SYLLABUS FOR RADIOTHERAPY TECHNOLOGY

Ist Year

SUBJECT– I : HUMAN ANATOMY & PHYSIOLOGY

(Suggested number of teaching hours 120 including tutorials)

Knowledge of the normal structure and function of the different parts of the body must be coupled with some idea of the way in which disease arises and extends, so that the technologist can assist in the various procedures used in diagnosis and treatment.

The syllabus gives under the main headings the names of organs and systems to indicate the scope of teaching required. Both in diagnosis and treatment. Knowledge of the size and position of an organ is of paramount importance. The level to be aimed at here is difficult to define, but books on surface anatomy are available and only rarely will it be necessary to refer to major works on anatomy, such as Gray and Cunningham.
Under the repeating headings common terms used in connections with diseases of this system, no detailed list of diseases is required, but an explanation of those terms which the technologist may encounter in daily work is necessary.

1.General Anatomical Terms

2.Regions of the body

3.Description of a typical animal cell: Cell mitosis; genes; sex cell; ova and spermatozoa. Fertilization of the ovum. Broad lines of embryonic development. Cell function and differentiation of tissues.

4.Structure of General Tissues : Epithelium; simple and complex epithelial glands; skin. Connective tissue; fibrous tissue; cartilage; bone; Haversian systems; blood; numbers and types of cells in blood; clotting of blood. Muscle tissue; involuntary, voluntary and cardiac muscle. Nerve tissue.

5.Bones, joints and locomotors system: General description of bones, their main processes and attachments, 'including the skull with emphasis on the skull as a whole. Development of bones, Primary and secondary oneenters;diaphysesandempiphyses. Position and function of main joints. Some common diseases and injuries of bones and joints; Healing of actures.

6.Thorax and Abdomen: Structure of thoracic cage, abdominal cavity; diaphragm and mediasternum.

7.Heart and Blood Vessels: Structure and function of the heart, pericardium, peripheral vascular system; names of main arteries and veins, circulation. Common terms used in connection with diseases of this system.

8.Respiratory system : Nasal passages and accessory nasal sinuses, pharynx and larynx, trachea, bronchi and lungs; pleura, nature and function of respiration. Common terms used n connection with diseases of this system.

9.Lymphnode Groups: Lymph and tissue fluid, main lymphatic gland groups and drainage areas, lymphoid tissue and tonsil.

10.Reticulo-Endothelial system : Spleen and liver, bone marrow,extent and nature, physiology of the red and white blood corpuscle's.

11.Alimentary system :Mouth, tongue and teeth, salivary glands, pharynx and esophagus, stomach, small and large bowel, liver and biliary tract, pancreas, motility of the alimentary tract; digestion, absorption and metabolism, nutrition and dietetics, common terms used in connection ith diseases of this system.

12.Urinary tract: Kidneys, ureters, bladder and urethra; urine formation and excretion, common terms used in connection with diseases of the system.

13.Reproductive system: male genital tract; testes; epidedymis, seminal vesicle and prostate; female genital tract; uterine tubes, ovaries, uterus, vagina and vulva, the mammary glands; menstruation, pregnancy and lactation; common terms used in connection with diseases of this system.

14.Endocrine glands: anatomy and function of pituitary, thyroid, para thyroids, adrenal, thymus, pancreas and gonads as endocrine organs; common terms used in connection with diseases of this system.

15.Nervous system: brain: main subdivisions and lobes; ventricular system, spinal cord, concept of motor, sensory and reflex pathways; meninges and cerebrospinal fluid; its circulation; autonomic nervous system; common terms used in onnection with diseases of this system.

16.Special sensory organs; structure and function of the eye; structure and function of the ear; structure and function of the skin.

17.Surface markings and topographical relations; radiography anatomy.

