



YENEPOYA UNIVERSITY

Deralakatte, Mangaluru - 575018


REGULATIONS AND CURRICULUM GOVERNING

UNDERGRADUATE PROGRAM

B.Sc MEDICAL IMAGING TECHNOLOGY

(CURRICULUM - EFFECTIVE FROM 2015-16)

ATTESTED


Dr.Gangadhara Somayaji K.S.
Registrar
Yenepoya(Deemed to be University)
University Road, Deralakatte
Mangalore-575 018, Karnataka



Office of the Registrar
University Road,
Deralakatte
Mangalore - 575018
Ph: 0824-2204667/68/69/71
Fax: 0824-2203943

No.YU/REG/ACA/Academic Council-18/2014

18.10.2014

NOTIFICATION

Sub: Starting of B.Sc. course in Medical Imaging Technology from the
Academic year 2015-16 under the Faculty of Allied Health & Basic
Sciences

Ref: 18th meeting of the Academic Council held on 08.10.2014 (Agenda-17)

The Academic Council at its meeting held on 08.10.2014 (vide Agenda – 17) and subsequently the Board of Management have approved the proposal to start 3 year + 1 year internship in B.Sc. course (Medical Imaging Technology) as proposed by the Board of Studies concerned and recommended by the Faculty of Allied Health & Basic Sciences.

The Regulations/Syllabus recommended by the Faculty of Allied Health & Basic Sciences has also been approved by the Academic Council.

The course shall start from the academic year 2015-16.


REGISTRAR K

Copy to:

1. The Principal, YMC
2. Dean, Faculty of Allied Health & Basic Sciences
3. HoD, Radiology & Medical Imaging
4. Controller of Examinations
5. Academic Section – to write to Govt. of Karnataka & UGC in the matter

**Regulations and Course Curriculum for
Bachelor of Science in Medical Imaging Technology B.Sc (MIT)
(Annual Scheme)**

1. Introduction:

- 1.1. These regulations shall be called Yenepoya University Regulations for B.Sc. – Medical Imaging Technology course and govern the policies and procedures including selection, admission, imparting of instructions, conduct of examinations, evaluation and certification of candidate's performance and all amendments there to, leading to the award of B.Sc – Medical Imaging Technology degree.
- 1.2. This set of regulations shall be binding on all the candidates undergoing the said degree program.
- 1.3. These regulations may be modified from time to time as mandated by the statutes of the University. These provisions shall be applicable to any new degree program that may be introduced from time to time.
- 1.4. This set of regulations may evolve and get refined or updated or amended or modified or changed through appropriate approvals from the Academic Council or the Board of Management from time to time and shall be binding on all parties concerned including the Candidates, Faculty, Staff, Departments, and Institute Authorities.
- 1.5. All disputes arising from this set of regulations shall be addressed to the Board of Management. The decision of the Board of Management is final and binding on all parties concerned. Further, any legal disputes arising out of this set of regulations shall be limited to jurisdiction of Courts of Mangalore only.

2. Definitions:

Unless the context otherwise requires,

- University means Yenepoya University;
- BOM means Board of Management of Yenepoya University;
- Regulations means this set of academic regulations;
- BOS means Board of Studies in Allied Health Sciences;
- Constituent College means any institution under the ambit of the Yenepoya University;
- Head of the Institution means the Dean/Principal of the college/Institute;
- He includes both genders He and She.

3. Duration of the course:

The Candidate shall undergo a period of study extending over 3 years followed by 1 year compulsory rotating Internship.

4. Medium of Instruction and Examinations:

The medium of Instruction and Examination shall be English.

5. Maximum period for completion of the course:

The maximum period for completion of B.Sc Medical Imaging Technology course is 6 years.

6. Eligibility for Admissions:

- a. A candidate seeking admission to B.Sc.Medical Imaging Technology course must have passed 2 year PUC examination of Karnataka, PUE Board or an equivalent examination of any other approved Board or University with not less than 40% marks in Physics, Chemistry, and Biology and English as one of the languages of study.

OR

- b. Candidates with two years Diploma in Radiography after plus two from a recognized Government Board.
- C. Lateral entry to second year for B.sc MIT for candidates who have passed diploma program from the Government boards and recognized by RGUHS and these students are eligible to take admission on lateral entry system.

OR

- For SC/ST or category I Candidates the minimum percentage of marks shall be a pass in PUC or its equivalent examination (in PCB).
- Foreign nationals and candidates who have qualified from a foreign university/Board should obtain permission from Yenepoya University prior to the admission for equivalence of the qualification.
- The candidate should have attained the age of 17 years as on 31st December of the year of Admission.

Note: The vocational higher secondary education course conducted by Vocational Higher Secondary Education, Government of Kerala with five subjects including Physics, Chemistry, Biology and English in addition to vocational subjects conducted is considered equivalent to plus TWO examinations of Government of Karnataka Pre University Course.

7. Selection of eligible candidates:

Selection of candidates for admission to the course shall be based on the marks secured in the qualifying examination followed by personal interview.

8. Withdrawal – Temporary and Permanent:

8.1. Temporary:

8.1.1. A candidate who has been admitted to the course may be permitted to withdraw temporarily for a period of six months or more up to one year on the grounds of prolonged illness, grave calamity in the family etc, provided:

- a. He applies stating the reason of withdrawal with supporting documents and endorsement by parent/guardian.
- b. The Institute is satisfied that without counting the period of withdrawal candidate is likely to complete his requirement of the degree within maximum time specified.
- c. There are no outstanding dues or demands with the department, library, hostel, Institute etc.

8.1.2. The tuition fee for the subsequent year may be collected in advance based on the severity of the case before giving approval for any such temporary withdrawal.

8.1.3. Scholarship holders are bound by the appropriate rules applicable

8.1.4. The decision of the Institute /university regarding withdrawal of a candidate is final and binding

8.2. Permanent withdrawal:

8.2.1. A candidate who withdraws admission before closing date of admission for the academic session is eligible for the refund of the deposit only. The fees once paid will not be refunded on any account.

8.2.2. Once the admission for the year is closed, and if a candidate wants to leave the institution, he will be permitted to do so and take the Transfer Certificate from the institute, if required only after remitting all the tuition fees for the remaining years.

8.2.3. Those candidates who have received any scholarship/stipend/other forms of assistance from the Institute shall repay all such amounts in addition to those mentioned in the clause above.

8.2.4. The decision of the Institute/University regarding withdrawal of a student is final and binding.

9. Migration:

Migration of candidates may be considered only if the following conditions are fulfilled:

9.1. On compassionate ground:

9.1.1. Death of supporting guardian

9.1.2. Disturbed conditions as declared by Govt. of India

9.2. Candidates may be permitted to migrate to another university on compassionate ground provided they comply with the academic requirements of the lower class.

9.3. Such application for migration shall be permitted on receiving a “No Objection” certificate from the receiving University.

10. Conduct and discipline:

10.1. Candidates shall conduct themselves within and outside the premises of the Institute in a manner befitting the student of an Institution of national importance.

10.2. As per the order of Honorable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.

10.3. The following act of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures:

10.3.1. Ragging as defined and described by the Supreme Court/Government

10.3.2. Lack of courtesy and decorum; indecent behavior anywhere within or outside the campus.

10.3.3. Willful damage or stealthy removal of any property/belongings of the Institute/Hostel or of fellow students/citizens.

10.3.4. Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.

10.3.5. Mutilation or unauthorized possession of library books.

10.3.6. Noisy or unseemly behavior, disturbing studies of fellow students.

10.3.7. Hacking in computer systems (such as entering into other person’s domain without prior permission, manipulation and/or damage to the computer hardware and software or any other cybercrime etc.)

- 10.3.8. Plagiarism of any nature.
- 10.3.9. Any other act of gross indiscipline as decided by the Board of Management from time to time.
- 10.4. Commensurate with the gravity of offense, the punishment may be: reprimand, fine, expulsion from the hostel, debarment from an examination, disallowing the use of certain facilities of the Institute, rustication for a specific period or even outright expulsion from the institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.
- 10.5. For any offence committed in (i) a hostel (ii) a department or in a classroom and (iii) elsewhere, the Chief Warden, the Head of the Department and the Dean (Student Affairs), respectively, shall have the authority to reprimand or impose fine.
- 10.6. All cases involving punishment other than reprimand shall be reported to the Vice-Chancellor.
- 10.7. Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Dean (Academic Affairs) for taking appropriate action.

11. Graduation Requirements:

Candidate shall be declared eligible for the award of the degree if he has:

- Fulfilled degree requirement.
- No dues to the University, Institute, Departments, Hostels, Library, etc.
- No disciplinary action pending against him.

The award of the degree must be recommended by the Board of Management.

12. Convocation:

Degrees will be awarded in person for the students who have graduated (with completion of Internship) during the preceding academic year. Degree will be awarded to such students who are unable to attend the convocation. Students are required to apply for the convocation along with prescribed fee within the specified date, after having satisfactorily completed all degree requirements.

13. Academic Appeals Board (AAB):

There shall be an Academic Appeals Board constituted by the University

Constitution:

- Head of the institution of a constituent college (By seniority) ... Chairman
- A Professor from a constituent college (Nominated by the Vice-Chancellor) ... Member
- Three faculty members (Nominated by the Vice-Chancellor) ... Members
- The Registrar (Evaluation) ... Member Secretary

Note:

- The Chairman may co-opt and/or invite more members.
- Depending on the prevailing circumstances, the senior most member in the Board shall act as Chairman in the absence of Chair person
- The quorum of each meeting shall be minimum of Four

Functions of the Board:

- To receive grievance/ complaints in writing from the students regarding anomaly in award of marks due to bias, victimization, erratic evaluation, etc. and redress the complaints.
- To interact with the concerned Teacher and the student separately, before taking the decision.
- The decision of the AAB will be based on simple majority.
- The recommendation of the AAB shall be communicated to the Registrar (Evaluation) for further appropriate action as required.

