JAMIA HAMDARD

DEPARTMENT OF PARAMEDICAL SCIENCES

CBCS ENABLED SYLLABUS

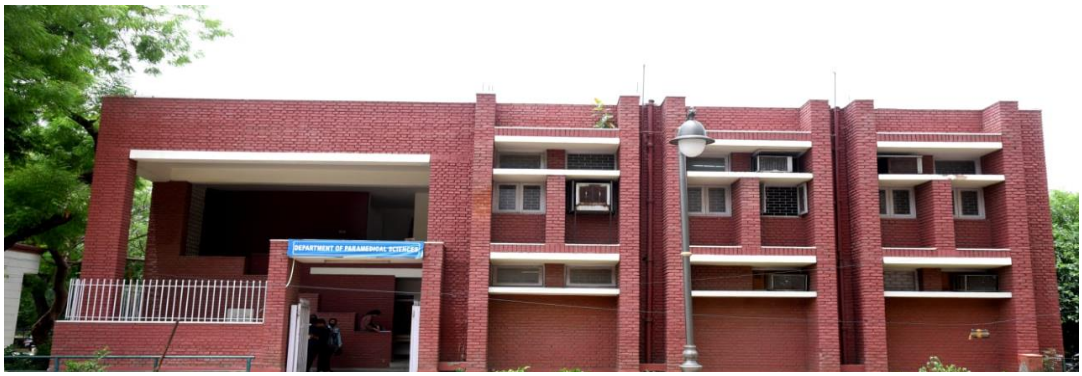
BSc. Medical Imaging Techniques

SYLLABUS FOR BSC.

Medical Imaging Techniques

Choice Based Credit System (CBCS)

Approval Date:26th SEPTEMBER 2019



DEPARTMENT OF PARAMEDICAL SCIENCES

JAMIA HAMDARD

Deemed to be University

Accredited in 'A' Grade by NAAC

Declared to be designated as Institute of Eminence (IoE) by MHRD, GOI

NEW DELHI 110062

www.jamiahamdard.edu

PROGRAM NAME: BSc. Medical Imaging Techniques

PROGRAM CODE: 317

ACADEMIC SESSION OF INTRODUCTION OF THE PROGRAMME: (2022-2023)

SCHOOL NAME: SNSAH

DEAPRTMENT NAME: DEPARTMENT OF PARAMEDICAL SCIENCES

APPROVAL DATE OF THE BOARD OF STUDIES (B.O.S) MEETING FOR THE PRESENT SYLLABUS

26th SEPTEMBER 2019

APPROVAL DATE AND NUMBER OF ACADEMIC COUNCIL OF MEETING FOR THE PRESENT SYLLABUS

26th SEPTEMBER 2019

(39thAC)

JAMIA HAMDARD, NEW DELHI - 110062

Internal Quality Assurance Cell (IQAC)

GUIDELINES FOR PREPARING THE

UGC – LEARNING OUTCOMES-BASED CURRICULUM

JAMIA HAMDARD, NEW DELHI - 110062

Internal Quality Assurance Cell (IQAC)

Template for Programm under on UGC – Learning Outcomes-Based Curriculum Framework

SNSAH

Vision Statement

To create an institute of national & international repute in paramedical offering state of the education entailing the finest skills combined with compassionate patient care

Mission Statements

MS1: To provide the most advanced & comprehensive course offerings to health sciences student possible by employing the most qualified faculty, utilizing the most advanced technology

MS 2: To provide a quality paramedical education & prepare human & competent global paramedic professional

MS 3: To provide highest level of quality patient care & can make contribution towards education & research

PARAMEDICAL SCIENCES

Vision Statement

Academic excellence in education, research & health care by grooming into highly skilled health professionals & faithful experts fully committed to serve the society

Mission Statements

MS1: To strive to upload a future generation with academic standards

MS 2: To impart basic, theoretical, practical & professional knowledge of high quality for overall holistic growth of every student

MS 3: To develop innovative education activities & participates in public health reforms through training, research & intervention in the field of allied health sciences

BSc IN MEDICAL IMAGING TECHNOLOGY

QUALIFICATION DESCRIPTORS (QDs)

Upon the completion of Academic Programme BSc IN MEDICAL IMAGING TECHNOLOGY students will be able to:

QD-1: This Degree serves as a basis for future higher studies in the field such as MSc, Ph.D., and M.Phil. degree in Medical Imaging Technology. The successful completion of which, makes one eligible for the post of a lecturer in any university/College as well as for an observer or a Scientist.

QD-2: Operating procedure for newer modalities, e.g.: Mammography, Computed Tomography, MRI, Nuclear Medicine, all Routine and Specialized Radiographic procedures with x ray & fluoroscopy.

QD-3: Assisting in Managing and Organizing medical imaging departments. Join BARC sponsored RADIATION SAFETY OFFICER Program & after completion can join Radiation safety and Quality control Program in the department. Radiological supervisory work.

QD-4: A Student Acquiring BMIT degree can be employed as: Medical Radiological Technologist. Radiologic Techniques educator. Radiological Equipment Sales Representative. Radiological Work Supervisor. Radiological Researcher.

QD-5: Exhibit respect and empathy to each individual within a diverse population when in the clinical setting. Demonstrate a commitment to professional ethics, attitudes and behaviors and to continuing professional development. Apply theoretical knowledge and critical thinking to professional practice.

Mapping Qualification Descriptors (QDs) with Mission Statements (MS)

	MS-1	MS-2	MS-3
QD-1	1	1	3
QD-2	2	2	2
QD-3	1	2	3
QD-4	3	2	1
QD-5	1	3	2

‘3’ in the box for ‘High-level’mapping, 2 for ‘Medium-level’mapping, 1 for ‘Low-level’mapping.

SNSAH

BSc IN MEDICAL IMAGING TECHNOLOGY

PROGRAM LEARNING OUTCOMES (PLOs)

After completing this Course, the students should be able to …….

PLO-1: Upon completion of the program, graduates are awarded an associate in applied science degree and are eligible to take the radiography registry examination wherever required.

PLO-2: Function as competent entry-level professionals that meet the healthcare needs of the community. Join BARC sponsored RADIATION SAFETY OFFICER program & after completion can join Radiation safety and Quality control Program in the department.

PLO-3: Demonstrate a commitment to professional ethics, attitudes and behaviors and to continuing professional development.

PLO-4: Apply theoretical knowledge and critical thinking to professional practice.

PLO-5: Operating procedure for newer modalities, e.g.: Mammography, Computed Tomography, MRI, Nuclear Medicine, all Routine and Specialized Radiographic procedures with x ray & fluoroscopy.

PROGRAM SPECIFIC OUTCOMES (PSOs)

After completing this Course, the students should be able to …….

PSO-1: Make maximum diagnostic value image with minimum radiation dose to patient. Proper handling of and upmost care of the patient. Assisting in Managing and Organizing medical imaging departments

PSO-2: Radiological supervisory work & after completion can join Radiation safety and Quality control Program in the department.

PSO-3: Operating procedure for newer modalities, e.g.: Mammography, Computed Tomography, MRI, Nuclear Medicine etc. Conduct all Routine and Specialized Radiographic procedures.

Mapping of Program Learning Outcomes (PLOs)

With Qualification Descriptors (QDs)

	QD-1	QD-2	QD-3	QD-4	QD-5
PLO-1	**1**	**2**	**3**	**3**	**2**

PLO-2	**1**	**2**	**1**	**1**	**1**
PLO-3	**2**	**1**	**3**	**1**	**2**
PLO-4	**2**	**2**	**1**	**2**	**2**
PLO-5	**2**	**1**	**1**	**2**	**2**
PSO-1	**1**	**1**	**2**	**2**	**1**
PSO-2	**1**	**1**	**2**	**1**	**2**
PSO-3	**2**	**1**	**2**	**2**	**3**

'3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low-level' mapping.

