene and Yoga to keep the body, mind, soul and behavior healthy.

COURSE OUTCOMES

At the end of the course, students will be able to...

RP-AHS-CO1: To know the importance of radiation in clinical environment.

RP-AHS-CO2: Summarize the working principles of radio diagnostic equipment.

RP-AHS-CO3: Major criteria for image processing and acquisition.

RP-AHS-CO4: Essential physics for a medical imaging technologist.

RP-AHS-CO5: Knowledge about radiation dosimetry of radio diagnostic units.

RP-AHS-CO6: It helps students to understand the roles of medical imaging in healthcare sector.

COURSE CONTENT

UNIT	TITLE	THEORY (64 HOURS)
I	**BASICS OF ATOMIC PHYSICS** • Unit of Atomic structure, mass & atomic number, force, work, power and energy, ionization, excitation. • Radiation dosimetry to measure radiation received by occupational workers and patients. • Factors affecting Image acquisition and processing methods.	14
II	**PRODUCTION OF X-RAY AND CONSTRUCTION** • X-ray production and the construction of x-ray unit for clinical purpose.	14

III	**SCREEN FILM RADIOGRAPHY AND COMPUTED RADIOGRAPHY** • Principles of screen film and computed radiography. • Grid, types of grid, and grid ratio. • Process of image acquisition from interaction of x-ray with patient to image formation. • Spatial, contrast, and temporal resolution. • Radiographic cassettes from past to present.	**12**
IV	**DIGITAL RADIOGRAPHY AND FLUROSCENE** • Flat panel detector systems • PACS • Fluoroscopy	**12**
V	**DARK ROOM PHYSICS AND DOSIMETRY** • Dark room construction and specifications • Film processing techniques and storage of chemicals • Dosimetry devices with its usage in radiation environment.	**12**

PRACTICALS (64 HOURS)

- Parts of radiographic cassettes
- Radiographic film processing
- Radiographic image acquisition
- Radiological dosimetry
- Digital Image acquisition methods
- Construction of x-ray machine
- Factors affecting image resolution

DEMONSTRATION

- Radiographic cassettes
- Radiographic films
- Dosimetry

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Radiographic equipment visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

TEXT BOOKS

1. W. J. Meredith & J.B. Massey. Fundamental Physics of Radiology (Varghese Publishing House).
2. Robin J.Wilks. Principles Of Radiological Physics.
3. (Churchill Livingstone) George A. Hay & Donald Hughus First Year Physics For Radiographer (Elbs).
4. Radiation Physics & Medical Physics Christinsen, Curry And Dowdey:
5. An Introduction Of The Physics Of Diagnostic Radiology (Lea Febiger)
6. 2nd Ed. D.N. And M.O. Chesney, X-Ray Equipment For Student Radiographers (Cbs)
7. W.J. Meredith & J.B. Massey: Fundamental Physics Of Radiology. (Varghese Publishing House).

BLUE PRINT FOR PAPER MIT 5 –RADIOLOGICAL PHYSICS

Unit	Systems	Weightage (%)	Marks	Question type		
				LAQ (2 out of 4)	SAQ (5 out of 6)	VSAQ (10 out of 12)
I	Basics of Atomic Physics	27.5	22	1	1	2
II	Production of X-Ray and Construction	15	12		1	2 +1*
III	Screen Film Radiography and Computed Radiography	27.5	22	1	1	2
IV	Digital Radiography and Fluoroscopy	15	12	1*	1	2 + 1*
V	Dark Room Physics and Dosimetry	15	12	1*	1 +1*	2
*Note: * represents question of choice*						

The duration of Examination (University) is Three (3) hours.
The total marks for the University Examination will be 100 marks.

Long Answer Questions : 2 X 10 marks = 20 marks (Choice 2 out of 4)
Short Answer Questions : 5 X 6 marks = 30 marks (Choice 5 out of 6)
Very Short Answer Questions : 10 X 3 marks = 30 marks (Choice 10 out of 12)
TOTAL = Theory 80 + IA 20 = 100 marks

PAPER MIT-5 –RADIOLOGICAL PHYSICS
MODEL QUESTION PAPER

TIME: 3 HOURS **MAXIMUM MARKS: 80**

Illustrate your answers with suitable diagrams wherever necessary.

A. Long answer questions. **(2 X 10 =20)**

1. a) Explain briefly about half wave and full wave rectifier. (OR)
   b) Describe about interaction of X ray with matter.
2. a) Write in detail about the construction of modern x-Ray tube. (OR)
   b) Describe about Electromagnetic radiation.

B. Short answer questions -Answer any 5 questions **(5X 6 =30)**

1. Write a short note on the uses of radioactive nuclides in medicine.
2. Write a short note on construction and types of transformer.
3. Draw a neat diagram of Filament circuit
4. Write a short note on biological effects of radiation
5. Write a short note on TLD
6. Write a short note on beam limiting devices

C. Very Short answer questions -Answer any 10 questions **(10x3 = 30)**

1. Define Line focus principle
2. Space charge effect
3. Write a note on maximum permissible dose limit
4. Magnification Radiography
5. Grid ratio
6. Light beam collimators
7. Define linear attenuation coefficient.
8. Define half value layer.
9. Properties of x ray.
10. Ohm‘s law & Kirchhoff‘s law.
11. Write a short note on grids
12. Write a short note on inherent filter

RADIOGRAPHIC POSITIONING

PAPER MIT 6: RADIOGRAPHIC POSITIONING

NAME OF THE SUBJECT PAPER	**: RADIOGRAPHIC POSITIONING**
DURATION OF THEORY CLASSES	**: 80 HOURS**
DURATION OF PRACTICAL CLASSES	**: 32 HOURS**
UNIVERSITY THEORY EXAMINATION	**: 100 MARKS (80 U+ 20 IA)**
UNIVERSITY SPRACTICAL EXAMINATION	**: 100 MARKS(80U+20 IA)**
DURATION OF THEORY EXAMINATION	**: 3 HOURS**

COURSE DESCRIPTION

This course provides introduction to basic patient positioning for various radiological investigations and also while performing clinical imaging examinations.

OBJECTIVES

- To understand basics radiographic positioning.
- To study the various methods of patient handling and positioning for radiological examinations.
- To know about the positioning for all the anatomical region‘s radiography.

PROGRAM OUTCOMES

MITPO1: Performs the duty as a medical technologist, mastering PRP-MPuter applications with good written & communication skills and also skilled at computer applications including E- library.

MITPO2: To gain knowledge about radiation safety precautions, biomedical waste management adhering to the environmental needs of the society, and preventing the spread of infectious diseases.

MITPO3: Understanding the structure and functions of different organs in normal humanbody.

MITPO4: The learning objectives of this course is to understand radiation sources, types and its properties , production and properties of X-rays, radiation quantities and units used in theindustry.

MITPO5: Phlebotomists are trained to draw blood primarily by performing venipunctures (for collection of minute quantities of blood and fingerpricks)

MITPO6: To study and understand about the radiographicpositioning.

MITPO7: Ability to perform urinalysis, Serology, haematology, cytology, blood banking, biochemical and microbiologicalparameters.

MITPO8: To know the basics of reagent preparation, instrument handling and can perform common analytical in ClinicalBiochemistry.

MITPO9: To equip students regarding dark room facility, X-ray cassette and lean about filmartifacts.

MITPO10: To know different types of imaging modality such as MRI, PET scan, SPECT and also understand about quality assurance test, dosimetrytools

MITPO11: To practice in-vitro study in radiology (GI tract, Billary Tract, Urinary System, Reproductive System, Cardiovascular System, Venography, Central Nervous System, Respiratory System, and Miscellaneous)

MITPO12: various life style disorders and with due counseling& guidance advising the patients with proper diet, hygiene and Yoga to keep the body, mind, soul and behavior healthy.

COURSE OUTCOMES

At the end of the course, students will be able to...

RP-AHS-CO1: To know the importance of patient care in clinical environment.

RP-AHS-CO2: Summarize the radiographic positioning for radiological examinations.

RP-AHS-CO3: Major criteria for patient positioning and image acquisition.

RP-AHS-CO4: Essential role for a medical imaging technologist in patient care.

RP-AHS-CO5: Knowledge about radiation protection to patients.

RP-AHS-CO6: It helps students to understand the roles of medical imaging technologist in handling patients.

COURSE CONTENT

UNIT	TITLE	THEORY (80HOURS)
I	**SKULL VIEWS AND CHEST VIEWS** • Basic projections for cranium, facial bones, nasal bones, mandible, petrous bones for mastoid, orbit, optic foramen, zygomatic arches, nasal sinuses. • Patient handling and positioning for radiographic investigations. • Factors affecting Image acquisition and processing methods.	**16**
II	**UPPER EXTREMITIES** • Basic projections, Hand, wrist, forearm, elbow, humerus, shoulder, clavicle.	**15**
III	**ABDOMEN AND PELVIS VIEWS** • Basic projection, supine, erect, KUB, pelvis-AP, Hip- lateral.	**16**
IV	**LOWER EXTREMITIES** • Technique for Femur, knee joint, leg, ankle, foot, basic views.	**15**

V	**SPINE AND SPECIAL VIEWS** • Basic projection for c.spine, thoracic spine, lumber spine, sacrum, coccyx, Sub-mento vertical view, odontoid view, towne's view, caldwell view, Y-View, swimmer's view, scaphoid view, lordoticview, apicogram, decubitus view, frog leg view, pelvis - Inlet and Outlet, Iliac and obturator view, skyline view, mortice view, Ball catcher's view, carpel tunnel view, intercondylar notch projection, scoottie dog view, and calcaneum-axial	**18**

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Radiographic equipment visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

TEXT BOOKS

1. Clark‘s Positioning Radiography.
2. Merill‘s atlas of radiographic positioning.

BLUE PRINT FOR PAPER MIT6 – RADIOGRAPHIC POSITIONING

Unit	Systems	Marks	Weightage (%)	Question type		
				LAQ (2 out of 4)	SAQ (5 out of 6)	VSAQ (10 out of 12)
I	Skull Views and Chest Views	27.5	22	1	1	2
II	Upper Extremities	15	12	1*	1	2 + 1*
III	Abdomen and Pelvis Views	15	12	1*	1	2
IV	Lower Extremities	15	12	-	1 +1*	2 + 1*
V	Spine and Special Views	27.5	22	1	1	2
*Note: * represents question of choice*						

The duration of Examination (University) is Three (3) hours.

The total marks for the University Examination will be 100 marks.

Long Answer Questions : 2 X 10 marks = 20 marks (Choice 2 out of 4)

Short Answer Questions : 5 X 6 marks = 30 marks (Choice 5 out of 6)

Very Short Answer Questions : 10 X 3 marks = 30 marks (Choice 10 out of 12)

TOTAL = Theory 80 + IA 20 = 100 marks

PAPER MIT-6-RADIOGRAPHIC POSITIONING

MODEL QUESTION PAPER

TIME: 3 HOURS **MAXIMUM MARKS: 80**

A. Long answer questions **(2 X 10 =20)**

1. a) Write a note on the special views of shoulder. (OR)

   b) Explain about radiation protection steps to be followed during bed side radiography
2. a) Write a note on the basic views of lumbar spine and explain the Scotty dog view.

   (OR)

   b) What are postioning terminologies commonly used in a radiology department?

B. Short answer questions -Answer any 5 questions (5 X 6 =30)

1. Write a short note on lateral dorsal decubitus ?
2. Write a short note on KUB X- Ray ?
3. Write about the scaphoid view
4. Write a note on lumbar spine basic views
5. Define median sagittal plane coronal plane transverse plane
6. Write a short note on the lateral oblique view for mastoid air cells?

C. Very Short answer questions -Answer any 10 questions (10x3 = 30)

1. Define lordtic view.
2. Skyline projection.
3. Write a note on SMV.
4. Write a note on tele roentgenogram.
5. Write a short note on patient position for open mouth view.
6. Write a short note water view.
7. Write a short note on translateral view of cervical spine.
8. Define how kVp, mAs influence the contrast.
9. Define BIRADS.
10. Define Adduction & abduction.
11. Write a note on Bones of Cranium.
12. Write a short note on chambers of Heart.

ULTRASOUND IMAGING AND MAMMOGRAPHY

PAPER MIT 7: ULTRASOUND IMAGING AND MAMMOGRAPHY

NAME OF THE SUBJECT PAPER	**: ULTRASOUND IMAGING AND MAMMOGRAPHY**
DURATION OF THEORY CLASSES	**: 80 HOURS**
DURATION OF PRACTICAL CLASSES	**: 32 HOURS**
UNIVERSITY THEORY EXAMINATION	**: 100 MARKS (80 U+ 20 IA)**
UNIVERSITY PRACTICAL EXAMINATION	**: 100 MARKS(80U+20 IA)**
DURATION OF THEORY EXAMINATION	**: 3 HOURS**

COURSE DESCRIPTION

This course provides introduction to basic physics of radiology and medical imaging modalities. It also focuses on the working principles of various radio diagnostic instruments in the past and present.

OBJECTIVES

- To understand basics of ultrasound physics and mammography physics.
- To study the processes involved in production of ultrasound and the construction of aultrasound unit.
- To study the ultrasound and mammography image acquisition method as well as the recent advances in the acquisition.
- To study the ultrasound and mammography image processing method as well as the latest developments in the processing method.
- To know about the role of ultrasound and mammography in routine clinical practices.

PROGRAM OUTCOMES

At the end of the 4 year of training B.Sc MIT students should be able to

MITPO1: Performs the duty as a medical technologist, mastering PRP-MPuter applications with good written & communication skills and also skilled at computer applications including E- library.

MITPO2: To gain knowledge about radiation safety precautions, biomedical waste management adhering to the environmental needs of the society, and preventing the spread of infectious diseases.

MITPO3: Understanding the structure and functions of different organs in normal humanbody.

MITPO4: The learning objectives of this course is to understand radiation sources, types and its properties , production and properties of X-rays, radiation quantities and units used in theindustry.

MITPO5: Phlebotomists are trained to draw blood primarily by performing venipunctures (for collection of minute quantities of blood and fingerpricks)

MITPO6: To study and understand about the radiographicpositioning.

MITPO7: Ability to perform urinalysis, Serology, haematology, cytology, blood banking, biochemical and microbiologicalparameters.

MITPO8: To know the basics of reagent preparation, instrument handling and can perform common analytical in ClinicalBiochemistry.

MITPO9: To equip students regarding dark room facility, X-ray cassette and lean about film artifacts.

MITPO10: To know different types of imaging modality such as MRI, PET scan, SPECT and also understand about quality assurance test, dosimetry tools

MITPO11: To practice in-vitro study in radiology (GI tract, Billary Tract, Urinary System, Reproductive System, Cardiovascular System, Venography, Central Nervous System, Respiratory System, and Miscellaneous)

MITPO12: various life style disorders and with due counseling & guidance advising the patients with proper diet, hygiene and Yoga to keep the body, mind, soul and behavior healthy.

COURSE OUTCOMES

At the end of the course, students will be able to...

RP-AHS-CO1: To know the importance of ultrasound and mammography in clinical environment.

RP-AHS-CO2: Summarize the working principles of ultrasound and mammography.

RP-AHS-CO3: Major criteria for image processing and acquisition.

RP-AHS-CO4: Essential physics for a medical imaging technologist.

RP-AHS-CO5: Knowledge about radiation dosimetry of mammography.

RP-AHS-CO6: It helps students to understand the roles of medical imaging in healthcare sector.

COURSE CONTENT

UNIT	TITLE	THEORY (80HOURS)
I	**BASIC PRINCIPLE OF USG** • Interaction of USG with matter, PZT, transducer, transducer design, types of probes	**12**
II	**DOPPLER AND MODES OF USG** • Doppler principle, doppler shift, types of doppler, modes in USG- A,B,TM mode, image display, grey scale imaging, real time imaging and transducer .	**16**
III	**ARTIFACTS AND CLINICAL APPLICATION** • Artifacts and clinical application: Basic artifacts in USG, bioeffects of ultrasound, image quality in USG • Clinical Application: Abdomen and pelvis, ANC, doppler	**16**
IV	**BASIC PRINCIPLE PHYSICS OF MAMMOGRAPHY** • Anatomy of breast, mammography equipment, heel effect, grids, compression peddle, collimation and HVL, automatic exposure control, magnification in mammography	**18**
V	**CLINICAL APPLICATION IN MAMMOGRAPHY** • BIRADS, Screening and diagnostic mammography, Basic views - CC, MLO, Special views- Cleopatra view, Magnification view etc.	**17**

PRACTICALS (32 HOURS)

- Parts of mammography cassettes
- Mammographic film processing
- Mammographic image acquisition
- Ultrasound instrumentation
- Factors affecting image resolution

Demonstration

- Mammographic cassettes
- Mammographic films
- Ultrasound probe

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Radiographic equipment visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

TEXT BOOKS

1. D.N. Chesney & M.O Chesney: Radiographic Imaging (Cbs)
2. Protection Of The Patient In Medical Radiography (Bergaman) Derrick P. Roberts & Nigel L. Smith
3. Radiographic Imaging A Practical Approach (Churchill Uvingstone) Stewart C. Suchong
4. Radiological Science (Work Book And Laboratory Manual) Kodak
5. Fundamentals Of Radiographic Photography Books 1,2,3,4,5 (Kodak Ltd.) Seeman& Herman
6. Physical And Photography Principles Of Medical Radiography (Wiley) Hford
7. Manual Of Photography Bouthworth&Bently : Elementary Photogenic Chemistry (Pitmans) Longmore
8. Medical Photography (Focal Press) Kodak Data Books. Jackson: Developing.

BLUE PRINT FOR MIT PAPER7-ULTRASOUND IMAGING AND MAMMOGRAPHY

Unit	Systems	Weightage (%)	Marks	Question type		
				LAQ (2 out of 4)	SAQ (5 out of 6)	VSAQ (10 out of 12)
I	Basic Principle of USG	15	12	-	1	2
II	Doppler and Modes of USG	15	12	1*	1	2
III	Artifacts and Clinical Application	18.75	15	1*	1+1*	3
IV	Basic Principle Physics of Mammography	23.75	19	1	1	1 +1*
V	Clinical Application in Mammography	27.5	22	1	1	2 +1*
*Note: * represents question of choice*						

The duration of Examination (University) is Three (3) hours.
The total marks for the University Examination will be 100 marks.
Long Answer Questions : 2 X 10 marks = 20 marks (Choice 2 out of 4)
Short Answer Questions : 5 X 6 marks = 30 marks (Choice 5 out of 6)
Very Short Answer Questions : 10 X 3 marks = 30 marks (Choice 10 out of 12)
TOTAL = Theory 80 + IA 20 = 100 marks

PAPER MIT-7–ULTRASOUND IMAGING AND MAMMOGRAPHY

MODEL QUESTION PAPER

TIME: 3 HOURS **MAXIMUM MARKS: 80**

A. Very long Answers - Answer any one of the following: (2x10=20)

1. a)Write in brief about the structure of the x-ray film. Add a note on its types. (OR)
   b) Detail about Safe handling and storage of film materials in dark room.
2. a) Write a note on computer radiography construction working. (OR)
   b) Explain about roller of Automatic processor.

B. Short answer questions - Answer any ten of the following: (5x6=30)

1. Write a short note on construction of Dark room.
2. Write a short note construction of films.
3. Write a short note on intensifying screen
4. Write a note on construction of cassette
5. Write a short note on factor affecting resolution.
6. Write a short note on Computed Radiography.

C. Very Short answer questions - Answer ten of the following: (10x3=30)

1. Define Fogging
2. Write a note on Rare earth Phosphors
3. Define Contrast & Density.
4. Silver Recovery.
5. Anti halation layer.
6. Single emulsion film uses
7. Explain PACS.
8. Add a note on silver halide grain
9. Quantum mottle.
10. Replenshier used in Automatic processor
11. Write a short note on dark room hatches
12. Write a note on safe light

INTERVENTIONAL PROCEDURE AND DENTAL RADIOGRAPHY

PAPER MIT8: INTERVENTIONAL PROCEDURE AND DENTAL RADIOGRAPHY

NAME OF THE SUBJECT PAPER	**: INTERVENTIONAL PROCEDURE AND DENTAL RADIOGRAPHY**
DURATION OF THEORY CLASSES	**: 80 HOURS**
DURATION OF PRACTICAL CLASSES	**: 32 HOURS**
UNIVERSITY THEORY EXAMINATION	**: 100 MARKS (80 U+ 20 IA)**
UNIVERSITY SPRACTICAL EXAMINATION	**: 100 MARKS(80U+20 IA)**
DURATION OF THEORY EXAMINATION	**: 3 HOURS**

COURSE DESCRIPTION

This course provides introduction to basics of interventional procedures and dental radiography. It also focuses on the working principles of the instruments in the past and present.

OBJECTIVES

- To understand basics of interventional procedure and dental radiography physics.
- To study the various interventional procedures in clinical practices.
- To study the dental radiography image acquisition method as well as the recent advances in the acquisition.
- To study the dental radiography image processing method as well as the latest developments in the processing method.
- To know about the role of technologist in interventional procedure and dental radiography in routine clinical practices.

PROGRAM OUTCOMES

At the end of the 4 year of training B.Sc MIT students should be able to

MITPO1: Performs the duty as a medical technologist, mastering PRP-MPuter applications with good written & communication skills and also skilled at computer applications including E- library.

MITPO2: To gain knowledge about radiation safety precautions, biomedical waste management adhering to the environmental needs of the society, and preventing the spread of infectious diseases.

MITPO3: Understanding the structure and functions of different organs in normal humanbody.

MITPO4: The learning objectives of this course is to understand radiation sources, types and its properties , production and properties of X-rays, radiation quantities and units used in theindustry.

MITPO5: Phlebotomists are trained to draw blood primarily by performing venipunctures (for collection of minute quantities of blood and fingerpricks)

MITPO6: To study and understand about the radiographic positioning.

MITPO7: Ability to perform urinalysis, Serology, haematology, cytology, blood banking, biochemical and microbiological parameters.

MITPO8: To know the basics of reagent preparation, instrument handling and can perform common analytical in Clinical Biochemistry.

MITPO9: To equip students regarding dark room facility, X-ray cassette and lean about film artifacts.

MITPO10: To know different types of imaging modality such as MRI, PET scan, SPECT and also understand about quality assurance test, dosimetrytools

MITPO11: To practice in-vitro study in radiology (GI tract, Billary Tract, Urinary System, Reproductive System, Cardiovascular System, Venography, Central Nervous System, Respiratory System, and Miscellaneous)

MITPO12: various life style disorders and with due counseling& guidance advising the patients with proper diet, hygiene and Yoga to keep the body, mind, soul and behavior healthy.

COURSE OUTCOMES

At the end of the course, students will be able to...

RP-AHS-CO1: To know the importance of interventional procedure and dental radiography in clinical environment.

RP-AHS-CO2: Summarize the working principles of dental radiography.

RP-AHS-CO3: Major criteria for image processing and acquisition.

RP-AHS-CO4: Essential physics for a medical imaging technologist.

RP-AHS-CO5: Knowledge about interventional procedure.

RP-AHS-CO6: It helps students to understand the roles of medical imaging technologist in healthcare sector.

COURSE CONTENT

UNIT	TITLE	THEORY (80HOURS)
I	**FNAC AND BIOPSY** • CT and USG guided procedures - T-tube cholangiogram, PTC, PTBD, Embolisation and its agents, lung, liver, abdominal, pigtail, aspiration, bone biopsy, angiogram, lymph-angiogram, AVM, AVF, angioplasty, catheters	**12**
II	**CONTRAST MEDIA** • Classification of contrast media, reaction of contrast media, treatment for reactions, emergency drugs and equipments used in contrast media, drugs in crash cart, physiological changes in contrast media, premedication and after care during reaction of CM,	**16**

	complications of contrast media..	
III	**FLUOROSCOPY PROCEDURES** • Barium swallow, Barium meal and follow through, Barium enema, IVP, HSG, RGU, MCU, dacrocystography, sinography, vertebroplasty, sialography, fistulography, discography, enteroclysis.	**16**
IV	**OPG INTRAORAL AND EXTRA ORAL, RADIOGRAPHY** • IOPA, OPG, construction of OPG, darkroom, safelight, views in dental radiography- occlusal, periapical, bitewing, slab technique, RVG	**18**
V	**RADIATION PROTECTION IN INTERVENTION AND DENTAL RADIOGRAPHY** • ALARA, Radiation protection - Time, Distance, Shielding, Primary barrier, Secondary barrier, tube leakage, scattered radiation, uses of lead apron, thyroid shield, lead barrier, lead goggles, lead cap, ovarian shield, lead shoes.	**17**

PRACTICALS (32 HOURS)

- FNAC and Biopsy protocols in CT
- Contrast media management
- Interventional Procedures
- Dental Radiography
- Radiation regulatory standards

Demonstration

- Protocol management
- Interventional procedures
- Dosimetry

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Radiographic equipment visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

TEXT BOOKS

1. D.N. Chesney & M.O Chesney: Radiographic Imaging (Cbs)
2. Protection Of The Patient In Medical Radiography (Bergaman) Derrick P. Roberts & Nigel L. Smith
3. Radiographic Imaging A Practical Approach (Churchill Uvingstone) Stewart C. Suchong
4. Radiological Science (Work Book And Laboratory Manual) Kodak

5. Fundamentals Of Radiographic Photography Books 1,2,3,4,5 (Kodak Ltd.) Seeman& Herman
6. Physical And Photography Principles Of Medical Radiography (Wiley) Hford
7. Manual Of Photography Bouthworth & Bently : Elementary Photogenic Chemistry (Pitmans) Longmore
8. Medical Photography (Focal Press) Kodak Data Books. Jackson: Developing.