14. BSc. Medical Imaging Technology-

Total 30 weeks Annual teaching program

1st year:

Sl. No	Subject	Theory No. of hours	Practical No. of hours	Total no. of hours
A	MAIN SUBJECTS			
1.	Human anatomy	70	20	90
2.	Physiology	70	20	90
3.	Biochemistry-1	70	20	90
4.	Pathology-1	70	20	90
5.	Microbiology -1	70	20	90
	Total	350	100	450
B	Subsidiary subjects			
1.	English	25		
2.	Kannada	25		
3.	Health-care	40		

2nd year:

SL.NO	SUBJECT	Theory No. of hours	Practical No. of Hours	Clinical posting	Total No. of hours
A.	MAIN SUBJECTS				
1.	Radiographic photography and image processing (Dark room)	50	50	250	350
2.	Radiation physics and medical physics	50	50	250	350
3.	Radiographic positioning	50	150	250	350
	Total	150	250	750	1050
B.	Subsidiary subjects				
1.	Sociology	20			
2.	Constitution of India	10			
3.	Environmental Science and Health	10			

3rd year:

Sl. NO	Subjects	Theory No. of hours	Practical No. of Hours	Clinical posting	Total no. of hours
A	Main subjects				
1.	Diagnostic Imaging Techniques (USG, CT, MRI & Nuclear Medicine)	50	50	250	350
2.	Radiological procedures	50	50	250	350
3.	Radiation safety & patient care	50	150	250	350
	Total	150	250	750	1050
B	Subsidiary subjects				
1.	Ethics	20			
2.	Research and Biostatics	10			
3.	Computer application	10			

15. Attendance and Monitoring Progress of Studies:

15.1. Attendance:

15.1.1. A Candidate shall study in the concerned Department of the Institution for the entire period as a full time student. No candidate is permitted to work in any laboratory / college/hospital / pharmacy, etc., while studying. No candidate should join any other course of study or appear for any other degree examination conducted by this university or any other university in India or abroad during the period of registration.

Each year shall be taken as a unit for the purpose of calculating attendance.

A Candidate who has put in a minimum of 75% of attendance in the theory and practical **separately** and who has fulfilled other requirements of the course shall be permitted to appear for University examination.

16. Examination:

There shall be an University examination at the end of each Year.

16.1 **Scheme of Examination:**

Evaluation is based on formative evaluation (internal assessment) and summative evaluation (University examination).

16.1.1 **Internal Assessment:**

Internal Assessment shall be calculated on the basis of sessional examinations, seminars, assignments, case discussions etc. There shall be at least three sessional examinations and the average of the best two sessional along with the marks of seminars, assignments, case-discussions etc. will be considered to calculate the Internal Assessment mark.

16.1.2 **University Examination:**

A candidate who satisfies the requirements of attendance, progress and conduct shall be eligible to appear for the university examinations. There shall be a University Examination at the end of each year.

17. Compulsory Rotatory Internship

A candidate is required to complete 1 year of Rotatory internship in a Teaching Hospital or in a Hospital recognized by the University.

The internship should be rotatory and cover clinical branches concerned with B.Sc. MIT such as various sections of Radiodiagnosis and / Surgery, Orthopedics, Neurosurgery, Cardiothoracic including ICU, Pediatric General Medicine and OBG.

The internship is in partial fulfillment of the requirements of the course and no candidate shall be declared to have completed the course otherwise.

18. Criteria for Pass:

Main subjects: A candidate is declared to have passed in a subject, if he/she secures 40% of marks in University Theory exam and internal Assessment added together.

A candidate is declared to have passed the examination in a subject if he/she secures 40% of the marks in theory and 40% in practical separately. For a pass in theory, a candidate has to secure a minimum of 40% marks in the University conducted written examination and Internal Assessment added together and for pass in practical, a candidate has to secure a minimum of 40% marks in the university conducted practical examination and Internal Assessment added together.

18.1.3 Carryover benefit

A candidate who fails in main subjects and /or subsidiary subjects of first year and/ or second year shall be permitted to carry over those subjects up to final year. However, the candidate must pass all the subjects of first year before entering to final year. All the subjects of second year should be cleared before appearing for third year university examination.

18.2 Rules for grace marks:

Grace marks up to a maximum of 4 marks may be awarded at the discretion of the university to a student who has failed only in one subject to enable him to pass in the examination in the first attempt. A maximum of 5% of the total marks may be awarded as grace mark to improve his class if passed in single attempt.

18.3 Re-totaling:

Re-totaling of marks is permitted only for theory papers. The University, on application within the stipulated time and remittance of a prescribed fee, shall permit a recounting of marks, for the subject(s) applied. The marks obtained after re-totaling will be the final marks awarded.

18.4 Improvement of Class

A maximum of 5% of the total marks may be awarded as grace mark to improve his class.

18.5 Supplementary Examinations:

Lower year examination shall be conducted by the university along with current year examinations for the benefit of unsuccessful candidates.

18.6 Declaration of Results and Classification:

Class will be awarded only to those candidates who pass the entire examination in the first attempt. Class shall be declared on the basis of the aggregate of marks scored in individual year.

- 70% and above - First Class with Distinction
- 60% and above but less than 70% - First class
- 50% and above but less than 60% - Second class
- 40% and above but less than 50% - Pass class

A Candidate who passes the examinations in more than one attempt shall be declared

as passed in 'Pass' class irrespective of the percentage of marks secured.

Compulsory Rotatory internship requirement has to be fulfilled by the candidate for declaration results and classification.

18.7 Award of Ranks:

Ranks will be awarded on the basis of aggregate marks of I to III year examinations.

Only those candidates who have completed the course in the minimum number of years prescribed (3 years) and who have passed all the 3 years in the first attempt are eligible for the award of ranks.

1st year:

Subject code	Subject	Marks				
		Theory	Theory IA	Practical	Practical IA	Total
1.	Human anatomy	80	20	--	--	100
2.	Physiology	80	20	--	--	100
3.	Biochemistry	80	20	--	--	100
4.	Pathology	80	20	--	--	100
5.	Microbiology	80	20	--	--	100
	Subsidiary subjects					
1.	Communicative English	40	10	--	--	50
2.	Healthcare	40	10	--	--	50
3.	Kannada	40	10	--	--	50

2nd year:

1.	Radiographic photography and image processing (Dark room)	80	20	40	10	150
2.	Radiation physics and medical physics	80	20	--	--	100
3.	Radiographic positioning	80	20	40	10	150
	Subsidiary subjects					
1.	Sociology	80	20			100
2.	Constitution of India	80	20			100
3.	Environmental science & health	80	20			100

3rd year:

1.	Diagnostic Imaging Techniques (USG, CT , MRI & Nuclear Medicine)	80	20	40	10	150
2.	Radiological procedures	80	20	40	10	150
3.	Radiation safety & patient care	40	10	--	--	50
	Subsidiary subjects					
4.	Ethics	80	20			100
5.	Research and biostatistics	80	20			100
6.	Computer application	80	20			100

SCOPE OF MEDICAL IMAGING TECHNOLOGY

A Medical Imaging graduate has got a wide scope of the following positions

- Medical Imaging Technologist
- M.Sc.& PhD in Medical Imaging Technology
- Teaching faculty of Medical Imaging
- Application specialist in various Bio medical manufacturing companies
- Scientific officer in Research Institutes
- Can set up own diagnostic center

1st YEAR B.Sc. MIT

Subject: HUMAN ANATOMY

Objectives:

1. To understand the general anatomy of the human body.
2. Anatomical correlation of body parts.
3. Application of anatomical terminologies in Medical Imaging Technology.

Skills:

1. Explain the subdivisions of anatomy, terms of location and position, fundamental planes, vertebrate structure of man, organization of the body cells and tissues.
2. Anatomical Correlation of Bones, arteries, veins, nerves and organs.
3. Identify different body organs and their exact location.
4. Different body positioning terminologies.

Theory hours	90
Practical/ Demonstration hours	30
Method of Assessment	Written examination

1. Introduction: Humanbody as a whole

a) Theory:

Definition of anatomy and its divisions. Terms of location, positions and planes. Cell and its organ ells.

Epithelium: definition, classification, describe with examples, function. Glands: classification, describe serous & mucous glands with examples. Basic tissues: classification with examples

b) Practical:

Histology of types of epitheliums.

Histology of serous, mucous & mixed salivary gland.

2. Locomotion and support

a) Theory:

Cartilage: types with example & histology.

Bone: classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, inter-vertebral disc, fontanelles of fetal skull.

Joints: classification of joints with examples, synovial joint (in detail for radiology).

Muscular system: classification of muscular tissue & histology, names of muscles of the body.

b) Practical:

Histology of the 3 types of cartilage.

Demo of all bones showing parts, radiographs of normal bones & joints. Histology

of compact bone (TS & LS).

Demonstration of all muscles of the body.

Histology of skeletal, smooth & cardiac muscle (TS & LS).

3. Cardio vascular system

a) Theory:

Heart: size, location, chambers, exterior & interior, blood supply of heart. Systemic & pulmonary circulation, branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, peripheral pulse, inferior vena cava, portal vein, Porto-systemic anastomosis, great saphenous vein, Dural venous sinuses.

Lymphatic system: cistern chyli & thoracic duct, histology of lymphatic tissues, names of regionally emphatics, axillary and inguinal lymph nodes in brief.

b) Practical:

Demonstration of heart and vessels in the body

Histology of large artery, medium sized artery & vein, large vein.

Histology of lymph node, spleen, tonsil & thymus.

Normal chest radiograph showing heart shadows.

Normal angiograms.

4. Gastro-intestinal system

a) Theory:

Parts of GIT, oral cavity, lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring, esophagus, stomach, small and large intestine, liver, gall bladder, pancreas, Radiographs of abdomen.

b) Practical:

Demonstration of parts of gastrointestinal system.

Normal radiographs of gastro intestinal system.

Histology of gastro intestinal system.

5. Respiratory system

a) Theory:

Parts of RS, nose, nasal cavity, larynx, trachea, lungs, broncho-pulmonary segments, histology of trachea, lung and pleura, names of paranasal air sinuses.

b) Practical:

Demonstration of parts of respiratory system.

Normal radiographs of chest.

Histology of lung and trachea.

6. Peritonema

a) Theory:

Description in brief.

b) Practical:

Demonstration of reflections.