BOOKS FOR STUDY

Text book

1.Anatomy and Physiology for Radiographers - C.A. Warrick

Reference books

2.Gray's anatomy Descriptive and applied - T.B. Johnstor.
3.Foundation of Anatomy and Physiology - Ross and Wilson.
4.An Atlas of Normal Radiographic Anatomy - Richard & Alvin
5.Essentials of Human Anatomy - Russell

SUBJECT 2 : BASIC PHYSICS & RADIATION PHYSICS

This syllabus should be augmented by as much of practical and demonstration classes as possible. Suggested number of minimum teaching hours: 120

1.Basic concepts: Units and measurements-Force, work, power and energy-Temperature and heat-SI units of above parameters. Atomic structure-atom model-Nucleus-electronic configuration-periodic table-Isotopes-Ionization-excitation-Binding energy-electron volt-Electro magnetic radiation-Quantum nature of radiation-mass energy equivalence-Fluorescence-electromagnetic spectrum

2.Electricity and magnetism: Electric charges, Coulomb's law-Unit of charge-Electric potential, unit of potential-Electric induction, capacitance and capacitors, series and parallel connection-electric current, unit, resistance, ohm's law, electric power, Joule's law Magnetism: Magnetic induction-magnetic properties-Hysteresis-magnetic effect of current-Electrical instruments, Galvanometer, voltmeter, ammeter and multimeter.

3.Electromagnetic Induction: Induced electro motive force, Faradays experiments, laws of electro magnetic induction, Self and mutual induction-Alternating current; Ac generator, Peak and RMS values, AC circuits with resistance,capacitance and inductance, Choke coil, eddy current. Transformer, theory, design, losses, auto transformer, high voltage transformer, electric power transmission

4.X-rays:Discovery of x-rays, properties-production, x-ray spectrum, bremsstrahlung and characteristic x-rays- X-ray tube; Coolidge tube, tube design, line focus principle, space charge effect, tube cooling- Modern x-ray tubes; stationary anode, rotating anode, grid controlled x-ray tubes, heel effect, off focus radiation, tube insert and housing-Tube rating-Quality and intensity of x-rays,factors influencing them.

5.X-ray generator circuits: Vacuum tube diodes-semi conductor diodes-transister-rectification, half and full wave-self rectification – X-ray generator; filament circuit-kilo voltage circuit-single phase generator-three phase generator -constant potential generator. Fuses, switches and interlocks-Exposure switching and timers-HT cables-earthing

6.Radioactivity: Discovery of radioactivity, natural radioactivity-activity units- radium, thorium and uranium series- alpha, beta decay and gamma rays - radioactive disintegration-exponential decay, half life period, decay constant. Artificial radioactivity –production of radioisotopes-cyclotron-neutron-fission and fusion-chain reaction-atom bomb-nuclear reactor

7.Interaction of X and gamma rays: Transmission through matter, law of exponential attenuation, half value layer, linear attenuation coefficient-coherent scattering-otoelectric effect- compton scattering-pair production-photonuclear disintegration-Particle interactions. Interactions of x and gamma rays in the body;fat-softtissue-bone-contrast media-total attenuation coefficient-relative clinical importance

8.Radiation quantities and units: Radiation intensity-exposure, roentgen, its limitations-kerma and absorbed dose-electronic equilibrium-rad, gray, conversion factor for roentgen to rad-RBE-LET-quality factor-dose equivalent-rem, sievert.

9.Radiation detection and measurements: Principle of radiation detection-Ionization chamber-proportional counter-GM tubes-scintillation detectors-semiconductor detector-Gamma ray spectrometer. Measuring system: free ionization chamber-thimble ion chamber-condenser chamber-victoreen electrometer-secondary standard dosimeter-film dosimeter-chemical dosimeter-thermoluminecent dosimeter-Pocket dosimeter. Radiation survey meter-zone monitor-contamination monitor, their function use and maintenance.

BOOKS FOR STUDY

Text book

1.First year Physics for Radiographers - Hay & Hughes.

Reference books

2.Basic radiological physics-K.Thayalan, Jaypee publishers (P) Ltd, New Delhi(2001)
3.Fundamental of X-ray and Radium Physics - Joseph Selman
4.Basic Medical Radiation Physics - Stanton.
5.Chrtistensen's Physics of Diagnostic Radiology –
Christensen.