BLUE PRINT FOR PAPER8-INTERVENTIONAL PROCEDURE AND DENTAL RADIOGRAPHY

Unit	Systems	Weightage (%)	Marks	Question type		
				LAQ (2 out of 4)	SAQ (5 out of 6)	VSAQ (10 out of 12)
I	FNAC and Biopsy	22	1	1	2	22
II	Contrast Media	22	1	1	2	22
III	Fluoroscopy Procedures	15	12	1*	1	2 + 1*
IV	OPG, Intraoral and Extra oral Radiography	15	12	1*	1	2 + 1*
V	Radiation protection in Intervention and Dental radiography	15	12	1*	1	2 + 1*
*Note: * represents question of choice*						

The duration of Examination (University) is Three (3) hours.

The total marks for the University Examination will be 100 marks.

Long Answer Questions : 2 X 10 marks = 20 marks (Choice 2 out of 4)

Short Answer Questions : 5 X 6 marks = 30 marks (Choice 5 out of 6)

Very Short Answer Questions : 10 X 3 marks = 30 marks (Choice 10 out of 12)

TOTAL = Theory 80 + IA 20 = 100 marks

PAPER MIT-8-INTERVENTIONAL PROCEDURE AND DENTAL RADIOGRAPHY

MODEL QUESTION PAPER

TIME: 3 HOURS **MAXIMUM MARKS: 80**

A. Very long Answers - Answer any one of the following: (2x10=20)

1. a)Write in brief about the CT and USG guided procedures. (OR)
   b) Detail about Safe handling and storage of film materials in dark room.
2. a) Write a note on Radiation protection in Intervention and Dental radiography . (OR)
   b) Explain about Classification of contrast media.

B. Short answer questions - Answer any ten of the following: (5x6=30)

1. Write a short note on construction of Dark room.
2. Write a short note construction of films.
3. Write a short note on intensifying screen
4. Write a note on construction of cassette
5. Write a short note on factor affecting resolution.
6. Write a short note on Computed Radiography.

C. Very Short answer questions - Answer ten of the following: (10x3=30)

1. Define Fogging
2. Write a note on Rare earth Phosphors
3. Define Contrast & Density.
4. Silver Recovery.
5. Anti halation layer.
6. Single emulsion film uses
7. Explain PACS.
8. Add a note on silver halide grain
9. Quantum mottle.
10. Replenshier used in Automatic processor
11. Write a short note on dark room hatches
12. Write a note on safe light.

II YEAR ELECTIVE COURSES

II YEAR ELECTIVE COURSE CONTENT
ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)
ENVIRONMENTAL STUDIES

NAME OF THE SUBJECT PAPER	**: ENVIRONMENTAL STUDIES**
DURATION OF THEORY CLASSES	**: 16 hrs**
DURATION OF PRACTICAL SESSIONS	**: 32 hrs**
EXAMINATION	**: 100 marks (80 U + 20 IA)**
NO UNIVERSITY PRACTICAL EXAMINATION	
DURATION OF THEORY EXAMINATION	**: 1 ½ hrs**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: II YEAR**

SYLLABUS

UNIT-I (Renewable and Non – renewable resources**)**

The multidisciplinary nature of environmental studies – Definition, scope and importance – Need for public awareness.

1 Forest resources: Use and over-exploitation, deforestation, case studies.Timber extraction, mining, dams and their effects on forests and tribalpeople.
2 Water resources: Use and over-utilization of surface and ground water,floods, drought, conflicts over water, dams-benefits and problems.
3 Mineral resources: Use and exploitation, environmental effects ofextracting and using mineral resources, case studies.
4 Food resources: World food problems, changes caused by agriculture andovergrazing, effects of modern agriculture, fertilizer-pesticide problems,water logging, salinity, case studies.
5 Energy resources: Growing energy needs, renewable and non-renewableenergy resources, use of alternate energy sources, case studies.
6 Land resources: Land as a resource, land degradation, man induced Landslides, soil erosion and desertification.Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.

UNIT-II (Ecosystems)

Concept of an ecosystem - Structure and function of an ecosystem Producers, consumers and decomposers – Energy flow in the ecosystem-Ecological succession- Food chains, food webs and ecological pyramids –Introduction, types, characteristic features, structure and function of the following ecosystem:

- Forest ecosystem
- Grassland ecosystem
- Desert ecosystem
- Aquatic ecosystems (Ponds, streams, lakes, rivers, ocean estuaries)

UNIT-III (Biodiversity and its conservation)

Introduction – Definition: genetics, species and ecosystem diversity

- Biogeographically classification of India
- Value of Biodiversity: Consumptive use, productive use, social,

ethicalaesthetic and option values

- Biodiversity at global, national and local levels
- India as a mega- diversity nation
- Hot-spots of biodiversity-Threats to biodiversity: habitat loss, poachingof wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation ofbiodiversity

UNIT-IV (Environmental Pollution)

Definition- causes, effects and control measures of:

- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear pollution
- Solid waste Management: causes, effects and control measures of urbanand industrial wastes — role of an individual in prevention of pollution —Pollution case studies — Disaster management: floods, earthquake, cyclone and landslides.

UNIT-V

Social Issues and the Environment: From unsustainable to sustainable development — Urban problems and related to energy — Water conservation, rain water harvesting, watershed management —Resettlement and rehabilitation of people; its problems and concerns. Case studies - Environmental ethics: issues and possible solutions climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

- Wasteland reclamation — Consumerism and waste products —Environmental Protection Act — Air (Prevention and Control of Pollution) Act — Water (Prevention and control of Pollution) Act — Wildlife Protection Act — Forest Conservation Act - Issues involved in enforcement environmental legislation — Public awareness
- Human Population and the Environment: Population growth, variation among nations — Population explosion — Family welfare Programmes —Environment and human health- Human Rights - Value Education- HIV/ AIDS - Women and Child Welfare- Role of Information Technology in Environment and Human Health — Case Studies.

FIELD WORK

1. Visit to local area to document environmental assets- river/ forest/ grassland / hill / mountain
2. Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
3. Study of common plants, insects, birds
4. Study of simple ecosystems- pond, river, hill slopes, etc.

TEXT BOOKS RECOMMENDED

1. Agarwal, K.C. Environmental Science, Nidi Publishers.
2. BharuchaErach, The Biodiversity of India, Mapin Publication.
3. Brunner RC, Hazardous waste incineration, McGraw Hill Publishers.
4. Iaclhav H, Environmental Protection and Laws, Himalaya Publication.
5. Odum EP, fundamentals of Ecology, WB Sannders Publication.

TEACHING LEARNING ACTIVITIES

The course content in Environmental Studies will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Field Visits

SKILL- BASED ELECTIVE COURSES – II YEAR
GOOD CLINICAL LABORATORY PRACTICE

NAME OF THE SUBJECT PAPER	**: Good Clinical Laboratory practice**
DURATION OF THEORY CLASSES	**: 16 Hrs**
DURATION OF PRACTICAL SESSIONS	**: 32 Hrs**
PRACTICAL EXAMINATION	**: 50 Marks (40 U + 10 IA)**
NO UNIVERSITY THEORY EXAMINATION	
DURATION OF EXAMINATION	**: 1 ½ Hrs**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: II YEAR**

THEORY & PRACTICALS (DURATION 16 + 32 Hours)

Learning Objective

- To understand the relevance, importance and basic concepts of good laboratory practices
- To apply the knowledge to become familiar with the basic laboratory skills

UNIT I: INTRODUCTION

Introduction to Bioethics and Biosafety.Biosafety Guidelines and Regulations.Legal and Socio-economic Impacts of Biotechnology.Use of Genetically Modified Organisms and their Release in theEnvironment. Hazardous Materials used in Biotechnology their Handling and Disposal.

UNIT II: GOOD LABORATORY PRACTICE PRINCIPLE

Test Facility Organization and Personnel: Management responsibility, Study directors responsibility, safety measures and personal responsibility. Quality assurance program. Facilities: Test System Facilities, Facilities for Handling test and Reference Substances. Archive Facilities. Waste Disposal, Animal Care Facilities, Animal Supply Facilities.

UNIT III: STANDARDED OPERATING PROCEDURES

Definition, Initiation of SOP, Preparation of SOP, Administration, Distribution and Implementation. Maintenance of laboratory records.Formatting SOP, Reagent/materials certification, Certification of analysts,Certification of laboratory facilities, Documentation and maintenance of record.

UNIT IV: DATE REPORTING AND STORAGE

Performance of study, Study plan, Conduct of study, Reporting of results. Archival storage of records and reports.

Learning Outcome

- To understand the implications of good laboratory practices

SKILL- BASED ELECTIVE COURSES – II YEAR
COMPUTER APPLICATIONS

NAME OF THE SUBJECT PAPER : COMPUTER APPLICATIONS

DURATION OF THEORY CLASSES : 16 Hrs

DURATION OF PRACTICAL SESSIONS : 32 Hrs

PRACTICAL EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY THEORY EXAMINATION

DURATION OF EXAMINATION : 1 ½ Hrs

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : II YEAR

THEORY & PRACTICALS (DURATION 16 + 32 Hours)

UNIT - I - Introduction to Computers

- Concepts of Computers
- Hardware and software trends and technology
- Classification of computers
- Application of computers in Laboratories

UNIT - II - Operating System

- Introduction
- Types of operating systems
- Windows

UNIT - III –Multimedia

- Types and uses
- Computer aided teaching and testing

UNIT — IV -Internet

- Introduction to Internet
- Use of Internet and e- mail
- Statistical packages

LIST OF PRACTICAL EXERCISES

1. Computer operating systems like MS~DOS and WINDOWS
2. Study of software packages like Chem Draw, Tinker and Microsoft package. Unit - Typing text in MS word- manipulating text- formatting the text – using different font sizes, bold, italics, Bullets and numbering – pictures, file insertion – aligning the text and justify – choosing paper size – adjusting margins- header and footer, inserting page numbers in a document – printing a file with options – using spell check and grammar – find and replace mail merge – inserting tables in a document.

Creating table in MS – Excel – cell editing – using formulas and functions – manipulating data with excel – using sort function to sort numbers and alphabets – drawing graphs and charts using data in excel – auto formatting – inserting data from other worksheets Preparing new slides using MS- POWER POINT – inserting slides – slide transition and animation – using templates – different text and font sizes – slides with sounds – inserting clip arts, pictures, tables and graphs – presentation using wizards.

Internet- using search engine – Google search – Exploring the text Explorer and Navigator – uploading and downloading of files and images E mail ID creation – sending messages – attaching files in E- mail

TEACHING LEARNING ACTIVITIES

The course content in Computer Applications will be covered by:

1. Interactive Lectures
2. Lab

SKILL- BASED ELECTIVE COURSES – II YEAR
Library and E-resource

NAME OF THE SUBJECT PAPER : Library and E-resource

DURATION OF THEORY CLASSES : 16 Hrs

DURATION OF PRACTICAL SESSIONS : 32 Hrs

PRACTICAL EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY THEORY EXAMINATION

DURATION OF EXAMINATION : 1 ½ Hrs

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : II YEAR

THEORY & PRACTICALS (DURATION 16 + 32 HOURS)

Course Objectives

- To enable the students to understand at different levels of information systems in the society and their functions.
- To enable the students apply their knowledge in various library practice.
- To enable the students to understand the basic concepts of the Health Sciences.

UNIT: 1

Evolution, growth and development of LIS in India-current trends.
Type of libraries: Academic, Public and special Libraries (Health Science Libraries).

UNIT: 2

Library concepts & Legislation: Five laws of Library science, Professional ethics of librarian, Delivery of books and newspaper act/IntellectualProperty/Plagiarism.

UNIT: 3

Library Association and International Bodies: Library Association –ILA, IASCIC, ALA, IFLA and UNESCO, SALIS, MLAI (Medical Library Association of India).

UNIT: 4

Library Rules & Regulation, Stock Verification, Annual Reports, Budgets, Library buildings, furniture, equipment‘s.

SKILL- BASED ELECTIVE COURSES – II YEAR
PUBLIC HEALTH AND HYGIENE

NAME OF THE SUBJECT PAPER	**: Public Health and Hygiene**
DURATION OF THEORY CLASSES	**: 16 Hrs**
DURATION OF PRACTICAL SESSIONS	**: 32 Hrs**
PRACTICAL EXAMINATION	**: 50 Marks (40 U + 10 IA)**
NO UNIVERSITY THEORY EXAMINATION	
DURATION OF EXAMINATION	**: 1 ½ Hrs**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: II YEAR**

THEORY & PRACTICALS (DURATION 16 + 32 Hours)

Learning objectives

- To understand the concepts, significance and relevance of public health and hygiene
- To understand the health hazards as associated with public health and hygiene

I Introduction

Definition and Concept of Public Health, historical aspects, public health system in India and in the rest of world

II Aspects of health

Indicators of health, Determinants of Health, (Social, Economic, Cultural, Environmental, Education, Genetics, Food and Nutrition).Burden and prevention of disease. Environmental health- sanitation, air, water pollution, waste management. Mental health.

III Epidemology

Introduction, principles and concepts, study design, analysis methods, presentation and interpretation of epidemiological data

IV Hygiene concepts

Definition, importance, personal hygiene, medical hygiene, food hygiene, industrial hygiene.

Learning outcomes

- To understand public health and hygiene issues, their relevance and significance as can be practiced in real-life situations.

Text Books

1. Introduction to Public Health, Raymond L. Goldsteen, Karen Goldsteen, David G. Graham, 2011, Springer publishing company
2. Introduction To Community Health Nursing, Kasturi SundarRao, 4th edition, Bi Publications Pvt Ltd
3. Concepts of Epidemiology, Raj S Bhopal, 2002, Oxford University press

Reference Books

1. A Treatise On Hygiene And Public Health, BirendraNathGhosh, 9th edition, Calcutta Scientific Publishing Co
2. An Introduction to Public Health, Caryl Thomas, 1949, John Wright and Sons Ltd.,

GENERIC ELECTIVE COURSES – II YEAR
BASIC PSYCHOLOGY

NAME OF THE SUBJECT PAPER : Basic Psychology

DURATION OF THEORY CLASSES : 64 Hrs

EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY PRACTICAL EXAMINATION

DURATION OF THEORY EXAMINATION : 1 ½ Hrs

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : II YEAR

THEORY (64 Hours)

LEARNING OBJECTIVES

After complete ting the course the student can able to

- To identify the emerging specialties
- To understand the behavior and mental processes
- How the theories and principles of psychology may be applied to individual, societal and global issue
- Explain the application of psychology in Allied Health Sciences

Unit I: Introduction

Introduction to applied Psychology, Scientific methods in Psychology, Application of Psychology: Psychology in Industry, community, family, education, health, self development, Human relations. Scope of psychology with special relevance to Allied Health Sciences.

Unit II: various cognitive processes and their application

Factors affecting learning, Importance of studying Psychology of learning in relation to Allied Health Sciences

Memory and forgetting, Kinds of remembering, the nature of forgetting, Improving memory, relevance to Allied Health Sciences

Intelligence, Normal distribution of intelligence levels, Intelligence Testing, Intelligence tests, Uses and abuses of intelligence tests, relevance of intelligence and aptitude for Allied Health Sciences

Unit-III: Life style, Health, Stress and Coping Behavior

Cultural evolution, Life style choices and consequences, Healthy and Unhealthy life styles.Nutrition, Physical fitness, Smoking and Drinking. Stress and Health, The biological basis of stress, Stress and Physical functioning, Coping with stress, Adjustment a lifelong process. Cognitive appraisal and Stress, Stressful life styles,

Coping with everyday stress, Sources of stress, Coping styles and Strategies, Stress inoculation training.

Unit IV : Psychology of Vulnerable Individuals

Psychology of the challenged, types of disability, effects of disability, psychology of women, women and health, dealing with alcoholics and their families, post-traumatic stress disorder, psychology of the sick and ill, how patients react to chronic illness, effects of illness and hospitalization

REFERENCE BOOKS

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. Ernest R. Hillgard, Richard C. Atkinson, Rita L. Atkinson, —Introduction to Psychology‖ 6th Edition, Oxford IBH publishing Co. Pvt. Ltd., New Delhi,1975.
3. Baron.A. Robert, Psychology, Pearson Education Vth Ed.,2002
4. Psychology –the science of behavior –fifth edition1982-Neil Carson-William Bulkist-Allyn and Bacon.

GENERIC ELECTIVE COURSES – II YEAR SOCIOLOGY

NAME OF THE SUBJECT PAPER : SOCIOLOGY

DURATION OF THEORY CLASSES : 64 Hrs

EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY PRACTICAL EXAMINATION

DURATION OF THEORY EXAMINATION : 1 ½ Hrs

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : II YEAR

THEORY (64 Hours)

Unit 1: Sociology: Discipline and Perspective

- Thinking Sociologically
- Emergence of Sociology, Sociology as a science; Sociology and Common Sense
- Some Basic Concepts: Association; Aggregates: Community, Categories, Groups and its Forms; Status and Role; Norms and Values.
- Individual and Society; Socialization: Concept and Agencies; Culture –meaning and characteristics; Types of culture – popular, elitist, folk, and consumer cultures; Pluralism and Multiculturalism, Culture and Personality.

Unit 2: Sociology and Other Social Sciences

- Sociology and Social Anthropology
- Sociology & Psychology
- Sociology & History

Unit 3: Human Society

- Social Institutions and Social Processes
- Social control: meaning, agencies and mechanisms
- Conformity and Deviance.
- Social Change, definition, factors, Social Mobility Readings

1. Anthony Giddens : Sociology
2. G. Rocher: A General Introduction to Sociology
3. George Ritzer. Encyclopaedia of sociology
4. Harry M. Johnson Sociology

GENERIC ELECTIVE COURSES – II YEAR
ENTREPRENEURSHIP ESSENTIALS

NAME OF THE SUBJECT PAPER	**: Entrepreneurship essentials**
DURATION OF THEORY CLASSES	**: 64 Hrs**
EXAMINATION	**: 50 Marks (40 U + 10 IA)**
NO UNIVERSITY PRACTICAL EXAMINATION	
DURATION OF THEORY EXAMINATION	**: 1 ½ Hrs.**
YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT	**: II YEAR**

THEORY (64 Hours)

LEARNING OBJECTIVES

- To understand the fit between you and your entrepreneurial ambitions
- To find a problem worth solving
- To identify your customers
- To develop a solution for your customers' problems and problem solution
- To build and demonstrate an MVP
- To structure a business model around the problem, customer, and solution and present your Business Model Canvas

UNIT – I ORIENTATION

What is entrepreneurship – myths about entrepreneurship – impact of an entrepreneur and social entrepreneurship – wealth building and making an impact

IDEA/PROBLEM

What is a business opportunity and how to identify it - Methods for finding and understanding problems - (Observation, Questioning, DT, Jobs to be done (JTBD) - Introduction to Design Thinking - Process and Examples - Generate ideas that are potential solutions to the problem identified.

UNIT - II

CUSTOMER

The difference between a consumer and a customer (decision maker); Market Types, Segmentation and Targeting, Defining the personas; Understanding Early Adopters and Customer Adoption Patterns - Identify the innovators and early adopters for start-up - Basics of Lean Approach and Canvas; Types of Business Models (b2b; b2c)

UNIT – III

BUSINESS MODEL AND VALIDATION

Introduction to Risks; Identify and document your assumptions (Hypotheses); Identify the riskiest parts of Plan - Develop the Solution Demo - Sizing the Opportunity - Building an MVP (Minimum Viable Product)

UNIT – IV

MONEY AND TEAM

Revenue Streams: Basics of how companies make money - Understand income, costs, gross and net margins - Identify primary and secondary revenue streams - Pricing and Costs - Financing Your New Venture - Team Building: Role of a good team in a venture's success; What to look for in a team; How do you ensure there is a good fit? Defining clear roles and responsibilities

UNIT – V

MARKETING AND SALES

Positioning – channels and strategy – sales planning – Importance of project management to launch and track progress - Understanding time management, workflow, and delegation of tasks– Business regulation: Basics of business regulations of starting and operating a business - Importance of being compliant and keeping proper documentation

LEARNING OUTCOMES

- This course will give the students the foundational experience of the entire cycle of entrepreneurship, through a combination of theory and practice.
- Students will learn what it takes to be an entrepreneur, recognizing business opportunities and the basics to create launch and manage new businesses.
- The participating students will create a campus venture‘ or a "real" venture of their own to practice the concepts taught during the program. The course is built in a modular fashion such that colleges can tailor their offerings to cover either the entire offering (idea to an MVP) or limit to building a business model.

III YEAR

B.Sc – MEDICAL IMAGING TECHNOLOGY
FACULTY OF ALLIED HEALTH SCIENCES
SRI BALAJI VIDYAPEETH
(Deemed to be University)
Accredited by NAAC with 'A' Grade

III YEAR

CORE SUBJECTS

1. Computed Tomography
2. Magnetic Resonance Imaging
3. Nuclear Medicine Imaging
4. Quality Assurance, Radiation Biology & Radiation Hazards

Discipline Elective Course (DEC) – Choose any TWO

1. Biomedical Waste Management
2. Basic Radiation Biology
3. Clinical imaging protocols of Computed Tomography (CT)
4. Clinical imaging protocols of Radiography & Fluoroscopy
5. Clinical imaging protocols of Magnetic resonance imaging (MRI)

AHS COURSE CONTENT THIRD YEAR B.SC. MEDICAL IMAGING TECHNOLOGY (MIT)

Faculty code	Category	Course title	Hours					Credits				
AHS	**Core theory MIT**	**Subjects**	**Theory**	**Practical**	**Tutorials**	**Clinical training**	**Total hours**	**Lecture**	**Practical**	**Tutorials**	**Clinical training**	**Total credits**
AHS	MIT -9	Computed Tomography	64	64				4	2			6
AHS	MIT-10	Magnetic Resonance Imaging	64	64				4	2			6
AHS	MIT -11	Nuclear Medicine Imaging	80		32			5		1		6
AHS	MIT -12	Quality Assurance, Radiation Biology & Radiation Hazards	80		32			5		1		6
AHS	MIT-CT 2	Clinical Training MIT 9 to 12				256					8	8
AHS	DE 1-8	Student‘s choice	64					4				4
AHS	DE 1-8	Student‘s choice	64					4				4
			416	**128**	**64**	**256**	**864**	**26**	**4**	**2**	**8**	**40**

SCHEME OF EXAMINATION

Papers	Subject	Theory		Practical			Grand total (900)	Min pass marks (450)
		UE	IA	UE	IA	UIA*		
MIT -9	Vascular Access and Complications.	80	20	80	20		200	100
MIT -10	Dialysis in Special Situations.	80	20	80	20		200	100
MIT -11	Peritoneal Dialysis.	80	20				100	50
MIT -12	Renal Transplantation and Recent Advances	80	20				100	50
MIT-CT 2	Clinical Training MIT 9 to 12					100	100	50
DEC	Discipline elective	80	20				100	50
DEC	Discipline elective	80	20				100	50

COMPUTED TOMOGRAPHY

PAPER MIT9: COMPUTED TOMOGRAPHY

NAME OF THE SUBJECT PAPER	**: COMPUTED TOMOGRAPHY**
DURATION OF THEORY CLASSES	**: 64 HOURS**
DURATION OF PRACTICAL CLASSES	**: 64 HOURS**
UNIVERSITY THEORY EXAMINATION	**: 100 MARKS (80 U+ 20 IA)**
UNIVERSITY SPRACTICAL EXAMINATION	**: 100 MARKS(80U+20 IA)**
DURATION OF THEORY EXAMINATION	**: 3 HOURS**

COURSE DESCRIPTION

This course provides introduction to basic physics of Computed Tomography, and it also focuses on the working principles, reconstruction techniques, and post processing techniques of various radio diagnostic procedures.

OBJECTIVES

- To understand basics of Computed Tomography
- To study the processes involved in production of Computed Tomography image and the construction of Computed Tomography unit.
- To study the Computed Tomography image acquisition method as well as the recent advances in the Computed Tomography acquisition.
- To study the Computed Tomography processing method as well as the latest developments in the processing methods.
- To know about the role of various radiation detectors used in the Computed Tomography unit.

PROGRAM OUTCOMES

At the end of the 4 year of training B.Sc MIT students should be able to

MITPO1: Performs the duty as a medical technologist, mastering PRP-MPuter applications with good written & communication skills and also skilled at computer applications including E- library.

MITPO2: To gain knowledge about radiation safety precautions, biomedical waste management adhering to the environmental needs of the society, and preventing the spread of infectious diseases.

MITPO3: Understanding the structure and functions of different organs in normal humanbody.

MITPO4: The learning objectives of this course is to understand radiation sources, types and its properties , production and properties of X-rays, radiation quantities and units used in theindustry.

MITPO5: Phlebotomists are trained to draw blood primarily by performing venipunctures (for collection of minute quantities of blood and fingerpricks)

MITPO6: To study and understand about the radiographicpositioning.

MITPO7: Ability to perform urinalysis, Serology, haematology, cytology, blood banking, biochemical and microbiologicalparameters.

MITPO8: To know the basics of reagent preparation, instrument handling and can perform common analytical in ClinicalBiochemistry.

MITPO9: To equip students regarding dark room facility, X-ray cassette and lean about filmartifacts.