7. Urinary system

a) Theory:

Kidney, ureter, urinary bladder, male and female urethra.
Histology of kidney, ureter and urinary bladder.

b) Practical:

Demonstration of parts of urinary system.
Histology of kidney, ureter, urinary bladder.
Radiographs of abdomen-IVP, retrograde cystogram.

8. Reproductive system

a) Theory:

Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology).

Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology). Mammary gland: gross.

b) Practical:

Demonstration of section of male and female pelvis with organs in situ.
Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tube, ovary.
Radiographs of pelvis, hysteron - salpingogram.

9. Endocrineglands

a) Theory:

Endocrine glands: pituitary gland, thyroid gland, parathyroid gland, suprarenal gland (gross & histology).

b) Practical:

Demonstration of the glands.
Histology of pituitary, thyroid, parathyroid, supra renal glands.

10. Nervous system

a) Theory:

Neuron, classification of nervous system, cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology), meninges, ventricles & cerebrospinal fluid, names of basal nuclei, blood supply of brain, cranial nerves.

Sympathetic trunk & names of parasympathetic ganglia.

b) Practical:

Histology of peripheral nerve & optic nerve.
Demonstration of all plexuses and nerves in the body. Demonstration of all parts of brain.
Histology of cerebrum, cerebellum, spinal cord.

11. Sensory organs:

a) Theory:

Skin: histology, appendages of skin.

Eye: parts of eye & lacrimal apparatus. Extra-ocular muscles & nerve supply. Parts of ear: external, middle and inner ear and contents.

b) Practical:

Histology of thin and thick skin.

Demonstration and histology of eye ball. Histology of cornea & retina.

12. Embryology:

a) Theory:

Spermatogenesis & oogenesis.

Ovulation, fertilization.

Fetal circulation

Placenta.

b) Practical:

Demonstration of models.

REFERENCE BOOKS

1. Chaurasia: A Textbook of Anatomy
2. T.S.Ranganathan: AtextbookofHumanAnatomy
3. Fattana: Human anatomy (Description and applied) Saunder's & C P Prism Publishers, Bangalore-1991
4. Bhatnagar: Essentials of Humanembryology. Revised Edition Orient Blackswan Pvt.Ltd.

PHYSIOLOGY

No. of theory classes: 90

No .of practical classes: 20 hrs

BLOOD

Introduction: composition and function of blood

Red blood cells: erythropoiesis, stages of differentiation, function, count, physiological variation.

Structure, function, concentration, physiological variation, methods of estimation of hemoglobin

White blood cells: production, function, life span, count, differential count

Platelets: origin, normal count, morphology functions

Plasma proteins: production, concentration, types, functions, albumin, globulin, fibrinogen, prothrombin

Hemostasis: definition, normal hemostasis, clotting factors, mechanism of clotting, disorders of clotting factors.

Blood Bank:

Blood groups: ABO system, Rh system

Blood grouping & typing, cross matching

Rh system: Rh factor, Rh incompatibility

Blood transfusion: indication, universal donor and recipient. Selection criteria of a blood donor, transfusion reactions.

Anticoagulants: classification, examples and uses

Anemias: morphological and etiological classification, effects of anemia on body.

Blood indices: color index, MCH, MCV, MCHC

Erythrocyte Sedimentation Rate: and packed cell volume, normal values, definition, determination

Blood volume: normal value, determination of blood volume and regulation of blood volume.

Blood volume: normal value, determination of blood volume and regulation of blood volume.

Body fluid: PH, normal value, regulation and variation

Lymph: lymphoid tissue formation, circulation, composition and function of lymph.

2. CARDIOVASCULAR SYSTEM

Heart: physiological anatomy, nerve supply

Properties of cardiac muscle, cardiac cycle: systole, diastole. Intraventricular pressure curves.

Cardiac output, heart sounds, areas of auscultation.

Blood pressure: definition, normal value, clinical measurement of blood pressure, physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension.

Pulse: jugular, radial pulse, triple response.

Heart sounds: normal heart sounds, causes, Characteristics and significance, heart rate.

Electrocardiogram (ECG) significance.

3. DIGESTIVE SYSTEM

Physiological anatomy of gastro intestinal tract, functions of digestive system salivary glands: structure and functions, deglutition, stages and regulation.

Stomach: structure and functions

4. RESPIRATORY SYSTEM

Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract, respiratory muscles.

Respiratory organs: lungs, alveoli, respiratory membrane, stages of respiration

Mechanism of normal and rigorous respiration, forces opposing and favoring expansion of the lungs.

Intra pulmonary pleural pressure, surface tension, recoil tendency, of the wall.

Transportation of respiratory gases: transportation of oxygen: direction, pressure gradient, forms of transportation, oxygenation of Hb. Quantity of oxygen transported. Lung volumes and capacities.

Regulation of respiration> mechanism of regulation, nervous and chemical regulation, respiratory center, Herring Breuer reflexes.

Applied physiology and respirations: hypoxia, cyanosis, asphyxia, dyspnea, dysbarism, artificial respiration, apnea.

5. ENDOCRINE SYSTEM

Definition, classification of endocrine glands and their hormones, properties of hormones.

Thyroid gland hormone: hormone secreted, physiological function, regulation of secretion,

Disorders: hypo and hyper secretion of hormone

Adrenal cortex: physiological anatomy of adrenal gland, adrenal cortex, cortical hormones, functions and regulations.

Adrenal medulla: hormones, regulation and secretion. Functions of adrenaline and nor-adrenaline.

Pituitary hormones: anterior and posterior pituitary hormones, secretion, function. Hormones of pancreas.

Insulin: secretion, regulation, function and action

Diabetes mellitus: regulation of blood glucose level.

Parathyroid gland: function, action, regulation of secretion of parathyroid hormone

Calcitonin: function and action

6. SPECIAL SENSES

Vision: structure of eye, function of different parts. Structure of retina

Hearing: structure and functions of ear, mechanism of hearing

Taste buds: functions

Smell: physiology, receptors.

7. NERVOUS SYSTEM

Functions of nervous system, neuron, structure, classification and properties.

Neuroglia, nerve fiber, classification, conduction of impulses continues and salutatory.

Velocity of impulse transmission and factors affecting

Synapse structure, types, properties.

Receptors: definition, classification, properties

Reflex action: unconditioned properties of reflex action, Babibnski's sign. Spinal cord nerve tracts. Ascending tracts, descending tracts.

- **Pyramidal tracts**

Extrapyramidal tracts, functions of medulla, pons, hypothalamic disorders. Cerebral cortex lobes and functions, sensory cortex, motor cortex, cerebellum, functions of cerebellum.

Basal ganglion: functions, EEG.

- **Autonomic Nervous system**

Sympathetic and parasympathetic distribution, functions and comparison

8. EXCRETORY SYSTEM

Functions of kidneys, nephron, vasa recta, cortical and juxtamedullary nephrons, comparison, juxta glomerular apparatus: structure and function. Renal circulation peculiarities.

Mechanism of urine formation: ultrafiltration criteria for filtration GFR, plasma fraction, GFR, factors affecting GFR. Determination of GFR selective reabsorption- sites of reabsorption, substance reabsorbed, mechanism of reabsorption of glucose, urea, H⁺, CL- amino acids etc. TMG, tubular load, renal threshold % of reabsorption of different substances, selective secretion.

Properties and composition of normal urine, urine output. Abnormal constituents in urine, mechanism of urine concentration. Counter –current mechanisms: micturition, innervation of bladder, cystometrogram.

Diuretics: water, diuretics, osmotic diuretics, artificial kidney, renal function test: plasma clearance, actions of ADH, aldosterone and PTH on kidneys.

9. REPRODUCTIVE SYSTEM

Function of reproductive system, puberty

Male reproductive system: functions of testes, spermatogenesis: site, stages, factors influencing, semen. Endocrine function of testes.

Androgens: testosterone structure and functions.

Female reproductive system: ovulation, menstrual cycle: physiological changes during pregnancy, pregnancy test.

Lactation: composition of milk, factors controlling lactation

10. MUSCLE NERVE PHYSIOLOGY

Classification of muscle, structure of skeletal muscle, sarcomere contractile proteins, Neuromuscular junction. Transmission across neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue, rigor mortis.

11. SKIN

Structure and function, body temperature measurement, physiological variation, regulation of body temperature by physical chemical and nervous mechanism. Role of hypothalamus, hypothermia and fever.

PRACTICALS:

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

Calculation of blood indices

Determination of clotting time, bleeding time

Blood pressure recording

Auscultation of heart sounds

Artificial respiration

Determination of vital capacity

REFERENCE BOOKS

1. Guyton (Arthur): Text Book of physiology. Latest Ed. Prism publishers.
2. Chatterjee CC: Human Physiology Latest Ed. Vol-1, Medical Allied Agency.
3. Choudhary Sujith K: Concise Medical Physiology Latest Ed. New Central Book
4. Ganong William F: Review of medical Physiology> latest ED. Tata McGraw Hill

BIOCHEMISTRY

No. Theory classes: 90 hours

No. of practical classes; 20 hrs.

1. Specimen collection:

Pre- analytical variables

Collection of blood

Collection of CSF & other fluids.

Urine collection

Use of preservatives

Anticoagulants

2. Introduction to laboratory apparatus:

Pipettes: different types (graduated, volumetric, Pasteur, automatic etc). calibration of glass pipettes. Burets, beakers, petri dishes, depression plates.

Flasks: different types (volumetric, round bottomed, Erle Meyer conical etc.). funnels: different types (conical, Buchner etc.).

Bottles: reagent bottles-graduated and common, wash bottles- different type specimen bottles

3. Measuring cylinders, porcelain dish

Tubes: test tubes, centrifuge tubes, test tube draining rack, Tripod stand, wire gauze, Bunsen burner.

Cuvettes, significance of cuvettes in colorimeter, cuvettes for visible and UV range.

Cuvette holder racks: bottle, test tube, pipette, desiccator, stop watch, timers, scissors.

Dispensers: reagent and sample

Maintenance of lab glass ware and apparatus, glass and plastic ware in laboratory,

Use of glass: significance of boro silicate glass, care and cleaning of glass ware, different cleaning solutions of glass.

Care and cleaning of plastic ware, different cleaning solution.