The Course

Highlights of the course are described in the following table:

a.	Name of the Course	BSc. IN MEDICAL IMAGING TECHNOLOGY
b.	Nature	Regular
c.	Duration	Minimum: Three Years & a half (six months compulsory rotatary internship included) (3 +1 years(internship) full time Integrated Program, Lateral entry in third semester for students with two year Diploma)
d.	Medium of Instruction and Examinations	English
e.	**Eligibility Criteria**	
	Educational Requirements	Eligibility for the admission : must have passed in 10+2 or equivalent qualification with any discipline from a recognized institution with 50% aggregates Those in possession of central/state recognized two year diploma will be permitted lateral entry into fourth semester
f.	Commencement of the course	July of every year
h.	Mode of Admission	Admission to the course will be made on the basis of the merit determined by the score of CET conducted by Jamia Hamdard. Students who have appeared in NEET after interview can also be given admission. For admission against the foreign national/NRI/Industry sponsored seats, students will be required to appear only in interview conducted by Jamia Hamdard.
i.	Period of Completion (Span Period)	Not more than 06 years
J.	Fees	As per university norms.
k.	Total Number of Students per year	25

l.	Total number of Semesters and examinations	Six Semesters and Semester Examination in every December and May
m.	Total Theory Papers	18 Theory papers (100 marks) Exam -75 Marks/ Internal - 25 Marks + 01(100 marks) project + 01 (100marks) Assignment +04 qualifying exams
n.	Total credits	…… (One credit hour is equal to 15 hours of teaching for theory as well as practical. Credits for theory given against the subject in the course syllabus)
o.	Minimum Average Pass Marks	40% in each subject, Grade D

Course design

(a) The course work shall be divided into three parts as given below:

Part-I Semester-I July to mid December

Semester-II January to mid May

SUMMER TRAINING mid May to mid July (two months)

Part-II Semester-III July to mid December

Semester-IV January to mid May

Part III Semester V July to mid December

Semester VI Assignment

1year compulsory internship

(b) During an academic year, a candidate shall be enrolled only for one course of study and shall not appear at any other examination of this or any other University.

(c) The semester-wise course outline, total marks allocated to each course, internal assessment and semester examinations marks for all specialization are Listed.

Detailed course content of the syllabus shall be prescribed by the Board of Studies (BOS) and shall be reviewed periodically.

Every candidate shall have to undergo eight weeks summer training in an organization of repute in India or abroad. The project for the summer training shall be assigned by the organization concerned.

The BOS, depending on circumstances prevailing in the market, may change any paper and increase or decrease the number of optional papers.

1. Attendance

a) All students must attend every lecture delivered, however, to account for the late joining or other such contingencies, the attendance requirement for appearing in the semester examinations shall be a minimum of 75% of the total classes actually held.
b) In order to maintain the attendance record of a course, a roll call will be taken by the teacher in every scheduled lecture.
c) Attendance on account of participation in the prescribed functions of NCC, NSS, Inter-University sports, educational tours/field work assigned by the university to students shall be credited to the aggregate, provided the attendance record, duly counter signed by the officer in-charge, is sent to the Head of Department within two weeks time after the function/activity.
d) The teacher in-charge will consolidate the attendance record for the lectures for each student. The statements of attendance of students shall be displayed on the Department's Notice Board by the teacher concerned at the beginning of the following month and consolidated attendance before the conclusion of each semester as given in the University Calendar. A copy of the same shall be sent to the Head of Department for record. Notices displayed on the Notice Board shall be deemed to be a proper notification, and no individual notice shall be sent to students.
e) If a student is found to be continuously absent from the classes without information for a period of 30 days, the teacher in charge shall report it to the Head of Department, who will inform the Registrar through the Dean. Registrar will issue a notice to such student, as to why his/ her admission should not be cancelled. The Registrar will take a decision on cancellation of admission within 30 days of issue of the notice. A copy of the order shall be communicated to the student.
f) A student with less than 75% attendance of the lectures in each course shall be detained from appearing in the semester examination of that course. The Dean of Faculty concerned may consider application for the condonation of shortage of attendance up to 5% on account of sickness or any other extra ordinary

circumstances, provided the medical certificate duly certified by registered Medical Practitioner, had been submitted within 7 days of the recovery from the illness.

g) A student detained on account of attendance will be re-admitted to the same class in the next academic year on payment of current fees except Enrolment and identity card fees

2. Scheme of Examination

Each theory course shall carry 100 marks. Of these, 75 marks shall be for semester examination and 25 marks for internal assessment.

The candidate shall have to make an oral presentation of his/ her summer training report before a joint session of the faculty and students. Presentation of report shall carry 40 marks. The same report shall be examined by an internal examiner out of 60 marks. The total summer training shall carry 100 marks.

3. Internal Assessment

Internal assessment for 25 marks in respect of theory papers will be based on written tests, assignments, presentations, viva-voice etc.

- The evaluation shall be done by course instructors and marks will be notified within a week of such test.
- There shall be two written tests in each course in a semester. The test will be conducted as per the academic calendar individual faculty member to announce the date for tests or conduct them as per academic calendar.
- The teacher concerned shall maintain records of marks of various components of evaluation for each student and the same will be confidential and notified at the end of the semester.
- The internal assessment marks shall he submitted by head of the Department to the Registrar at the end of the semester.
- A candidate who has to reappear (as an ex-student) in the semester examination of a course will retain the marks of internal assessment.
- A student who will be required to seek re-admission, for whatever reason, will have to appear for internal assessment and tests afresh
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9. Semester Examinations

a) The Semester examinations shall be held at the end of each semester as notified in the academic calendar. There shall be no supplementary examination. Candidates shall appear in the examination of their uncleared papers in the next semester examination of the same paper along with other students of junior batch. Thus, the uncleared papers of Semester - I shall be cleared in Semester- III and those of Semester - II in Semester-IV. Likewise, the examination of uncleared papers of

semester V and VI would be taken up by the student next year along with the junior batch.

b) The duration of semester examinations of each theory paper will be 3 hours.

c) The question papers shall be set by either an external or an internal examiner duly appointed by the Board of Studies and approved by the Vice Chancellor.

d) The papers set by the examiners shall be moderated by a panel of moderators constituted by the Board of Studies at the time of approving the panel of examiners.

e) Upon completion of the training, the training report has to be submitted in duplicate immediately on joining the third semester.

f) Evaluation of the summer training report for 60 marks shall be done by a panel comprising an external examiner and teacher in charge on the basis of presentation and viva-voce.

g) Any student who fails to defend his /her training report satisfactorily shall have to undergo training afresh in the following year and defend it in similar manner as laid down in Para 9 (f).

h) All students shall be required to be present at the time of presentation. Their attendance will be taken into account while awarding marks for presentation.

i) Every candidate shall have to prepare a project study / assignment in the Sixth semester. The subject of project/assignment shall be approved on the recommendations of the supervisor(s) and the Head of the Department.

j) A student shall be required to maintain record of periodic progress in the project in a diary. He / she should be in constant touch with his/her supervisor and obtain his/her signature in the diary regularly. There would be continuous appraisal of the project which will carry' 25 marks as a part of internal assessment and remaining 75 marks will be given by external examiner.

k) The minimum pass marks shall be 50% (grade E) in each theory/ assignment and viva-voce (combined examination).

10. Promotion Criteria

a) A student shall be promoted to semester-III if he/she has secured at least 50% marks each in at least 10 subjects out of 14 prescribed in Semester - I and Semester - II taken together.

b) No student shall be promoted to Semester V if he/she has more than 04 uncleared papers of the preceding semesters taken together.

c) After the declaration of the semester-VI results, if a student has any paper uncleared of any semester, he/ she will have to reappear in these papers in concerned semester in next academic year as an ex-student along with the next batch.

d) The degree will be granted only after clearing all the semester examination and completion of six months compulsory internship from the parent institution or in extraordinary circumstances from a

government hospital after taking permission from the head of the departments of the concerned hospitals

e) For all the papers labeled as qualifying exams the student needs to clear these papers during the span period to be awarded the degree

11. Span Period

A student must complete all the requirements of degree within a period of Six years from his/ her admission.