MITPO10: To know different types of imaging modality such as MRI, PET scan, SPECT and also understand about quality assurance test, dosimetrytools

MITPO11: To practice in-vitro study in radiology (GI tract, Billary Tract, Urinary System, Reproductive System, Cardiovascular System, Venography, Central Nervous System, Respiratory System, and Miscellaneous)

MITPO12: various life style disorders and with due counseling& guidance advising the patients with proper diet, hygiene and Yoga to keep the body, mind, soul and behavior healthy.

COURSE OUTCOMES

At the end of the course, students will be able to...

CT-AHS-CO1: To know the importance of Computed Tomography in clinical environment.

CT-AHS-CO2: Summarize the working principles of computed tomography.

CT-AHS-CO3: Major criteria for image processing and acquisition.

CT-AHS-CO4: Essential tomographic physics for a medical imaging technologist.

CT-AHS-CO5: Knowledge about Computed tomography detector used in radio diagnostic units.

CT-AHS-CO6: It helps students to understand the roles of medical imaging in healthcare sector.

COURSE CONTENT

UNIT	TITLE	THEORY (64 HOURS)
I	**HISTORY AND PRINCIPAL OF CT** • Conventional X-ray Tomography(basic principal) , EMI scanner, generations - first, second, third, fourth , fifth , sixth and seventh generations, • principal of helical CT scan • Scan parameters (KVp, MAs, pitch), MDCT, MSCT.	**12**
II	**PRODUCTION OF X-RAY AND CONSTRUCTION** • Control console computers, Gantry – X ray tube, Collimation and filtration, Detectors-Scintillation crystal and Xenon Gas Ionization chamber, high voltage generator, couch	**12**
III	**SCREEN FILM RADIOGRAPHY AND COMPUTED RADIOGRAPHY** • Image reconstruction, back projection, Iterative method and analytical methods, • pixel and voxel, Image Display, C.T. Number, Hounsfield unit ,Window Level and Window Width, 2D And 3D Images, • post processing in CT- VR, MIP ,MPR etc.,	**14**
IV	**DIGITAL RADIOGRAPHY AND FLUOROSCOPY** • Patient dose CTDI, CTDIvol, CTDIw dose length product (DLP), multiple scan average dose (MSAD). • Image display, Image quality, Resolution-Spatial and contrast resolution, Patient exposure, artifacts - motion, streak, beam hardening, ring, partial volume, spiral, rod artifacts	**14**
V	**CLINICAL APPLICATIONS OF CT** • Brain, Spine- Head and Neck- Thorax- Abdomen - Pelvis- Musculoskeletal system. • Anatomy -clinical indication and contraindication, patientpreparation, technique, contrast media, injection protocol of various procedures, patient care	**12**

PRACTICALS (64 HOURS)

- Clinical demonstration in computed tomography while performing plain study.
- Clinical demonstration in computed tomography while performing contrast study.

Demonstration

- Post processing techniques
- Computed Tomography room layout
- Detectors

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Radiographic equipment visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

TEXT BOOKS

1. W. J. Meredith & J.B. Massey. Fundamental Physics of Radiology (Varghese Publishing House).
2. Robin J.Wilks. Principles Of Radiological Physics.
3. (Churchill Livingstone) George A. Hay & Donald Hughus First Year Physics For Radiographer (Elbs).
4. Radiation Physics & Medical Physics Christinsen, Curry And Dowdey:
5. An Introduction Of The Physics Of Diagnostic Radiology (Lea Febiger)

BLUE PRINT FOR MIT PAPER 9- COMPUTED TOMOGRAPHY

Unit	Systems	Weightage (%)	Marks	Question type		
				LAQ (2 out of 4)	SAQ (5 out of 6)	VSAQ (10 out of 12)
I	History and Principal of CT	22.5	18	-	2	2
II	Instrumentation of CT	15	12	1*	1	2 +1*
III	Data Acquisition and Presentation	23.75	19	1	1	1 + 1*
IV	Radiation Dose and Image Quality	18.75	15	1*	1	3
V	Clinical Applications of CT	20	16	1	1*	2
*Note: * represents question of choice*						

The duration of Examination (University) is Three (3) hours.
The total marks for the University Examination will be 100 marks.
Long Answer Questions : 2 X 10 marks = 20 marks (Choice 2 out of 4)
Short Answer Questions : 5 X 6 marks = 30 marks (Choice 5 out of 6)
Very Short Answer Questions : 10 X 3 marks = 30 marks (Choice 10 out of 12)
TOTAL = Theory 80 + IA 20 = 100 marks

PAPER MIT-9 – Computed Tomography
MODEL QUESTION PAPER

TIME: 3 HOURS **MAXIMUM MARKS: 80**

A. Long answer questions ANY ONE **(2 X10=20)**

1. a) Write in detail about computed tomography instrumentation. (OR)
   b) Explain MDCT?
2. a) Write in detail about dose reduction technique in CT.(OR)
   b) Explain retrospective ECG acquisition and prospective ECG gated acquisition?

B. Short answer questions -Answer any 5 questions **(5 X 6 =30)**

1 Write a short on CT number
2 Write a short note on generation of CT?
3 Explain about ATCM?
4 Write a short note Pitch?
5 Write a short note on interaction of X-ray with Matter?
6 Write a short note on the construction of CT gantry?

C. Short answer questions - Answer any 10 questions **(10X 3 =30)**

1. DICOM
2. HTC Grids
3. Axial and lateral resolution
4. Write a note on PITCH.
5. Write in brief about the Window Width and Window Level.
6. Write a note on helical CT.
7. Write a note on Spiral CT.
8. Relationship between frequency and wavelength
9. Write a note on CTDL
10. Define MIP.
11. Aliasing artifact
12. Axial and lateral resolution

MAGNETIC RESONANCE IMAGING

PAPER MIT 10: MAGNETIC RESONANCE IMAGING

NAME OF THE SUBJECT PAPER : MAGNETIC RESONANCE IMAGING

DURATION OF THEORY CLASSES : 64 HOURS

DURATION OF PRACTICAL CLASSES : 64 HOURS

UNIVERSITY THEORY EXAMINATION : 100 MARKS (80 U+ 20 IA)

UNIVERSITY PRACTICAL EXAMINATION : 100 MARKS(80U+20 IA)

DURATION OF THEORY EXAMINATION : 3 HOURS

COURSE DESCRIPTION

This course provides introduction to basic physics ofMagnetic Resonance Imaging, and it also focuses on the working principles, reconstruction techniques, and post processing techniques of various radio diagnostic procedures.

OBJECTIVES

- To understand basics of Magnetic Resonance Imaging
- To study the processes involved in production of Magnetic Resonance Imaging. Imageand the construction of Magnetic Resonance Imaging unit.
- To study the Magnetic Resonance Imaging acquisition method as well as the recent advances in the Magnetic Resonance Imagingacquisition.
- To study the Magnetic Resonance Imagingprocessing method as well as the latest developments in the processing methods.
- To know about clinical application of Magnetic Resonance Imaging

PROGRAM OUTCOMES

MITPO1: Performs the duty as a medical technologist, mastering PRP-MPuter applications with good written & communication skills and also skilled at computer applications including E- library.

MITPO2: To gain knowledge about radiation safety precautions, biomedical waste management adhering to the environmental needs of the society, and preventing the spread of infectious diseases.

MITPO3: Understanding the structure and functions of different organs in normal humanbody.

MITPO4: The learning objectives of this course is to understand radiation sources, types and its properties , production and properties of X-rays, radiation quantities and units used in theindustry.

MITPO5: Phlebotomists are trained to draw blood primarily by performing venipunctures (for collection of minute quantities of blood and fingerpricks)

MITPO6: To study and understand about the radiographicpositioning.

MITPO7: Ability to perform urinalysis, Serology, haematology, cytology, blood banking, biochemical and microbiologicalparameters.

MITPO8: To know the basics of reagent preparation, instrument handling and can perform common analytical in ClinicalBiochemistry.

MITPO9: To equip students regarding dark room facility, X-ray cassette and lean about filmartifacts.

MITPO10: To know different types of imaging modality such as MRI, PET scan, SPECT and also understand about quality assurance test, dosimetrytools

MITPO11: To practice in-vitro study in radiology (GI tract, Billary Tract, Urinary System, Reproductive System, Cardiovascular System, Venography, Central Nervous System, Respiratory System, and Miscellaneous)

MITPO12: various life style disorders and with due counseling& guidance advising the patients with proper diet, hygiene and Yoga to keep the body, mind, soul and behavior healthy.

COURSE OUTCOMES

At the end of the course, students will be able to...

CT-AHS-CO1: To know the importance of Magnetic Resonance Imaging in clinical environment.

CT-AHS-CO2: Summarize the working principles ofMagnetic Resonance Imaging.

CT-AHS-CO3: Major criteria for image processing and acquisition.

CT-AHS-CO4: Essential MR physics for a medical imaging technologist.

CT-AHS-CO5: Knowledge about Magnetic Resonance Imaging detector used in radio diagnostic units.

CT-AHS-CO6: It helps students to understand the roles of medical imaging in healthcare sector.

COURSE CONTENT

UNIT	TITLE	THEORY (64 HOURS)
I	**PRINCIPLES OF MRI** • Basic principle, Atomic structure, Hydrogen as imaging medium , magnetism, magnetic fields, • types of magnets, eddy currents, solenoids, spin, precession, net magnetization vector, larmor Frequency, flip angle, free induction decay, contrast and resolution, • Relaxation time T1 & T2 images, Comparison of T1 and T2 image, RF pulse.	**15**
II	**INSTRUMENTATION OF MRI** • MR components- Magnet, Radio Frequency coil - Radio Frequency Transmitter & Receiver Coils with types, • Gradient coil, shim coil, magnetic field shielding, • MR signal localization, computation and display, site selection, zones in MRI, MR- safety.	**14**
III	**PULSE SEQUENCE** • Basic Pulse sequences, introduction to pulse sequencing , spin echo, turbo spin echo, gradient echo, inversion recovery, • Proton density, diffusion weighted imaging, angiography and venography, • Echo planar imaging, fat suppression, and spectroscopy.	**12**
IV	**CLINICAL APPLICATION** • MRI- role of radiographer, protocols for various studies, patient preparation and screening of patients, positioning of the patient, patient care, • Modification of procedures in an unconscious or un co-operative patient, plain studies, contrast studies, special procedures. • Methods of MRI imaging methods – Head and Neck, Thorax, Abdomen, Musculoskeletal System imaging, • MR Artifacts- Cause of artifacts - Image quality, image contrast, signal to noise ratio, resolution.	**15**
V	**RECENT ADVANCES IN MR IMAGING** • Perfusion study, functional MRI, diffusion tensor imaging, tractography, • flow study, Advanced MR techniques, post processing 3D reconstruction	**8**

PRACTICALS (64 HOURS)

- Clinical demonstration in magnetic resonance imaging (MRI) while performing plain study
- Clinical demonstration in magnetic resonance imaging (MRI) while performing contrast study

Demonstration

- Imaging techniques
- Safe zone of MRI
- Equipment‘s of MRI

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Radiographic equipment visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

TEXT BOOKS

1. W. J. Meredith & J.B. Massey. Fundamental Physics of Radiology (Varghese Publishing House).
2. Robin J.Wilks. Principles Of Radiological Physics.
3. MRI in practice - catherinewestbrook – 4th edition.
4. Radiation Physics & Medical Physics Christinsen, Curry And Dowdey:
5. An Introduction Of The Physics Of Diagnostic Radiology (Lea Febiger)

BLUE PRINT FOR MIT PAPER 10 – MAGNETIC RESONANCE IMAGING

Unit	Systems	Weightage (%)	Marks	Question type		
				LAQ (2 out of 4)	SAQ (5 out of 6)	VSAQ (10 out of 12)
I	Principles of MRI	27.5	22	1	1	2
II	Instrumentation of MRI	27.5	22	1	1	2 +1*
III	Pulse Sequence	15	12	1*	1	2 +1*
IV	Clinical Application	15	12	1*	1 +1*	2
V	Recent Advances in MR Imaging	15	12		1	2
*Note: * represents question of choice*						

PAPER MIT-10 - MAGNETIC RESONANCE IMAGING

MODEL QUESTION PAPER

TIME: 3 HOURS **MAXIMUM MARKS: 80**

Illustrate your answer with suitable diagrams wherever necessary.

A. Long answer questions **(2 X 10 =20)**

1. Write in detail about spin echo pulse sequences in MRI. (OR)
   Explain the routine brain MRI sequence
2. Write in detail about gradient Echo pulse sequence. (OR)
   Explain about the artistic image formed in MRI

B. Short answer questions -Answer any 5 questions **(5X 6=30)**

1. Explain phase and frequency encoding
2. Write a note on Active and Passive shimming
3. Write a short note on T1 relaxation in Fat & Water
4. Write a note on SPIR
5. Write a short note FLAIR
6. Write about flip angle.

C. Very Short answer questions -Answer any 10 questions **(10x3 =30)**

1. Define SWI
2. Fringe field
3. Chemical shift artifact
4. Explain superconducting magnet
5. Write about H2 Precession
6. Explain f MRI
7. Explain the role of MRI in seizure case
8. Role of phantom in MRI
9. Explain $t2^8$ Image
10. Explain spectroscopy
11. Explain gyro magnetic ratio
12. Define Resonance

NUCLEAR MEDICINE IMAGING

PAPER CN – 11: NUCLEAR MEDICINE IMAGING

NAME OF THE SUBJECT PAPER	**: NUCLEAR MEDICINE IMAGING**
DURATION OF THEORY CLASSES	**: 80 HRS**
DURATION OF PRACTICAL SESSIONS	**: 32 HRS**
UNIVERSITY THEORY EXAMINATION	**: 100 MARKS (80 U + 20 IA)**
UNIVERSITY PRACTICAL EXAMINATION	**: NIL**
DURATION OF THEORY EXAMINATION	**: 3 hrs**

COURSE DESCRIPTION

This course provides introduction to basic physics of Nuclear Medicine, and it also focuses on the working principles, reconstruction techniques, and post processing techniques of various nuclear medicine procedures

OBJECTIVES

- To understand basics of Nuclear Medicine
- To study the processes involved in production of Nuclear Medicine. Image and the construction of Nuclear Medicine unit.
- To study the Nuclear Medicine acquisition method as well as the recent advances in the Nuclear Medicine acquisition.
- To study the Nuclear Medicine image processing method as well as the latest developments in the processing methods.
- To know about clinical application of Nuclear Medicine

PROGRAM OUTCOMES

MITPO1: Performs the duty as a medical technologist, mastering PRP-MPuter applications with good written & communication skills and also skilled at computer applications including E- library.

MITPO2: To gain knowledge about radiation safety precautions, biomedical waste management adhering to the environmental needs of the society, and preventing the spread of infectious diseases.

MITPO3: Understanding the structure and functions of different organs in normal human body.

MITPO4: The learning objectives of this course is to understand radiation sources, types and its properties , production and properties of X-rays, radiation quantities and units used in the industry.

MITPO5: Phlebotomists are trained to draw blood primarily by performing venipunctures(for collection of minute quantities of blood and fingerpricks)

MITPO6: To study and understand about the radiographic positioning.

MITPO7: Ability to perform urinalysis, Serology, haematology, cytology, blood banking,

biochemical and microbiological parameters.

MITPO8: To know the basics of reagent preparation, instrument handling and can perform common analytical in Clinical Biochemistry.

MITPO9: To equip students regarding dark room facility, X-ray cassette and lean about film artifacts.

MITPO10: To know different types of imaging modality such as MRI, PET scan, SPECT and also understand about quality assurance test, dosimetrytools

MITPO11: To practice in-vitro study in radiology (GI tract, Billary Tract, Urinary System, Reproductive System, Cardiovascular System, Venography, Central Nervous System, Respiratory System, and Miscellaneous)

MITPO12: various life style disorders and with due counseling& guidance advising the patients with proper diet, hygiene and Yoga to keep the body, mind, soul and behavior healthy.

COURSE OUTCOMES

NM-AHS-CO1: To know the importance of Nuclear medicine in clinical environment.

NM-AHS-CO2: Summarize the working principles of Nuclear Medicine.

NM-AHS-CO3: Major criteria for image processing and acquisition.

NM-AHS-CO4: Essential NM physics for a medical imaging technologist.

NM-AHS-CO5: Knowledge about Nuclear medicine detector used in nuclear medicine units.

NM-AHS-CO6: It helps students to understand the roles of medical imaging in healthcare sector.

COURSE CONTENT

UNIT	TITLE	THEORYS (80HOURS)
I	**PHYSICS OF NUCLEAR MEDICINE** • Introduction to nuclear Medicine, Unsealed Sources, production of Radionuclide used in Nuclear Medicine, Reactor based Radionuclide, Accelerators based Radionuclide, photonuclear activation, Equations for Radionuclide production, Radionuclide Generators and their operation principles. • Various usages of Radiopharmaceuticals. Thyroid Uptake Measurements, Reno gram, Life Span of RBC, Blood Volume studies, life Span of RBC etc. • General concept of Radionuclide, imaging and Historical envelopments. Difference between in-vivo and in- vitrodosimetry	**16**
II	**RADIOACTIVITY AND INTERACTION OF RADIATION** • Radioactivity - Discovery– Natural & Artificial Radioactivity- Isotopes and nuclides – binding forces between nuclear particles • alpha & beta particles – gamma radiation - mechanisms of radioactive decay – half life - Interaction of electrons, X-rays & ϒ-rays with matter • - Radiation intensity & exposure - radiation dose - Radiation quality–	**16**

	law of exponential attenuation – half value layer • linear attenuation coefficient – Scattering – photoelectric effect – Compton-scattering – pair production – particle interactions – total attenuation coefficient- relative clinical importance.	
III	**COMPONENTS OF RADIONUCLIDE IMAGING** • Diet in Obesity: Aetiology, Assessment, Types, Childhood and Adult Obesity, Complications, • Management and preventive strategies of Obesity. Diet in Leanness: Aetiology, Nutritional requirement and Dietary management. • Diet during eating disorders- anorexia, bulimia, binge eating.	**16**
IV	**POSITRON EMISSION TOMOGRAPHY AND RADIATION DETECTORS** • Principles of PET, PET Instrumentations, Annihilation Coincidence Detection, PET Detector Scanner Design, Data Acquisition for PET, Data corrections and Quantitative Aspect of PET • Construction and Principles of Operation – Ionization Chamber – Isotope calibrator – Proportional Counter – Geiger Muller counter – Voltage calibration of a Geiger Mueller tube, optimum operating condition – • Dead time correction – Uses of Gas – filled detectors – Semiconductor detectors Scintillation detector: Thallium activated Sodium iodide crystal – Photo multiplier tube, electron multiplication, • high voltage supply, Shielding, collimators, field of view. Well counter – construction, design of shielding. Signal output, Pre-amplifier – reasons for use – Voltage amplifier – liquid scintillation detector.	**16**
V	**RADIATION BIOLOGY AND RADIATION SAFETY IN NUCLEAR MEDICINE** • Biological effects of Radiation - induction of Radiation injury – somatic and hereditary effects of radiation – effects of radiation on embryo – normal and abnormal human exposure to radiation. • Maximum permissible levels – Choice of Radiopharmaceutical for the clinical situation and the equipment‘s in hand - Dosimetry – absorbed dose – calculation of absorbed dose. • Dosimetry of individuals – absorbed dose from diagnostic & therapeutic nuclear medicine procedures – personnel monitoring – instruments used in radiation survey and monitoring.	**16**

TUTORIALS (32 HOURS)

1. External posting for nuclear Medicine.

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Lab visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

TEXT BOOKS

1. 1.Piles : Medical Radiographic Technique (Thomas)
2. Santel.R. : Roentgenologic Technique (Edwards Inc)
3. Philip Wballiger : Merils Atlas Of Radiographic Positions and Radiological Procedures (Mosby)
4. Goldman : A Radiographic Index
5. Patesson : Printed Notes For Radiographers In India (Cmai)
6. Stephen Chapman &RichareNakielny : A Guide To Radiological Procedures (Jaypee Brothers)

BLUE PRINT FOR PAPER MIT 11 - NUCLEAR MEDICNINE

Unit	Systems	Weightage (%)	Marks	Question type		
				LAQ (2 out of 4)	SAQ (5 out of 6)	VSAQ (10 out of 12)
I	Physics of Nuclear Medicine	27.5	22	1	1	2
II	Radioactivity and Interaction of Radiation	15	12	1*	1	2 + 1*
III	Components of Radionuclide Imaging	15	12	-	1	2 + 1*
IV	Positron Emission Tomography and Radiation Detectors	27.5	22	1	1	2
V	Radiation Biology and Radiation safety in Nuclear Medicine	15	12	1*	1	2 + 1*
*Note: * represents question of choice*						

The duration of Examination (University) is Three (3) hours.

The total marks for the University Examination will be 100 marks.

Long Answer Questions : 2 X 10 = 20 marks (Choice 2 out of 4)

Short Answer Questions : 5 X 6 = 30 marks (Choice 5 out of 6)

Very Short Answer Questions : 10 X3 = 30 marks (Choice 10 out of 12)

TOTAL = Theory 80 + IA 20 = 100 marks

PAPER MIT-11 - NUCLEAR MEDICINE IMAGING
MODEL QUESTION PAPER

TIME: 3 HOURS **MAXIMUM MARKS: 80**

A. Long answer questions **(2 X 10 =20)**

1. a) Write a note on the special views of shoulder. (OR)
   b) Explain about radiation protection steps to be followed during bed side radiography
2. a) Write a note on the basic views of lumbar spine and explain the Scotty dog view. (OR)
   b) Basic projection of foot in detail.

B. Short answer questions -Answer any 5 questions marks **(5 X 6 =30)**

1. Write a short note on lateral dorsal decubitus?
2. Write a short note on KUB x ray?
3. Write about the scaphoid view
4. Write a note on lumbar spine basic views
5. What is postioning terminology commonly used in a radiology department
6. Define median sagittal plane coronal plane transverse plane

C. Very Short answer questions -Answer any 10 questions **(10x3 = 30)**

1. Define lordtic view.
2. Skyline projection.
3. Write a note on SMV.
4. Write a note on teleroentgenogram.
5. Write a short note on patient position for open mouth view.
6. Write a short note water view.
7. Write a short note on translateral view of cervical spine.
8. Define how kVp, mAs influence the contrast.
9. Define BIRADS.
10. Define Adduction & abduction.
11. Write a note on Bones of Cranium.
12. Write a short note on chambers of Heart.

QUALITY ASSURANCE, RADIATION BIOLOGY & RADIATION HAZARDS

PAPER MIT12: QUALITY ASSURANCE, RADIATION BIOLOGY & RADIATION HAZARDS

NAME OF THE SUBJECT PAPER	**: QUALITY ASSURANCE, RADIATION BIOLOGY & RADIATION HAZARDS**
DURATION OF THEORY CLASSES	**: 80 HOURS**
DURATION OF PRACTICAL CLASSES	**: 32 HOURS**
UNIVERSITY THEORY EXAMINATION	**: 100 MARKS (80 U+ 20 IA)**
UNIVERSITY SPRACTICAL EXAMINATION	**: 100 MARKS(80U+20 IA)**
DURATION OF THEORY EXAMINATION	**: 3 HOURS**

COURSE DESCRIPTION

This course provides introduction to quality assurance tests of various radio diagnostic equipment and radiation biology. It also focuses on the radiation hazards of the human being.

OBJECTIVES

- To understand basics of quality assurance tests of various radio diagnostic equipment.
- To study the radiation biology and radiation hazards.
- To study the biological effects of radiation and its prevention.
- To study the radiation hazards to living human being.
- To know about the role of technologist in quality assurance tests, radiation safety, and radiation protection.

PROGRAM OUTCOMES

MITPO1: Performs the duty as a medical technologist, mastering PRP-MPuter applications with good written & communication skills and also skilled at computer applications including E- library.

MITPO2: To gain knowledge about radiation safety precautions, biomedical waste management adhering to the environmental needs of the society, and preventing the spread of infectious diseases.

MITPO3: Understanding the structure and functions of different organs in normal humanbody.

MITPO4: The learning objectives of this course is to understand radiation sources, types and its properties , production and properties of X-rays, radiation quantities and units used in theindustry.

MITPO5: Phlebotomists are trained to draw blood primarily by performing venipunctures (for collection of minute quantities of blood and fingerpricks)

MITPO6: To study and understand about the radiographic positioning.

MITPO7: Ability to perform urinalysis, Serology, haematology, cytology, blood banking, biochemical and microbiological parameters.

MITPO8: To know the basics of reagent preparation, instrument handling and can perform common analytical in Clinical Biochemistry.

MITPO9: To equip students regarding dark room facility, X-ray cassette and lean about filmartifacts.

MITPO10: To know different types of imaging modality such as MRI, PET scan, SPECT and also understand about quality assurance test, dosimetry tools

MITPO11: To practice in-vitro study in radiology (GI tract, Billary Tract, Urinary System, Reproductive System, Cardiovascular System, Venography, Central Nervous System, Respiratory System, and Miscellaneous)

MITPO12: various life style disorders and with due counseling& guidance advising the patients with proper diet, hygiene and Yoga to keep the body, mind, soul and behavior healthy.

COURSE OUTCOMES

At the end of the course, students will be able to...

QA-AHS-CO1: To know the importance of quality assurance tests inradiology.

QA-AHS-CO2: Summarize the various acceptance tests.

QA-AHS-CO3: Major criteria for radiation safety.

QA-AHS-CO4: Essential physics ofradiation biology.