4. Instruments (theory and demonstration) diagrams to be drawn

Use, care and maintenance of water bath, oven, & incubators, water distillation plant, water de ionizers, refrigerators, cold box, deep freezers, reflux condenser, centrifuge, balances, colorimeter, spectrophotometer, pH meter and electrodes.

Centrifuges: definition, principles, Svedberg unit, centrifugal force, centrifugal field, RPM, conversion of G to RPM, and vice versa, different types of centrifuges.

Manual balances: single pan, double pan, triple balance, direct read out electrical balances.

Guideline to be followed and precautions to be taken while weighing. Weighing different types of chemical, liquids, hygroscopic compounds etc.

colorimeter, spectrophotometer, pH meter, electrodes, salt bridge solution: principles, parts, types, guidelines to be followed and precaution to be taken while using.

5. Safety of measurements

6. Conventional and Si units

7. Atomic structure

Dalton's theory, properties of electrons, protons, neutrons, Rutherford's model of atomic structure, Bohr's model of atomic structure, orbit and orbital quantum numbers, Heisenberg's uncertainty principle. Electronic configuration, Aufbau principle, Pauli's exclusion principle, etc.

Valency and bonds: different types of strong and weak bonds with examples. Theory & Practical's for all the following under this section: molecular weight, equivalent weight of elements, normality, molarity. Preparation of molar solutions (mole/liter solution) e.g.: 1 M NaCl, 0.15M NaCl, 1M NaOH, 0.1 M HCl, 0.1N H₂SO₄ etc. preparations of normal solutions. E.g., 1N Na₂CO₃, 0.1N Oxalic acid, 0.1 N HCl, 0.1N H₂SO₄, 0.66 N H₂SO₄ etc. percent solutions. Preparation of different solutions: v/v w/v (solids, liquids and acids). Conversion of a percent solution into a molar solution.

8. Dilutions

Diluting solutions: e.g., preparation of 0.1 N NaCl from 1N NaCl & from 2N NaCl etc., preparing working standard from stock standard, body fluid dilutions, reagent dilution techniques, calculating the dilution of a solution, body fluids reagent etc, saturated and supersaturated solutions. Technique for preparation of standard solutions e.g., Glucose, urea, etc, significance of volumetric flask in preparing standard solutions. Volumetric flasks of different sizes, preparation of standard solutions of deliquescent compounds (CaCl₂, potassium carbonate, sodium hydroxide etc.). Preparation of standards using conventional and SI units' acids, bases, salts and indicators.

9. Acids and Bases

Definition, physical and chemical properties with examples. Arrhenius concept of acids and bases, Lowery- Bronsted theory of acids and bases. Classification of acids and bases. Differences between bases and alkali, acidity and basicity, mono protonic and polyprotic acids and bases. Concepts of acid base reaction, hydrogen ion concentration, ionization of water, buffer, pH value of a solution.

Preparation of buffer solutions using pH meter. Salts: definition, classification, water of crystallization, definition and different types, deliquescent and hygroscopic salts.

10. Acid-base indicators: (Theory and Practical's) Theory

Definition, concept, mechanism of dissociation of an indicator, color change of an indicator in acidic and basic conditions, use of standard buffer solution and indicators for pH determinations, preparation and its application, list of commonly used indicators and their pH range, suitable pH indicators used in different titrations, universal indicators.

Practicals

Titration of a simple acid and a base (preparation of standard solution of oxalic acid and using this solution finding out the normality of sodium hydroxide solution. Acid to be titrated using this base Calculation of normality of an acid or a base after titration, measurement of hydrogen ion concentration.

11. Quality control

Accuracy, precision. Specificity, sensitivity, limits of error allowable in laboratory, percentage error.

Normal values and Interpretations.

12. Special Investigations

Serum electrophoresis, immune globulins, drugs: digitoxin, theophylline's, regulation of acid base status, Henderson Hassel Bach equations, buffers of the fluid, pH regulation, disturbance in acid base balance, anion gap, metabolic acidosis, metabolic alkalosis, respiratory acidosis, respiratory alkalosis, basic principles and estimation of blood gases and pH, basic principles and estimation of electrolytes, water balance, sodium regulation, bicarbonate buffers, nutrition, nutritional support with special emphasis on parental nutrition, calorific value, nitrogen balance, respiratory quotient, basal metabolic rate, dietary fibers, nutritional importance of lipids, carbohydrates and proteins, vitamins.

PRACTICALS

Analysis of normal urine.

Composition of urine.

Procedure for routine screening.

Urine examination for detection of abnormal constituents.

Interpretation and diagnosis through charts.

Liver function tests.

Lipid profile.

Renal function test.

Cardiac markers.

Blood gas and electrolytes.

Estimation of blood sugar, blood urea and electrolytes.

Demonstration of strips, demonstration of glucometer.

REFERENCE BOOKS

1. Varley: Clinical chemistry
2. Kaplan: Clinical chemistry
3. Vasudevan DM, Sreekumari, S: Textbook of Biochemistry for Medical students, Latest Ed
4. Das, Debajyothi: Biochemistry, Latest ED, Academic, Publishers, Calcutta–1992
5. Rajagopal: Practical Biochemistry for Medical students-,Orient Longman PVT Lt

PATHOLOGY

No. of Theory classes: 70 hours

No. of Practical classes: 20 hrs

Theory

1. Histopathology

Introduction to histopathology

Bio- medical waste management

2. Clinical pathology

Introduction to clinical pathology

Collection, transport, preservation, and processing of various clinical specimens

Urine examination: collection and preservation of urine, physical, chemical, microscopic examination.

Examination of body fluids

Examination of body fluids

Examination of cerebrospinal fluid (CSF)

Sputum examination

Examination of faces

3. Hematology

Introduction to hematology

Normal constituents of blood, their structure and function

Collection of blood samples

Anticoagulants used in hematology

Instruments and glassware used in hematology, preparation and use of glassware.

Laboratory safety guidelines

SI units and conventional units in hospital, laboratory.

Hb, PCV, ESR

Normal Hemostasis

Bleeding time, clotting time, prothrombin time, activated partial thromboplastin time

4. Blood bank

Introduction

Blood grouping and Rh types, cross matching

PRACTICALS

Urine Examination: physical, chemical, microscopic

Blood grouping Rh typing

Hb estimation, Packed Cell Volume (PCV), Erythrocyte Sedimentation Rate (ESR), Bleeding time, clotting time

Histopathology: section cutting and H & E staining

REFERENCE BOOKS

1. Bancroft: Histopathology techniques
2. Todd & Sanford: Clinical Diagnosis by laboratory method
3. Ramanic Sood: Laboratory Technology (Methods and interpretation) 4th Ed.J.P.Bros, NewDelhi-1996.
4. SachdevK.N.: Clinical Pathology and Bacteriology 8th Ed,J.P.Bros, NewDelhi-1991.
5. Krishna: Textbook of Pathology, Orient Longman PVT Ltd.NewDelhi-1991.

MICROBIOLOGY

No.of Theory classes:70 hours

No.of Practical classes:20 hours

Theory

- 1. Morphology** **4hours**
Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.
- 2. Growth and nutrition** **3hours**
Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.
- 3. Culture media** **1hour**
Use of culture media in diagnostic bacteriology, anti-microbial sensitivity test.
- 4. Sterilisation and Disinfection** **4 hours**
Principles and use of equipment's of sterilization namely hot air oven, auto clave and serum inspissator, pasteurization, antiseptic and disinfectants.
- 5. Immunology** **6 hours**
Immunity, vaccines, types of vaccine and immunization schedule, principles and interpretation of common serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA. Rapid tests for HIV and HBsAg (excluding technical details).
- 6. Systematic Bacteriology** **20 hours**
Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (excluding classification, antigenic structure and pathogenicity), Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, Eschcoli, Klebsiella, Proteus, Vibrio cholerae, Pseudomonas & Spirochetes.
- 7. Parasitology** **10 hours**
Morphology, life cycle, laboratory diagnosis of following parasites: E. histolytica, Plasmodium, tapeworms, Intestinal nematodes.
- 8. Mycology** **4 hours**
Morphology, diseases caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi
- 9. Virology** **10 hours**
General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.
- 10. Hospital infection** **4 hours**
Causative agents, transmission methods, investigation, prevention and control of hospital infection.
- 11. Principles and practice Biomedical waste management** **4 Hours**

Practical**20 hours**

Compound microscope.

Demonstration of sterilization equipment's: hot air oven, autoclave, bacterial filters.

Demonstration of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, MacConkey medium, LJ media, Robertson cooked meat media, Potassium tellurite media with growth, Mac with LF & NLF, NA with staph.

Antibiotic susceptibility test.

Demonstration of common serological tests: Widal, VDRL,

ELISA. Gramstaining.

Acid fast staining.

Stool exam for helminthic ova & cysts.

Visit to hospital for demonstration of biomedical waste management. Anaerobic culture methods.

REFERENCEBOOKS

1. Anathanarayana & Panikar: Medical Microbiology–Latest Edition University Press.
2. Robert Cruickshank: Medical Microbiology–The Practice of Medical Microbiology.
3. Basic Laboratory methods in Parasitology: 1st Ed, JP Bros, New Delhi.
4. Basic laboratory procedures in clinical bacteriology, 1st Ed, JP Brothers, New Delhi.
5. Ajit Damle: Medical Parasitology.

SUBSIDIARY SUBJECTS

First Year B.Sc. Medical Imaging Technology

ENGLISH

Teaching Hours: 20

1. CourseDescription

This course is designed to help the student acquire a good command and comprehension of the English language through individual papers and conferences.

2. Behavioral objectives

The student at the end of training shall be able to:

- a) Read and comprehend English language.
- b) Speak and write grammatically correct English
- c) Appreciate the value of English literature in personal and professional life.

3. Contents

Unit-I: Introduction:

- a) Study techniques.
- b) Organization of effective taking and logical processes of analysis and synthesis.
- c) Use of the dictionary.
- d) Enlargement of vocabulary.
- e) Effectivediction.

Unit-II: Applied grammar:

- a) Correct usage.
- b) The structure of sentences
- c) The structure of paragraphs.
- d) Enlargements of vocabulary.