Subject : 3 : RADIOGRAPHIC PHOTOGRAPHY:

Suggested number of teaching hours is 120, including tutorials and practical demonstration. This Radiographic photography syllabus is intended as a guide to the theory and practical knowledge required by the students. Appreciation and application of all the factors listed below will enable the technologist to produce x-ray films of good quality and diagnostic value. The lectures should be linked with practical demonstration to illustrate the importance of all that goes to make up correct exposure conditions.

1.X-ray film materials: Structure of film emulsion-Grain technology-Gelatin-Basic film types-Film formats and packing-Direct exposure duplitised films-Single coated emulations-Films for specialized use-manufacturing process.

Sensitometry :Photographic density—characteristic curve –information from the characteristic curve-speed Vs definition

Storage of x-ray film-unprocessed film-radiographs

2. Intensifying screens and cassettes: Intensifying screen- phosphor- Construction-Intensifying factor-speed and detail-crossovereffect-resolution-mottle-reciprocity-screen symmetry- screen-film contact- screen types and cleaning. New phosphor technology-influence of kilovolt age. Photostimulable phosphor imaging x-ray cassette-design-types-Identification of cassettes- General care of cassettes and storage.

3.Photochemistry: Film processing-latent image formation-Mechanism-theory-Developer-nature of development-pH scale-constitution of developer-development time-

factors in the use of developer. Fixers-constitution of fixing solution-factors affecting the fixer-replenishment of fixer--silver conservation-Drying –developer and fixer for automatic film processor-rinsing-washing and drying.

4.processing equipment: Materials for processing equipment-manual processor-care of processing equipment-automatic processor-manual VS automatic-principles and typical equipment Microprocessor control-Cine processing-Daylight systems-Processing faults-maintenance

5.Processing room: Day light processing-location of the dark room-dark room illumination-equipment and layout-x-ray viewing room.Daylight handling-daylight systems with cassettes-without cassettes.

6. Radiographic image-components of image quality-unsharpness in radiographic image-contrast of the radiographic image-distinctness of the radiographic image-size, shape and spatial relationships. Presentation of radiographs-opaque letters and legents-perporating devices-actinic markers-Identification of dental films-preparation of stereo radiographs-viewing conditions

7.Monitor photography- Characteristics of the video image-television camera-imaging camera—imaging film-sensitimetric characteristics-processing-final image. Laser-light and laser-laser imaging-laser imagers—imaging plates-principle of photo stimulated luminescence

BOOKS FOR STUDY

Text book
1.Radiographic Imaging - Chesney & Chesney,Blakwell scientific publications, oxford(1981)
Reference books
2.Radiographic imaging-Derrick P.Roberts and Nigel L.Smith.Churchill Livingstone,Edinburgh (1994)
3.Radiographic Latent image processing - W.E.J. Mckinney
4.Photographic processing,quality control and evaluation of photographic material -J.E. Gray
5.Photographic processing Chemistry - L.F.A. Mason.
6.Physical and photography principles of Medical Radiography -Seeman & Herman.

IInd Year

Subject–4: General PRINCIPLES OF HOSPITAL PRACTICE AND patient care

Suggested number of teaching hours 100 including tutorials and demonstrations. This section is intended to emphasize to the student technologist the importance of patient welfare. Many of the points included in this section may be considered during the teaching of other subjects also; but it is strongly urged that specific teaching and as much practical demonstration and instruction as possible should be given in this section. Modern hospital treatment is based on team work, it is essential that the student should appreciate the technologists role and that the importance of co-operation with wards and other departments. The students should be attached to wards or the accident and emergency department for a definite training period, the length of time being suited to the individual hospital.

1 **Hospital procedure**: Hospital staffing and organization; records relating to patients and departmental statistics; professional attitude of the technologist to patients and other members of the staff; medico- legal aspects; accidents in the departments appointments organization; minimizing waiting time; out-patient and follow-up clinics; stock-taking and stock keeping.

2 **Care of the patient** : FIRST contact with patients in the department; management of chair and stretcher patients and aids for this, management of the unconscious patient; elementary hygiene; personal cleanliness; hygiene in relation to patients (for example clean linen and receptacles , nursing care; temperature pulse and respiration; essential care of the patient who has a tracheostomy; essential care of the patient who has a colostomy; bedpans and urinals; simple application of a sterile dressing.