QA-AHS-CO5: Knowledge about radiation hazards.

QA-AHS-CO6: It helps students to understand the roles of medical imaging technologist in quality assurance tests and radiation physics.

COURSE CONTENT

UNIT	TITLE	THEORY (80HOURS)
I	**RADIATION REGULARITY BODIES** • AERB, BARC, NCRP, ICRP, IAEA, NRPB, WHO, etc.. guidelinesfor radiation protection and pregnancy	**16**
II	**QUALITY ASSURANCE IN DIAGNOSTIC RADIOLOGY** • Classification of contrast media, reaction of contrast media, treatment for reactions, emergency drugs and equipments used in contrast media, drugs in crash cart, physiological changes in contrast media, premedication and after care during reaction of CM, complications of contrast media..	**16**

III	**ROLE OF RADIOGRAPHER IN PLANNING, QA & RADIATION PROTECTION** • Role of technologist in radiology department - Personnel and area monitoring., Setting up of a new X-Ray unit, staff requirement, AERB specifications for site planning and mandatory guidelines – Planning of X-ray rooms, dark rooms – Inspection of X-Ray installations - Registration of X-Ray equipment installation- Certification - Evaluation of workload versus, radiation factors – Occupational exposure and protection Tools/devices.	**16**
IV	**RADIATION BIOLOGY** • Cell Biology-Cell Physiology and biochemistry , Interaction of Radiation with Cells - Concepts of micro dosimetry- Direct and indirect action of radiation on living cells, Biological effect of radiation - Stochastic and deterministic, Modification of radiation damage – RBE, LET, OER, dose rate, dose fractionation	**16**
V	**RADIATION HAZARDS AND UNITS** Philosophy of Radiation protection, effects of time, Distance & Shielding. Calculation of Work load, weekly calculated dose to radiation worker & General public Good work practice in Diagnostic Radiology. Planning consideration for radiology, including Use factor, occupancy factors, and different shielding material. Units of radiation - Quality factor - Flux- Fluence- KERMA- Exposure- Absorbed dose- Equivalent Dose- Weighting Factors-Effective Dose - Occupational Exposure Limits - Dose limits to public	**16**

PRACTICALS (32 HOURS)

- QA Tests
- Radiation safety
- Radiation protection
- Radiation hazards
- Radiation regulatory standards

Demonstration

- QA tests
- Radiation Monitoring
- Dosimetry

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Radiographic equipment visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

TEXT BOOKS

1. Piles : Medical Radiographic Technique (Thomas)
2. Santel.R. : Roentgenologic Technique (Edwards Inc)
3. Philip Wballiger : Merils Atlas Of Radiographic Positions and Radiological Procedures (Mosby)
4. Goldman : A Radiographic Index
5. Patesson : Printed Notes For Radiographers In India (Cmai)
6. Stephen Chapman &RichareNakielny : A Guide To Radiological Procedures (Jaypee Brothers)

BLUE PRINT

Unit	Systems	Weightage (%)	Marks	Question type		
				LAQ (2 out of 4)	SAQ (5 out of 6)	VSAQ (10 out of 12)
I	Radiation Regularity Bodies	15	12	-	1 +1*	2 + 1*
II	Quality Assurance in Diagnostic Radiology	15	12	1*	1	2 + 1*
III	Role of Radiographer in Planning, QA & Radiation Protection	15	12	1*	1	2 + 1*
IV	Radiation Biology	27.5	22	1	1	2
V	Radiation Hazards and Units	27.5	22	1	1	2
*Note: * represents question of choice*						

The duration of Examination (University) is Three (3) hours.

The total marks for the University Examination will be 100 marks.

Long Answer Questions : 2 X 10 marks = 20 marks (Choice 2 out of 4)

Short Answer Questions : 5 X 6 marks = 30 marks (Choice 5 out of 6)

Very Short Answer Questions : 10 X 3 marks = 30 marks (Choice 10 out of 12)

TOTAL = Theory 80 + IA 20 = 100 marks

PAPER MIT-12-QUALITY ASSURANCE, RADIATION BIOLOGY & RADIATION HAZARDS

MODEL QUESTION PAPER

TIME: 3 HOURS **MAXIMUM MARKS: 80**

A. Long answer questions **(2 X 10 =20)**

1. a) Explain about Role of Radiographer in Planning, QA & Radiation Protection. (OR)
   b) Explain about radiation protection steps to be followed during a bed side radiography
2. a) Write a note on the basic views of lumbar spine and explain the Scotty dog view. (OR)
   b) Basic projection of foot in detail.

B. Short answer questions -Answer any 5 questions marks **(5 X 6 =30)**

1. Write a short note on lateral dorsal decubitus?
2. Write a short note on KUB x ray?
3. Write about the scaphoid view
4. Write a note on lumbar spine basic views
5. What is positioning terminology commonly used in a radiology department
6. Define median sagittal plane coronal plane transverse plane

C. Very Short answer questions -Answer any 10 questions **(10x3 = 30)**

1. Define lordotic view.
2. Skyline projection.
3. Write a note on SMV.
4. Write a note on teleroentgenogram.
5. Write a short note on patient position for open mouth view.
6. Write a short note water view.
7. Write a short note on translateral view of cervical spine.
8. Define how kVp, mAs influence the contrast.
9. Define BIRADS.
10. Define Adduction & abduction.
11. Write a note on Bones of Cranium.
12. Write a short note on chambers of Heart.

DISCIPLINE ELECTIVE – III YEAR

B.Sc. MEDICAL IMAGING TECHNOLOGY
DISCIPLINE SPECIFIC ELECTIVE
DISCIPLINE ELECTIVE I - BASIC RADIATION BIOLOGY

NAME OF THE SUBJECT PAPER : Basic Radiation Biology

DURATION OF THEORY CLASSES : 64 Hrs

THEORY EXAMINATION : 50 Marks (40U + 10 IA)

UNIVERSITY PRACTICAL EXAMINATION : NIL

DURATION OF THEORY EXAMINATION : 1 1/2Hrs

SYLLABUS

Cell Biology

Introduction to cell biology- Biochemistry- Structure of the cell- Cellular components: Plasma membrane, Cytoplasm, Nucleus - Interaction of cells with their environment- Cell metabolism Life cycle of the cell: Cell cycle, Cell division, Cell synchronization- Cellular abnormalities and introduction to cancer. Radiation excitation and ionization Radiation chemistrydirect and indirect effects, free radicals, oxygen effect and free radical scavengers - LET and RBE theory, dual action theory, intracellular repair, general knowledge of repair models.

Deterministic Effects:

Early deterministic effects of radiation, acute radiation syndrome, late deterministic effects of radiation, radiation effects on importance organs and organ systems, induction of cataract, radiation effects on the developing embryo and shortening of life span.

Stochastic Effects (Genetic effects):

Genetic effects of radiation, genetic diseases in humans, genetic risk estimation, background data from humans and other animals. History of radiation injuries in humans. Radiation carcinogenesis, radiation epidemiology, linear non-threshold hypothesis, DDREF, cancer risk estimation, cancer caused by radiation exposure,

second cancers in RT patients, cancer risk from diagnostic radiology, attributable life time risk.

Cell Damage

Cell Damage, DNA Repair Mechanisms, Radiation Sensitivity and Cell Death, Cell Survival Curves and the Cell Cycle, Cellular Sensitivity, Radiation Effects and Lethal Dose, Diagnosis and Treatment and Organ Dose, Tumor vs. normal tissue radiobiology.

Fractionation

Rationale, factors involved Time, dose, and fractionation relationship is effective formulae split dose treatments. Brachytherapy low dose rate, high dose rate and pulsed treatments. combination therapy (adjuvant surgery or chemotherapy),yperthermia, hypoxic cell radiosensitizers, high LET radiation. Photody namic therapy.The volume effect, general principle and current ypotheses. Shrinking Fi eld technique.

DISCIPLINE ELECTIVE II – CLINICAL IMAGING PROTOCOLS OF MAGNETIC RESONANCE IMAGING

NAME OF THE SUBJECT PAPER	**: CLINICAL IMAGING PROTOCOLS OF MAGNETIC RESONANCE IMAGING**
DURATION OF THEORY CLASSES	**: 64 Hrs**
THEORY EXAMINATION	**: 50 Marks (40U + 10 IA)**
UNIVERSITY PRACTICAL EXAMINATION	**: NIL**
DURATION OF THEORY EXAMINATION	**: 1 1/2Hrs**

SYLLABUS

UNIT-I: Principles of MRI

- Basic Principles: Atomic structure- Hydrogen as imaging medium – magnetism- magnetic fields- types of magnets-Spin – precession – relaxation time – pulse cycle – T1 weighted image – T2 weighted image – proton density image.

- Pulse sequence : Spin echo pulse sequence – turbo spin echo pulse sequence - Gradient echo sequence – Turbo gradient echo pulse sequence - Inversion recovery sequence – STIR sequence – SPIR sequence – FLAIR sequence – Echo planar imaging – Advanced pulse sequences.

UNIT – II: Instrumentation of MRI

- MR Instrumentation: Types of magnets – RF transmitter – RF receiver – Gradient coils – shim coils – RF shielding – computers.

UNIT-III: Clinical Application

- Role of radiographer as MRI Technician, protocols for various studies, patient preparation and screening of patients, positioning of the patient, patient care, modification of procedures in an unconscious or un co-operative patient, Informed consent, plain studies, contrast studies.

UNIT: IV Imaging Protocols of MRI Studies.

- Brain, Spine- Head and Neck- Thorax- Abdomen - Pelvis- Musculoskeletal system, Upper Extremities- Lower Extremities & Nerves.
- Anatomy -clinical indication and contraindication, patient preparation, positioning of the patient technique, contrast media, and injection protocol of various:

UNIT-V: MR safety and quality control

- MR safety, Bio effects, Zones in MRI, RF antenna effect, Safety guidelines, Calibration, Quality control, Quench, Emergency Switches.

DISCIPLINE ELECTIVE III – CLINICAL IMAGING PROTOCOLS OF COMPUTED TOMOGRAPHY

NAME OF THE SUBJECT PAPER	**: CLINICAL IMAGING PROTOCOLS OF COMPUTED TOMOGRAPHY**
DURATION OF THEORY CLASSES	**: 64 Hrs**
THEORY EXAMINATION	**: 50 Marks (40U + 10 IA)**
UNIVERSITY PRACTICAL EXAMINATION	**: NIL**
DURATION OF THEORY EXAMINATION	**: 1 1/2Hrs**

SYLLABUS

UNIT I: I Introduction of Computed Tomography (CT)

- History,
- Basic principle of CT scan,
- Pixel and Voxel,
- Hounsfield unit, CT Number,
- Detectors used in CT,
- X-ray tube in CT

UNIT: II Generations and Instrumentation:

- Generations - first, second, third, fourth, fifth, sixth and seventh generations, Image Reconstruction. Various generation in CT and its advantages.
- Instrumentation -Control console, Computers, Gantry – x- ray tube, Collimation and filtration, Couch.

UNIT: III Clinical Application

- CT- role of radiographer, protocols for various studies, patient preparation and screening of patients, modification of procedures in an unconscious or un co-operative patient, patient care.

UNIT: IV Imaging Protocols of Various Studies

- Brain, Spine- Head and Neck- Thorax- Abdomen - Pelvis- Musculoskeletal system, Upper Extremities and Lower Extremities.
- Anatomy -clinical indication and contraindication, patient preparation, positioning of the patient technique, contrast media, and injection protocol of various procedures.

UNIT: V Data Acquisition and Data Presenting

- Image Display- Work Station, Function of image processing Facilities, Evaluation of image, Image Quality, Patient Exposure Techniques, Dose Reduction Techniques, Radiation safety in CT, Dose management in CT, Quality Assurance.

DISCIPLINE ELECTIVE IV – CLINICAL IMAGING PROTOCOLS OF RADIOGRAPHY & FLUOROSCOPY

NAME OF THE SUBJECT PAPER	**: CLINICAL IMAGING PROTOCOLS OF RADIOGRAPHY & FLUOROSCOPY**
DURATION OF THEORY CLASSES	**: 64 Hrs**
THEORY EXAMINATION	**: 50 Marks (40U + 10 IA)**
UNIVERSITY PRACTICAL EXAMINATION	**: NIL**
DURATION OF THEORY EXAMINATION	**: 1 1/2Hrs**

SYLLABUS

UNIT-I: Introduction of Radiography

Basic Physics:

Structure of Atom, Atomic Number, Mass number, Isotopes, Ionization and Excitation Thermionic emission, Characteristic X ray, Bremsstrahlung Radiation, Production and properties of x-ray, Construction and working of X ray tube, Thermoluminescent dosimeter (TLD).

Clinical radiography Positioning:

- Preparation of the Room, Apparatus and Instruments
- Positions of the Patient: Erect, Sitting, Supine, Prone, Lateral, Oblique, Decubitus Etc.,
- Relative Position of X-Ray Tube and Patient, Relevant Exposure Factors. Use of Accessories Such As Radiographic Cones, Grid and Positioning Aids. . Radiation Protection, Use Of Gonad Shield, Practical Methods Reducing Radiation Dose To The Patient

UNIT II: Upper limb, Lower limb, Chest , Abdomen

- 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).

- Routine Projections for Lungs, Cardia and Diaphragm. Supplementary Projections for contrast studies like BA swallow, Thoracic Inlet, Soft Tissue Neck, Decubitus, 'Apicograms, and Paediatric Cases
- KUB, Erect Abdomen and Decubitus Projection, Supplementary Projections For Acute Abdomen.

UNIT-III: Introduction of Procedures and Fluoroscopy

Fluoroscopy:

History, Basic of Principles& Working, Instrumentation- Image intensifier, coupling, television monitor, limitations of image intensifier, automatic brightness control(ABC), Automatic Exposure Control (AEC).

Radiographic Procedures:

General considerations, Responsibility of Radiographer, During Radiological Procedures, Preparation of Patient for Different Procedures. Contrast Media - Positive And Negative, Ionic & Non - Ionic Adverse Reactions,To Contrast Media And Patient Management Emergency Drugs In The Radiology Department Emergency Equipments In The Radiology Department -Asepsis -Radiation Protection - Ten Day Rule .

UNIT-IV: Gastro intestinal tract &Urinary System

- GIT-Barium swallows, pharynx and oesophagus-Barium meal and follow through -Small bowel enema -Barium Enema
- Barium Studies - Indications –Contraindication – Risk Factors-Preparation - Procedure-Filming Technique - Complications - Advantages and disadvantage.
- **Urinary System**: Intravenous urography -Retrograde pyelography – Antegrade pyelography- micturating cystouresthrography, Urethrography

UNIT-V: Female Reproductive System& Miscellaneous

- **Hysterosalpingography (HSG)-**Indications –Contraindication – Equipment-Procedure-Technique- After care- Complications - Advantages and disadvantages.

Miscellaneous:

- Sialography
- Sinography
- Fistulography

QUESTION BANK

B.Sc. AHS I YEAR

PAPER-1: ANATOMY

UNIT: 1 GENERAL ANATOMY

HUMAN CELL

Q. NO	TOPICS	TYPE
1.	Discuss the Cell & its Organelles.	SAQ

EPITHELIUM

Q.NO	TOPICS	TYPE
1.	Classification of Epithelium with its examples.	SAQ
2.	Draw the neat label diagram of Simple epithelium with its examples.	SAQ
3.	Draw the neat label diagram of Compound epithelium with its examples.	SAQ
4.	Write a note on Goblet cell.	VSAQ
5.	Write a note on Basement membrane of epithelium.	VSAQ

GLANDS

Q.NO	TOPICS	TYPE
1.	Classification of Glands with its examples.	SAQ
2.	Discuss the Microscopic structure of Mucous / Serous / Mixed salivary gland with its examples.	SAQ

CARTILAGE

Q.NO	TOPICS	TYPE
1.	Discuss the Microscopic structure of Hyaline cartilage / Elastic cartilage / White fibro cartilage with its examples.	SAQ
2.	Classification of Cartilage with its examples.	VSAQ
3.	Write a note on Perichondrium.	VSAQ

BONE

Q.NO	TOPICS	TYPE
1.	Classification of Bones with its examples.	SAQ
2.	Draw & Discuss the Microscopic structure of Compact bone (T.S)	SAQ
3.	Discuss the blood supply of long bone.	SAQ
4.	List out the bones in region wise.	SAQ
5.	State the parts of growing long bone.	VSAQ
6.	State the parts of adult long bone.	VSAQ
7.	Write a note on Periosteum.	VSAQ
8.	Write a note on carpal bones.	VSAQ
9.	Write a note on Sesamoid bone.	VSAQ
10.	Write a note on Fontanellae of fetal skull.	VSAQ
11.	Write a note on Haversion system of compact bone.	VSAQ
12.	List out the structural differences between the Bone & Cartilage.	VSAQ

JOINTS

Q.NO	TOPICS	TYPE
1.	Classification of Joints with its examples.	SAQ
2.	Classification of Synovial joint with its examples.	SAQ
3.	Discuss the structure of synovial joint.	SAQ
4.	Classification of Cartilagenous joint with its examples.	SAQ

MUSCULAR TISSUE

Q.NO	TOPICS	TYPE
1.	Draw & Discuss the Microscopic structure of Skeletal muscle / Cardiac muscle / Smooth muscle with its examples.	SAQ
2.	Classification of muscular tissue with its examples.	VSAQ
3.	State the muscles of mastication & its nerve supply.	VSAQ
4.	List out the microscopic structural differences between the types of muscles.	VSAQ

SKIN

Q.NO	TOPICS	TYPE
1.	Draw & Discuss the Microscopic structure of Thick / Thin skin.	SAQ
2.	Classification / Types of skin with its example.	VSAQ
3.	List out the structural differences between the types of skin.	VSAQ

UNIT: 2 CARDIOVASCULAR SYSTEMS

MEDIASTINUM

Q.NO	TOPICS	TYPE
1.	Definition, location & general boundary / outline boundary of Mediastinum.	SAQ
2.	Discuss the boundaries & contents of Superior mediastinum.	SAQ
3.	Discuss the boundaries & contents of Inferior mediastinum.	SAQ

HEART

Q.NO	TOPICS	TYPE
1.	Explain the gross features of Right atrium under following headings – a) Definition, b) location, c) external features, d) internal features, e) Function, f) arterial supply.	LAQ
2.	Describe the Blood supply of Heart.	LAQ
3.	Discuss the location & External features of Heart.	SAQ
4.	Discuss the Valves of Heart. (A.V -valve & Semilunar valve)	SAQ
5.	Discuss the Systemic & Pulmonary circulation of Heart.	SAQ
6.	Discuss the Right coronary artery / Left coronary artery under following headings – a) Origin, b) course, c) branches.	SAQ
7.	Write a note on Apex of Heart.	VSAQ
8.	List out the chambers & great blood vessels of Heart.	VSAQ
9.	Trace the conducting system of Heart.	VSAQ
10.	State the definition, layers, sinuses & nerve supply of Pericardium.	VSAQ

BLOOD VESSELS

Q.NO	TOPICS	TYPE
1.	Describe the Portal vein under following headings – a) Definition, b) formation, c) location, d) course, e) branches, f) Parts, g) Tributaries.	LAQ
2.	Explain the Cavernous sinus under following headings – a) Definition, b) location, c) measurement, d) extension, e) relations, f) Tributaries, g) communications.	LAQ
3.	Parts & branches of Aorta	SAQ

4.	Discuss the origin, course, parts & branches of Subclavian artery.	SAQ
5.	Discuss the origin, course, parts & branches of Axillary artery.	SAQ
6.	Discuss the origin, course & branches of Brachial artery.	SAQ
7.	Discuss the origin & branches of Internal iliac artery.	SAQ
8.	Discuss the origin, course & branches of External carotid artery.	SAQ
9.	Discuss the origin, parts, course & branches of Internal carotid artery.	SAQ
10.	Classification of Dural venous sinuses.	SAQ / VSAQ
11.	Enumerate the branches of Brachial artery.	VSAQ
12.	State the branches of Radial & Ulnar artery.	VSAQ
13.	State the branches of Femoral artery.	VSAQ
14.	List out the sites of Peripheral pulse.	VSAQ
15.	List out the sites of Porto caval anastomosis.	VSAQ
16.	State the formation, course & termination of Great saphenous vein / Short saphenous vein.	VSAQ
17.	Write a note on Cysterna chyli.	VSAQ
18.	Formation, location & branches of Superficial palmar arch / Deep palmar arch.	VSAQ

UNIT: 3 RESPIRATORY SYSTEM

Q.NO	TOPICS	TYPE
1.	Explain the **Larynx** under following headings – a) Definition, b) location, c) extension, d) measurement, e) Skeletal framework, f) function.	LAQ
2.	Explain the **Lung** under following headings – a) Definition, b) location, c) coverings, d) weight & Colour, e) external features, f) medial surface impression, g) hilum, h) Root of lung, i) blood supply, j) note on Bronchopulmonary segments.	LAQ
3.	Discuss the definition, formation & structures opening in the Lateral wall of nose.	SAQ
4.	Discuss the definition, extension, measurement, external feature of Trachea.	SAQ
5.	Discuss the definition, layers, parts of layers, recesses, nerve supply of Pleura.	SAQ / VSAQ
6.	State the parts of Respiratory system.	VSAQ
7.	Enumerate the structures forming the Nasal septum.	VSAQ
8.	Write a note on Carina.	VSAQ
9.	Write a note on Bronchopulmonary segments.	VSAQ
10.	List out the Para nasal air sinuses.	VSAQ
11.	Enumerate the muscles of Respiration & state its nerve supply.	VSAQ

UNIT: 4 DIGESTIVE SYSTEMS

Q.NO	TOPICS	TYPE
1.	Describe the **Tongue** under following headings – a) Definition, b) location, c) parts, d) external features, e) muscles, f) Nerve supply.	LAQ
2.	Explain the **Pharynx** under following headings – a) Definition, b) location, c) extension, d) sub-division, e) Muscles forming the pharynx, f) nerve supply.	LAQ

3.	Explain the **Stomach** under following headings – a) Definition, b) location, c) capacity, d) measurement, e) External features, f) Parts, g) relations, h) blood supply.	LAQ
4.	Describe the **Duodenum** under following headings – a) Definition, b) location, c) parts, d) measurement, e) external features, f) Internal features (2^{nd} part), g) blood supply.	LAQ
5.	Explain the **Liver** under following headings – a) Definition, b) location, c) Colour, d) weight, e) external features, f) Relations, g) bare area, h) Porta hepatis, i) blood supply, j) function.	LAQ
6.	Explain the **Pancreas** under following headings – a) Definition, b) location, c) anatomical & functional parts, d) measurement, e) Colour, f) external features, g) relations, h) Duct of pancreas, i) Blood supply.	LAQ
7.	Discuss the location & external features of Tongue.	SAQ
8.	Discuss the parts, muscles of Tongue & state its nerve supply.	SAQ
9.	Discuss the location, external features, parts & blood supply of stomach.	SAQ
10.	Discuss the external & internal features of the 2^{nd} part of Duodenum.	SAQ
11.	Discuss the Caecum under following headings – a) Definition, b) location, c) measurement, d) types, e) external features, f) Internal features, g) blood supply.	SAQ
12.	Discuss the Appendix under following headings – a) Definition, b) location, c) parts, d) measurement, e) position, f) Blood supply.	SAQ
13.	Discuss the characteristic features / cardinal features of Large intestine.	SAQ
14.	Discuss the Extra hepatic biliary apparatus under following headings – a) Definition, b) parts, c) measurement, d) function, e) Note on gall bladder.	SAQ
15.	Discuss the definition, location, origin, course & branches of Coeliac trunk.	SAQ
16.	List out the parts of Digestive system.	VSAQ
17.	State the parts & papillae of Tongue.	VSAQ
18.	State the nerve supply of Tongue.	VSAQ
19.	Enumerate the muscles of Tongue.	VSAQ
20.	State the extension & sub-divisions of Pharynx.	VSAQ
21.	State the extension & constrictions of Esophagus.	VSAQ
22.	List out the structural differences between the Jejunum & Ileum.	VSAQ
23.	State the location & types of Caecum.	VSAQ
24.	State the location / parts & position of Appendix.	VSAQ
25.	Write a note on Porta hepatis.	VSAQ
26.	Write a note on bare area of Liver.	VSAQ
27.	Write a note on Pancreatic duct.	VSAQ
28.	Enumerate the parts & function of Biliary apparatus.	VSAQ
29.	Classification of Salivary glands.	VSAQ
30.	State the branches of Superior mesenteric artery.	VSAQ
31.	State the branches of Inferior mesenteric artery.	VSAQ
32.	State formation of Marginal artery / artery of Drummond.	VSAQ

UNIT: 5 URINARY SYSTEM

Q.NO	TOPICS	TYPE
1.	Explain the Kidney under following headings – a) Definition, b) location, c) measurement, d) Colour, e) external features, f) Hilum, g) relations, h) coverings, i) internal features, j) Blood supply.	LAQ
2.	Explain the Urinary bladder under following headings – a) Definition, b) location, c) shape, d) measurement, e) capacity, f) External features, g) relations, h) supports, i) Internal features (Trigone of urinary bladder), j) blood supply, k) role.	LAQ
3.	Discuss the location & relations of Kidney.	SAQ
4.	Discuss the extension, parts, measurement, constrictions & blood supply of Ureter.	SAQ
5.	Discuss the external features & supports of Urinary bladder.	SAQ
6.	State the parts of Urinary system.	VSAQ
7.	Write a note on hilum of kidney.	VSAQ
8.	State the extension, parts & constrictions of ureter.	VSAQ
9.	Write a note on Trigone of urinary bladder.	VSAQ
10.	State the definition, extension & parts of Male urethra.	VSAQ
11.	Write a note on Female urethra.	VSAQ

UNIT: 6 REPRODUCTIVE SYSTEMS
MALE REPRODUCTIVE SYSTEM

Q.NO	TOPICS	TYPE
1.	Explain the **Testis** under following headings – a) Definition, b) location, c) measurement, d) shape, e) external features, f) Coverings, g) internal features, h) functions, i) blood supply.	LAQ
2.	Describe the **Prostate gland** under following headings – a) Definition, b) location, c) shape, d) measurement, e) shape, f) External features, g) lobes, h) coverings, i) blood supply.	LAQ
3.	Discuss the location, external features, layers & blood supply of Scrotum.	SAQ
4.	Discuss the External & internal features of Testis.	SAQ
5.	Discuss the External features, lobes & coverings of Prostate.	SAQ
6.	State the parts of Male Reproductive system.	VSAQ.
7.	Enumerate the layers of Scrotum & state its nerve supply.	VSAQ.
8.	State the parts & role of Epididymis.	VSAQ.
9.	State the coverings of Testis & Prostate.	VSAQ.
10.	State the coverings & contents of Spermaticcord.	VSAQ.