Unit-III: Written composition:

- a) Precise writing and summarizing
- b) Writing of bibliography.
- c) Enlargement of vocabulary.

Unit-IV: Reading and comprehension:

- a) Review of selected materials and express oneself in one's words.
- b) Enlargement of vocabulary.

Unit-V: The Study of the various forms of composition:

- a) Paragraph.
- b) Essay.
- c) Letter.
- d) Summary.
- e) Practice in writing.

Unit-VI: Verbal communication:

- a) Discussions and summarization.
- b) Debates.
- c) Oralreports.
- d) Useinteaching.

REFERENCE

1. English Grammar: Collins, Birmingham University, International Language Data Base, Rupa & Co.1993.
2. Wren and Martin: Grammar and Composition, 1989, Chand & Co, Delhi.
3. Spoken English: V.Shasikumar and PV Dhanija. Pub.By:Tata McgrawHill,New Delhi
4. Writers Basic Book self-Series: Writers Digest series.

ಕನ್ನಡ : ಒಂದು

ಪಠ್ಯ ಕ್ರಮದ ರೂಪರೇಖೆ

- ಸ್ಥಾನ : ಬಿ.ಎಸ್.ಸಿ. (ಅಲೈಡ್ ಹೆಲ್ತ್ ಸೈನ್ಸ್ ಕೋರ್ಸ್) ಮೊದಲ ವರ್ಷ
ಸಮಯ : ೨೫ ಘಂಟೆಗಳು (ಇಪ್ಪತ್ತೈದು ಘಂಟೆಗಳು)
ಪಠ್ಯಕ್ರಮದ ವಿವರಣೆ : ವಿದ್ಯಾರ್ಥಿ / ವಿದ್ಯಾರ್ಥಿನಿಯರು ದಿನ ನಿತ್ಯ ಸಂಪರ್ಕಿಸಬಹುದಾದ ಜನಸಾಮಾನ್ಯರೊಡನೆ ಶುಶ್ರೂಷೆಗೆ ಸಂಬಂಧಿಸಿದಂತೆ ಕನ್ನಡದಲ್ಲಿ ಸಂಭಾಷಣೆ ಮಾಡಲು ಹಾಗೂ ತಿಳುವಳಿಕೆ ನೀಡಲು ಸಹಕಾರವಾಗುವಂತೆ ಪಠ್ಯಕ್ರಮದ ಮಾದರಿಯನ್ನು ಅಳವಡಿಸುವುದು.
ಉದ್ದೇಶ : ೧) ದಿನ ಬಳಕೆಯ ವ್ಯವಹಾರದಲ್ಲಿ ಶುಶ್ರೂಷಣೆಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಕನ್ನಡ ಭಾಷೆಗೆ ಅಳವಡಿಕೆ.
೨) ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಭಾಷೆಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಪಠ್ಯಕ್ರಮದ ವಿವರಣೆ

- ಘಟಕ ಒಂದು : ೧) ಅಕ್ಷರಮಾಲೆ, ಸ್ವರಗಳು, ವ್ಯಂಜನಗಳು.
೨) ಪದ, ಪದಪೂಂಜ, ವಾಕ್ಯರಚನೆ, ಪತ್ರಲೇಖನ, ಪ್ರಬಂಧರಚನೆ.
ಘಟಕ ಎರಡು : ಶುಶ್ರೂಷಣಾ ಪದಗಳು (ಇಂಗ್ಲಿಷ್‌ನಿಂದ ಕನ್ನಡಕ್ಕೆ ಶುಶ್ರೂಷ ಸಾಮಾನ್ಯ ಬಳಕೆಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ).
ಘಟಕ ಮೂರು : ರೋಗಿ ಹಾಗೂ ಶುಶ್ರೂಷಕರ ಮಧ್ಯೆ ಸಾಮಾನ್ಯವಾಗಿ ನಡೆಯುವ ಸಂಭಾಷಣೆ.
೧) ಪ್ರಶ್ನೆಗಳಿಗೆ ಸಲಹೆ ಕೊಡುವ ವಾಕ್ಯಗಳು.
೨) ವೈದ್ಯರೊಂದಿಗೆ ಹಾಗೂ ಇತರೆ ಸಹಚರರೊಂದಿಗೆ ವ್ಯವಹರಿಸಲು, ಸಂಭಾಷಣೆ ನಡೆಸಲು ಬೇಕಾದ ವಾಕ್ಯಗಳು.

ಅಧ್ಯಯನಕ್ಕೆ ಶಿಫಾರಸ್ಸು ಮಾಡಲಾಗಿರುವ ಗ್ರಂಥಗಳು

೧. ಕನ್ನಡ ವ್ಯಾಕರಣ (೮, ೯ ಮತ್ತು ೧೦ನೇ ತರಗತಿಗಳಿಗೆ ಕರ್ನಾಟಕ ಸರ್ಕಾರ, ಪಠ್ಯಪುಸ್ತಕಗಳ ಇಲಾಖೆ)
೨. ವ್ಯವಹಾರಿಕ ಕನ್ನಡ : ಎಚ್‌ಸೈ
೩. ಪತ್ರ ಲೇಖನ : ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು
೪. ಲೇಖನಕಲೆ : ಎನ್. ಪ್ರಹ್ಲಾದ ರಾವ್
೫. ಆಹಾರ ಮತ್ತು ಇತರೆ ಪ್ರಬಂಧಗಳು : ಡಾ|| ಪಿ ಎಸ್ ಶಂಕರ್
೬. ವೈದ್ಯ ಪದಗಳ ಹುಟ್ಟು ರಚನೆ : ಡಾ|| ಡಿ ಎಸ್ ಶಿವಪ್ಪ

HEALTHCARE

Teaching Hours: 40

1. Introduction to Health

- a) Definition of health, determinants of health, health indicators of India, health team concept.
- b) National health policy
- c) National health programs (Briefly objectives and scope)
- d) Population of India and family welfare program in India

2. Introduction to Nursing

- a) What is nursing? Nursing principles, inter-personnel relationships.
- b) Bandaging: basic turns, bandaging extremities, triangular bandages and their application.
- c) Nursing position, prone, lateral, dorsal, dorsal recumbent, Fowler's positions, comfort measures, bedmaking, rest and sleep.
- d) Lifting and transporting patients: lifting patients up in the bed, transferring from bed to wheelchair, transferring from bed to stretcher.
- e) Bed side management: giving and taking bedpan, urinal. f) Observation of stools, urine, sputum
- g) Use and care of catheters, enema giving.
- h) Methods of giving nourishment: feeding, tube feeding, drips, transfusion.
- i) Care of rubber goods.
- j) Recording of body temperature, respiration and pulse.
- k) Simple aseptic techniques, sterilization and disinfection. l) Surgical dressing: observation of dressing procedures.

3. First Aid:

Syllabus as for Certificate Course of Red Cross Society of St. John's Ambulance Brigade.

REFERENCE BOOKS:

- 1. Preventive and Social Medicine by K.Park

2nd YEAR BSc. MIT

Subject: PHYSICS FOR MEDICAL IMAGING

Objectives:

1. To understand the general physics related to Medical imaging technology.
2. Construction and working of Equipments used in x- ray and fluoroscopy.
3. Application of Equipments in Medical Imaging Technology.

Skills:

- 1) Students will be able to understand the construction and equipment description of X-ray, fluoroscopy and mammography.
- 2) Knowledge of basic physics associated with radiology.
- 3) Maintenance and care of x-ray Equipments used in radiology departments.
- 4) Quality control of radiology Equipments.

Theory hours	90
Practical /Demo/Tutorials hours.	150
Method of Assessment	Written Examination

Unit- I

12 theory & 15 practical hours

1) Fundamental of Electricity (Basic of Electronics)

Electric charges & Units of electric charge, Coulombs law, Electric induction, Resistance, conductors, Insulators & Semiconductors, Electric current, Ohm's law. Electromagnetism and Electromagnetic induction. Alternating Current

2) Electromagnetic Radiation

Electromagnetic waves & their properties.

The Electromagnetic spectrum, Spectrum of white light, spectra- continuous, line & band spectra, Absorption spectra.

Luminescence Intensity & Quality of Electromagnetic Radiation.

The structure of the Atom, Nucleus, Atomic Number (Z), Mass Number (A),

Ionization & Excitation

Unit- II

25 theory & 20 practical hours

3) Production of X-rays:

Discovery of x-rays, production & properties of x-rays.

Diagnostic x-ray tube and its construction.

Thermionic emission, space charge effect, line focus principle, heel effect, saturation voltage.
Grid controlled X-ray tube
Interaction of electron beam with X-ray tube target- characteristic radiation and bremsstrahlung radiation.
X-ray beam intensity.
Methods of X-ray tube cooling

4) X-ray generators

Transformers and its types, laws of transformers, transformer losses
Filament circuit, high voltage circuit
Rectification
Types of generators
Fuses, switches and exposure timers, circuit breakers, Meters.
Earthing, insulation, high tension cables construction & design.

Unit- III

13 theory & 20 practical hour

5) Basic interactions between x-rays and matter

Coherent scattering, photoelectric Effect, Compton scattering, pair production & photo disintegration.

6) Attenuation and absorption,

Reduction in intensity due to absorption & attenuation and the inverse square law (exponential formula), filtration, attenuation coefficients and half value layer.
Energy absorbed from x-rays, factors affecting transmission of a homogenous beam through an object (geometry, thickness, wavelength of beam, composition of an object), transmission of a heterogeneous x-ray beam.

Unit- IV

20 theory & 30 practical hours

7) Control of secondary radiations:

Filters- inherent filters, added filters, heavy metal filters
X-ray beam restrictors- aperture diaphragms, cones, cylinders and collimators
Grids- evaluation of grid performance, grid cutoff, types of grids
Air gap technique

8) Fluoroscopic imaging:

Direct fluoroscopy, fluoroscopy image
Image intensifier
Image characteristics in fluoroscopy, automatic brightness control
Viewing and recording the fluoroscopic image- closed circuit television, vidicon, plumbicon camera, charged coupled device, cathode ray tube

Unit- V

20 theory & 65 practical hours

9) Equipment for special procedures:

Portable and mobile x-ray units, Radiographic and fluoroscopic tables, tele-command tables. cranial and dental equipment, skull tables, mammography, tomography, rapid cassette changer, rapid film changer

Final Internal assessment.