3 **First aid** : Aims and objectives of first aid; wounds and bleeding, dressing and bandages; pressure and splints, supports etc. Shock; insensibility; asphyxia; convulsions; resuscitation, use of suction apparatus, drug reactions; prophylactic measures; administration of oxygen; electric shock; burns; scalds; hemorrhage; pressure points; compression band. Fractures; splints, bandaging; dressing, foreign bodies ; poisons.

4 **Infection** : Bacteria, their nature and appearance ; spread of infections; auto-infection or cross-infection; the inflammatory process; local tissue reaction, general body reaction; ulceration; asepsis and antisepsis.

5 **Principles of asepsis**: Sterilization - methods of sterilization; use of central sterile supply department; care of identification of instruments, surgical dressings in common use, including filamented swabs, elementary operating theatre procedure; setting of trays and trolleys in the radiotherapy department (for study by radiotherapy students only)

6 **Departmental procedures**: Department staffing and organization; records relating to patients and departmental statistics; professional attitudes of the technologist to patients and other members of the staff, medico-legal aspects accidents in the department; appointments; organization; minimizing waiting time; out-patient and follow-up clinics; stock taking and stock keeping.

7 **Drugs in the department** : Storage : classification; labeling and checking, regulations regarding dangerous and other drugs; units of measurement, special drugs, anti-depressive, anti-hypertensive etc.

BOOKS FOR STUDY

Text book

1.Deeley – A guide to Radiotherapy nursing (Livingstone

Reference books

2.Care of patient in diagnostic Radiography - Chesney & Chesney.
3.Chesney's Care of the patient in Diagnostic Radiography – Pauline J . Culmer.
4.Aid to Tray and Trolley Setting - Marjorie Hougton
5.First Aid - Haugher & Gardner
6.A guide to Oncology nursing (Livingstone) - Deeley
7.Practical nursing and first- aid - Ross and Wilson. Livingstone.

Subject – 5 : PHYSICS OF RADIOTHERAPY AND EQUIPMENTS
(Suggested number of teaching hours 120 including tutorials and practical demonstration).

The following syllabus is intended to be comprehensive in the range of subjects to be covered without being detailed. Candidates should possess a sound knowledge of the subjects and those of practical procedures which technologists might be called upon to undertake.

1.Teletherapy machines: Kilvoltage units-Grenz therapy-contact therapy-superficial therapy-Deep therapy. Mega voltage therapy-van de Graff generator-Linear accelerator,-betatron-microtron. Radioisotope machines-Cobalt-60 units –source -hosing -beam collimation and penumbra-Heavy particle beams

2.Beam therapy data: Phantom and bolus-Build up and dose maximum-percentage depth dose-tissue air ratio-back scatter factor- Equivalent square field concept-Scatter air ratio- Irregular field concept-tissue phantom ratio-tissue maximum ratio SSD and SAD technique-rotation technique--Time and dose calculations in SSD,SAD and rotation therapy. Worked examples for cobalt-60 and linac treatments Electron beam therapy-interactions-energy specification-calibration-characteristics of electron beams.

3.Treatment planning concepts: Isodose chart-Measurement of isodose curves-parameters of isodose curves. Wedge filters-Wedge field techniques-Combination of radiation fields-Isocentric techniques-tumor dose specification. Simulator-treatment verification-Correction for contour irregularities-Corrections for tissue in homogeneities. Treatment planning system-external beam planning-brachytherapy planning

4.Beam directing devices: Different types of collimators- penumbra trimmers-Front and back pointer-pin and arc. Tissue compensation-Field blocks-field shaping-multileaf collimator-IMRT concept-separation of adjacent fields.

5.Brachytherapy: Radioactive sources- calibration of brachytherapy sources-Brachytherapy methods-Mould-implant-Intracavitory-Intraluminal-Implant dosimetry systems-Radiographic verification of implant-Orthogonal verification of intracavitory application-dose calculation methods. After loading systems-BARC Cs-137 kit-LDR remote after loading system and HDR remote after loading system.