FEMALE REPRODUCTIVE SYSTEM

Q.NO	TOPICS	TYPE
1.	Explain the **Mammary gland** under following headings – a) Definition, b) location, c) extension, d) shape, e) structures / features, f) Blood supply.	LAQ
2.	Explain the **Uterus** under following headings – a) Definition, b) location, c) shape, d) measurement, e) external features, f) Positions, g) relations, h) supports, i) blood supply.	LAQ

3.	Discuss the Gross structure of Mammary gland.	SAQ
4.	Discuss the location & external features of Uterus.	SAQ
5.	Discuss the location, position & supports of Uterus.	SAQ
6.	Discuss the external & internal features of Ovary.	SAQ
7.	State the parts of Female Reproductive system.	VSAQ
8.	State the parts & role of Fallopian tube.	VSAQ
9.	Enumerate the ovarian follicles.	VSAQ
10.	State the parts & positions of Uterus.	VSAQ

UNIT: 7 ENDO CRINE SYSTEM

Q.NO	TOPICS	TYPE
1.	Describe the **Thyroid gland** under following headings – a) Definition, b) location, c) hormones, d) peculiarities, e) external features, f) Parts, g) relations, h) coverings, i) blood supply, j) Functions.	LAQ
2.	Explain the **Pituitary gland** under following headings – a) Definition, b) location, c) shape, d) measurement, e) external features & hormones, f) Blood supply.	LAQ
3.	Explain the **Suprarenal gland** under following headings – a) Definition, b) location, c) measurement, d) external features, e) Internal features, f) hormones, g) blood supply.	LAQ
4.	Discuss the external features of Thyroid gland, state its coverings & blood supply.	SAQ
5.	Discuss the external features & hormones of Pituitary gland.	SAQ
6.	Discuss the external & internal features of Suprarenal gland & state its hormones.	SAQ
7.	List out the Endocrine glands.	VSAQ
8	Classification of Endocrine glands.	VSAQ
9.	State the location & blood supply of Thyroid gland.	VSAQ
10.	State the location & hormones of Pituitary gland.	VSAQ
11.	State the location & hormones of Parathyroid gland.	VSAQ

UNIT: 8 NERVOUS SYSTEM

Q.NO	TOPICS	TYPE
1.	Classification of Nervous system.	SAQ
2.	Discuss the Cerebrum under following headings – a) Definition, b) location, c) external features.	SAQ
3.	Discuss the external features & blood supply of Cerebrum.	SAQ
4.	Discuss the Supero-lateral surface of Cerebrum.	SAQ
5.	Discuss the Cerebellum under following headings – a) Definition, b) location, c) nucleus, d) functions, e) blood supply.	SAQ
6.	Discuss the Spinal cord under following headings – a) Definition, b) location, c) extension, d) measurement, e) coverings, f) Blood supply.	SAQ
7.	Discuss the extension & external features of Spinal cord.	SAQ
8.	Discuss the location & external features of Midbrain.	SAQ
9.	Discuss the location & external features of Pons.	SAQ
10.	Discuss the location & external features of Medulla oblongata.	SAQ
11.	Discuss the blood supply of Brain.	SAQ
12.	Discuss the formation of Circle of Willis.	SAQ
13.	Classification of Cranial nerves.	SAQ /

		VSAQ
14.	State the parts of Brain.	VSAQ
15.	Write a note on Sulci & Gyri.	VSAQ
16.	State the location & nucleus of Cerebellum.	VSAQ
17.	State the layers of Meninges & its space.	VSAQ
19.	State the layers of meninges & its modification.	VSAQ
18.	State the modification of Spinal meninges.	VSAQ
20.	Enumerate the cranial nerves emerges from Midbrain / Pons / Medulla oblongata.	VSAQ
21.	List out the Cranial nerves.	VSAQ
22.	List out the Basal nuclei	VSAQ
23.	State the location & parts of Corpus callosum.	VSAQ

UNIT: 9 GENERAL EMBRYOLOGY

Q.NO	TOPICS	TYPE
1.	Discuss the stages of Spermatogenesis.	SAQ
2.	Discuss the stages of Oogenesis.	SAQ
3.	Discuss the Placenta under following headings – a) Definition, b) external features, c) functions.	SAQ
4.	Write a note on Fertilization & state its phases.	VSAQ
5.	Write a note on Implantation.	VSAQ
6.	Write a note on Ovulation.	VSAQ

PAPER 2 - PHYSIOLOGY

UNIT – I

GENERAL PHYSIOLOGY

Very short answer questions (VSAQ)

1. Draw labeled diagram of human cell and mention any four functions of cell organelles.
2. Explain one function of
   a) Mitochondria, b). Golgi apparatus
   c) Endoplasmic reticulum d) Ribosome
3. Give two differences between mitosis and meiosis.
4. Name the phases of mitosis
5. Name different types of intercellular connections?
6. Classify various mechanisms of transport across cell membrane.
7. Describe different mechanism of passive transport across the cell membrane
8. Describe different mechanism of active transport across the cell membrane
9. Define osmosis. Give examples.
10. Define symport. Give one example.
11. Define antiport. Give one example.
12. Define homeostasis. Name the types of feedback mechanisms involved in homeostasis with one example.
13. Briefly explain negative feedback mechanisms with examples.
14. Briefly explain positive feedback mechanisms with examples.
15. Give normal values of i) Intracellular fluid (ICF), ii) Extracellular fluid (ECF), iii) plasma and iv) Interstitial fluid

HEMATOLOGY (BLOOD)

Long answer questions (LAQ)

1. What is erythropoiesis? Describe the stages and factors influencing it.
2. What is anemia? Describe the types of anemia. Give the blood picture in each of them.
3. What s immunity? Explain its types.
4. Explain the mechanism of hemostasis.
5. Explain intrinsic and extrinsic mechanisms of blood clotting.
6. Name the blood group systems. Explain the basis for its classification. Add a note on its clinical importance.

Short answer questions (SAQ)

1. Briefly describe the composition of blood.
2. Write the functions of blood.
3. List the plasma proteins. Write its functions.
4. What is Erythropoiesis? List its stages.
5. Define anemia with types. Explain iron deficiency anemia.
6. Briefly explain ABO and Rh system.
7. Erythroblastosis fetalis.
8. Define hemostasis with stages.
9. Name the clotting factors.
10. Define immunity. What are its types?

Very short answer questions (VSAQ)

1. Classifications of WBC.
2. Functions of neutrophil.
3. What is Phagocytosis?
4. Functions of eosinophil.
5. Functions of basophil.
6. Functions of lymphocytes.
7. Functions of red blood cell (RBC).
8. Write the normal values of hemoglobin in adults male and female.
9. Functions of hemoglobin.
10. Functions of platelets.
11. What is hemophilia?
12. What is anticoagulant?
13. Name any two anticoagulants.
14. Name the blood group systems.
15. Define Landsteiner's law.
16. Mismatch transfusion.

UNIT – II

CARDIOVASCULAR SYSTEM

Long answer questions (LAQ)

1. Define cardiac cycle. Explain with the help of a diagram the mechanical and pressure changes during cardiac cycle.
2. Draw a labelled diagram showing the innervations of heart. Describe the regulation of heart rate.
3. Define blood pressure. Give its normal values. Write the factors controlling blood pressure.
4. Define cardiac output and cardiac index. Give its normal values. Describe the factors regulating cardiac output.
5. What is shock? What are its types? Discuss the cardiovascular compensatory changes that occur during shock.

Short Answer Questions (SAQ)

1. Write the difference between pulmonary and systemic circulation.
2. Briefly describe the conducting system of heart.
3. Draw labeled diagram of conducting system of heart.
4. List out the properties of cardiac muscle. Briefly explain any two properties.
5. Draw a normal Lead II ECG indicating its waves and segments.
6. Define blood pressure (BP). What are the components of it and write its normal range.
7. List the factors affecting blood pressure
8. Define cardiac cycle. List the events during cardiac cycle.
9. Define shock. Name its types.
10. Briefly explain the types of heart sounds.

Very Short Answer Questions (VSAQ)

1. Write any two differentiating points between pulmonary and systemic circulation.
2. Define blood pressure.
3. What is systolic blood pressure? Write its normal value.
4. What is diastolic blood pressure? Write ifs normal value.
5. Define pulse. Write its normal range.
6. Write any two difference between tachycardia and bradycardia
7. Define cardiac output. Write its normal values.
8. Define stroke volume. Write its normal values.
9. What is electrocardiogram (ECG)?
10. List any four properties of cardiac muscle

UNIT III

RESPIRATORY SYSTEM

Long answer questions (LAQ)

1. Describe the mechanics of breathing.
2. Explain oxygen transport in the blood. Describe the oxygen dissociation curve.
3. Discuss the transport of carbon dioxide in the blood.
4. Name the respiratory centers. Explain the neural regulation of respiration.
5. Classify hypoxia. Describe the types with suitable examples.

Short answer questions (SAQ)

1. Briefly explain the mechanism of inspiration.
2. Briefly explain the mechanism of expiration.
3. Draw labeled diagram of pontine and medullary respiratory centers.
4. Briefly explain the transport of oxygen in the blood
5. Briefly explain the transport of carbon dioxide in the blood.
6. Draw labeled diagram of normal spirogram indicating lung volume and capacities.
7. Define and give normal values of lung volumes.
8. Define and give normal values of lung capacities.
9. What is surfactant? Give its function.
10. Define hypoxia. List its various types.
11. Classify and explain any one type of hypoxia.

Very short answer questions (VSAQ)

1. Name the inspiratory muscles.
2. Name the expiratory muscles.
3. Name the respiratory and non-respiratory functions of lungs.
4. Write any four functions of respiratory system.
5. Function of surfactant.
6. Name the respiratory centers.
7. Normal values of lung volumes.
8. Normal values of lung capacities.
9. Draw labeled diagram of respiratory center.
10. List the types of hypoxia
11. Vital Capacity.
12. What is dead space?
13. What is hypoxia?

14. What is dyspnea?
15. What is cyanosis?
16. What is periodic breathing?

UNIT – IV
IV – GASTRO-INTESTINAL PHYSIOLOGY

Long Answer Questions (LAQ)

1. Describe the phase and control of deglutition. Add a note on its applied importance.
2. Write the composition of saliva? Describe the regulation of salivary secretion. Discuss its functions.
3. Describe the composition and phases of gastric secretion. Briefly explain the HCl secretion in stomach.
4. Describe the phases of pancreatic secretion.

Short Answer Questions (SAQ)

1. Give the composition and functions of saliva?
2. Give composition and functions of gastric secretion?
3. Briefly explain mechanism of HCl secretion
4. Give composition and functions of pancreatic secretion?
5. Briefly explain entero-hepatic circulation with neat diagram.
6. Briefly explain the functions of liver.
7. Classify gastro intestinal (GI) hormones and write its actions of any two hormones.
8. Peptic ulcer.

Very Short Answer Questions (VSAQ)

1. What is mastication?
2. What is deglutition?
3. Write any four functions of saliva.
4. Write any four functions of liver.
5. Functions of pancreatic juice.
6. Name any four GI hormones.
7. Functions of gastrin.
8. Functions of secretin.
9. Functions of cholecystokinin pancreozymin.
10. What are the movements of stomach?
11. What are the movements of small intestine?
12. What are the movements of large intestine?
13. Write any four functions of bile.
14. What is the difference between liver and gall bladder bile?

UNIT – IV
RENAL PHYSIOLOGY (EXCRETORY SYSTEM)

Long Answer Questions (LAQ)

1. Describe the mechanism of urine formation.
2. Define GFR (Glomerular filtration rate). Write its normal values. Briefly explain the factors affecting GFR.
3. Describe the Structure and functions of juxta glomerular apparatus

4. Draw a labeled diagram showing nerve supply to the urinary bladder. Explain the mechanism of micturition. What is a neurogenic bladder?
5. Describe the role of counter current multiplier and exchange system in concentrating urine.
6. Discuss the role of different buffer systems in regulation of acid – base balance.

Short Answer Questions (SAQ)

1. Briefly explain the functions of kidney.
2. Briefly explain the formation of urine.
3. Briefly explain mechanism behind voiding of urine.
4. Define GFR (Glomerular filtration rate). Write its normal values. List the factors affecting GFR.
5. What is the normal renal blood flow? How is it measured?
6. List the Special features of renal blood flow.
7. List any three differences between Cortical and Juxtamedullary nephrons.
8. Draw a labeled diagram of juxtaglomerular apparatus. What are its functions?
9. With a flow chart and suitable diagram, indicate the process of micturition reflex.
10. Briefly explain the role of ADH (Anti-diuretic hormone) on kidney?
11. Briefly explain renal dialysis.

Very Short Answer Questions (VSAQ)

1. Draw labeled diagram of a nephron.
2. Draw labeled diagram of filtration membrane
3. Write any four functions of kidney.
4. Functions of macula densa and Juxtaglomerular cells
5. What are the steps of urine formation?
6. Give one substances used to measure GFR and renal plasma flow.
7. What is micturition reflex?
8. What is cystometrogram?
9. Filtration fraction.
10. Define renal clearance.
11. Name the types of renal clearance.
12. List any three differences between cortical and medullary nephrons.
13. What is diuresis?
14. What is diuretics?
15. Name any two diuretics.
16. Give two functions of skin?

UNIT – V

V - ENDOCRINE PHYSIOLOGY

Short Answer Questions (SAQ)

1. List the anterior pituitary (Adenohypophysis) hormones. Give any two hormone functions.
2. Mention the physiological role of GH (Growth hormone). Add a note on its hyper and hypo secretion.
3. Name the posterior pituitary hormones. Give their functions.
4. Name the adrenal cortical and medullary hormones. Mention the functions of glucocorticoids.
5. Mention the functions of aldosterone.

6. Name the thyroid hormones. Write its functions.
7. Name the hormones synthesized by pancrease. Mention their role in maintaining blood glucose.
8. Explain the actions of hormones on hyperglycemia and hypoglycemia.

Very Short Answer Questions (VSAQ)

1. Name any four hypothalamic hormones.
2. Name the anterior pituitary (Adenohypophysis) hormones.
3. List the posterior pituitary (Neurohypophysis) hormones
4. What is diabetes mellitus? What are its types?
5. What is the difference between gigantism and agromegaly?
6. What is dwarfism?
7. Name the thyroid hormones.
8. Write any two functions of thyroid hormones.
9. What is Grave's disease?
10. What is myxedema?
11. What is cretinism?
12. What is the difference between myxedema and cretinism?
13. Functions of parathormone.
14. Functions of mineralocorticoids (Aldosterone).
15. Functions of glucocorticoids.
16. What is Cushing's syndrome?
17. What is Addison's disease?
18. What is the difference between diabetes mellitus and diabetes insipidus?
19. Name the hormones secreted by pancrease.
20. Name the diabetogenic and antidiabetogenic hormones.
21. Functions of insulin.
22. Functions of glucagon.
23. What is diuresis? What are its types?
24. Functions of adrenal medullary hormone.
25. What is fight or flight response?

V- REPRODUCTIVE SYSTEM

Short answer questions (SAQ)

1. What is spermatogenesis? Mention its stages.
2. Briefly explain the ovarian cycle.
3. Briefly explain ovulation with hormonal regulations.
4. What is menstrual cycle? Briefly explain its phases.
5. Briefly explain any two female contraceptive methods.
6. List the contraceptive methods in male and female.
7. Explain the IUCD (Intrauterine contraceptive device).
8. List the functions of estrogen.
9. List the functions of progesterone.

Very short answer questions (VSAQ)

1. Write any two functions of testosterone.
2. What is menarche and menopause?
3. What is menstrual cycle?
4. List the placental hormones.
5. List the functions of Follicular stimulating hormone (FSH).
6. List the functions of sertoli cells

7. Functions of placenta.
8. Name the factors influencing spermatogenesis.
9. What is fertilization?

UNIT – VI
NERVE MUSCLE PHYSIOLOGY

Short answer questions (SAQ)

1. Draw the labeled diagram of neuromuscular junction (NMJ).
2. Briefly explain the ionic basis of action potential in a neuron.
3. Briefly explain the steps of neuromuscular transmission of signal impulse.
4. With the help of a flow chart, depict the steps of muscle contraction.
5. Briefly explain the excitation – contraction coupling in a skeletal muscle
6. Write any four differences between skeletal, cardiac and smooth muscles.
7. Myasthenia gravis

Very short answer questions (VSAQ)

1. Describe the structure of a neuron.
2. Give the normal value of resting membrane potential of i) motor neuron and ii) skeletal muscle.
3. Give normal resting membrane potential of neuron and skeletal muscle.
4. List any two properties of nerve fibers.
5. Name any two neuromuscular blocking agent
6. Draw the structure of sarcomere
7. Name the muscle proteins.
8. List any four properties of skeletal muscle.
9. Rigor mortis

VI – CENTRAL NERVOUS SYSTEM (CNS)
Short answer questions (SAQ)

1. Briefly explain the divisions of nervous system.
2. With a flow chart and suitable diagram briefly explain the synaptic transmission of excitatory postsynaptic potential (EPSP).
3. With a flow chart and suitable diagram briefly explain the synaptic transmission of inhibitory postsynaptic potential (IPSP).
4. Briefly explain the functions of cerebral cortex.
5. What are the functions of cerebellum?
6. What are the functions of basal ganglia?
7. What are the functions of hypothalamus?

Very short answer questions (VSAQ)

1. Name any four properties of synapse.
2. Write any two functions of thalamus.
3. Functions of medulla oblongata.
4. Functions of cerebro spinal fluid (CSF).
5. Name any two neurotransmitters.
6. Name any four hypothalamic hormones.
7. Name the anterior pituitary (Adenohypophysis) hormones.
8. List the posterior pituitary (Neurohypophysis) hormones

VI - SPECIAL SENSES
Short answer questions (SAQ)

1. Trace the visual pathway with a neat labeled diagram
2. Explain the errors of refraction
3. Trace the auditory pathway with a neat labeled diagram

4. Functions of Middle ear.
5. Trace the olfactory pathway.

Very short answer questions (VSAQ)

1. Name the receptors for vision, smell, taste and hearing.
2. Functions of eye
3. List the primary colors of vision
4. Accommodation reflex.
5. What are the functions of rods and cones in eye?
6. Explain the terms ageusia, hypogeusia, dysgeusia.
7. Name the primary taste sensations

PAPER-3: BIOCHEMISTRY

UNIT-I: INTRODUCTION TO BIOCHEMISTRY

Long answer questions **(10 marks)**

1. How is acid base balance maintained in the body?
2. Write in detail about Acid base disorders

Short Questions **(6 marks)**

1. Discuss the different buffer system of acid base homeostasis.
2. What is the normal PH of blood? How is it maintained?
3. Explain the role of lungs in acid base system
4. Glass electrode and determination of pH
5. Explain the Metabolic acidosis & Metabolic alkalosis
6. Explain the Respiratory acidosis & Respiratory alkalosis
7. Role of kidney in the regulation of blood pH
8. Biochemical assessment of acid base balance

Very Short answer questions: **(3 marks)**

1. Define pH. What is the normal values of blood & urine PH
2. Define buffer and give 2 examples.
3. Define acid/ base with example
4. Write any 2 conditions for acid base imbalance.
5. What is Henderson Hasselbalch equation
6. Define Anion gap with example
7. List out any 2 causes & symptoms for Respiratory acidosis & alkalosis
8. List out any 2 causes & symptoms for Metabolic acidosis & alkalosis
9. Define isoelectric PH.

PROTEINS

Long answer questions **(10 marks)**

1. Define proteins & detail in classification of Proteins with suitable examples
2. Describe the different levels of protein structure in detail with suitable diagram

Short Questions **(6 marks)**

1. What are Essential amino acids & mention its clinical significance
2. Mention any five biologically important peptides & its clinical role
3. Define Protein denaturation & causes, characteristics with example
4. Classify amino acids in detail with example.
5. Explain Transamination & Give one example.
6. Functions of plasma proteins
7. Define Electrophoresis & its clinical significance
8. Define Chromatography & its clinical significance
9. Explain the secondary structural organization of proteins
10. Mention the hydrolytic products of proteins
11. Precipitation reactions of protein
12. Define peptide bond formation & characteristics of peptide bond
14. Determination protein structure
15. Biological functions of amino acids16 Biological functions of proteins.

Very Short answer questions: **(3 marks)**

1. Name any 4 agents causing denaturation of protein
2. Name any 2 defense & buffer proteins
3. Name the Sulphur containing essential amino acid& functions.
4. Explain oxidative deamination with example
5. Explain decarboxylation with example
6. Mention the Properties of proteins
7. Name the conjugated protein with example
8. Name the derived protein with example
9. Define A:G ratio
10. Nutritional classes of proteins with example
11. Define zwitterion
12. Fibrous & globular proteins

ENZYMES

Long answer questions **(10 marks)**

1. Classify enzymes? Explain any 4 factors affecting the enzymes activity
2. Explain the different types of enzyme inhibition with suitable examples

Short Notes **(6 marks)**

1. How are enzymes classified and give one example for each class?
2. Explain factors affecting enzyme activity
3. Mention the clinical applications of enzymes and how they are useful in diagnosis ofdisease
4. Explain the features of active site of enzyme
5. Explain the competitive inhibition with suitable example
6. Explain the non-competitive inhibition with suitable example
7. What are the Co enzymes & Explain the features with example
8. Explain the regulation of enzyme activity
9. Define Iso-enzyme? Give two examples and its importance in clinical diagnosis
10. Explain the types of specificity

Very Short answer questions **(3 marks)**

1. Define Enzymes & Catalyst
2. Define Active site
3. What is Co- enzymes, mention any 2 examples with significance.
4. Define Enzyme unit
5. Define Apo enzyme & Holoenzymes
6. What is Suicide Inhibition
7. List any 3 Therapeutic uses of enzymes.
8. Plasma enzymes
9. Define km
10. Koshland's induced fit theory
11. Fischer's template theory
12. Prosthetic groups
13. Examples of Metalloenzymes & Metal activated enzymes

UNIT II – CARBOHYDRATES

Long answer questions **(10 marks)**

1. Write in detail about the Polysaccharides and mention its importance.
2. Properties of Monosaccharides
3. Define Carbohydrates & detail in classification of carbohydrates with examples
4. Explain the reaction of Monosaccharides.

Short Questions **(6 marks)**

1. Define carbohydrate and classify with examples
2. Write a note on Mucopolysaccharides & mention one function of each
3. Differentiate between Glycogen and Starch
4. Define Mutarotation
5. List out the functions of carbohydrates
6. Explain the Clinical importance of monosaccharides
7. Properties of monosaccharides
8. Explain Homopolysaccharides & mention their function
9. Write a note on Disaccharides
10. Define glycosides? Name any 3 glycosides & mention their function

Very Short answer questions **(3marks)**

1. What is heparin? Mention its composition & function
2. List any 2 reducing sugars
3. List any 4 functions of glycoprotein
4. Difference between glycoprotein & proteoglycan
5. Why is sucrose a non-reducing sugar
6. Mention the clinical application of Inulin & Dextran
7. Difference between reducing and non-reducing sugars
8. Define invert sugar
9. What is cellulose? Mention its function
10. Note on Anomers
11. Define Epimers with examples
12. Biological importance of mannitol
13. Optical isomerism with examples.
14. Define amino sugars with examples
15. Define glycosides

NUCLEIC CHEMISTRY

Short Answer Questions **(6 marks)**

1. List any 5 synthetic analog bases and mention its function
2. Short notes on types of RNA & mention its function
3. Define nucleoside and nucleotide by giving suitable examples.
4. Describe the structure of t-RNA and mention its function
5. List the important functions of nucleotides
6. Give a detailed account on Secondary structure of DNA
7. Difference between DNA and RNA
8. Difference between Purines and Pyrimidines

Very Short Answer Questions **(3 marks)**

1. Name the purine and pyrimidine bases of DNA & RNA
2. Differentiate Ribose and Deoxy ribose.
3. Name any 4 minor bases
4. Draw a neat labeled diagram of DNA
5. Mention the types of DNA and give 3 points each
6. What are the biological important bases and its function
7. Define Chargaff's rule
8. Functions of nucleic acid
9. What is ribosomal RNA
10. Draw a neat labeled diagram of t-RNA

UNIT III - LIPIDS

Long answer questions **(10 marks)**

1. what are lipids? classify them. Give biological significance of lipids.
2. what are fatty acids? classify them. Give biological significance of polyunsaturated fattyacids
3. Explain the phospholipids with examples and its function.