Grading System

The grade awarded to a student in any particular course will be based on his/her performance in sessional and final examinations combined together. The letter grades and their equivalent numerical points are listed below:

% Of Marks Scored	Grade	Grade Points	Description of Performance
80% or more	A+	10	Outstanding
75% or more but less than 80%	A	9	Excellent
70% or more but less than 75%	B	8	Good
60% or more but less than 70%	C	7	Average
50% or more but less than 60%	D	6	Marginal
45% or more but less than 50%	E	5	Fail
Absent/ Detained	I	-	Incomplete

Earned Credit (EC)

The credit for the course in which a student has obtained "C" or a higher grade will be counted as credits earned by him/ her. Any course in which a student has obtained "I" grade will not be counted towards his/ her earned credits

Evaluation of Performances

- SGPA (Semester Grade Point Average) will be awarded on successful completion of each semester
- CGPA (Cumulative Grade Point Average) which is the grade point average for all the completed semester at any point in time, which will be awarded in each semester on

successful completion of the current semester as well as all of the previous semester. CGPA is not applicable in semester I.

Calculation of SGPA and CGPA in a semester

$$SGPA = \frac{\text{(Earned Credits X Grade Point)}}{\text{(Course Credits Registered)}}$$

$$CGPA = \frac{\sum_{J=1}^{m} \text{(Earned Credits X Grade Point)}}{\text{(Course Credits Registered)}}$$

Where m is the number of semester passed

For Example

Semester - I

Course name	Subject Credits	Marks	Grade Awarded	Grade Point	Points secured
101	3	56	C+	6	18
102	3	65	B+	8	24
103	3	55	C+	6	18
104	3	68	B+	8	24
105	3	62	B	7	21
TOTAL	**15**	306		**35**	**105**

Total credits = 15

Total Points secured = 105

SGPA = 105/15 = 7

Semester II

Course name	Subject Credits	Marks	Grade Awarded	Grade Point	Points secured
201	3	63	B	7	21
202	3	62	B	7	21
203	3	76	A	9	27
204	3	55	C+	6	18
205	3	61	B	7	21
TOTAL	**15**	**317**		**35**	**118**

Total credits = 15

Points secured = 118

SGPA = 118/15 = 7.80

CGPA = 223/30 = 7.40

Classification of successful candidates:

The result of successful candidates who fulfill the criteria for the award of degree shall be classified at the end of last semester, on the basis of his/her CGPA

Classification shall be done on the basis following criteria: -

- He/ she shall be awarded "Distinction" if her/ his final CGPA is 9 and above and passed all the semester examinations in the first attempt
- He/ she shall be awarded "First Division" if her/ his final CGPA is 6.75 and above but less than 9.00
- He/ she shall be awarded "Second Division" if her/ his final CGPA is 6.00 and above but less than 6.75.
- He/ she shall be awarded "Pass" if her/ his final CGPA is 5.00 and above but less than 6.00
- He / she shall be treated as "Fail" if his/ her final CGPA is less tha
-

Distribution of Marks and Hours of Study

Semester-1

Paper Code	Subject	Theory hours	Practical/Tutorial hours	Maximum Marks Theory Practical/viva				Max. Marks Theory + Practical
				IA*	SE*	IA	SE	
GFC-101	Human Anatomy	50	20	25	75	25	75	100+100=200
GFC-102	Human Physiology	50	20	25	75	25	75	100+100=200
GFC-103 A&B	Medical Ethics, Legal aspects and Medical Terminology & English skills	05+25=30	-	15+10	30+20	-	-	75+00=75(T)
GFC-104	Computer Skills	05	30			25	50	75(P)

IA- Internal assessment, SE–Semester Examination
Clinical postings 8hrs/wk

Total Marks-Theory ---200

Total Marks Practical—200

Total Credits 06

NOTE: Medical Ethics, Legal aspects and Medical Terminology, English skills & Computer Skills will be qualifying exams only

SEMESTER II

Paper Code	Subject	Credit	Didactic Hours	Practical hours	Maximum Marks Theory / Practical/Viva-Voce			
					IA	SE	IA	SE
BMIT-201	Basic Physics of Radiology	6	60	30	25	75	25	75
BMIT-202	Radiographic Photography-Imaging	6	45	45	25	75	25	75
BMIT - 203	Routine radiographic Procedures-	16	90	150	25	75	25	75
Total		28	195	225	75	225	75	225

Total Credit - 28

Total Marks-Theory --- 300

Total Marks Practical—300

Qualifying Exam in semester II

Paper Code	**Subject**	**Maximum Marks IA**	**Maximum Marks SE**	**Total Marks**
	EVS*	25	75	100

*EVS-Environmental sciences & Health

SEMESTER III

Paper Code	Subject	Credit	Didactic Hours	Practical hours	Maximum Marks			
					Theory		Practical	
					IA	SE	IA	SE
BMIT-301	Specialized radiographic procedures	20	120	180	25	75	25	75
BMIT-302	Quality control and Radiation Safety & General Principles of hospital practice & patient care in Imaging Department	8	60	60	25	75	25	75
BMIT-303	Interventional, Mammography and Digital Radiography	8	30	90	25	75	25	75
Total		36	210	330	75	225	75	225

Total Credit - 36

Total Marks-Theory ---300

Total Marks Practical--300

SEMESTER IV

Paper Code	Subject	Credit	Didactic hours	Practical hours	Maximum Marks			
					Theory		Practical	
					IA	SE	IA	SE
BMIT-401	Physics of Newer modalities- CT	6	60	30	25	75	25	75
BMIT-402	Physics of Newer modalities-MRI	6	60	30	25	75	25	75
BMIT-403	Physics of Newer modalities- Ultrasound & Nuclear Medicine	10	90	60	25	75	25	75
Total		22	210	105	75	225	75	225

Total Credit- 22

Total Marks-Theory ----300

Total Marks Practical—300

SEMESTER-V

Paper Code	**Subject**	**Credit**	**Didactic hours**	**Practical hours**	**Maximum Marks**			
					Theory		**Practical**	
					IA	SE	IA	SE
BMIT-501	CT-Imaging, Practical Aspect & Role of Technologist's	8	45	75	25	75	25	75
BMIT-502	MR-Imaging, Practical Aspect & Role of Technologist's	8	45	75	25	75	25	75
BMIT-503	US-Imaging, & Nuclear Medicine Practical Aspect & Role of Technologist's	11	45	120	25	75	25	75
Total		27	100	75	75	225	75	225

Total Credit- 27

Total Marks-Theory --- 300

Total Marks Practical---300

SEMISTER VI

Paper Code	Subject	Maximum Marks IA	Maximum Marks SE	Total Marks
BmiT601	Dissertation & Viva voce 30 credits	25	75	100

Total credit: 30

Total Marks: 100

(7th & 8th SEMESTER COMPULSORY TWELVE MONTHS INTERNSHIP)

NOTE: Practical and tutorials should include clinical experience with training in specialty .It should also include postings & seminars about current techniques. As part of the journal club, students will prepare and submit case reports on cases that they assisted during clinical training.