Books for study

Text Book

1.The Physics of radiation therapy-Faiz M Khan, Williams and wilkins(1994)

Reference Books

2.Johns.Harold and Conningham : Physics of radiology (USA Charles C Thomas)
3.Massey and Meredith – Text book of physics applied to radiotherapy and radio diagnosis.
4.Joseph Selman – Part II Physics of radiotherapy.

PRINCIPLES OF RADIOTHERAPY

(Suggested number of teaching hours 120 including tutorials and demonstration)

The student should have a knowledge of various diseases which come within the encompass of radiotherapy. This knowledge includes pathology and epidemiology. A general knowledge of the disease process, including a knowledge of normal cell structure and life cycle, is necessary basis for an understanding of the abnormal.Students should have a knowledge of the effect of various radiations in tissues; the effect on the cell ; the tissues, the body as a whole; a general understanding of the importance of linear energy transfer and relative biological effectiveness; and a broad knowledge of drugs and other agents which can be used in conjunction with radiation; such as sensitizing or protective agents; the effects of oxygen etc. The student should have an understanding of principles underlying the choice of treatment and the relative place of radiotherapy with surgery, chemotherapy and hormone therapy in treatment of malignant diseases. This understanding should include a sound knowledge of principles of radiation dosage, effect of fractionation, sensitivity and relative biological effectiveness of the radiation used.

1.Effects of various radiation on normal tissues and malignant tumor: Early and late reaction on Skin, Mucous membrane, GI tract, Genito urinary system, respiratory system, CNS

2.Introduction to malignant tumor: Basic pathology-Carcinoma:
Sarcoma-Lympoma

3.Pattern of Spread, Biopsy/Investigations related to malignant tumor-staging work up and TNM.

4.Introduction of different malignant tumor treated in radiotherapy department including TNM Skin-lip-oral cavity & Para nasal sinus-nasopharynx-orophaynx-hypopharynx-larynx-thyroid-postcricoid—oesophagus-mediastinum- lungs-pancreas-liver-breast-cervix-body of the uterus-vagina-valva-kidney,ureter,bladder,rectum-prostate,penis,testis-poreticulam tissue-bone marrow-CNS ,eye,orbit-soft tissue & bone-pediatric tumor,retinoblastoma, wilms tumor, rhobdomyosarcoma

Books for study

Textbook

1.Walter and Miller: Short text book of radiotherapy

Reference books

2.Meredith W J (et al) Radiation dosage the Manchester system
2.Smith : Ivan H (et al) Cobalt 60 teletherapy
3.Silver and Solomon : Radioactive isotopes in Med. & Biol.
4.Wachsmann : Felise and Berth Gunther Moving field radiation therapy.
5.Murphy and Walter : Radiation Therapy
6.Sulton and Maurice : Cancer explained
7.Fletcher, Gilbert : Radiation therapy in the management of cancers
8.Mos William : Therapeutic radiology

Subject 7 : RADIOTHERAPY TECHNIQUES
(Suggested lecturer hours120)

I Application of radiotherapy in benign conditions

II Application of radiotherapy in malignant condition

1.Tumor localization

Radiological diagnostic procedures – X-ray, ultrasound, CT scan, MRI, Mammogram-Radio nuclide investigation

Tumor localization & check film and application of simulation in radiotherapy.

2.Treatment planning

CT planning-MRI planning-Interpretation of treatment prescription-Record keeping relevant to planning – patient position, support, immobilization, Land marks Mould room techniques and immobilization.Treatment positioning in radiotherapy to various cancers; CNS-benign-pitutry-craniophan. Malignant tumor-primary and secondary; orbit-eye – middle ear-parotid-buccal mucosa-tongue-hard palate-maxillary antrum- naso pharynx-oropharynx- hypo pharynx- larynx- oesophagus- media sternum- lung- bladder- prostate-penis- testis-cervix-,body of the uterus—vagina-valva-lympoma