Short Questions **(6 marks)**

1. Explain in detail about Sphingomyelins & their function
2. Write a short note on Micelles, Bio membranes
3. Write a short note on Sphingophospholipids
4. Write a short note on Liposomes
5. Write a short note on Triacylglycerol
6. What is saturated fatty acid and give three examples with biological significance
7. What are prostaglandins? Mention their function
8. What is unsaturated fatty acid? Explain the types and biological significance
9. Write a short note on Properties of fatty acids
10. Write a short note on Essential Fatty Acids?
11. Write a short note on Trans fatty acids
12. Write a short note on cholesterol
13. Describe briefly about the classifications of lipids with suitable examples
14. What are the compounds formed from cholesterol?
15. Write in detail about the lipoprotein & its functions

Very Short answer questions **(3 marks)**

1. Lung surfactant
2. Saponification number
3. Iodine number
4. Acid number
5. What are Apo Lipoproteins?
6. Respiratory Distress Syndrome (RDS)
7. Define halogenation
8. What is rancidity of lipids?
9. Omega 3 Fatty acids
10. Cardiolipin
11. Free Fatty Acids

12. Leukotriene's (LTs)
13. Thromboxane's (Tx)
14. Write the products formed due to complete hydrolysis of triacylglycerol
15. What is cephalin

UNIT IV - ENGERY METABOLISM AND NUTRITIONAL BIOCHEMISTRY

Long answer questions **(10 marks)**

1. Write in detail about the RDA, dietary sources, biochemical role and deficiency manifestations of folic acid/ vitamin B12/ calcium /lron
2. Explain the RDA, dietary sources, biochemical role and deficiency manifestations ofvitamin A/ vitamin D/ vitamin C/ vitamin K

Short Notes **(6 marks)**

1. List out the clinical significance of Vitamin E/ Vitamin K
2. Coenzymes & functions of any 1 B-complex vitamin (Thiamine/ Riboflavin/ Niacin/Pyridoxine/ Folic acid etc.)
3. Explain the Vitamin E has selenium sparing action.
4. Discuss the steps involved in digestion & absorption of calcium/ phosphorous / iron
5. How plasma calcium level is regulated
6. Functions of copper/ selenium/ zinc
7. Role of proteins in diets
8. Describe protein energy malnutrition
9. Nutritional value of protein
10. Dietary role of different lipids
11. Dietary fiber
12. Thermogenic effect of food
13. Obesity
14. Define nitrogen balance &Mention the factor that causes positive & negative nitrogenbalance
15. Define BMR & factor affecting BMR
16. What are Essential Amin Acids? Mention their clinical importance
17. Explain the RDA, sources, biochemical role and deficiency of sodium / potassium
18. What are Essential Fatty Acids? Mention their clinical importance.

Very Short answer questions **(3marks)**

1. Write any 3 causes for Tetany
2. Define Heme proteins/ non heme proteins
3. Hemochromatosis/ Hemosiderosis
4. Iron deficiency anemia
5. Wilson's disease
6. Fluorosis
7. Define balanced diet
8. Define calorific values & Its significance
9. Define Respiratory quotient
10. What is Glycemic index
11. What is pellagra
12. Ceruloplasmin

UNIT V CLINICAL CHEMISTRY

Short Notes **(6marks)**

1. Detail account on basic principle, methodology and diagnostic significance ofelectrophoresis.
2. Detail account on basic principle, methodology and diagnostic significance of paperchromatography
3. Short notes on Osmolality, significance and measurement.
4. write about the different types of electrophoresis & application of each type
5. Explain the method of cholesterol /urea /glucose estimation
6. write about the different types of electrophoresis & application of each type

Very Short answer questions **(2 marks)**

1. Define Osmolality/ Osmolarity
2. Write the principle of (GOD-POD) method
3. List any 3 simple test to identify Carbohydrates, lipids and proteins
4. Mention the normal values of glucose/ cholesterol/ protein/ urea/ creatinine
5. Define osmolal gap
6. what is Rf value
7. Write the principle of Molisch test /Benedict's test
8. List out the normal/ abnormal constituents of urine

ENVIRONMENTAL CHEMISTRY

Short Notes **(6 marks)**

1. Explain in detail about biomedical waste management
2. Write short notes on air pollution
3. Write short notes on Acid Rain.
4. Write short notes on carbon monoxide
5. Write short notes on mutagenesis.
6. Explain in detail about bio pesticides & its types
7. Explain briefly about the harm full effects of plastics to human health

Very Short answer questions **(3marks)**

1. Define pollutants & give 2 examples
2. What are biomedical wastes?
3. Name five categories of bio pesticides
4. Write about biological water borne disease
5. What are the problems caused by plastics?
6. Name some chemicals causing water borne disorders
7. What is Bio-degradable & Non-biodegradable Waste?
8. Define greenhouse effects
9. What is Ames test?
10. What is meant by carcinogens, and list any three chemicals causing carcinogens
11. What is biosafety?

PAPER 4A - GENERAL MICROBIOLOGY

UNIT –I : GENERAL BACTERIOLOGY

10 MARKS

1. Discuss the methods of collection and transportation of specimens.
2. Define the terms sterilization,disinfection and antisepsis.Name various agents used for sterilization and discuss the role of hot air oven in sterilization.
3. Define the terms sterilization. Discuss the role of moist heat in sterilization and their sterility control methods.
4. Discuss the various types of disinfectants and discuss the role of halogens in chemical disinfection.

6 MARKS

1. Write a short note on contribution of Louis Pasteur.
2. Write a short note on contribution of Robert Koch.
3. Write a short note on contribution of Edward Jenner.
4. Write a short note on Koch postulates.
5. Tabulate the difference between prokaryotes and Eukaryotes .
6. Draw a labeled diagram of a bacterial cell. Describe the cell wall of bacteria.
7. Draw a labeled diagram of Autoclave. Describe the structure and functioning.
8. Draw a labeled diagram of Hot air oven. Describe the structure and functioning.
9. Tabulate the difference between differentiate between flagella and fimbria .
10. Write a short note on spores.
11. Describe bacterial growth curve.
12. What are culture media? Classify and discuss them in brief.
13. Discuss in detail anaerobic methods of cultivation of bacteria.
14. Discuss the methods of preservation of microorganisms.
15. Write a short note on phenols as disinfectant.
16. Write a short note on Aldehydes as disinfectant.
17. Write a short note on Antimicrobial sensitivity testing.
18. Discuss the methods of collection and transportation of specimens.
19. Outline the steps in Gram staining and interpretation.
20. Outline Ziehl-Neelsen staining procedure and interpretation.
21. Name the different types of hospital wastes and discuss in detail the methods of disposal of hospital wastes

3 MARKS

1. Write four functions of bacterial cell wall.
2. Write four differences between gram positive & gram negative bacterial cell wall.
3. What is protoplast & spheroplast.
4. What are the functions of capsule.
5. How will you classify bacteria based on position of flagella.
6. Write four examples of spore producing bacteria.
7. Write four examples of capsule producing bacteria.
8. Write four examples of capnophilic bacteria.
9. Write four examples of strict aerobic bacteria.
10. Write four examples of strict anaerobic bacteria.

11. Write four examples of microaerophilic bacteria.
12. Define sterilization .
13. Define disinfectant .
14. Name the types of filters and their uses.
15. What is cold sterilization.
16. Define inspissation.
17. What is an agar? write its role in preparation of media.
18. Name four selective media.
19. Name four differential media.
20. Name four transport media.
21. Write the composition of TSI agar.
22. Write the principles of catalse test.
23. Write the principles of oxidase test.
24. Name the two motile and non-motile organisms

UNIT -2 : IMMUNOLOGY

6 MARKS

1. Discuss the mechanism of innate and acquired immunity.
2. What is hypersensitivity? Classify hypersensitivity reactions? Describe in detail about type I reactions.
3. Discuss the principle and clinical applications of immunofluorescence technique.
4. Discuss the principle and clinical applications of ELISA technique.
5. Describe the structure and functions of Ig M, Ig G & Ig A.
6. Write a short notes on autoimmunity.
7. Discuss about delayed type hypersensitivity.
8. Describe about phagocytosis process.
9. Herd immunity.
10. Type III Hypersensitivity.

3 MARKS

1. Write the difference between active & passive immunity.
2. Define Immunity.
3. Write two examples of each , live attenuated bacterial & viral vaccines.
4. Write two examples of each , killed bacterial & viral vaccines
5. Write four difference between live & killed vaccines.
6. Define hapten.
7. What is heterophile antigen? write two examples.
8. Write two uses of ELISA.
9. Define hypersensitivity.
10. Difference between immediate and delayed type of hypersensitivity.
11. Define autoimmunity

UNIT -3 SYSTEMIC BACTERIOLOGY

10 MARKS

1. Discuss the pathogenicity and laboratory diagnosis of *Staphylococcus aureus*.
2. Name various organism causing sore throat and discuss in detail the laboratory diagnosis of diphtheria.
3. Classify Streptococci. Discuss the pathogenesis and lab diagnosis of *S.pyogenes*.

4. Classify the Clostridia of medical importance. Describe the pathogenesis, laboratory diagnosis of gas gangrene.
5. Classify Mycobacteria. Give an account on pathogenesis and laboratory diagnosis of pulmonary tuberculosis. Add a note on BCG vaccine.
6. Discuss the morphology, pathogenesis and laboratory diagnosis of syphilis.
7. Discuss in detail about pathogenesis and laboratory diagnosis of enteric fever.
8. List the diarrhea causing bacteria. Write in detail about pathogenesis and laboratory diagnosis of *vibrio*.

6 MARKS

1. Name four causative agents of enteric fever and explain about WIDAL test.
2. Name the UTI causing bacteria. How to collect urine & laboratory diagnosis of *E.coli*.
3. Describe about Toxin produced by *staphylococcus aureus*.
4. Discuss about prophylaxis of diphtheria.
5. Difference between *Streptococcus viridians* & *Streptococcus pneumoniae*.
6. Coagulase test.
7. Tetanus.
8. Explain about morphology and pathogenicity of *Bacillus anthracis*.
9. Classification of shigella and explain the antigenic structure and toxins produced by *Shigella*.
10. Weil's diseases.
11. Laboratory diagnosis of syphilis
12. Discuss the pathogenicity of Chlamydia.

3 MARKS

1. Name the pigments produced by *Pseudomonas*.
2. Name two toxins produced by *Clostridium tetani*.
3. Define Asepsis.
4. Enumerate any four diseases caused by *Streptococcus pyogenes*.
5. Gas gangrene.
6. Name four first line drugs used to treat tuberculosis infections.
7. List four species of *Shigella*.
8. List the cultivation methods of leprae.
9. MRSA.
10. ASO
11. CRP
12. Non –gonococcal urethritis (NGU).
13. Name two selective media for V.cholera
14. Significant bacteriuria.
15. Meningitis .
16. Selective medium of Salmonella
17. VDRL and RPR.
18. Name two transport and enrichment media for *V.cholerae*.
19. What are coliform bacilli? write two examples.
20. Actinomycosis
21. List the atypical mycobacteria.
22. Ghon's focus.
23. BCG vaccine
24. Name the two beta hemolytic bacteria.

25. Mantoux test.

UNIT -4 : VIROLOGY

10 MARKS

1. Name two RNA viruses.Name four methods of transmission of Hepatitis B virus infection in man.Mention the schedule of Hepatitis B vaccination.
2. Mention the modes of transmission of HIV in humans.Draw a neat diagram of HIV and label the parts.List the tests available for the confirmation of HIV in the microbiology laboratory.
3. Describe the laboratory diagnosis and prophylaxis of poliomyelitis.
4. Explain the laboratory diagnosis and prophylaxis of Rabies.

6 MARKS

1. Describe the serological markers of Hepatitis B virus.
2. Describe the prophylaxis of polio virus.
3. Complications of dengue virus.
4. Write a short note on adenovirus.
5. Infectious mononucleosis.
6. List the opportunistic infections in AIDS patient.

3 MARKS

1. Name four DNA virus.
2. Name four RNA virus
3. Haemorrhagic causing virus.
4. MMR vaccine.
5. Draw a neat labeled diagram of HIV.
6. Rabies vaccine.
7. List the cultivation methods of virus.

UNIT -5: PARASITOLOGY

6 MARKS

1. Difference between amoebic and bacillary dysentery.
2. Describe the life cycle of *Entamoeba histolytica*.
3. Describe the life cycle of *Giardia lamblia*
4. Describe the life cycle of *Malaria*
5. Describe the life cycle of *hookworm*
6. Describe the life cycle of *Roundworm*
7. Lab diagnosis of Plasmodium.
8. Describe the lab diagnosis of parasitological samples.

3 MARKS

1. Morphology of *E.histolytica*.
2. Black water fever.
3. Vectors.
4. Morphology of Leishmania.
5. Peripheral blood smear of Malaria.
6. Dog tapeworm.
7. Cysticercus bovis.
8. Cysticercus cellulose.
9. Microfilaria.

UNIT -6: MYCOLOGY

6 MARKS

1. Discuss the laboratory diagnosis of fungal infections.
2. Write a short notes on zygomycosis.
3. Aspergillosis
4. Describe about systemic mycoses.
5. Cryptococcosis - Lesions caused & Laboratory diagnosis.
6. Discuss the opportunistic mycoses.
7. Describe the morphology & cultural characteristics of Dermatophytes.
8. Describe the morphology& cultural characteristics of *Candida albicans*

3 MARKS

1. SDA
2. Name two selective culture media for Candida spp.
3. Name two selective culture media for Cryptococcus spp.
4. What is germ tube test.
5. Mention four fungal laboratory contaminants .
6. Name four dimorphic fungus.
7. Name two examples of yeast.
8. Name four opportunistic fungus.
9. Name four superficial mycoses.
10. Mycetoma

UNIT -7: HOSPITAL INFECTION CONTROL

6 MARKS

1. Biomedical waste management.
2. Write a short note on universal precaution.
3. Write a short note on universal precaution.
4. Mode of transmission of infections.
5. Write short note on the vaccines recommended for health care workers.
6. Recall the procedure to be followed for sharp injury to health care workers.
7. Describe the prevention of Nosocomial infections.

3 MARKS

1. Define segregations.
2. List four infectious waste.
3. Define land filling.
4. What is HICC? List two roles of HICC.
5. List two techniques used for the treatment of infectious waste.
6. Define universal precautions.
7. Define PPE.
8. List four methods to control the Hospital acquired infections.

PAPER 4B - GENERAL PATHOLOGY

LONG ANSWER **(10 MARKS)**

1. Mention the types of necrosis with two example each
2. Mention the types of cellular adaptations with one example each
3. Mention the types of cell injury and describe the changes seen in each type
4. Describe the morphological alterations in reversible cell injury
5. Describe the morphological alterations in irreversible cell injury

SHORT ANSWERS **(6 MARKS)**

1. Tabulate the differences between exudate and transudate
2. Tabulate the differences between benign and malignant tumor
3. Define Gangrene. Mention the types of gangrenes with one example each
4. Mention the factors that influence wound healing and repair
5. Tabulate the differences between acute and chronic inflammation
6. Describe the principle chemical mediators of inflammation
7. Tabulate the differences between necrosis and apoptosis
8. Write a short note on apoptosis
9. Describe causes and morphological features of chronic inflammation
10. Explain granulomatous inflammation with a neat labeled diagram
11. Tabulate the differences between dry and wet gangrene
12. Explain mode of spread of tumors in brief
13. Adverse effects of smoking
14. Write a short note on asbestosis
15. Write a short note on silicosis

VERY SHORT ANSWERS **(3 MARKS)**

1. Define apoptosis. Mention two examples.
2. List the cardinal signs of acute inflammation
3. Define acute inflammation reaction and mention its outcome
4. Define chronic inflammation and give 2 examples
5. Mention the components of granulation tissue
6. Mention the parts of microscope
7. Give 2 examples of granulomatous inflammation
8. Define neoplasia
9. Define hypertrophy. Give 2 example
10. Define atrophy. Give 2 example
11. Define hyperplasia. Give 2 example
12. Define metaplasia. Give 2 example
13. Define reversible cell injury and mention two features
14. Define phagocytosis.
15. Define Virchow triad

HAEMATOLOGY

SHORT ANSWERS **(6 MARKS)**

1. Define anemia. Mention the types of anemia on the basis of etiology.
2. Classify leukemia. Mention general features of acute leukemia.
3. Enumerate various color codlings of various biomedical waste disposal with 4 examples

4. Describe the collection. transport, preservation and processing of clinical specimen
5. Describe the structure and function of different types of WBC'S with a neat labeled diagram
6. Write a short note on occupational health hazards.
7. Describe mechanism of homeostasis
8. Describe various types anticoagulant and its uses with its color coding
9. Explain microscopic examination of urine samples.
10. Describe the method of collection, transport, preservation of CSF.
11. Write short note on Coomb's test
12. Define anemia . Mention the general clinical features and basic interpretation of anemia.
13. Classify hemolytic anemia and mention in brief the laboratory findings

VERY SHORT ANSWERS **(3 MARKS)**

1. Define Landstenier's Law
2. Define blood group
3. Mention the normal platelet count and function of platelets.
4. Mention the types of transfusion transmitted infection
5. Mention 2 causes of Eosinophilia.
6. Mention 2 causes of Neutrophilia.
7. Mention 4 preservative of urine and its indication
8. Define cross matching
9. Mention Principle of major cross matching
10. Mention Principle of minor cross matching
11. Write about the principle of benedicts test.
12. Write about biomedical waste management.

SYSTEMIC PATHOLOGY

LIVER

1. Define Cirrhosis.(3M)
2. Describe in detail about viral hepatitis. (6M)
3. Mention the various stages of alcoholic liver disease(3M)
4. Describe in detail about gall stones.(6M)
5. Write about the etiology, pathogenesis and clinical features of chronic cholecystitis.(10M)

BRAIN TUMOURS

1. Classify brain tumours (3M)

KIDNEY

1. Mention the types of renal calculi.(3M)
2. Describe the clinical features of renal stones.(3M)
3. Define hydronephrosis (3M)
4. Classify renal tumours.(3M)

BONE TUMOURS

1. Classify bone tumours(3M)
2. Give two examples of benign bone tumors.(3M)
3. Give two examples of malignant bone tumours(3M)

FEMALE GENITAL TRACT

1. Classify ovarian tumours(3M)
2. Describe the types of endometrial hyperplasia and risk factors associated with it.(6M)
3. Write a short note on risk factors for endometrial cancer.(6M)
4. Describe the etiopathogenesis and risk factors for cervical cancer.(10M)

BREAST

1. Describe the risk factors and clinical features of breast carcinoma.(10M)
2. Give 2 example of benign breasts tumour (3M)
3. Give 2 example of malignant breast tumours.(3M)

CARDIOVASCULAR SYSTEM
RHEUMATIC HEART DISEASES

1. Enumerate the modified Jones criteria for rheumatic heart disease(6M)

INFECTITVE ENDOCARDITIS

1. List the causative organisms for infective endocarditis(3M)
2. Enumerate the Dukes criteria for infective endocarditis.(6M)

ARTHEROSCLEROSIS

1. Enumerate the risk factors for atherosclerosis.(6M)
2. Mention two complications of atherosclerosis (3M)\
3. Mention the types of Ishemic heart disease. (3M)
4. Write in detail about myocardial infarction. (10M)

RESPIRATORY SYSTEM
LUNG INFECTIONS

1. Describe the various Stages of Pneumonia.(6M)
2. Define Pneumonia.(6M)

COPD

1. Define emphysema.(3M)
2. Define chronic bronchitis.(3M)
3. Define broncheactasis.(3M)
4. Tabulate the differences between chronic bronchitis and emphysema.(6M)
5. Mention various systemic effects of smoking (3M)

ASTHMA

1. Describe the etiopathogenesis and clinical features of bronchial asthma.(6M)
2. Define ARDS(3M)
3. Give 2 examples for conditions associated with ARDS.(3M)

GASTROINTESTINAL SYSTEM

1. Enumerate the clinical features of peptic ulcer.(3M)
2. Describe the Risk factors and clinical features of carcinoma stomach.(10M)
3. Describe the Risk factors and clinical features of carcinoma colon.(10M)

ABILITY ENHANCEMENT COMPULSORY ELECTIVES
AECC-1- ENGLISH QUESTION BANK

UNIT-1 – GRAMMAR

Six Mark Questions

1. Define grammar, Explain the types of grammar with example.
2. What do you mean by noun and Explain its type with examples?
3. Write a brief note on types of sentences with examples.
4. How many types of tenses are there?

Two Mark Questions

1. Define verb.
2. Define Adjective with example.
3. Define Adverb with example.
4. Define Gerund and preposition.
5. What do you mean by conjunction and interjection?
6. How many types of tenses are there?
7. He Said, “My father is ill”.(Change the sentence into indirect speech)
8. He said to her, “Where are you going”? (Change the sentence into indirect speech)
9. They said that they can’t live without water.(change the sentence into direct speech)
10. Radha said, ”I am very busy now”.(Change the sentence into indirect speech)
11. She says that she is a little bit nervous.(change the sentence into direct speech)
12. You are busy, _____? (Fill the sentence with suitable question tag)
13. Helmet makes driving safe, _____? (Fill the sentence with suitable question tag)
14. Dogs cannot fly, _____? (Fill the sentence with suitable question tag)
15. She was talking, _____?(Fill the sentence with suitable question tag)
16. He won’t come today____?(Fill the sentence with suitable question tag)
17. He _____ (drink)tea every morning. (Fill the sentence with suitable tense)
18. I enjoy_____(read) at a cafe.(Fill the sentence with suitable tense)
19. We_____(see) a film last night.(Fill the sentence with suitable tense)
20. They went home, after they_____(finish) their work.(Fill the sentence with suitable tense)
21. I_____(stay) here till you return.(Fill the sentence with suitable tense)
22. I_____ do it tomorrow. (Fill the sentence with modal verb)
23. _____ you help me with the house work, please? (Fill the sentence with modal verb)
24. I _____ speak English.(Fill the sentence with modal verb)
25. The doctor_____ see you now.(Fill the sentence with modal verb)
26. He _____ be the love of my life.(Fill the sentence with modal verb)
27. All_____ submit your notebook.(Fill the sentence with modal verb)
28. Seetha loves Rama. (Change the sentence to passive voice)
29. The story has been read by me. (Change the sentence to active voice)
30. Do you speak English well? (Change the sentence to passive voice)
31. Open the door (Change the sentence to passive voice)
32. Let the T.V be watched by them. (Change into active voice)
33. He admitted his guilt. (Change the simple sentence into complex sentence)
34. In-spite of his hard work, he failed. (Change the simple sentence into compound sentence)

35. It was raining, but they went out. (Change the compound sentence into simple sentence)
36. He failed to prove that he was innocent. (Chance the complex sentence into simple sentence)
37. If you do not work hard, you will fail. (Change the complex sentence into compound sentence)
38. Everest is _____ highest mountain in the world. (Fill up with the suitable article)
39. The rose is _____ beautiful flower. (Fill up with the suitable article)
40. _____ umbrella is useful in rain. (Fill up with the suitable article)
41. Do you paly _____ Piano? (Fill up with the suitable article)
42. _____ unicorn is a special creature. (Fill up with the suitable article)
43. Red _____ danger. (Fill up with suitable prepositions)
44. I acted _____him. (Fill up with suitable prepositions)
45. Mr. Kumar is _____ the office. (Fill up with suitable prepositions)
46. I am ready _____ help. (Fill up with suitable prepositions)
47. Put it _____ (Fill up with suitable prepositions)
48. Bharath is the cleverest of all the boys in the class. (Identify the degrees of comparison)
49. Seetha is taller than Geetha.(Identify the degrees of comparison)
50. Hyderabad is not so hot as Chennai.(Identify the degrees of comparison)
51. I am not so strong as he. (Identify the degrees of comparison)
52. Mumbai is bigger than Hyderabad. (Identify the degrees of comparison)

UNIT-2 : VOCABULARY

Six Mark Questions

1. Define vocabulary and explain its types.
2. How to improve our vocabulary.
3. Write the uses of Dictionary.

Two Mark Questions

1. Use a prefix to make the word meaningful:

Possible

2. Use a prefix to make the word meaningful:

Legal

3. Use a suffix to make the word meaningful:

Beauty

4. Use a suffix to make the word meaningful:

Clever

5. Use a suffix to make the word meaningful:

Danger

6. Give the antonym:

Weak

7. Give the antonym:

Open

8. Give the antonym:

Narrow

9. Give the antonym:

Expand

10. Give the antonym:

Superior

11. Give the synonym:
Incredible
12. Give the synonym:
Ecstatic
13. Give the synonym:
Rest
14. Give the synonym:
Behavior
15. Give the synonym:
Tired
16. Use the following idioms / phrases into sentence:
In black and white
17. Use the following idioms / phrases into sentence:
Get away
18. Use the following idioms / phrases into sentence:
Come forward
19. Use the following idioms / phrases into sentence:
Break down
20. Use the following idioms / phrases into sentence:
Look after someone
21. Write any two words miss used or confused?
22. Define Homophones.
23. Use the homophonic words in the sentences.
Write & right
24. Use the homophonic words in the sentences.
Whole & hole
25. Use the homophonic words in the sentences.
Weight & wait
26. Use the homophonic words in the sentences.
Sell & cell
27. Use the homophonic words in the sentences.
Sum & some

UNIT-3 : WRITING SKILLS
(Six Mark Questions)

1. Make a precise of the following passage and suggest a heading:

Effective speaking depends on effective listening. It takes energy to concentrate on hearing and to concentrate on understanding what has been heard. Incompetent listeners fail in a number of ways. First, they may drift. Their attention drifts from what the speaker is saying. Second, they may counter. They find counter-arguments to whatever a speaker may be saying. Third, they compete. Then, they filter. They exclude from their understanding those parts of the message which do not readily fit with their own frame of reference. Finally, they react. They let personal feelings about a speaker or subject override the significance of the message which is being sent.What can a listener do to be more effective? The first key to effective listening is the art of concentration. If a listener positively wishes to concentrate on receiving a message his chances of success are high. It may need determination. Some speakers are difficult to follow, either because of voice problems or because of the form in which they send a message. There is then a particular need for the determination of a listener to concentrate on what is being said.Concentration is helped by alertness. Mental alertness is helped by physical alertness. It is not simply physical fitness, but also positioning of the body, the limbs and the head. Some people also find it helpful to their concentration if they hold the head slightly to one side. One

useful way for achieving this is intensive note-taking, by trying to capture the critical headings and sub-headings the speaker is referring to. Note-taking has been recommended as an aid to the listener. It also helps the speaker. It gives him confidence when he sees that listeners are sufficiently interested to take notes; the patterns of eye-contact when the note-taker looks up can be very positive; and the speaker's timing is aided-he can see when a note-taker is writing hard and can then make effective use of pauses. Posture too is important. Consider the impact made by a less competent listener who pushes his chair backwards and slouches. An upright posture helps a listener's concentration. At the same time it is seen by the speaker to be a positive feature amongst his listeners. Effective listening skills have an impact on both the listener and the speaker.