SEMESTER-1

BSc IN MEDICAL IMAGING TECHNOLOGY

Course Code: GFC-101 (Theory) & 103 (practical)

Title of the Course: Human Anatomy

Lecture:50,Practical :20 **Credit hour :L-2,P-1**

After completing this Course, the students should be able to

- Comprehend the biology concerned with the study of the body structure of organisms and their parts.
- Learn the Preservation, and, embalming of body organs
- Learn the study of bones, joints ,and muscles
- Demonstrate the different parts of the human body
- Categorize general slides of tissues & organs

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	1	1	1	1
CLO-2	1	1	1	1	1	1	1	1
CLO-3	1	1	1	1	1	1	1	1
CLO-4	1	1	1	1	1	1	1	1
CLO-5	1	1	1	1	1	1	1	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

UNIT-I **12 hour**

Introduction to Anatomy

Anatomical terms, planes, organization of human body- cell, tissue, organ & organ system.

Musculo-skeletal system:

Types of bones, structure & divisions of the skeleton system, name of all the bones and their parts, joints- classification.

Structure and types of muscles

Anatomy of the Nervous system

Central nervous system & Peripheral nervous system- different components

UNIT-II **15 hour**

Anatomy of Circulatory system:

General plan of circulatory system and its components-

Heart- size, location, coverings, chambers, blood supply, nerve supply, the blood vessels

General plan of circulation, pulmonary circulation

Name of arteries and veins and their positions

Lymphatic system - general plan

Anatomy of the Respiratory system:

Organs of Respiratory System – (Brief knowledge of parts and position)

UNIT-III **13 hour**

Anatomy of the Digestive system:

Anatomy of alimentary tract; Parts of the tract

Accessory glands of digestion; Pancreas, Liver, Gall Bladder

Anatomy of Excretory system Kidneys- location, gross structure, excretory ducts, ureters, urinary bladder, urethra

UNIT-IV **10 hour**

Reproductive system

Male Reproductive System

Female Reproductive System

Anatomy of the endocrine system

Name of all endocrine glands their positions, Hormones and their functions- Pituitary,

Thyroid, Parathyroid, Adrenal glands, Gonads & Islets of pancreas

Books recommendend

1. Human Anatomy Regional and Applied Vol. 1, Vol.2 & Vol.3, B.D.Chaurasia C.B.S.Publishers, New Delhi

2. Hand Book of General Anatomy B.D.Chaurasia, C.B.S.Publishers, New Delhi

3. Text Book of Human Histology Inderbir Singh, Jaypee Brothers, Medical Publishers, Delhi

4. Gray's Anatomy Susan Standring, Elsevier Churchill Livingstone, Edinburg

Teaching-Learning Strategies in brief

- In a university, typical teaching is giving lectures to large group of students, followed by tutorial, Presentation, Chalk & board & with workshop as well as some individual study.
- However, there are variety of other delivery methods that can be highly effective &concepts like flipped classroom & problem based learning.
- The following material is provide you with an overview of the many modes of distribution that you can use in your teaching & learning.

Assessment methods and weightages in brief

- There are two components of assessment: Internal assessment & External semester examination. There are two sessional exam conduct.
- At the end of each semester, semester exams & viva are conducted that comprise a huge weightage. Total marks are 100 for the subject(Internal assessment:13 & External semester:37)

Course Code: 102(Theory) & 104(Practical)

Title of the Course: Human Physiology

Lecture:50 ,Practical:20 **Credit hour:L-2,P-1**

After completing this Course, the students should be able to

- Blood Groups - ABO and RH grouping estimation
- Measurement of Blood pressure, heart rate, pulse rate, respiratory rate, reflexes.
- Measurement of RBC, WBC, Platelet count
- Measure of bleeding time and clotting time
- Hemoglobin test

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	1	1	1	1
CLO-2	1	1	1	1	1	1	1	1
CLO-3	1	1	1	1	1	1	1	1
CLO-4	1	1	1	1	1	1	1	1
CLO-5	1	1	1	1	1	1	1	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

UNIT-I **12 hour**

General Physiology

Cell, Transport across cell membrane, homeostasis, resting membrane potential, action potential

Blood

Composition and functions of Blood

RBC, WBC, Platelet count, Hemoglobin

Blood Groups - ABO and RH grouping

Hemostasis & Anticoagulants

UNIT-II **15 hour**

Cardio vascular system

Cardiac muscle, Pacemaker & conducting tissue

Cardiac Cycle

Cardiac output, Heart rate, ECG

Arterial blood pressure

Respiratory System

Functions of Respiratory system

Mechanism of respiration, lung volumes & capacities

UNIT-III **13 hour**

Nerve & Muscle physiology

Neuron structure & properties

Neuromuscular junction

Skeletal muscle structure mechanism of contraction

Cerebrospinal Fluid (CSF): Composition, functions & Circulation.

Central & autonomic Nervous system

Organization of CNS

Functions of various parts of Brain, in brief

Composition, functions and circulation of CSF

Differences between sympathetic and parasympathetic division

UNIT-IV **10 hour**

Digestive system

Functional Anatomy, organization & innervations

Composition and functions of all Digestive juices

Digestion & Absorption of carbohydrates, proteins and fats

Excretory System

Kidneys: Functions, Nephron, Juxta-glomerular Apparatus

Renal circulation

Mechanism of Urine formation

GFR

Endocrine and Reproductive systems

Endocrine glands & hormones secreted

Functions of Reproductive system

Male Reproductive System: spermatogenesis, Testosterone.

Female reproductive system: Ovulation, Menstrual cycle.

Pregnancy test

Books recommended

1. Text book of Physiology Guyton (Arthur C) Prism Publishers Bangalore

2. Review of medical Physiology Ganong Appleton and Lange,

Teaching-Learning Strategies in brief

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Assessment methods and weightages in brief

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Course Code: GFC-105

Title of the Course: Medical Ethics, Legal aspects and Medical Terminology

Lecture:5 **Credit hour:Na**

After completion of this course, the students should be able to:

CLO1-Apply the Ethical value

CLO2-he/she learn moral value about medical terms

CLO3- Legal responsibilities they might encounter in their subsequent coursework, in their clinical rotations and ultimately in their roles as health care professionals.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	1	1	1	1
CLO-2		1	1		1			1
CLO-3		1		1	1	1	1	

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed syllabus **25 hour**

Role Definition and Interaction, Ethical, Moral, and Legal Responsibilities

Medical terminology- The course employs a body systems-oriented, word-analysis approach to learning medical terminology. The goal of the class is to prepare students for the terminology they might encounter in their subsequent coursework, in their clinical rotations and ultimately in their roles as health care professionals.

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Course Code: GFC-106

Title of the Course: English

Lecture:25 **Credit hour:NA**

After completion of this course, the students should be able to:

- **CLO1-**Acquire a good command over English language for common and medical terminology used in medical practice.
- **CLO2-**Able to speak and write proper English
- **CLO3-**Able to read and understand English
- **CLO4-**Able to understand and practice medical terminology

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)and Program Specific Outcomes (PSOs)

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CLO-1	1	1	1	1	1	1	1	1
CLO-2	1	1	1	1	1	1	1	1
CLO-3	1	1	1	1	1	1	1	1
CLO-4	1	1	1	1	1	1	1	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed syllabus **25 hour**

It is designated to help the students to acquire a good command over English language for common and medical terminology used in medical practice.

Objectives:

Ability to speak and write proper English

Ability to read and understand English

Ability to understand and practice medical terminology

Teaching-Learning Strategies in brief

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Course Code: GFC-107

Title of the Course: Computer Skills

Lecture:5 Practical:30

After completion of this course, the students should be able to:

- **CLO1-**Perform basic computer applications system.
- **CLO2-** learn & perform related to medical records and information data system

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	1	1	1	1
CLO-2		1		1	1		1	

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed syallabus **35 hour**

Computer applications related to medical imaging technician

Teaching-Learning Strategies in brief

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- Sessional exam conduct for 15 marks and 10 marks on continuous mode evaluation that are : Attendance, Assignments, Quiz ,Seminar
- At the end of each semester, semester exams & viva are conducted that comprise a huge weightage.Total marks are 100 for the subject(Internal assessment:25 & External semester:75)

Course Code:EVS

Title of the Course: EVS -ENVIRONMENT SCIENCE AND HEALTH

Lecture-100 **Credits:08**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to,

Student will Learn soil,water pollution

Acknowledge & Perform the management of pollution

Apply all managements in basic life .