Theory Maximum Marks – 20.

Average of best two Internal assessment marks to be sent to University.

Suggested Reference Books of Radiation Physics & Medical Physics

- 1) Basic radiological physics: K. Thayalan
- 2) Joseph Selmon
- 3) Christinsens physics of diagnostic radiology, Curry and Dowdey:
- 4) D.N. And M.O. Chesney, X-Ray Equipment for Student Radiographers (CBS)

Subject: RADIOGRAPHIC POSITIONING

Objectives:

1. To understand the basic patient positioning and scanning in radiology departments.
2. To apply special positioning skills for different pathological and physical conditions.
3. Application of Equipments while working in radiology departments.

Skills:

1. Prepare the room, apparatus and instruments for an x-rayscan
2. Set up the X-ray machine for the procedure
3. Position the patient correctly for an x-ray in the following positions: Erect, Sitting, Supine, Prone, Lateral, Oblique, Decubitus.
4. Explain relative positions of x-ray tube and patient and the relevant exposure factors related to these.
5. Explain the use of accessories such as Radiographic cones, grid and positioning aids
6. Explain the anatomic and physiological basis of the procedure to be undertaken
7. Explain the radiographic appearances of both normal and common abnormal conditions where elementary knowledge of the pathology involved would ensure application of the appropriate radiographic technique

Theory hours	90
Practical/Demo/Tutorials/Assignments hours	300
Method of Assessment	Written examination/Viva

Unit- I

18 theory & 55 practical hours

1) Principles of Radiography:

Preparation of the Rooms 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 of reducing radiation dose to the patient.

Brief introduction to anatomy before each positioning classes.

2) Upper limb:

Routine projections for the whole hand, fingers, wrist joint, forearm, elbow joint and humerus.

Supplementary projections for Scaphoid, Carpal tunnel, Ball Catchers projections, Head of the Radius, Supracondylar fracture and Olecranon process.

3) Shoulder Girdle and Thorax

Routine projections for the shoulder joint, Scapula, Acromion-Clavicular joint, Clavicle, Sternoclavicular joint, Sternum and Ribs.

Supplementary projections for the axial projection of Clavicle, Bicipital groove, Coracoid process.

Unit- II

18 theory & 65 practical hours

4) Lower limb:

Routine projections for the whole foot, toes, calcaneum, ankle joint, leg, knee- joint, patella and femurs.

Supplementary projections for Talo-Calcaneal joint, Forced projections for torn ligaments, Flat Feet, Club Feet, Intercondylar projections for loose bodies in the knee, Axial projection for Patella.

5) Pelvic girdle and hip region:

Routine projections for the whole pelvis, Sacro-Ileac joints, hip joint and Neck of Femur.

Supplementary projections for the greater and lesser trochanters of Femur.

Frog leg projection, Ischium, Symphysis Pubis, Ileum, Acetabulum and Congenital Dislocation of Hip, Arthrodesis.

6) Vertebral Column:

Routine projections for Atlanto -Occipital joint, cervical spine, Cervico- thoracic Junction, thoracic Spine, lumbar Spine, Lumbo Sacral Region, Sacrum and Coccyx.

Supplementary projections for the intervertebral foramina, posterior arch of Atlas, Flexion and Extension of Cervical Spine, Scoliosis and Kyphosis, Sacro Ileac Joint.

Unit- III

18 theory & 65 practical hours

7) Chest:

Routine projections and Supplementary projections for Thoracic inlet, soft tissue Neck, Decubitus, Apicograms, paediatric cases

8) Abdomen

KUB, Erect abdomen and Decubitus projection, Supplementary projections for acute abdomen.

9) Mammography

Routine views
Supplementary views
Magnification view

Unit- IV

25 theory & 65 practical hours

10) Skull

Routine projections for cranium and facial bones.
Supplementary projections for trauma, Towne's method, Sellaturcica, Optic foramina, Jugular foramina, Temporal bones, Mastoids, Petrous bone, Zygomatic arches, Orbits, Maxillae, Nasal bones, Mandible, Temporomandibular joints.

11) Nasal Sinuses

Techniques for Frontal, Maxillary, Ethmoidal and Sphenoid Sinuses, erect and horizontal projections for fluid levels.

12) Dental Radiography

Routine projections of all teeth - Intra Oral and Extra Oral Projections.
Supplementary projections, Occlusals and Bitewings, Orthopantomography.

Unit- V

11 theory & 50 practical hours

13) Skeletal Survey

Skeletal survey for Metabolic Bone Diseases, Metastases, Hormonal Disorders, Renal Disorders.

14) Different Radiographic Techniques

Theatre radiography, Trauma radiography, Ward radiography
High kV technique, Soft tissue radiography
Macro and Micro radiography

Reference Books:

- Philip W. Ballinger: Atlas of Radiographic Positioning and Radiological Procedures (Mosby)

- Ra Swallow, E Naylor: Clarks Positioning In Radiography
- Ross and Gailway: A Handbook of Radiography (Lewis)
- Glenda J.Bryan: Diagnostic Radiography (Mosby)
- Meril’s Atlas of radiographic positioning and Radiological procedure

Subject: RADIOGRAPHIC PHOTOGRAPHY AND IMAGE PROCESSING. (DARK ROOM)

Objectives:

1. To know basic physics of radiography
2. Construction and working of film, intensifying screen, cassette, dark room, computed radiography, direct radiography, automatic processor.
3. To understand radiographic film Processing chemistry.
4. To study the factors affecting image quality in radiographic image and their application.

Skills:

- 1) Students will be able to manage the workflow in x-ray imaging.
- 2) Knowledge of improving image quality in radiographic images.
- 3) Appropriate knowledge for the use of radiation factors.
- 4) Students will be able to process the radiographic film in different systems, eg: dark-room, CR, DR and automatic processor.
- 5) Ability for the care and maintenance of radiographic films, cassettes, intensifying screens, darkroom accessories and X-ray equipment.

Theory hours	90
Practical hours	240
Method of Assessment	Written examination/Viva

Unit I

21 theory &63 practical hours

1) Photographic Principles

Radiographic film- construction and types
 Photographic effect and latent image formation
 Film density and log relative exposure
 Characteristic curve – its formation and features
 Film faults and Artifacts

2) Intensifying Screens

Luminescence- fluorescence and phosphorescence
 Construction and types of Intensifying Screens
 Resolving power of Intensifying Screens

Speed of intensifying screen
Screen film contact tests
Advantages and limitations of Intensifying Screens.

3) X-ray Cassette:

Construction of X-ray cassettes
Types of cassettes
Mounting Intensifying Screens on cassettes
Care and maintenance of cassettes

Unit II

18 theory & 36 practical hours

4) Dark Room – Planning & Construction

Planning for a small & large Hospital
Location of Dark Room
Construction of Dark Room
Ventilation
Wall Protection
Entrance to Dark Room - Single Door, Double Door, Labyrinth and rotating

5) Dark Room Accessories

Dry bench
Hopper, Drawer, Cupboard
Loading and unloading cassettes
Hangers, types of hangers and storage of hangers
Wet bench
Cleanliness, control of dust, dark room sinks
Hatches
Drier
Safe Lights- types and uses, factors affecting safelight performance, safelight Tests
Viewing room, Film dispensing

Unit III

15 theory & 45 practical hours

6) Film Processing

Photochemistry
Developer
Rinsing
Fixer
Washing and drying
Preparation of processing solutions
Manual processing apparatus
Effect of temperature in processing
Rapid processing

7) Automatic processor

Principle of working and features, thermal regulation and replenishment system
Care and maintenance of automatic processor,

Advantages and limitations of automatic processor.

Unit IV

18 theory & 46 practical hours

8) Computerized and Digital Radiography

Day Light Film handling

Computerized radiography-Principles, Processing, Equipments, Advantages, disadvantages

Digital Radiography - Principles, Processing, Equipments, Advantages. Disadvantages

Unit V

18 theory & 50 practical

hours

11) The Radiographic Image:

The emergent beam related to densities on film contrast –objective and subjective

Radiation contrast, film contrast and Radiographic contrast

Density

Sharpness

Unsharpness

12) Resolution:

Factors affecting resolution, choice of Kilovoltage and Milliamperage.

Choice of Short Focus and Broad Focus, selection of Focus to Film Distance and Object to Film Distance selection of cassettes.

Avoiding scatter radiation, magnification, distortion, penumbra

13) Reproduction of Radiographs:

Copying Radiographs

Magnification and Minification Radiography

14) Imaging Communication:

Hospital Information System, Radiology Information System

PACS, DICOM

Reference Books:

1. D.N. Chesney & M.O Chesney: Radiographic Imaging (Cbs)I.C.R.P. : Protection Of The
2. Christensen, Curry & Dowdey: An Introduction of Physics To Diagnostic Radiography
3. Stewart C. Bushong : Radiological Science for technologists

Examination scheme

Theory. There shall be three theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks shall be as given under.

Type Of Questions	No Of Questions	Marks For Each Questions	Total
Long Essay	5. To answer 2.	10	20
Short Essay	10 To answer 8	05	40
Short answer	10(no choice)	02	20
Total			80

Theory internal assessment - 20marks for each paper.

Viva/Practical Examination: Maximum marks 40

Viva IA- 10 marks

SUBSIDIARY SUBJECTS Second Year B.Sc. Medical Imaging Technology SOCIOLOGY

Teaching Hours: 20

1. Course description

This course will introduce student to the basic concepts of sociology, principles, social processes and social institutions in relation to the individual, family and community. The various social factors affecting the family in rural and urban communities in India will be studied.

2. Introduction

- a) Meaning, definition and scope of sociology.
- b) Its relation to anthropology, psychology, social psychology.
- c) Methods of sociological investigations: case study, social survey, questionnaire, interview and opinion poll methods.
- d) Importance of its study with special reference to healthcare professionals.

3. Social factors in health and disease

- a) Meaning of social factors.
- b) Role of social factors in health and disease.

4. Socialization

- a) Meaning and nature of socialization.
- b) Primary, secondary and anticipatory socialization.
- c) Agencies of socialization.