2. **Make a precise of the following passage and suggest a heading:**

Despite all the research every one of us catches cold and most of us catch it frequently. Our failure to control one of the commonest of all ailments sometimes seems ridiculous. Medical science regularly practises transplant surgery and has rid whole countries of such killing diseases as Typhus and the Plague. But the problem of common cold is unusually difficult and much has yet to be done to solve it. It is known that a cold is caused by one of a number of viral infections that affect the lining of the nose and other passages leading to the lungs but the confusing variety of viruses makes study and remedy very difficult. It was shown in 1960 that many typical colds in adults are caused by one or the other of a family of viruses known as rhinoviruses, yet there still remain many colds for which no virus has as yet been isolated.There is also the difficulty that because they are so much smaller than the bacteria which cause many other infections, viruses cannot be seen with ordinary microscopes. Nor can they be cultivated easily in the bacteriologist's laboratory, since they only grow within the living cells of animals or plants. An important recent step forward, however, is the development of the technique of tissue culture, in which bits of animal tissue are enabled to go on living and to multiply independently of the body. This has greatly aided virus research and has led to the discovery of a large number of viruses. Their existence had previously been not only unknown but even unsuspected.The fact that we can catch a cold repeatedly creates another difficulty. Usually, a virus strikes only once and leaves the victim immune to further attacks. Still, we do not gain immunity from colds. Why? It may possibly be due to the fact that while other viruses get into the bloodstream where anti-bodies can oppose them, the viruses causing cold attack cells only on the surface. Or it may be that immunity from one of the many different viruses does not guarantee protection from all the others. It seems, therefore, that we are likely to have to suffer colds for some time yet.

3. **Make a precise of the following passage and suggest a heading:**

There is nothing more frustrating than when you sit down at your table to study with the sincerest of intentions and instead of being able to finish the task at hand, you find your thoughts wandering. However, there are certain techniques that you can use to enhance your concentration. "Your concentration level depends on a number of factors," says Samuel Ghosh, a social counsellor. "In order to develop your concentration span, it is necessary to examine various 2 facets of your physical and internal environment," she adds. To begin with one should attempt to create the physical environment that is conducive to focussed thought. Whether it is the radio, TV or your noisy neighbours, identify the factors that make it difficult for you to focus. For instance, if you live in a very noisy neighbourhood, you could try to plan your study hours in a nearby library. She disagrees with the notion that people can concentrate or study in an environment with distractions like a loud television, blaring music etc. "If you are distracted

when you are attempting to focus, your attention and retention powers do not work at optimum levels," cautions Ghosh. "Not more than two of your senses should be activated at the same time," she adds. What that means is that music that sets your feet tapping is not the ideal accompaniment to your books. Also do not place your study table or desk in front of a window. "While there is no cure for a mind that wants to wander, one should try and provide as little stimulus as possible. Looking out of a window when you are trying to concentrate will invariably send your mind on a tangent," says Ghosh. The second important thing, she says, is to establish goals for oneself instead of setting a general target and then trying to accomplish what you can in a haphazard fashion. It is very important to decide what you have to finish in a given span of time. The human mind recognizes fixed goals and targets and appreciates schedules more than random thoughts. Once your thoughts and goals are in line, a focussed system will follow. She recommends that you divide your schedule into study and recreation hours. When you study, choose a mix of subjects that you enjoy and dislike and save the former for the last so that you have something to look forward to. For instance, if you enjoy verbal skill tests more than mathematical problems, then finish Maths first. Not only will you find yourself working harder, you will have a sense of achievement when you wind up. Try not to sit for more than 40 minutes at a stretch. Take a very short break to make a cup of tea or listen to a song and sit down again. Under no circumstances, should one sit for more than one and a half hours. Short breaks build your concentration and refresh your mind. However, be careful not to overdo the relaxation. It may have undesired effects.

4. **Make a precise of the following passage and suggest a heading:**

Research has shown that the human mind can process words at the rate of about 500 per minute, whereas a speaker speaks at the rate of about 150 words a minute. The difference between the two at 350 is quite large. So a speaker must make every effort to retain the attention of the audience and the listener should also be careful not to let his mind wander. Good communication calls for good listening skills. A good speaker must necessarily be a good listener. Listening starts with hearing but goes beyond. Hearing, in other words is necessary but is not a sufficient condition for listening. Listening involves hearing with attention. Listening is a process that calls for concentration. While, listening, one should also be observant. In other words, listening has to do with the ears, as well as with the eyes and the mind. Listening is to be understood as the total process that involves hearing with attention, being observant and making interpretations. Good communication is essentially an interactive process. It calls for participation and involvement. It is quite often a dialogue rather than a monologue. It is necessary to be interested and also show or make it abundantly clear that one is interested in knowing what the other person has to say. Good listening is an art that can be cultivated. It relates to skills that can be developed. A good listener knows the art of getting much more than what the speaker is trying to convey. He knows how to prompt, persuade but not to cut off or interrupt what the other person has to say. At times the speaker may or may not be coherent, articulate and well organized in his thoughts and expressions. He may have it in his mind and yet he may fail to marshal the right words while communicating his thought. Nevertheless, a good listener puts him at ease, helps him articulate and facilitates him to get across the message that he wants to convey. For listening to be effective, it is also necessary that barriers to listening are removed. Such barriers can be both physical and psychological. Physical barriers generally relate to hindrances to proper hearing whereas psychological barriers are more fundamental and relate to the interpretation and evaluation of the speaker and the message.

5. **Make a precise of the following passage and suggest a heading:**

The term dietary fibres refers collectively to indigestible carbohydrates present in plant foods. The importance of these dietary fibres came into the picture when it was observed that the people having diet rich in these fibres, had low incidence of coronary heart disease, irritable bowel syndrome, dental caries and gall stones. The foodstuffs rich in these dietary fibres are cereals and grains, legumes, fruits with seeds, citrus fruits, carrots, cabbage, green leafy vegetables, apples, melons, peaches, pears etc. These dietary fibres are not digested by the enzymes of the stomach and the small intestine whereas most of other carbohydrates like starch and sugar are digested and absorbed. The dietary fibres have the property of holding water and because of it, these get swollen and behave like a sponge as these pass through the gastrointestinal tract. The fibres add bulk to the diet and increase transit time in the gut. Some of these fibres may undergo fermentation in the colon. In recent years, it has been considered essential to have some amount of fibres in the diet. Their beneficial effects lie in preventing coronary heart disease, and decreasing cholesterol level. The fibres like gums and pectin are reported to decrease postprandial (after meals) glucose level in the blood. These types of dietary fibres are recommended for the management of certain types of diabetes. Recent studies have shown that the fenugreek (Methi) seeds, which contain 40 per cent gum, are effective in decreasing blood glucose and cholesterol levels as compared to other gum containing vegetables. Some dietary fibres increase transit time and decrease the time of release of ingested food in colon. The diet having less fibres is associated with colon cancer and the dietary fibres may play a role in decreasing the risk of it. The dietary fibres hold water so that stools are soft, bulky and readily eliminated. Therefore, high fibre intake prevents or relieves constipation. The fibres increase motility of the small intestine and the colon and by decreasing the transit time there is less time for exposure of the mucosa to harmful toxic substances. Therefore, there is a less desire to eat . and the energy intake can be maintained within the range of requirement. This phenomenon helps in keeping a check on obesity. Another reason in helping to decrease obesity is that the high-fibre diets have somewhat lower coefficients of digestibility. The dietary fibres may have some adverse effects on nutrition by binding some trace metals like calcium, magnesium, phosphorus, zinc and others and therefore preventing their proper absorption. This may pose a possibility of nutritional deficiency especially when diets contain marginal levels of mineral elements. This may become important constraints on increasing dietary fibres. It is suggested that an intake of 40 grams dietary fibres per day is desirable.

6. Write a letter to your uncle thanking him for the birthday present he had sent for you.
7. Write a letter to your mother about your daily routine.
8. Write a letter to your younger brother who has grown very weak. Suggest ways how he can improve his health.
9. Write a letter to your younger brother who has grown very weak. Suggest ways how he can improve his health.
10. Write a letter to your father requesting him to buy you a cycle.
11. Write an application to your Principal requesting him to grant leave. Also mention reason/reasons.
12. You are Nirmal/Nirmala, a student of Government High School, Gurgaon. Write an application to the Principal of your school, requesting him to allow you full fee concession.

13. Write an application to the Principal of your school to allow you to change your section.
14. You have lost your library card. Write a letter to the librarian to issue you a duplicate card.
15. Write a letter to the Chairman of the Municipal Board regarding insanitary conditions of the locality you live in.

Rearrange the following jumbled sentences to meaningful sentences:

1.are machines/to think/robots/that use/a computer brain
2.are sent/computer brain/in the robot's parts/messages/from the/to motors
3.can be/to do/of work/robots/programmed/many kinds
4.is the/computer science/concerned with/robotics/field/and engineering/creating robots

Two Mark Questions

1. How is note making important in your profession?
2. How many types of letters are there?
3. Define skimming.

UNIT-4 : SPOKEN COMMUNICATION

Six Mark Questions

1. Write a Dialogue between a shopkeeper and a customer.
2. Write a Dialogue between two friends on the topic of air pollution.
3. Write a Dialogue between two new comers in college campus.
4. Write a Dialogue between a Nurse and a doctor.
5. Write a Dialogue between a student and a teacher.
6. Why is phonetics important in studying English.
7. Write a conversation two friends discussing about the online classes.
8. Describe a brief note on group discussion.
9. What are the good qualities of debater?

Two Mark Questions

1. Write a short note on hazards of cell phone usage?
2. Describe your favorite friend.
3. Define pronunciation.
4. Define intonation.
5. Write any two words in British English and American English.
6. Define debate.

UNIT-5 : LISTENING AND READING SKILLS

Six Mark Questions

1. Read the following and answer the questions given below

   "I Have a Dream" is a public speech delivered by American civil rights activist Martin Luther King Jr. during the March on Washington for Jobs and Freedom on August 28, 1963, in which he calls for an end to racism in the United States and called for civil and economic rights. Delivered to over 250,000 civil rights supporters from the steps of the Lincoln Memorial in Washington, D.C., the speech was a defining moment of the civil rights movement.

   Beginning with a reference to the Emancipation Proclamation, which freed millions of slaves in 1863, King observes that: "one hundred years later, the Negro still is not free". Toward the end of the speech, King departed from his prepared text for a partly improvised peroration on the theme "I have a dream", prompted by Mahalia Jackson's cry: "Tell them about the dream, Martin!" In this

part of the speech, which most excited the listeners and has now become its most famous, King described his dreams of freedom and equality arising from a land of slavery and hatred. Jon Meacham writes that, "With a single phrase, Martin Luther King Jr. joined Jefferson and Lincoln in the ranks of men who've shaped modern America". The speech was ranked the top American speech of the 20th century in a 1999 poll of scholars of public address.

Q1.What issues does Martin Luther King's speech address?
1.Continuation of racism
2.End to racism and civil and economic rights
3. Civil rights
4.Civil War

Q2.What pushes King to speak: "I have a dream"?
1.He reads out the Emancipation Proclamation
2.He is prompted by Mahalia Jackson
3.he is overwhelmed by the crowd
4.Licoln had asked him to give the speech.

Q3.From the last paragraph, give one word for "to leave"
1.Departed
2. Proclamation
3.Improvised
4.Address

Q4.What is the name of martin Luther King's famed speech?
1.The Emancipation Proclamation
2.An Improvisation
3. A Peroration
4.I Have a Dream

Q5.In front of whom does King speak?
1.The civil rights supporters
2.His friends
3.Lincoln
4.The Negroes

Read the following and answer the questions given below

Conflict had existed between Spain and England since the 1570s. England wanted a share of the wealth that Spain had been taking from the lands it had claimed in the Americas.

Elizabeth I, Queen of England, encouraged her staunch admiral of the navy, Sir Francis Drake, to raid Spanish ships and towns. Though these raids were on a small scale, Drake achieved dramatic success, adding gold and silver to England's treasury and diminishing Spain's supremacy. Religious differences also caused conflict between the two countries. Whereas Spain was Roman Catholic, most of England had become Protestant. King Philip II of Spain wanted to claim the throne and make England a Catholic country again. To satisfy his ambition and also to retaliate against England's theft of his gold and silver, King Philip began to build his fleet of warships, the Spanish Armada, in January 1586.

Philip intended his fleet to be indestructible. In addition to building new warships, he marshaled 130 sailing vessels of all types and recruited more than 19,000 robust

soldiers and 8,000 sailors. Although some of his ships lacked guns and others lacked ammunition, Philip was convinced that his Armada could withstand any battle with England.

The martial Armada set sail from Lisbon, Portugal, on May 9, 1588, but bad weather forced it back to port. The voyage resumed on July 22 after the weather became more stable.

The Spanish fleet met the smaller, faster, and more maneuverable English ships in battle off the coast of Plymouth, England, first on July 31 and again on August 2. The two battles left Spain vulnerable, having lost several ships and with its ammunition depleted. On August 7, while the Armada lay at anchor on the French side of the Strait of Dover, England sent eight burning ships into the midst of the Spanish fleet to set it on fire. Blocked on one side, the Spanish ships could only drift away, their crews in panic and disorder. Before the Armada could regroup, the English attacked again on August 8.

Although the Spaniards made a valiant effort to fight back, the fleet suffered extensive damage. During the eight hours of battle, the Armada drifted perilously close to the rocky coastline. At the moment when it seemed that the Spanish ships would be driven onto the English shore, the wind shifted, and the Armada drifted out into the North Sea. The Spaniards recognized the superiority of the English fleet and returned home, defeated.

Q1.Sir Francis Drake added wealth to the treasury and diminished Spain's ___.

unlimited power
unrestricted growth
territory
treaties

Q2. King Philip recruited many __ soldiers and sailors.

warlike
strong
accomplished
timid
inexperienced

Q3. The __ Armada set sail on May 9, 1588.

complete
warlike
independent
isolated

Q4. The two battles left the Spanish fleet ___.

open to change
triumphant
open to attack
defeated
discouraged

Q5. The Armada was __ on one side.

closed off
damaged
alone
circled

2. Read the following and answer the questions given below

Opera refers to a dramatic art form, originating in Europe, in which the emotional content is conveyed to the audience as much through music, both vocal and

instrumental, as it is through the lyrics. By contrast, in musical theater an actor's dramatic performance is primary, and the music plays a lesser role. The drama in opera is presented using the primary elements of theater such as scenery, costumes, and acting. However, the words of the opera, or libretto, are sung rather than spoken. The singers are accompanied by a musical ensemble ranging from a small instrumental ensemble to a full symphonic orchestra.

1. It is pointed out in the reading that opera ----.
   A) has developed under the influence of musical theater
   B) is a drama sung with the accompaniment of an orchestra
   C) is not a high-budget production
   D) is often performed in Europe
   E) is the most complex of all the performing arts

2. We can understand from the reading that ----.
   A) people are captivated more by opera than musical theater
   B) drama in opera is more important than the music
   C) orchestras in operas can vary considerably in size
   D) musical theater relies above all on music
   E) there is argument over whether the music is important or the words in opera

3. It is stated in the reading that ----.
   A) acting and costumes are secondary to music in musical theater
   B) many people find musical theater more captivating than opera
   C) music in musical theater is not as important as it is in opera
   D) an opera requires a huge orchestra as well as a large choir
   E) opera doesn't have any properties in common with musical theater.

Read the following passage and answer the questions given below.

Dolphins are regarded as the friendliest creatures in the sea and stories of them helping drowning sailors have been common since Roman times. The more we learn about dolphins, the more we realize that their society is more complex than people previously imagined. They look after other dolphins when they are ill, care for pregnant mothers and protect the weakest in the community, as we do. Some scientists have suggested that dolphins have a language but it is much more probable that they communicate with each other without needing words. Could any of these mammals be more intelligent than man? Certainly the most common argument in favor of man's superiority over them that we can kill them more easily than they can kill us is the least satisfactory. On the contrary, the more we discover about these remarkable creatures, the less we appear superior when we destroy them.

1. It is clear from the passage that dolphins ----.
A) don't want to be with us as much as we want to be with them
B) are proven to be less intelligent than once thought
C) have a reputation for being friendly to humans
D) are the most powerful creatures that live in the oceans
E) are capable of learning a language and communicating with humans

2. The fact that the writer of the passage thinks that we can kill dolphins more easily than they can kill us ----.

A) means that they are better adapted to their environment than we are
B) shows that dolphins have a very sophisticated form of communication
C) proves that dolphins are not the most intelligent species at sea
D) does not mean that we are superior to them
E) proves that Dolphins have linguistic skills far beyond what we previously thought

3. One can infer from the reading that ----.
A) dolphins are quite abundant in some areas of the world
B) communication is the most fascinating aspect of the dolphins
C) dolphins have skills that no other living creatures have such as the ability to think
D) it is not usual for dolphins to communicate with each other
E) dolphins have some social traits that are similar to those of humans.

Read the following and answer the questions given below.

Naval architects never claim that a ship is unsinkable, but the sinking of the passenger-and-car ferry Estonia in the Baltic surely should have never have happened. It was well designed and carefully maintained. It carried the proper number of lifeboats. It had been thoroughly inspected the day of its fatal voyage. Yet hours later, the Estonia rolled over and sank in a cold, stormy night. It went down so quickly that most of those on board, caught in their dark, flooding cabins, had no chance to save themselves: Of those who managed to scramble overboard, only 139 survived. The rest died of hypothermia before the rescuers could pluck them from the cold sea. The final death toll amounted to 912 souls. However, there were an unpleasant number of questions about why the Estonia sank and why so many survivors were men in the prime of life, while most of the dead were women, children and the elderly.

1. One can understand from the reading that ----.
A) the lifesaving equipment did not work well and lifeboats could not be lowered
B) design faults and incompetent crew contributed to the sinking of the Estonia ferry
C) 139 people managed to leave the vessel but died in freezing water
D) naval architects claimed that the Estonia was unsinkable
E) most victims were trapped inside the boat as they were in their cabins

2. It is clear from the passage that the survivors of the accident ----.
A) helped one another to overcome the tragedy that had affected them all
B) were mostly young men but women, children and the elderly stood little chance
C) helped save hundreds of lives
D) are still suffering from severe post-traumatic stress disorder
E) told the investigators nothing about the accident

3. According to the passage, when the Estonia sank, ----.
A) there were only 139 passengers on board
B) few of the passengers were asleep
C) there were enough lifeboats for the number of people on board
D) faster reaction by the crew could have increased the Estonia's

chances of survival

E) all the passengers had already moved out into the open decks

6.Medical report writing.
You are a staff nurse in the psychiatry ward.Mr.Rammohan aged 40 was admitted in your ward with the complaint of Dengue .Write a report of this to your clinical instructor.

7.Medical report writing.
You are a staff nurse in the psychiatry ward.Ms.lalitha aged 34 was admitted in your ward with the complaint of Alzheimer disorder(memory loss) .Write a report of this to your clinical instructor.

8.Medical report writing.
You are a staff nurse in the psychiatry ward.Mr.Ranjith aged 50 was admitted in your ward with the complaint of Obsessive compulsive disorder .Write a report of this to your clinical instructor.

9.Medical report writing.
You are a staff nurse in the special ward.Mrs. Jaya priya aged 30 was admitted in your ward with the complaint of Diarrhea .Write a report of this to your clinical instructor.

10.Medical report writing.
You are a staff nurse in the psychiatry ward.Mr.Vijay aged 20 was admitted in your ward with the complaint of Anxiety disorder .Write a report of this to your clinical instructor.

11.Write a Comprehensive Report on the outbreak of Covid-19 in your Locality.

12.Write a Comprehensive Report on the outbreak of Malaria in your Locality.

13.Write a Comprehensive Report on the outbreak of Dengue in your Locality.

14.Write a Comprehensive Report on the outbreak of Cholera in your Locality.

15.Write a Comprehensive Report on the outbreak of Pneumonia in your Locality.

Two Mark Questions

1. How to make effective reading?
2. What are the types of reading?
3. Why medical report writing is important in your profession?
4. What are the skills you should have for successful Telephone conversation

II YEAR

PAPER – 5: RADIOLOGICAL PHYSICS

THREE MARKS

1. Define atomic structure. (UNIT - I)
2. Difference between mass and atomic number
3. Define ionization.
4. Define excitation.
5. Name some isotopes.
6. Define binding energy.
7. Ohm's law & Kirchhoff's law.
8. What is self-induction?
9. What is mutual induction?
10. Define Fluorescence and Phosphorescence.
11. What is luminescence?
12. How X-Rays are produced? (UNIT - II)
13. Define Line focus principle.
14. What is Space charge effect?
15. Properties of x ray.
16. Define capacitance.
17. Define half value layer.
18. Name some Beam Restricting Devices.
19. What is eddy current?
20. Define Anode Heel effect.
21. What are filters?Name some filters.
22. Write a short note on inherent filter.
23. What are Grids? Name its Types. (UNIT - III)
24. What is Grid ratio?
25. What is air gap technique?
26. What is Photo Stimulable Phosphor?
27. Define spatial resolution.
28. What are the types of film?
29. What is Photo Multiplier Tube?

30. Define linear attenuation coefficient.
31. Define contrast resolution.
32. What is Charge Coupled Device? (UNIT - IV)
33. What is PACS?
34. What are the limitations of image intensifier?
35. What is DICOM?
36. What is temporal resolution?
37. What are the limitations of image intensifier?
38. What is an indirect detection flat panel system?
39. Define Automatic Brightness Control (ABC).
40. What is thermos-luminescent dosimeter? (UNIT - V)
41. Define pocket dosimetry.
42. Write a note on maximum permissible dose limit.
43. What is contrast?
44. What is automatic film processor?
45. What is resolution?
46. Define image quality
47. What is image noise?
48. What is the purpose of area monitor?
49. What are the types of detectors available in diagnosis department?
50. What is dark room?

SIX MARKS

1. Write short note on Fluorescence, phosphorescence and luminescence
2. Write short note on Properties of x-ray.
3. Write short note on bremsstrahlung X-ray.
4. Write short note on characteristic x-ray.
5. Write short note on X-ray tube construction.
6. Write short note on stationary anode x-ray tube.
7. Write a short note on construction and types of transformer.
8. Write short note on beam restricting devices.
9. Write short note on screen film radiography.
10. Write short note on Computed Radiography.

11. Write short note on intensifying screen.
12. Write short note on structure of x-ray film.
13. Write short note on indirect detection flat panel systems. (UNIT - IV)
14. Write short note on direct detection flat panel system.
15. Write short note on construction of image intensifier.
16. Write short note on Dark room construction. (UNIT - V)
17. Write short note on Construction of Conventional Cassette.
18. Write short note on Construction of X-ray Film.
19. Write short note on Construction of CR imaging plate.
20. Write short note on automatic film processor.
21. Write short note on film processing.
22. Write short note on developer.
23. Write short note on fixer.
24. Write a short note on TLD.
25. Write a note on portable and mobile radiography.

TEN MARKS

1. Briefly discuss about the different types of atoms and write short notes on ionization & excitation.
2. What is electromagnetic induction? Describe in details about faraday's laws of electromagnetic induction.
3. What is a diode and its function? Write short notes on types of diode and application of diode.
4. Describe in details about the photon interaction with matter.
5. Describe in details about the rotating and stationary anode X-ray tube.

PAPER –06: RADIOGRAPHIC POSITIONING

THREE MARKS

1. Define the Anatomical Planes of Body. (UNIT - I)
2. What is dextrocardia condition.
3. Write any 5 indications for Chest x-ray?
4. Define Apicogram.