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	1	1	1	1
CLO-2	1	1	1	1	1	1	1	1
CLO-3	1	1	1	1	1	1	1	1

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Detailed Syllabus: **100 hour**

Introduction to Environment and Health

Sources, health hazards and control of environmental pollution

Water- safe and wholesome water

Sanitary sources of water

Understanding the methods of purification of water on small scale and large scale

Various biological standards, including WHO guidelines for third world country

Concept and methods for assessing quality of water

Domestic refuse, sewage, human excreta and sewage their effects on environment and health, methods and issues related to their disposal.

Awareness of standards of housing and the effect of poor housing on health

Role of arthropods in the causation of diseases, mode of transmission of arthropods borne diseases, methods of control

Recommended Books

Text Book of Environmental Studies for under graduate courses By Erach Bharucha**,** Orient Longman Private Limited /Universities Press India Pvt. Ltd.

Teaching-Learning Strategies in brief (4 to 5 sentences)

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SEMESTER-2

Course Code: BMIT-201 theory & 204 practical

Title of the Course: *Fundamental of basic and radiation Physics*

Lecture-60,practical-30 **Credits: l-4,p-2**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to,

- **CLO1**-student will able to learn Basic radiation physics.
- **CLO2-**he/she will learn Basic physics which apply in course .
- **CLO3-**acknowledge & learn Electrostatics & its law scattered radiation.
- **CLO4-** student will learn & perform Radiation protection, Measurements & units

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	2	1	2	2
CLO-2	1	1	1	1	2	1	1	1
CLO-3	1	1	1	1	1	1	1	1
CLO-4	1	1	1	3	2	1	2	3

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

Unit 1: **10 hour**

Basic Physics: Physical Quantities and units, Force, Work, Energy, Power, Heat, Matter, Atomic structure, Atomic Number, Atomic Mass, Binding Energy, Isotopes, Isobars, Ionization, Electromagnetic Radiation, Quantum or Photon.

Unit 2: **10 hour**

Electrostatics, & its Law's, Capacitor and uses of capacitors, Magnetism and electromagnetism, Electric current, Electric power, Heating Effects of Electric current, Electrical classification of matter, Electric Generators, Face Voltage, Line voltage, Poly phase connection, Rectifier and various rectification circuit.

Unit 3: **30 hour**

Production of x rays, X ray tubes and X ray Generators, factors affecting X ray emission, power Rating and Heat Loading, Interaction of x rays with matter.

Intensity (Quality & Quantity) of X-ray beam.

Scattered Radiation, Its effects & method to minimize the effects(filter, Beam restrictors (Collimators, grid, air gap technique

Unit 4: **10 hour**

Radiation Units, radiation detection & measurement, types of detectors.

Radioactivity

Biological effects of radiation

Radiation protection

Reference Books:

1. Text book of Radiographic positioning and Related Anatomy: Kenneth L. Bontrager, John P. Lampignano
2. Bushong -Radiological science for technologists
3. The Physics Of Radiology And Imaging Paperback– 2014 by Thayalan K
4. Physics for Diagnostic Radiology, Third Edition 3 Rev ed Edition (English, Hardcover, P P Dendy Brian Heaton Philip Palin Dendy Heaton Dendy
5. Christensen's Physics of Diagnostic Radiology,

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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

Course Code:BMIT-202 theory & 205 practical

Title of the Course: ***Radiographic photography & Imaging***

Lecture:60, practical-45 **Credits: l-4,p-3**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1- learn of Latent image formation on x ray film

CLO2- learn & able to perform film processing of x ray

CLO3- he /she learn & use in dept. of Film & different types of chemical solution maintains.

CLO4- will perform Safety and care mechanism of x ray film.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	2	1	1	1	1	2	2
CLO-2	1	1	2	2	1	1	1	1
CLO-3	1	1	1	1	2	1	1	1
CLO-4	1	1	1	1	1	2	1	2

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

Unit 1: **12 hour**

Photographic Process: Light image, Image produced by radiation, Light sensitive materials, Film Emulsion, Latent image.Film Materials: The structure of X-ray films, , Resolving power Graininess of film, sensitivity of film, speed of film, contrast of photographic films.

Sensitivity: Characteristic Curve and its usefulness.

Screens: Construction of intensifying screens, Choice of fluorescent material, Intensifying factors, detail, Sharpness, speed screen contact and care of intensifying screen.

Cassettes: Cassettes design, Care of cassettes, mounting of intensifying screen in the cassettes.

Unit 2: **12 hour**

Film processing Constituents of the processing, solutions and replenisher. Factors affecting the developer. Types of developer and fixer, Factors affecting he use of the fixer.

Film rinsing, washing, Intermediate rinse, washing, and drying . Quality

Drying: Assurance of films. Artifacts

Film processing Equipment Manual and Automatic processing tanks

Laser camera, Dry Processing.

Unit 3: **12 hour**

Dark Room Design: Outlay and materials use

The Radiographic Image: The sharpness, contrast, details, definition, viewing conditions.

Administration: Trimming, identification of films, legends, Relevant papers of the patients, records, filling reports distribution. Photographic aspects of radiography

X-raymaterials Accessories – Viewing boxes, including high intensity illumination of small areas, illuminators, projectors and viewing screens for miniature and cine radiography, magnifiers, embossing machine, inscribing materials, film trimmers an dental mouths and cutters filling units.

Unit 4: **9 hour**

Equipment for miniature radiography –assessment of photographic requirements, fluorescent screen,. Optimum resolution, sensitive material, speed resolutions, speed resolution, color sensitivity of films in relation to spectral omission. Dark room illumination and speed spectral sensitivity of film methods of processing sizes of roll and out film, technique of mass miniatures radiography, exposure technique uniformity, special protective measures, projection records, fillings' corner cutters, dental mouths and cutters filling units.

Reference Books:

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7. Bushong -Radiological science for technologists
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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

Course Code: BMIT-203 theory & 206 practical

Title of the Course: *Routine Radiographic procedure*

Lecture-90, practical-150 **Credits:l-6,p-10**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to

CLO 1-learn Introduction of all general procedure & scan with medical terms

CLO2-will acknowledge all types of Pathological terms related to radiography.

CLO3- will learn & apply different Anatomy of whole body in x ray imaging

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	2	2	2	1	1
CLO-2	1	1	1	1	1	1	2	1
CLO-3	1	1	1	1	1	1	1	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

UNIT-I **5 hour**

Ethics on Radiologic Technology, Description of Radiograph, Care of Radiographic Examination Room , Standard Precautions, Anatomical Position , Projection terminology, Image receptor placement & impotence of Anatomical markers .

Pathological terms related to radiography

UNIT-II **6 hour**

Radiography of Lungs & Heart:

PA projection, Lateral projection, RAB & LAO, RPO & LPO , AP Projection, Lordotic view, Apicogram, Lateral decubitus, Dorsal & ventral Decubitus

UNIT-III **15 hour**

ROUTINE RADIOGRAPHY OF UPPER LIMB: Digits, Hand, Wrist, Carpal Bones Forearm Elbow, Humerous SHOULDER GIRDLE: General Survey, Shoulder Dislocation, Acromio- Clavicular Joints, Calcified Tendons, Clavicle, Scapula, Coracoid Process.

THE LOWER LIMB:

Foot—Pathology, Pes Planus, Hallux valgus, Fracture & Dislocation, Foreign bodies

Toes—Trauma or Pathology, 1st Meta-Torso Phalangeal Sesamoids

ANKLE & SUBTALBULAR JOINTS, TIBIA & FEBULA,

Knee Joints: General Survey, Trauma, Loose bodies, Subluxation , Pathology, Intercondylar fossa Femur Shaft, Measurement of lower limb.