5. Social groups

- a) Concepts of social groups influence of formal and informal groups on health and sickness.
- b) The role of primary groups and secondary groups in the hospital and rehabilitation setup.

6. Family

- a) The family, meaning and definitions.
- b) Functions of types of family.
- c) Changing family patterns.
- d) Influence of family on individual's health, family and nutrition.
- e) The effects of sickness in the family
- f) Psycho somatic diseases and their importance.

7. Community

- a) Rural community: meaning and features.
- b) Health hazards of rural communities.
- c) Health hazards of tribal communities.
- d) Urban community: meaning and features.
- e) Health hazards of urban communities.

8. Culture and health

- a) Concept of culture.
- b) Concept of health.
- c) Culture and health.
- d) Culture and health disorders.

9. Social change

- a) Meaning of social changes.
- b) Factors of social changes.
- c) Human adaptation and social change.
- d) Social change and stress.
- e) Social change and deviance.
- f) Social change and health program.
- g) The role of social planning in the improvement of health and rehabilitation.

10. Social problems of disabled

(Consequences of the following social problems in relation to sickness and disability and remedies to prevent these problems)

- a) Population explosion.

- b) Poverty and unemployment.
- c) Beggary.
- d) Juvenile delinquency.
- e) Prostitution.
- f) Alcoholism.
- g) Problems of women in employment.

11. Social security

- a) Social Security and social legislation in relation to the disabled.

12. Social work

- a) Meaning of social work.
- b) The role of a medical social worker.

Reference books

1. Sachdeva & Vidyabhushan, Introduction to the study of sociology.
2. Indrani T. K., Textbook of sociology for graduates' nurses and Physiotherapy students, JP Brothers, New Delhi10.

CONSTITUTION OF INDIA

1. **Unit-I:** Meaning of the term 'Constitution'. Making of the Indian Constitution 1946-1950.
2. **Unit-II:** The democratic institutions created by the constitution, Bi cameral system of Legislature at the Centre and in the States.
3. **Unit-III:** Fundamental rights and duties their content and significance.
4. **Unit-IV:** Directive principles of States, policies the need to balance fundamental rights with directive principles.
5. **Unit-V:** Special rights created in the Constitution for Dalits, backwards, women and children and the religious and linguistic minorities.
6. **Unit-VI:** Doctrine of Separation of Powers, legislative, executive and judicial and their functioning in India.
7. **Unit-VII:** The Election Commission and State Public Service commissions.
8. **Unit-VIII:** Method of amending the Constitution.
9. **Unit-IX:** Enforcing rights through writs.
10. **Unit-X:** Constitution and sustainable development in India.

Books:

1. J.C. Johari: The Constitution of India: A Politico-Legal Study. Sterling Publication, Pvt. Ltd. New Delhi.
2. J.N. Pandey: Constitution Law of India, Allahabad, Central Law Agency, 1998.
3. Granville Austin: The Indian Constitution. Corner Stone of a Nation-Oxford, New Delhi, 2000.

3rd YEAR BSc. MIT

Subject: RADIOLOGICAL PROCEDURES

Objectives:

1. To know management and positioning of patients while performing radiological procedures.
2. Knowledge of indications, contraindications, contrast media, radiation dose, exposure timing and radiation safety measures for different radiological procedures.
3. To understand the patient preparations needed before any radiological examination.
4. Knowledge of post procedural care.

Skills:

- 1) Students will be able position the patients for radiological procedures.
- 2) Knowledge of image quality in radiological images.
- 3) Management of patients in radiology department for various procedures.
- 4) Ability to handle emergency situations in radiology department.
- 5) Precautions and care required in interventional suits.

Theory hours	90
Practical/Demo/Tutorials/Assignments hours	300
Method of Assessment	Written examination/Viva

Unit I

18 theory & 25 practical hours

1) Introduction:

General approach to Special Radiographic procedures
Responsibility of Radiology Technologist during radiological procedures.
Preparation of patient for different procedures.
Room layout in interventional radiology and fluoroscopy.

2) Contrast Media:

Positive and Negative, Ionic & Nonionic.
Adverse Reactions to contrast media and patient management.

3) Emergency Equipment's in the Radiology Department

Unit II

22 theory & 74 practical hours

4) Gastro Intestinal Tract:

Barium Swallow
Barium Meal - Single and Double Contrast
Barium Meal Follow Through
Small Bowel Enema (Enteroclysis)
Barium Enema - Gastrograffin Enema
Loopogram

7) Biliary Tract:

Percutaneous Transhepatic Cholangiography
Percutaneous Transhepatic Biliary Drainage
Endoscopic Retrograde Cholangio pancreatography

Unit III

10 theory & 45 practical hours

5) Urinary System:

IVU (Intravenous Urography)
Retrograde Pyelo Ureterography (RGU)
Micturating Cysto Urethrography
Ascending Urethrography

6) Reproductive System:

Hystero Salpingogram
FTR (Fallopian Tube Recanalization)
Sonosalpingography

Unit IV

13 theory & 30 practical

hours

8) Interventional procedures:

Catheter- classification, types and applications
Guide wire- classification, types and applications
Pressure Injector and Accessories
Percutaneous catheterization
Digital Subtraction Angiography
Catheterization Sites, Asepsis
General interventional procedures- types and instrumentation

Unit V

14 theory & 60 practical hours

9) Arteriography

Head and Neck Arteriography
Pulmonary Arteriography
Coronary Arteriography
Ascending Aortography
Trans Lumbar Aortography

Renal Arteriography
Trans Femoral Arteriography

10) Venography:

Lower Limb
Upper Limb
Chest Venography

**Unit VI
hours**

13 theory & 66 practical

3) Central Nervous System:

1. Cervical Myelography - Cisternal Puncture and Lateral Cervical Puncture
2. Lumbar Myelography
3. Myelography with water soluble and oily contrast media

4) Respiratory System:

- Bronchography
- Percutaneous Lung Biopsy

5) Other procedures in radiology

- Arthrography
- Sialography
- Sinography & Fistulography
- Dacryocystography
- Embolization & embolic agents

Reference books:

1. Radiological procedures- Bhushan and Lakkhar
2. A guide to radiological procedures- Chapman.

Subject: CT, MRI, USG AND NUCLEAR MEDICINE (DIAGNOSTIC MEDICAL IMAGING)

Objectives:-

1. To know basic principle and physics of CT scan.
2. Protocols needed for CT examination.
3. Preparation and positioning for CT examination.
4. Post processing of raw CT images.

Skills:

- 1) Students will be able to prepare and position the patients for CT examination.
- 2) Knowledge of improving image quality in CT images.
- 3) Scanning of patient with various CT protocols for better representation of images.
- 4) Post processing for CT scan data eg: volume rendering, surface shaded display, multi planar reconstruction, maximum intensity projection, curved linear projections.
- 5) Management of patient for any post contrast reactions.

Theory hours	90
Practical/Demo/Tutorials/Assignments hours	450
Method of Assessment	Written examination/Viva

Paper-I : COMPUTED TOMOGRAPHY**Unit I****10 theory & 15 practical hours**

1. Introduction and history
2. CT principle
3. CT generations
4. CT Instrumentation
5. CT detectors
6. Axial & Helical CT – Slip ring technology

Unit II**15 theory and 30 practical hours**

7. Data acquisition
8. Image pre-processing/reconstruction techniques
9. Algorithms for image reconstruction
10. Image display
11. Image post-processing techniques
12. CT artifacts
13. Image quality

Unit III**35 theory & 100 practical hours**

14. CT contrast media and administration
15. CT guided interventional procedures

Unit IV**15 theory & 15 practical hours**

16. Safety consideration
17. Documentation in CT
18. Role of Medical Imaging technologist in CT scan procedures
19. Quality assurance in CT

Paper- II : MAGNETIC RESONANCE IMAGING**Unit VI****20 theory & 10 practical hours**

1. Introduction to MRI
2. Basic principle
3. Image weighting and contrast in MRI
4. Instrumentation of MRI
 - Magnets- classification, types, advantages, disadvantages
 - Gradient & Body Coils
 - RF coils
 - Shim coils
 - Ramping
 - Cryogen
 - RF shielding
 - Computer

Unit VII**20 theory & 10 practical hours**

5. Encoding and Image formation
 - Encoding
 - K-Space
6. Parameters and Trade-offs
7. MRI Pulse sequences
 - Spin Echo pulse sequence
 - Gradient Echo pulse sequence
8. Fast imaging sequences

Unit VIII**20 theory & 20 practical hours**

9. Vascular Imaging
 - Digital Subtraction MRA
 - MR-Angiogram
 - MR-Venogram

Unit IX**25 theory & 85 practical hours**

10. MRI Artifacts and their compensation
11. MRI contrast agents
 - T1 contrast agent
 - T2 contrast agent

Unit X**20 theory & 40 practical hours**

12. Advanced MRI techniques
 - DWI & DTI
 - Perfusion
 - Spectroscopy
 - Functional MRI
 - Interventional MRI

Unit XI**15 theory & 15 practical hours**

13. MRI safety
14. Documentation
15. Quality assurance in MRI

Books for Reference:**Paper- I**

- Christensen, Curry & Dowdey : An Introduction Of Physics To Diagnostic Radiography
- Seeram CT, Euclid Seeram
- Spiral CT protocols- a practical approach – Jaypee publications
- Tomography and Magnetic Resonance Imaging of the Whole Body (Vol.1 & II) (Saunders).