5. List any 5 Basic projection of skull.
6. Name 5 Facial Bones.
7. Define Adduction & abduction.
8. Name the Para nasal Sinuses.
9. What x-ray is recommended for Rib fracture?
10. In what condition Expiration film is recommended?
11. Discuss about ball-Cather's view. (UNIT - II)
12. Discuss about Anatomy of Wrist joint.
13. Very short note on shoulder AP.
14. List the special views of shoulder.
15. Discus the positioning of shoulder axial view.
16. Discuss the patient positioning of Ulnar deviation.
17. Discus the positioning of Wallace projection.
18. Discus the patient positioning of carpal tunnel.
19. Positioning for Hand-AP and Lateral.
20. What is Supination and Pronation?
21. When is abdomen erect view recommended? (UNIT - III)
22. Define KUB.
23. Discuss about the basic views of pelvis.
24. Discuss about the basic views of abdomen.
25. In what condition hip AP is recommended?
26. Positioning for Frog leg view.
27. List the quadrants of abdomen.
28. Discuss about the technical factors of abdominal radiography.
29. What X-ray is recommended for patient with h/o flank pain?
30. Define Ten day rule.
31. Positioning for racing stars projections. (UNIT - IV)
32. Positioning for mortis view.
33. Basic views of leg.
34. What view is recommended to see retro-patellar space?
35. What radiography is recommended for patient with h/o Osteoarthritis knee?
36. Neutral rotation of ankle will helps to visualize what?
37. Why B/L Knee joint radiography is recommended?

38. What view is taken to see calcaneal spur?
39. Positioning for judet's view.
40. Positioning for Leg AP.
41. Anatomy of spine.

    (UNIT - V)
42. Basic views of cervical spine.
43. Basic views for thoracic spine
44. Basic views of lumbar spine
45. Basic view of sacrum.
46. What view is recommended to see odontoid process?
47. Write about SMV.
48. Write about Rhee's View
49. Write about cadwell view.
50. Write about Swimmers view.

SIX MARKS

1. Write a short note on Chest PA and Chest AP radiography.

   (UNIT - I)
2. Write a short note on Macro radiography.
3. Write a short note on Schuller's projection.
4. Write a short note on towne's view and reverse towne's view
5. Write a short note on Apicogram and lordatic view
6. Write a short note on Carpal tunnel view.

   (UNIT - II)
7. Write a short note on Y view.
8. Write a note on Bone age assessment.
9. Write a short note on Wallace view
10. Write a short note on Grashey projection.
11. Write a short on Lateral decubitus view.

    (UNIT - III)
12. Write a short note Pelvic inlet and pelvic outlet view.
13. Write a short note on Frog leg view
14. Write a short note on Judet's view and reverse judet's view

15. Write a short note on Pelvimetry.
16. Write a note on toes Dorsi plantar and toes Hallux.
    (UNIT - IV)
17. Write a short note on Weight bearing knee AP and stress knee AP.
18. Write a short note on Lauesnstein's projections.
19. Write a short note on Infentogram and invertogram.
20. Write a short note on Air gap technique.
21. Write a short note on weight bearing cervical spine AP and Lateral.
    (UNIT - V)
22. Write a short note on Sub-mento vertex.
23. Write a short note on Scoottie dog view.
24. Write a short note on Swimmers view.
25. Write a short note on Lumbar flexion and lumbar Extension.

TEN MARKS

1. Briefly discuss about the any five skull views.
2. Briefly discuss about the any five chest views.
3. Describe in details about inspiration and expiration techniques.
4. Briefly discuss about the any three views of abdomen and pelvis views.
5. Describe in details about the KUB with suitable clinical diagram.

PAPER –7: ULTRASOUND IMAGING AND MAMMOGRAPHY

THREE MARKS

1. Write about interaction of USG with mater. (UNIT - I)
2. Explain about transducer design.
3. Write about Piezoelectric effect.
4. Explain the types of probes.
5. What is matching layer?
6. Define frequency.
7. Define Wave length.
8. Define amplitude.
9. What is the frequency range of curvy liner probe?

10. What is the frequency range of linear probe?
11. What is Doppler USG? (UNIT - II)
12. Define Doppler principal.
13. Define Doppler Shift.
14. Explain the types of Doppler.
15. Explain the modes in USG.
16. Explain the B mode USG.
17. Explain the A mode USG.
18. Explain the M mode USG.
19. What is TGC?
20. What is Gray scale imaging?
21. Artifacts in USG. (UNIT - III)
22. List out the types of artifacts in USG.
23. Describe the biological effects of USG.
24. Discuss about image quality of USG.
25. List out the biometric parameters which were taken during the growth scan.
26. Discuss the indications lower limb Doppler
27. List out the indications of USG abdomen and pelvis
28. What is PNDT and its Role in USG scans?
29. What is ultrasound Elastography?
30. Write about Mirror Artifact.
31. Write about breast Tomography. (UNIT - IV)
32. Discuss about the anatomy of breast.
33. What is line focus principal?
34. Define Anode heel effect.
35. Define Space charge effect.
36. Define Half-Value Layer (HVL).
37. Write about the target material in Mammography.
38. Enumerate the parts of Mammography equipment.
39. Write about the importance of compression peddle.
40. Write about the performance of AEC in mammography.
41. Abbreviation for BIRADS? (UNIT - V)
42. What are the basic views in Mammography?

43. Abbreviation for CC& MLO?
44. Abbreviation for RAO & LAO?
45. Write about Cleopatra view.
46. Write about the axillary tail view.
47. What is screening Mammography?
48. What is diagnostic mammography?
49. Explain the types of Mammography.
50. Describe the recent advance in Mammography.

SIX MARKS

1. Write a short note on piezoelectric effect. (UNIT - I)
2. Write a short note on Interaction of US with mater.
3. Write about types of probes and its clinical application.
4. Write about working principal of Ultrasound.
5. Write a note on transducer Design.
6. Write a short note on real time imaging. (UNIT - II)
7. Write a short note on Doppler, Doppler shift, and its types.
8. Write a short note on tissue harmonic imaging.
9. Write a short note on modes of display in Ultra sound.
10. What is grey scale imaging and its merits?
11. What is resolution and, explain its types in detail? (UNIT - III)
12. Write a short note on Artifacts in Ultrasound and its types.
13. Write a short note on bio-effects of Ultrasound.
14. What is spatial resolution and temporal resolution?
15. Discuss about the image quality in Ultrasound.
16. Write a short note on anatomy of Breast (UNIT - IV)
17. What is mammography and its types?
18. Write a short on mammographic equipment.
19. Write a short note on AEC in mammography
20. Write a short notes on compression peddle.
21. Write a short note on BIRADS. (UNIT - V)
22. Write a short note on basic and special views of mammography.
23. Write a short note on Radiation protection in mammography.

24. Difference between radiography and mammography.
25. Write about the type of films and cassette mammography.

TEN MARKS

1. Describe in details about the Doppler Effect.
2. Briefly discuss about different type of ultrasound probes.
3. Write in details about modes available in USGA, B, & TM etc…
4. Briefly discuss about the mammography unit.
5. Describe in details about BI-RADS.

Paper – 8: INTERVENTIONAL PROCEDURES AND DENTAL RADIOGRAPHY

THREE MARKS

1. Explain (UNIT – I)
   1) FNAC 2) PTBD 3) PTC 4) AVM & AVF.
   i) Expand IVP ii)RGU iii) HSG iv) RGU v) MCU
2. Define Embolization. Expand UAE and BAE
3. Name the temporary embolic agents.
4. Name the liquid embolic agents.
5. Define biopsy.
6. What are the indications for T –Tube cholangiography?
7. Define PTC.
8. Define angiography.
9. Define phlebography.
10. Define pigtail catheter and its uses.
11. Define angioplasty.
12. Enumerate the types of angioplasty.
13. What are the size of pigtails are available.
14. What is lymph-angiography and what is the name of contrast used for lymphangiography.
15. What are the classifications of catheters?
16. Name the drug should available in crash card. (UNIT – II)
17. Give example of few ionic monomers and dimmers used in diagnostic radiology.

18. Give example of few non -ionic monomers and dimmers used in diagnostic radiology.
19. What are the reactions unrelated to contrast media.
20. What are the emergency drugs used in the reaction of contrast media
21. Enumerate the feature of ideal contrast media.
22. What are the premedication during reaction of CM?
23. What is the aftercare during reaction of CM?
24. Define Barium swallow. (UNIT – III)
25. Define Barium meal.
26. Define Barium meal follows through.
27. Define Barium enema.
28. Define dacrocystography.
29. Define sinography.
30. Define vertebroplasty.
31. Define sialography.
32. Define fistulography
33. Define discography
34. Define enteroclysis
35. Define IOPA. (UNIT – IV)
36. Define OPG
37. Write a note on safe light
38. Define occlusal technique
39. Define periapical technique
40. Define bitewing technique
41. Define slab technique
42. Define RVG.
43. Define ALARA (UNIT – V)
44. Name the three principle of radiation protection
45. Define Primary barrier
46. Define Secondary barrier
47. Define tube leakage
48. Define scattered radiation
49. uses of lead apron and what is its thickness

50. Uses of thyroid shield and what is its thickness
51. what is the thickness of i) lead barrier ii) Primary barrier iii) Secondary barrier
52. Define lead goggles.
53. Define lead cap
54. Define ovarian shield
55. Define lead shoes.
56. Define lead gloves.

SIX MARKS

1. What is the indication and contraindications of T- tube cholangiography?(UNIT – I)
2. Describe the technique of T-Tube cholangiogram.
3. Enumerate the indication and contraindication of PTC.
4. Explain PTBD procedure in detail.
5. Distinguish Percutaneous Trans hepatic Cholangiography and Endoscopic retrograde Cholangiography.
6. What are the pitfalls and after care for of PTC procedure.
7. Explain about PTBD procedure in detail.
8. Classification of modern embolic agents and write any one embolic agent mechanism of action.
9. Define pigtail. Explain about the pigtail drainage procedure while you assessed in your posting period.
10. Describe vascular embolization procedure. With given heading below,
11. 1) Indication. 2) Equipment 3) patient preparation 4) after care 5) complication.
12. Explain lymph-angiogram procedure in brief.
13. What is the indication and contraindications of angiography
14. How will you prepare a patient for angiography? What are the precautions will you take before the procedure?
15. Write a short note on direct needle puncture.
16. What are the complications in direct needle puncture?
17. Explain about seldinger needle for arterial puncture technique.

18. Discuss about Percutaneous transluminal angioplasty (PTA).
19. Describe in brief about Intracranial AVM procedure.
20. Explain UAE procedure.
21. Classify Catheters. Write a short note on their sterilization.
22. Write in brief about
23. Micro catheters
24. Drainage catheter.
25. Balloon catheters
26. Central venous catheter.
27. Explain hyper osmolality toxicity of contrast media. (UNIT – II)
28. Explain about the reaction of contrast media.
29. Describe the treatments for reaction of contrast media.
30. Explain Barium swallow procedure.

(UNIT – III)

31. Explain Barium meal procedure.
32. Explain Barium meal follow through procedure.
33. Explain Barium enema procedure
34. Explain IVP procedure.
35. Explain RGU procedure.
36. Explain HSG procedure
37. Explain RGU procedure
38. Explain MCU procedure
39. Explain dacrocystography procedure
40. Explain sinography procedure.
41. Explain vertebroplasty procedure
42. Explain sialography procedure
43. Explain fistulography procedure
44. Explain discography procedure
45. Explain enteroclysis procedure
46. Discuss the construction of OPG

(UNIT – IV)

47. Write a short note on construction of Dark room
48. Discuss about the views in dental radiography.

49. Write in brief about ALARA

(UNIT –V)

50. Explain the principle of Radiation protection

TEN MARKS

1. Write in detail about the emergency drugs management during contrast study.
2. Describe in detail about the physiological changes in contrast media.
3. Discuss about the importance of contrast study in CT & MRI.
4. Describe in detail about radiation protection devices.
5. Write in details about the principles of radiation protection.

III YEAR

PAPER – 9: COMPUTED TOMOGRAPHY

THREE MARKS

1. Define X-ray generator. (UNIT – I)
2. Define pitch.
3. Define AEC.
4. Define X-ray tube voltage (kVp).
5. DefineX-ray tube current (mA).
6. Write about basic principal of CT.
7. Classify generations of CT.
8. Define MDCT.
9. Define MSCT.
10. Define Tomography.
11. Define control console. (UNIT – II)
12. Discuss about X-ray tubes in CT.
13. What is a detector?
14. Classifications of detectors in CT.
15. Define scintillation detector in CT.
16. Define ionization chamber.
17. Explain principal of helical CT.
18. Difference between helical and axial slice.

19. Explain about history of CT.
20. What is patient couch?
21. Define back projection. (UNIT – III)
22. Define analytic method of reconstruction.
23. What is window width?
24. What is window length?
25. Define pixel.
26. Define voxel.
27. Define Hounsfield Unit (HU).
28. Explain MPR, MIP & VR.
29. Define CT numbers.
30. Define image display.
31. Define Streak Artifacts. (UNIT – IV)
32. What are the types of artifacts?
33. What is CTDI?
34. What is MSAD?
35. What is DLP?
36. Define Resolution.
37. Define types of resolution.
38. What is spatial resolution?
39. What is contrast resolution?
40. Define ring artifacts.
41. Define contrast agents in CT. (UNIT – V)
42. Define protocol for brain.
43. Define dose reduction technique in CT.
44. Define HRCT.
45. Describe patient preparation in CT.
46. How will you care the patient in CT.
47. Define contraindication of contrast injection in CT.
48. Explain the protocol for NCCT KUB.
49. Define patient positioning in CT.
50. What is CECT?

SIX MARKS

1. Write a short note on computed tomography? (UNIT – I)
2. Define basic principal and explain about image acquisition in CT.
3. Classify and explain the generations of CT?
4. Write a short note on scan parameters?
5. Describe MDCT& MSCT.
6. Explain the detectors used in CT and its types. (UNIT - II)
7. Explain about the x-ray tubes in CT.
8. What are collimation and its uses in CT?
9. What are filters and its uses in CT?
10. Explain about the high voltage generators.
11. Describe about the MIP. (UNIT – III)
12. Describe MPR and VR.
13. Explain about CT numbers, Pixel and voxel.
14. Describe about back projection.
15. Briefly describe the window width and window length.
16. Explain the dose reduction technique in CT. (UNIT – IV)
17. Explain about MSAD.
18. Explain about DLP.
19. Classify the types of artifacts.
20. Discuss about Resolution and its types.
21. Explain the protocols followed for injection of contrast media. (UNIT – V)
22. Discuss the protocol of brain, spine and MSK in CT.
23. Discuss the protocol of abdomen and pelvis in CT.
24. Explain the pre and post procedure care in CT guided biopsy procedures.
25. Explain the patient positioning, preparation and after care for contrast procedures in CT.

TEN MARKS

1. Describe about the computed tomography generation.
2. Write about the multi detector computed tomography.
3. Briefly discuss about the multi slice computed tomography.

4. Write in detail about dose length product (DLP).
5. How can you reduce radiation dose level from CT scan with net diagram.

PAPER- 10: MAGNETIC RESONANCE IMAGING

THREE MARKS

1. Define atomic structure. (UNIT – I)
2. Define magnetism.
3. Classify types of magnet.
4. Define eddy current.
5. Define precession.
6. Define larmor frequency.
7. Define solenoids.
8. Define contrast.
9. Define resolution.
10. What is RF coil? (UNIT – II)
11. What is gradient coil?
12. What is shim coil?
13. Define transmitter and receiver of coils.
14. Why needa MRI safety?
15. Do and don't in MRI.
16. Types of coils?
17. Safe zones in MRI?
18. What is pulse sequence? (UNIT – III)
19. Define spin echo.
20. Define turbo spin echo.
21. What is a gradient?
22. Define inversion recovery.
23. Define proton density.
24. Give a abbreviation of TSE, SE, IR and PD.
25. Define angiography.
26. Define Venogram.
27. Define spectroscopy.

28. Classify the protocols of brain. (UNIT – IV)
29. Classify the protocols of spine.
30. Classify the protocols of abdomen.
31. Classify the protocols of hand.
32. Classify the protocols of pelvis.
33. Classify the protocols of shoulder.
34. What are the steps involved in MRI scan.
35. How you will do MRI for uncooperative patient?
36. What is the contrastused in MRI?
37. Classify the plain studies in MRI.
38. What is axial, coronal and sagittal?
39. Define SNR.
40. List the artifacts in MRI.
41. Define the resolution and its types.
42. Define perfusion. (UNIT – V)
43. Define tractography.
44. What is a functional MRI?
45. What are the advantages of MRI scan?
46. What are the advantages of perfusion?
47. What are the advantages of tractography?
48. What is post processing?
49. Define 3D images.
50. What are the recent advances in MR Imaging?

SIX MARKS

1. Explain about the T1 and T2 relaxation. (UNIT – I)
2. Define precession and explain larmor frequency.
3. Define magnetism and explain types of magnet.
4. Explain about the flip angle.
5. Explain free induction decay.
6. Explain about the safe zones in MRI. (UNIT – II)
7. Explain about RF transmitter and receiver.

8. Define magnet and explain it working principal in MRI.
9. Write a short note on spectroscopy. (UNIT – III)
10. Explain about diffusion weighted imaging
11. Explain about the echo planar imaging.
12. Which sequence is used for fat suppression and explain its function.
13. What is the role of technologist in MRI?
14. Define fistulogram and explain about the sequence performed for fistulogram.
15. Explain what are the sequences performed,if patient came with complaints of seizure disorder.
16. Classify the sequence performed during ligament injury in knee joint.
17. Explain artifacts and its causes in MRI study. (UNIT – IV)
18. How you prepare patient for MRI study.
19. Explain about functional MRI?
20. Explain about diffusion tensor imaging.
21. Briefly explain about recent advances in MRI. (UNIT – V)
22. Define resolution and explain its types.
23. Explain about post processing in MRI.
24. Comparison of T1 and T2images.
25. Write a short note on SPIR and STIR.

TEN MARKS

1. Briefly discuss about the angiography and venography.
2. Describe in detail about spectroscopy.
3. Write in detail about various MRI protocols.
4. What are the role and responsibility of MRI technologist in radio diagnostic department.
5. Write in detail about any five methods of MRI imaging methods.

PAPER – 11: NUCLEAR MEDICINE IMAGING

THREE MARKS

1. Difference between in-vivo and in- vitro dosimetry. (UNIT - I)
2. Define reactor based radionuclide.
3. What are the Accelerators based Radionuclide?
4. Define photonuclear activation
5. What are the Equations for Radionuclide production?
6. What is Radionuclide Generators?
7. What are the operation principles for Radionuclide Generators?
8. Name any 4 usages of radiopharmaceuticals
9. What is a Blood Volume study?
10. What is the General concept of Radionuclide?
11. What is in-vivo dosimetry?
12. What is in- vitro dosimetry?
13. Define Radioactivity (UNIT - II)
14. Define Natural radioactivity
15. Define Artificial Radioactivity
16. Define Isotopes
17. Define gamma radiation
18. Define half life
19. Define half value layer
20. Define linear attenuation coefficient
21. What is photoelectric effect?
22. Define Compton-scattering
23. Define pair production
24. What is total attenuation coefficient?
25. What is Rectilinear Scanner? (UNIT - III)
26. What is Anger Camera?
27. What is Pin hole collimator?
28. What are the Limitation of the Detector System?

29. What is the Principles of PET? (UNIT - IV)
30. Define Data Acquisition for PET
31. What is lonization Chamber?
32. What is Proportional Counter?
33. What is Geiger Muller counter?
34. Define Gas filled detectors
35. What is a Photo multiplier tube?
36. What is Well counter?
37. Define Voltage amplifier
38. What is liquid scintillation detector?
39. What are the Biological effects of Radiation? (UNIT - V)
40. Define somatic effects of radiation
41. Define hereditary effects of radiation
42. What are the effects of radiation on embryo?
43. What are the maximum permissible dose levels?
44. What is absorbed dose?
45. Define calculation of absorbed dose.
46. Define absorbed dose from diagnostic nuclear medicine procedures.
47. Define absorbed dose from therapeutic nuclear medicine procedures.
48. Define personnel monitoring devices.
49. What are the instruments used in radiation survey?
50. What are the instruments used in radiation monitoring?

SIX MARKS

1. Write short note on Unsealed Sources. (UNIT - I)
2. What is the Reactor based Radionuclide and Accelerators based Radionuclide?
3. What are the Radionuclide Generators and their operation principles?
4. Write short note on production of Radionuclide used in Nuclear Medicine.
5. Write short note on Reactor based Radionuclide and Accelerators based Radionuclide.
6. Write short note on various usages of radiopharmaceuticals.
7. Write short note on Thyroid Uptake Measurements.

8. What are the General concepts of Radionuclide, imaging and Historical envelopments?
9. Write short note on in-vivo and in- vitro dosimetry.
10. What is Radioactivity?. Write a short note on its Discovery. (UNIT - II)
11. What are the mechanisms of radioactive decay?
12. Write short note on Radiation intensity & exposure.
13. Write short note on photoelectric effect and Compton-scattering.
14. Write short note on gamma radiation.
15. Write short note on Rectilinear Scanner and its operational principles. (UNIT – III)
16. What are the Basic Principles and Design of the Scintillation Camera?
17. Write a short note on Different types of Collimators.
18. Write a short note on Image Display and Recording Systems in Radionuclide Imaging.
19. Write short note on Instrumentation of PET (UNIT - IV)
20. Write short note on Construction and Principles of Proportional Counter
21. Write short note on Construction and Principles of Geiger Muller counter
22. Write short note on Voltage calibration of a Geiger Muller tube
23. Write short note on Construction and Principles of Photo multiplier tube
24. Write short note on Biological effects of Radiation (UNIT - V)
25. Write short note on induction of Radiation injury
26. Write short note on somatic and hereditary effects of radiation
27. Write short note on normal and abnormal human exposure to radiation
28. Write short note on absorbed dose and calculation of absorbed dose
29. Write short note on absorbed dose from diagnostic & therapeutic nuclear medicine procedures
30. Write short note on instruments used in radiation survey and monitoring.

TEN MARKS

1. Describe about the Positron Emission Tomography (PET) scan.
2. Briefly discuss about the semiconductor detector.
3. Describe about the liquid scintillation detector.
4. Write about instruments used in radiation survey and monitoring.

5. Describe about the radiopharmaceuticals.

PAPER – 12: QUALITY ASSURANCE, RADIATION BIOLOGY & RADIATION HAZARDS

THREE MARKS

1. Define regularity bodies (UNIT – I)
2. Give abbreviations of AERB
3. Give abbreviations of NCRP
4. Give abbreviations of BARC
5. Give abbreviations of WHO
6. Give abbreviations of ICRP
7. Define radiation protection
8. Give abbreviations of NPRB
9. Define quality assurance (UNIT – II)
10. Define quality control
11. Quality assurance in general radiography
12. Quality assurance in mammography
13. Quality assurance in c arm
14. Quality assurance in dental x ray
15. List of quality assurance tests
16. Care of x ray equipment
17. List the personnel monitoring devices
    (UNIT – III)
18. Define occupational exposure
19. Define radiation protection
20. List the radiation protecting tools
21. What are the guidelines of AERB for planning a x ray room
22. Linearity of kVp and ma
23. What is acceptance test
24. Explain kVp meter
25. How you will register the x-ray equipment installation (UNIT – IV)
26. Define dose and its unit

27. List the biological effects of radiation
28. Define Stochastic effects
29. Define deterministic effects
30. Define dose fracination
31. Define KERMA
32. Define RBE
33. Define LET
34. Define OER

(UNIT – V)

35. What is absorbed dose
36. Define equivalent dose
37. Define effective dose
38. Dose limits to public
39. Define Occupational exposure limits
40. What is the principals of radiation protection
41. Define roentgen and its units
42. What is the thickness of lead apron ,thyroid color, lead barrier an gonald shield
43. Define flux and fluence
44. List the different shielding material
45. Define Half value layer
46. What is Beam alignment and collimation

SIX MARKS

1. Explain AERB and BARC (UNIT – I)
2. Explain about radiation protection
3. Explain IAEA and ICRP
4. Explain about radiation regularity bodies
5. Explain about care of x-ray equipment

(UNIT – II)

6. Write a shot note on quality assurance
7. List the QA tests and explain it
8. Compare a QA tests between CT and Mammography
9. How you will perform QA tests for dental radiography

10. Describe QA measures of mammography unit
11. Define occupational exposure , explain about radiation protecting tools (UNIT – III)
12. Write a short note on installation of x ray equipment under AERB guideline
13. Write a short note on role of technologies in radiation protection
14. Explain about acute radiation syndrome
15. Explain planning of diagnostic x-ray installation
16. Explain about personnel and area monitoring devices (UNIT – VI)
17. Explain Stochastic and deterministic effects
18. Write a short note on direct and indirect action on living cells
19. Explain about modification of radiation damage
20. Describe principals of radiation protection with neat diagram (UNIT – V)
21. Define KERMA .explain absorbed dose ,equivalent dose and effective dose
22. How you will protect the patient from the radiation
23. Explain about radiation weighting factor
24. Write a shot note on responsibilities of the radiographer

TEN MARKS

1. Briefly discuss about the e-LORA.
2. Explain about the role of radiography unit room Planning, QA and radiation protection.
3. Briefly discuss about the micro dosimetry.
4. Write in detail about RBE, LET and OER.
5. Write in detail about radiography protocol given by AERB.