UNIT-IV **10 hour**

HIP JOINT: Dislocation, Proximal end of femur, Acetabulum, Congenital dislocated hip, Perthe,s Disease, Slipped Capital epiphysis, other pathology, Radiography of hip to check prosthesis and pinning's.

PELVIS—Pathology, Fracture, Subluxation of symphysis pubis, Sacro-iliac joints

UNIT-5 **18 hour**

THE VERTEBRAL COLUMN:

Atlanto- Occipital articulation-Lateral, Right & left Posterior Oblique, AP –PA

Cervical Vertebra: -- Atlas, Axis, Dens, Upper cervical Vertebra, Lower cervical Vertebra, Radiography of cervical intervertebral foramina, Vertebral Arch, Stretcher case,

THORACIC VERTEBRAE: Basic Projections, Severe injury cases

LUMBER—LUMBOSACRAL VERTEBRAE:

AP, Lat, Lumbo-sacral junction, fluxion & extension projection, weight Bearing Method, Bending projection

Sacrum and Coccyx: PA, PA Axial, Lateral, Axial method for Coccyx.

UNIT-6 **10 hour**

RADIOGRAPHY OF SPINE- SCOLIOSIS

Bones of the thorax; trauma (stretcher Patient) Upper Ribs- Trauma or pathology (Non-stretcher patient) Lower ribs- Trauma or pathology (Non-stretcher patient)

Sternum- Trauma or pathology (Non-stretcher patient)

UNIT-7 **7 hour**

RADIOGRAPHY OF ABDOMEN & PELVIC CAVITY;

Plain abdomen, acute abdomen, urinary tract, liver & diaphragm, diaphragmatic movement during respiration

UNIT-8 **12 hour**

Radiography of SKULL:

Cranium: -Lateral, PA, AP, Axial projection, Submento-vertical projection, Vertico-submental projection, Sella Turcica, floor of pituitary fossa, dorsum sellae, anterior & posterior clenoid processes, Orbit ,Optic canal & Foramen,. Jugular foramina.

FACIAL BONES: Basic Trauma, Pathology

Facial Lateral projection, occipito- mental, occipito-mental 30 degrees caudal, zygomatic arches, maxillae, nasal bones, mandible, tempo mandibular joints

TEMPORAL BONES: Temporal, mastoid, petrous.

PARANASAL AIR SINUSES: Maxillary antra, Sphenoidal, Ethmoidal- Anterior & Posterior

UNIT-9 **8 hour**

DENTAL RADIOGRAPHY:

Dental formula

Intra-oral radiography --Interproximal radiography, periapical radiography, Occlusal radiography, Extra - oral techniques --- oblique lateral, ortho-pantomography

RADIOGRAPHY OF SKELETAL SYSTEM SURVEY

Ward radiography, foreign body radiography, soft tissue radiography, Macro radiography.

Books Recommended:

1. Clark's Positioning in Radiography
2. Merrill's Atlas of Radiographic Positioning and Procedures.
3. Text book of Radiographic positioning and Related Anatomy: Kenneth L. Bontrager, John P. Lampignano

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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

SEMESTER-3

Course Code:BMIT-301 theory & 304 practical

Title of the Course: ***Special Radiography Procedure***

Lecture-120,practical-180 **Credits:l-8,p-12**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1-Apply knowledge of contrast media
CLO2-will able to Conduct Patient care in different procedure.
CLO3-learn & will Perform Different Radiological procedure

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	2	1	3	3	1	3	2
CLO-2	1	1	1	2	1	1	2	1
CLO-3	1	1	1	2	1	2	2	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

UNIT-I **5 hour**

CONTRAST MEDIA & CLASSIFICATION OF CONTRAST MEDIA

IODINATED CONTRAST MEDIA ---PHARMACOLOGY

Iodination of Benzene, Properties of Contrast Media—Clearance, density, viscosity, osmolarity, moles

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UNIT-II **20 hour**

IODINATED CONTRAST MEDIA:- Adverse reactions:- historical perspective on iodinated contrast media, Physiologic or Non – allergic reactions (Cardiovascular/ Pulmonary effects, Renal effects, CNS effects, Vasovagal reactions, Allergic & Pseudo allergic reactions.

IODINATED CONTRAST MEDIA: - Managing Reactions (primary assessment and oxygen delivery, Cardiac Complications, Allergic, Pseudo allergic and Asthmatic Reactions, Glycemic Events and Seizures.

UNIT-III **25 hour**

Contrast media in G.I.T

UPPER G.I.T

SIALOGRAPHY:

BARIUM SWALLOW, Single contrast technique, Double contrast Technique, Technique for specific conditions.

BARIUM MEAL: - Single contrast study, Double contrast study, Biphasic Study.

HYPOTONIC DUODENOGRAPHY

BARIUN MEAL FOLLOW THROUGH:-Single Contrast, Double Contrast, Enteroclysis.. BARIUM ENEMA: - :- Single contrast study, Double contrast study, sigmoid Flush, colostomy Enema, Instant barium enema.

UNIT-IV **16 hour**

URINARY SYSTEM :- IVU, Modified Techniques—Diuretic urogram, Hypertensive urogram, Drip infusion urography, Emergency urography, High dose urography, Retrograde Pyeloureterography, MCU, RGU,

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UNIT-5 **10 hour**

1. FEMALE REPRODUCTIVE SYSTEM: - HSG, Fallopian tube recanalisation,

2. MYELOGRAPHY: - Lumber myelography, Dorsal Myelography, cervical myelography.

UNIT-6 **18 hour**

Cisrernal Puncture, Lateral cervical Puncture

3. BILIARY SYSTEM: - T- Tube Cholangiography, Abnormal T- Tube cholangiography, Percutaneous Transhepatic Cholangiography,

4. DIRECT PORTAL VENOGRAPHY. - Percutaneous splenic puncture, transhepatic portography,

UNIT-7 **16 hour**

5. PHELEBOGRAPHY: - Lower limb. (asending & desending phlebography, Inferior venacavalgraphy,

6. BRONCHOGRAPHY: - Upper lobe, Lingula and Middle lobe, Lower Lobe, Delayed Bronchogram

7. DACROCYSTOGRAPHY.

UNIT-8 **10 hour**

8. ANGIOGRAPHY

Reference Books:

1. Radiological Procedures - A Guideline Paperback – 1 Jan 20 **by** **Bhushan N. Lakhkar**
2. Chapman & Nakielny's Guide to Radiological Procedures
3. Merrill's Atlas of Radiographic Positioning and Procedures.
4. Text book of Radiographic positioning and Related Anatomy: Kenneth L. Bontrager, John P. Lampignano

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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

Course Code:BMIT-302 theory & 305 practical

Title of the Course: ***Quality control & radiation safety & principles of hospital practice & patient care in imaging department***

Lecture-60, practical-60 **Credits:l**-4,p-4

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1-.Patient safety techniques in imaging department
CLO2-.Patient care in different type of patient in imaging department
CLO3-Testing of Different types of radiology modalities like USG,X RAY,MRI ,CT etc

Mapping of Course Learning Outcomes (COs) with Program Learning Outcomes (PLLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	2	3	2	2	1
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CLO-3	1	1	1	2	1	1	1	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

UNIT-I **12 hour**

Human Biology:

Human Radiation Response, Composition of the body, Cell theory, Molecular Composition, The Human Cell, Tissue and Organs

Fundamental Principles of Radiobiology:

Factors Affecting Radio sensitivity, Linear Energy Transfer, Relative Biological effectiveness, Protraction and Fractionation, Oxygen Effect, Age, Recovery, Chemical agents, Radiation Dose – Response Relationship

Molecular and Cellular Radiobiology:

Irradiation of Macromolecules, Radiolysis of Water, Direct and Indirect Effects, Target Theory, Cell Survival Kinetics

UNIT-II **7 hour**

Early Effects of Radiation:

Acute Radiation Lethality: prodromal Period, Hematologic Syndrome, Gastrointestinal Syndrome, Central Nervous System Syndrome, Lethal Dose, Local Tissue Damage, Hematologic Effects, Cytogenetic Effects.