Paper- II

- MRI Physics and Biological Principle, Stewart C Bushong
- MRI in Practice, Catherine Westbrook & Caralyn Kaut
- Protocols in MRI- Catherine Westbrook
- Physics of MRI - Bradley

A. Ultrasonography**Unit I****10 theory & 10 practical hours**

1. Introduction to ultrasound
2. Basic principle and physics of ultrasound
3. Characteristics of ultrasound
4. Interaction of ultrasound with matter
5. Instrumentation
6. Piezoelectric effect
7. Transducers
8. Ultrasound display modes
9. Ultrasound controls

Unit II**30 theory & 20 practical hours**

10. Doppler – principle and physics
11. Doppler Instrumentation
12. Doppler – types, uses, advantages, disadvantages and comparison
13. Ultrasound Artifacts and Doppler artifacts

Unit III**30 theory & 60 practical hours**

14. Biological effects of ultrasound and safety considerations
15. PNDDT Act
16. Ultrasound protocol for different body parts
17. Quality assurance in ultrasound

B. Nuclear Medicine Technology**Unit IV****20 theory & 10 practical hours**

1. History
2. Isotopes and Radionuclides
 - Production of Radionuclides
 - Transport of Radionuclides
3. Radio Activity
 - Radio Active transformations
 - Specific Activity
4. Radiopharmaceuticals
 - Preparation
 - Precautions while handling

Unit V**20 theory & 30 practical hours**

5. Gamma Camera instrumentation
 - Collimator- classification and types
6. Single Photon Emission Computed Tomography (SPECT)
7. Positron Emission Tomography (PET)
8. Advanced techniques in NM
 - SPECT-CT
 - PET-CT
 - PET-MRI

Unit VI**10 theory & 10 practical hours**

9. Safety Considerations & Radiation Dose in Nuclear Medicine
10. Room layout in nuclear medicine

Books for Reference:

1. *Christensen, Curry & Dowdey: An Introduction Of Physics To Diagnostic Radiography*
2. *Diagnostic Ultrasound Principles and Instruments, Frederick W Kremkau*
3. *Roger C. Saunders: Clinical Sonography : A Practical Guide (Little Brown & Company)*
4. *Palmer : Manual of Diagnostic Ultrasound (WHO)*
5. *Physics in Nuclear Medicine:, James A Sorenson, Simon R Cherry, Michael E Phelps*
6. *Fundamentals of Nuclear Pharmacy, Gopal B Saha*

Scheme of Examination Theory

There shall be two theory paper of three hours duration each carrying 80 marks for each paper. Distribution of type of questions and marks shall be as given under.

Type Of Questions	No Of Questions	Marks For Each Questions	Total
Long Essay	5 To answer 2	10	20
Short Essay	10 To answer 8	05	40
Short answer	10(no choice)	02	20
Total			80

Theory IA: 20 marks for each paper

Viva/Practical Scheme of Examination.

Maximum Marks 80.

Viva IA: **20 marks.**

Subject: RADIATION SAFETY & PATIENT CARE IN DIAGNOSTIC RADIOLOGY.

Objectives:

1. To know the basic needs and care for the patients inside the radiology departments.
2. Preparation of patients for various radiological examinations.
3. Knowledge of the transferring patients before and after the radiological examination and restraining of patients at the time of examination.
4. Knowledge of radiation protection principles and their application in radiology department.
5. Knowledge of departmental layouts for protection of patients, occupational workers and general public.

Skills:

- 1) Students will be able to transfer the patients without causing any complications and can restrain the uncooperative patients during radiological examinations.
- 2) Protecting the patients, occupational workers and general public from secondary radiation.
- 3) Regulation of radiation practices according to internationally accepted methods.
- 4) Obtaining vital signs, handling equipments used for various procedures.
- 5) Management and Care of patient during emergency situations.
- 6) Using sterilized techniques to reduce the chances of infection in work practices.

Theory hours	60
Practical hours	60
Method of Assessment	Written examination

Radiation Protection**Unit 1****13 theory & 10 practical hours****1. Introduction**

- Basic radiation units and quantities
- Exposure, Absorbed dose
- Absorbed dose equivalent
- Quality factor, Tissue weighting factor

2. Biological effects of radiation

Chemical effects of radiation - radiolysis of water; production of free radicals, radicals reactions. Stochastic and non-stochastic effects, chromosome aberrations and mutations, cellular effects, genetic effects. Early effects and late Radiation effects on whole body.

- ALARA/ALARP
- Maximum Permissible Dose (MPD)
- ICRP Regulations
- Radiation in Pregnancy and children

Unit II**13 theory & 25 practical hours****3. Construction of exposure rooms in Radiology Department**

- Work load, Use factor, Occupancy factor

- ICRP guidelines for room design in radiological modalities.
- Scatter and Leakage radiation
- Radiation Signage
- Protective devices
- Beam limiting devices- filter, cone, diaphragm, cylinder.
- Protection in fluoroscopy, mammography, mobile x-ray , CT

4. Radiation monitoring devices

Personal monitoring devices (TLD, Film Badge, Pocket Dosimeter, OSLD), Area monitoring devices- Gas-filled detectors (ion chambers, proportional counters and G M counters), scintillation detectors

5. Quality assurance and Quality Control in Conventional radiology and Fluoroscopy

Patient Care

Unit III

7 theory & 10 practical hours

1. Communication

- Patient education
- Communication with the patient
- Professional role and behavior

2. Introduction to Patient Care

- a. Responsibilities of Medical Imaging Technologist
- b. Obtaining Consents and history for different radiological examinations.
- c. Patient transfer and Restraining techniques
- d. Obtaining vital signs
- e. Ergonomics and body mechanism

Unit IV practical hours

8 theory & 10

3. Nursing procedures in Radiology

- Injection- methods and their routes of administration
- Clothing of patient
- Administering rectal enema

4. Emergency care

- First aid

- Emergency cart and drugs
- CPR

Unit V

05theoryhours

5. Medical ethics and records

- Medico legal implication of MLC cases
- Importance of consent
- Consent in detail
- Precaution while dealing with female patient
- Medical records

Examination scheme:

Examination will be of duration 1.30 hours carrying 40 marks
10 marks for internal assessment.

Distribution of marks should be equal for each section.

At least 40% of total marks in each section necessary for passing.

Average of best two Theory Internal assessment marks sent to University.

Average of best two Practical IA marks sent to University.

Long Essay	3 To answer 2	08	16
Short Essay	8 To answer 6	04	24
Total			40

Reference books:-

Radiation Protection

- Physics of diagnostic Radiology- Christenson
- ICRP manual
- Radiation protection in medical radiography- Mosby Elsevier publication

Patient Care

- Care of Patients in Diagnostic Radiology- Gunn
- Patient care in radiography- Mosby Elsevier publication

SUBSIDIARY SUBJECTS
Third B.Sc. Medical Imaging Technology
BIO-STATISTICS AND RESEARCH METHODOLOGY

1. Course description
Introduction to basic statistical concepts
Methods of statistical and interpretation of data. Introduction to research methodology
2. Objectives
Understands statistical terms
Possesses knowledge and skills in the use of basic statistical and research methodology
3. Contents
 - a) Unit-1: Introduction
 - i) Meaning, definitions and types of statistics
 - ii) Statistics as a singular and plural noun
 - iii) Branches of statistics
 - iv) Applications of statistics in medicine
 - b) Unit – II: presentation of data
 - i) Definition and types of data
 - ii) Raw data, the array, frequency distribution
 - iii) Basic definitions and principles of tabular presentation
 - iv) Basic principles of graphical representation
 - v) Types of diagrams: Bar, Pie, line, Histograms, Pictogram
 - c) Unit-III: Measure of central tendency
 - i) Need for measure of central tendency
 - ii) Definition and calculation of mean: ungrouped and grouped
 - iii) Meaning, interpretation and calculation of median ungrouped and grouped
 - iv) Meaning and calculation of mode ungrouped and grouped
 - v) Selection of an appropriate measure of central tendency
 - c) Unit- IV: Measure of variability
 - i) Need for measure of variation
 - ii) Range and mean deviation
 - iii) Variance and standard deviation
 - iv) Calculation of variance and standard deviation ungrouped and grouped
 - v) Properties and uses of variance and SD

BASICS IN COMPUTER APPLICATIONS

1. Introduction to data processing

Features of computers, advantages of using computers, getting data into/ out of computers, role of computers, data processing, application areas of computers involved in data processing, common activities in processing, types of data processing, characteristics of information, hardware and software.

2. Hardware Concepts

Architecture of computers, classification of computers, concept of damage, types of storage devices, characteristics of discs, tapes, terminals, printers, network, applications of networking, concept of PC system care, floppy care, data care.

3. Concept of Software

Classification of software, system software, application of software, operating system, computer system, computer virus, precautions against viruses, dealing with viruses, computers in medical electronics, basic anatomy of computers.

4. Principles of programming

Computer application, principles in scientific research, work processing, medicine, libraries, museum, education, information system.

5. Data processing

Computers in physical therapy: principles in EMG, exercise testing equipment, laser.

ETHICS

1. Introduction

Medical ethics is a systematic effort to work with in the ethos of medicine, which has traditionally been service to sick.

2. Objectives

Identify underlying ethical issues and problems in medical practice.

3. Course contents (Syllabus)

a. Introduction to medical ethics

What is ethics, what are values and norms, freedom and personal responsibility?

b. Definition of medical ethics

Major principles of medical ethics.

c. Perspective of medical ethics

The Hippocratic oath, The Declaration of Helsinki, The WHO Declaration of Geneva, International code of Medical Ethics (1993), Medical Council of India Code of Ethics (2002).

d. Ethics of the individual

Truth and confidentiality, the concept of disease, health and healing, the right to health.

e. The ethics of human life

Prenatal sex determination.

f. The family and society in medical ethics

Euthanasia, cancer and terminal care.

g. Death and dying

Use of life-support systems, the right to die with dignity, suicide – the ethical outlook.

h. Professional Ethics

Contract and confidentiality, malpractice and negligence.

4. Teaching/Learning Experience

- a. Increasing the awareness and knowledge of students of the value dimensions of interactions with the patients, colleagues, relations and public.
- b. Fostering the development of skills of analysis, decision making and judgment.
- c. Making the students aware of the need to respect the rights of the patient.
- d. Duties and responsibilities of the technologists.

4th Year- Compulsory Internship

Internship will be of one year duration.

To get into the internship the student should have passed in all the subjects of the 3rd Year.

No student will be allowed to start internship with arrears.

Internship includes

1. Clinical duty in various modalities

- Conventional X-Ray
- Mobile X-Ray
- Computerized Radiography
- CT scan
- MRI scan
- Ultrasound

2. Teaching practice in basic topics of Medical Imaging Technology

- Short teaching hours for the UG students

3. Out posting

- Out posting will be given on the requirement of interns in the outer hospitals and companies like Siemens, GE, Philips etc.