Late Effects of Radiation:

Local Tissue effects, Life Span Shortening, Radiation Induced Malignancy, Radiation and Pregnancy.

UNIT-III **12 hour**

Health Physics:

Principles of Radiation Physics, Designing of Radiation Protection:

Radiographic Protection Features, Fluoroscopic Protection Features, Design of Protective Barriers, Radiation Detection and Measurements.Radiation Protection Procedures. Occupational Radiation Exposure, Reduction of Occupational Radiation Exposure, Reduction of Unnecessary Patient Dose.

Quality Control:

Quality assurance, fluoroscopy Quality Control, Tomographic Quality Control, processor Quality control.

UNIT-4 **5 hour**

1.Professional issue in Radiologic Technology:

The criteria of a Profession, The Health Care Team, Professional Ethics, Legal issue in Radiologic Technology, Medical Record and Documentation

2. The Patient In Imaging:

Basic Human Needs, Patient Assessment, Patient Expectations, Communication.

UNIT-5 **8 hour**

3.Infection Control and Institutional Safety:

Nasocomial Infections, Element's needed to Transmit Infection, Universal Precaution and Body substance Isolation, Technique of Infection Control.

4.Basic Patient Care and Safety in Radiologic Imaging:

Moving and Transferring Patients, Assisting the patient in dress and undress, Cast care and Traction, Departmental Safety.

UNIT-6 **5 hour**

5.Surgical Asepsis:

The Environment and Surgical Asepsis, Methods of Sterilization, Disinfection, Opening Sterile Packs, Changing Dressing.

6.Medical Emergencies in Radiographic Imaging:

Shock, Pulmonary Embolus, Diabetic Emergencies, Respiratory Failure, Cardiac Failure, Airway Obstruction, Stroke, Fainting, Seizures.

UNIT-7 **6 hour**

7. Care of Patient During Imaging Examination of Gastrointestinal System, Urologic Procedure, and during Special procedures

8.Drug Administration:

System of Drug Administration, Medication Error and Documentation, Equipment for Drug Administration, Methods of Drug Administration, Care of patient with Intravenous Infusions

Books Recommended:

1. Bushong -Radiological science for technologists
2. The Physics Of Radiology And Imaging Paperback– 2014

by Thayalan K

3. Physics for Diagnostic Radiology, Third Edition 3 Rev ed Edition (English, Hardcover, P P Dendy Brian Heaton Philip Palin Dendy Heaton Dendy
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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

Course Code:BMIT-303 theory & 306 practical

Title of the Course: ***Interventional radiology, mammography &Digital imaging***

Lecture-30,practical-90 **Credits:l-2,p-6**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1-learn anatomy & physiology of Breast anatomy
CLO2-will acknowledge & use of Introduce Drugs ,patient care & preparation
CLO3-will able to Perform Conventional radiography technology.
CLO4-learn & Perform Digital radiography & advantages
CLO5-will Perform interventional radiology

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	2	3	1	3	1
CLO-2	1	1	1	2	3	1	3	1
CLO-3	1	1	1	1	1	1	1	1

CLO-4	1	1	1	3	3	1	3	1
CLO-5	1	1	1	3	2	1	2	1

. 3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

detailed Syllabus:

UNIT-I **5 hour**

Digital Radiography: Scanned Projection Radiography, source – Detector Assembly, Area Beam Versus Fan Beam, Computed Radiography, Direct Capture Radiography.

UNIT-II **5 hour**

Digital Fluoroscopy:

High – Voltage Generator, Charged Couple Device, Video System, Image Formation, PACS.

UNIT-III **10 hour**

Differences between soft tissue radiography and conventional radiography. Anatomy of the breast. Mammography, differences between diagnostic and screening mammography, unique features of a mammographic imaging system, requirement for compression in mammography. Image receptor characteristics used for screen-film and digital mammography.

UNIT-IV **10 hour**

Interventional: Introduction. Cardiovascular and Interventional Procedures & CV & Interventional Technologist,

1. Angiography Suite.
2. Fluoroscopy Equipment's.
3. Principles of Intervention.
4. Drugs used in Interventional Procedure, Environment and Patient Care.
5. Consumable.
7. Constant
8. Digital Image:
9. Advent of Digital, Image Characteristic.

Books Recommended:

1. Bushong -Radiological science for technologists
2. Radiological Procedures - A Guideline **by Bhushan N. Lakhkar**
3. Chapman & Nakielny's Guide to Radiological Procedures
4. Merrill's Atlas of Radiographic Positioning and Procedures.
5. Text book of Radiographic positioning and Related Anatomy: Kenneth L. Bontrager, John P. Lampignano (Number of Units may be decided by the School/Department/Centre)

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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

SEMESTER-4

Course Code: BMIT-401 theory & 404 practical

Title of the Course: ***Physics of Newer Modalities –CT***

Lecture-60, practical-60 **Credits:l-4,p-4**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1-identify Basic equipment's of the CT unit physics.
CLO2- Image Manipulation principle of ct machine for different scan
CLO3-will learn Working Principle of ct machine

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	3	1	3	1
CLO-2	1	1	1	1	3	1	3	1
CLO-3	1	1	1	1	3	1	3	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

UNIT-1 **15 hour**

1. Basic Concept:
   Historical Perspectives, Physical Principles of CT, Original CT design, Digital Image Processing.

1. Data Acquisition Concepts:

Evolution of CT Scanners ,Slip Ring Technology, X-Ray System, CT Detector Technology, X-Ray system, Detector Electronics, Data Acquisition and Sampling .

UNIT-2 **15 hour**

2. Principles, Image reconstruction from projections, Reconstruction algorithms, Types of Data, Image Reconstruction in Single slice SPIRAL/HELICAL CT, 3D Algorithm.

3. Instrumentation:

Imaging System, CT computer and Image Processing System, Image Display, Storage, Recording, Communication.

UNIT-3 **15 hour**

4. Image Manipulation:
   Definition, Windowing, Specialized Computer Program, Visualization and Analysis Workstation

5. Image Quality:

Qualities, Resolution, Noise, Linearity, Image Artifacts, quality Control.

UNIT-4 **15 hour**

6. Single-Slice Spiral Computed Tomography: Basic Principle and Instrumentation:
   Conventional Slice by Slice Data acquisition, Slice by Slice Volume Scanning, Instrumentation, Basic Scan Parameters, Advantage and Limitations.

7. Multi Slice Computed Tomography:
   Evolution of Multi Slice Scanners, Physical Principles, Instrumentation, Advantages of Multi Slice CT.

Reference Books:

1. 1.Text book of Radiographic positioning and Related Anatomy: Kenneth L. Bontrager, John P. Lampignano
2. Bushong -Radiological science for technologists
3. The Physics Of Radiology And Imaging Paperback– 2014 by Thayalan K
4. Physics for Diagnostic Radiology, Third Edition 3 Rev ed Edition (English, Hardcover, P P Dendy Brian Heaton Philip Palin Dendy Heaton Dendy
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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

Course Code: BMIT-402 theory & 405 practical

Title of the Course: ***Physics of Newer Modalities –MRI***

Lecture-60, practical-30 **Credits:l-4,p-2**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1-learn & apply Basic principle of MRI.
CLO2-use of Image Formation scan for image
CLO3-perform work on MR Instrumentation.
CLO4- will perform sequence of mri in different procedure

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	3	1	3	1
CLO-2	1	1	1	1	3	1	3	1

CLO-3	1	1	1	1	3	1	3	1
CLO-4	1	1	1	1	3	1	3	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

UNIT-1 **15 hour**

1. Basic Concepts:
2. Basic Principles of MRI
3. Radiofrequency Pulse
4. T1, T2, and T2*

UNIT-2 **15 hour**

5. TR, TE and Tissue Contrast
6. Tissue Contrast: clinical Applications
7. Pulse Sequence: saturation Recovery, Partial Saturation, Inversion Recovery)
   Pulse Sequence: Spin Echo.

UNIT-3 **15 hour**

8. Fourier Transformation
9. Image Construction: Slice Selection
10. Image Construction: Spatial Encoding
11. Signal Processing

Data Space, Field of View.

UNIT-4 **15 hour**

12. Artifacts in MRI
13. Hardware of MR scanner
14. MR patient safety concern

Reference Books:

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2. Bushong -Radiological science for technologists
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  PRACTICAL
  Note; practical base on the topics mentioned in the theory syllabus

Course Code: BMIT-403 theory & 406 practical

Title of the Course: ***Physics of Newer Modalities –Ultrasound & Nuclear medicine***

Lecture-60,practical-120 **Credits:l-4,p-8**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1- student will patient preparation in different scan & procedure

CLO2-he/she learn handling instrumentation

CLO3-apply different types of techniques for image formation

CLO4-learn & use nuclear medicine & pharmaceutical

CLO5- perform & consider all types of safety mechanism for patient

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	3	1	3	1
CLO-2	1	1	1	1	3	1	3	1
CLO-3	1	1	1	1	3	1	3	1
CLO-4	1	1	1	1	3	1	3	1
CLO-5	1	1	1	2	3	1	3	2

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

UNIT-I **15 hour**

ULTRASOUND:

1. Principles of Ultrasound an Overview:
2. Transducer & Types:
   Transducer Frequencies, CW Transducer, Pulsed Transducer, Pulsed Ultrasound Terminology, Piezoelectric Materials, Depolarization, construction, Phased Arrays, Steering the Beam, Focusing the Beam.
3. Instrumentation:
   Pulsar/Pulse Delays, Amplifiers/ Converters, Echo Delay/Simmer, Single Processor, Image Processor, Digital Scan Converter, Image Memory, Display
4. Echo-Reflection:
   Reflection & transmission, Specular Reflection, Scattering, Penetration & Resolution:
5. Resolution:
   Longitudinal Resolution, Lateral Resolution, Elevation Resolution, Temporal Resolution, Resolution Phantoms.

UNIT-2 **15 hour**

6. Artifacts:
   Slice Thickness, Refraction, Multipath, Reverberation, Acoustic Shadow, Acoustic Enhancement.
7. Doppler:

Doppler Effect, Doppler Shift, Speed Versus Velocity, Measuring Velocity, Spectral Analysis, aliasing, CW Doppler, PW Doppler, PW & CW Spectrum, Color Flow Image.

8. Patient preparation and imaging techniques.

Books Recommended:

1. Physics for Diagnostic Radiology, Third Edition (English, Hardcover, P P Dendy Brian Heaton Philip Palin Dendy Heaton Dendy
2. The Physics Of Radiology And Imaging by Thayalan K.
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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

SEMESTER-5

Course Code: 501 theory & 504 practical

Title: CT - IMAGING AND PRACTICAL ASPECTS:

Lecture:45, practical-75 **CREDIT: l-3,p-5**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1-Basic equipment's of the CT unit.
CLO2-Learn image quality image quality.
CLO3- Acknowledge Artifact
CLO4-Apply Safety measurements principle of patient

Mapping of Course Learning Outcomes (CLLOs) with Program Learning Outcomes (POs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	3	1	3	1

CLO-2	1	1	1	1	1	1	1	1
CLO-3	1	1	1	2	1	1	1	1
CLO-4	1	1	1	1	3	1	3	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

UNIT-1 **10hour**

1. Instrumentation an overview

UNIT-2 **10hour**

2. Clinical Application of CT and Patient Dose.

UNIT-3 **15hour**

3. Imaging Techniques for various body parts

Contrast Technique.

UNIT-4 **10hour**

4. Patient Care in CT

5. Safety Mechanism

Books Recommended:

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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

Course Code: 502 theory & 505 practical

Title: MR - IMAGING AND PRACTICAL ASPECTS:

Lecture:45,practical-75 **CREDIT:l-3,p-5**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1- he /she will learn Basic principle of MRI.

CLO2-acknowlegde all types of MR Instrumentation.

CLO3-learn Pulse sequence

CLO4-learn & perform Safety Principle of patients

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	3	1	3	1
CLO-2	1	1	1	1	1	1	1	1
CLO-3	1	1	1	2	1	1	1	1
CLO-4	1	1	1	1	3	1	3	1

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

UNIT-1 **10hou**

1. Instrumentation an overview
2. Clinical application of MRI, Contraindications and Protocols

UNIT-2 **15hou**

3.Imaging Techniques for various body parts

4. Contrast Techniques.

UNIT-3 **10hour**

5.Patient Care in MRI
6.Patient Preparation

UNIT-4 **10hour**

7.Patient Monitoring, Relieving patient Anxiety
8. Basic Safety Consideration

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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

Course Code: 503 theory & 506 practical

Title: ULTRASOUND: - IMAGING AND NUCLEAR MEDICINE PRACTICAL ASPECTS

Lecture:45, practical -120 **Creadit:l-3,p-8**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO1-learn & use Instrumentation of usg machine
CLO2- learn different type of Artifacts
CLO3-perform Doppler USG principle
CLO4- learn & apply Nuclear medicine principle
CLO5- acknowledge all the Equipments of NM
CLO6- ableto perform all Protocols of NM & USg
CLO7- learn History of interventional radiology
CLO8-learn & uses of Fluoroscopy equipments

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

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CLO-2	1	1	1	1	1	1	1	1
CLO-3	1	1	1	2	1	1	1	1
CLO-4	1	1	1	1	3	1	3	1
CLO-5	1	1	1	1	1	1	1	1
CLO-6	1	1	1	1	1	3	3	3
CLO-7	1	1	1	1	1	2	1	2
CLO-8	1	1	1	1	1	2	2	2

3 in the box for high level mapping , for medium level mapping ,1 for low level mapping

Detailed Syllabus:

UNIT-1 **10hour**

1. Instrumentation an overview
2. Imaging Techniques for various body parts & Patient preparation

UNIT-2 **10hour**

3. Contrast Techniques
4. Patient Care in Ultrasound
5. Basic Safety Mechanism

UNIT-3 **10hour**

INTERVENTIONAL PROCEDURES: IMAGING AND PRACTICAL ASPECTS:

1. Typical layout for an CIVR suite
2. Instrumentation an overview
3. Principle of Intervention (Patient Preparation, Screen Test.
4. High Risk Patient

5. Drugs used in Interventional Radiology
6. Catheters and Guide wires
7. Complication In Interventional radiology
8. Imaging Techniques s
9. Patient Care
10. Safety Mechanism.

UNIT-4 **15hour**

Nuclear Medicine:

1. Clinical Applications
2. Genitourinary studies
3. Bone Scan
4. Brain Scan
5. Gastrointestinal Studies
6. Card`1iac studies
7. Lung Studies
8. Thyroid Uptake Study

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PRACTICAL

Note; practical base on the topics mentioned in the theory syllabus

SEMESTER-6

Course Code: 601

Title: Dissertation & viva voce

Creadit:4

COURSE LEARNING OUTCOMES (CLOs)

fter completing this Course, the students should be able to …….

1. Project

mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

and Program Specific Outcomes (PSOs)

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PSO-1	PSO-2	PSO-3
CLO-1	1	1	1	1	3	1	3	1