3.External beam therapy practical experience

Care of machine-Set up single, multiple fields-Use of wedges, shields and tissue compensators-Use of beam directional devices, methods of patient immobilization-Knowledge of technique involving electron beam therapy-moving beam therapy-conformal therapy-stereo tactic radio surgery and radiotherapy-Handling emergencies in Teletherapy

4.Mould room technique:

Construction of casts-Construction of applicator and moulds-Construction of shields

5.Brachytherapy

Principle of brachytherapy;intestritial-intracavitory-surface mould-intra luminal- Safe handling of small sealed radioactive sources. Preparation, - Storage Brachytherapy source-Check x-rays -Record keeping in relation to brachytherapy sources patient data

Books for study

Text book

1.Moss: Radiation Oncology – Rationale technique results

Reference book

2.Walter and Miller : Short text book of radiotherapy
3.Sutton P M : Nature of cancer (London, English University press)
4.Meredith W J (et al) Radiation dosage the Manchester system
5.Wachsmann : Felise and Berth Gunther Moving field radiation therapy.
6.Murphy and Walter : Radiation Therapy
7.Fletcher,Gilbert : Radiation therapy in the management of cancers
8.Mos William: Therapeutic radiology
9.Barnes and Rees : Concise text book of radiotherapy

Subject : 8 : PATIENT CARE RELEVANT TO RADIOTHERAPY
(Suggested lecturer hours 100)

1. Preparation of patients for general radiotherapy procedures- departmental instructions to outpatients or ward staff- use of aperients; enemas and colonic irrigations flatulence and flatus, causes and methods of relief principles of catheterization and intubation,premedication. its uses and methods; anesthetized patients; diabetic patients special attention to food hazards of trauma. Preparation of the patients of biopsy and trolley set up; trolley set up for ENT examination, preparation of the patients for pelvic examination and trolley set up, general welfare of the patients during and after the treatment including the care ofany inter current diseases (diabetes, tuberculosis, arthritis), diet and fluid intake.

2.The observation and reporting any change in the signs and symptoms of patients receiving treatment, the use of blood count in the control of certain treatment, the care of blood counts, the care of local and systematic reaction, local reaction showed include those in the ear, nose, throat and eye and those arising from treatment given to the pelvis, instrumentation, the absolute necessity for accuracy in every aspects of each individual treatment, the terminal care of dying patients.

3.CARE OF PATIENTS:

General welfare of the patient during and after the treatment including the care any intercurrent disease (diabetic, tuberculosis, arthritis). Diet and fluid intake. The observation and reporting any change in the signs and symptoms of patients receiving treatment. The use of blood count in the control of certain treatment. The care of local and systemic reaction. Local reaction should include those in the ear, nose, throat and eye and those arising from treatments given to the pelvis. Care of cancer patients.

A. Patient care:

a. Identification and care of radiation reaction

i. Mucositis

ii. Dermatitis

iii. Cystitis, proctitis

b. Use of blood counts

c. Diet and nutrition

d. Communication and counseling of students

e. Management of special procedures

i. Catheter

ii. Tracheostomy

iii. Colostomy

iv. Ileal bladder

v. Breast prosthesis

vi. Anaesthetized patient

vii. Unconscious patient

viii.Incontinence

ix. Vomiting

x. Breathing difficulty

xi. Bleeding

xii. Fall

xiii.Irrational patients

xiv. Children and babies

xv. Elderly or demented

xvi. Patient with pain.

B. Organization of radiotherapy, department practice, appointment organization in the planning room, treatment area. Management of waiting patients.

C. Drugs used in Radiotherapy.

Books for study

Text book

1.Capra : Care of the cancer patient

Reference books

2.Sutton P M : Nature of cancer (London, English University press)
3.Sulton and Maurice : Cancer explained
4.Fletcher, Gilbert : Radiation therapy in the management of cancers
5.Barnes and Rees : Concise text book of radiotherapy
6.Walter and Miller : Short text book of radiotherapy

SUBJECT 9 : QUALITY ASSURANCE IN RADIOTHERAPY.
(Suggested No. of teaching hours 100)

1.Aim of Quality assurance -staffing requirements - qualification - roles and responsibility - Equipments required - dosimeter - survey meter - densito meter - clinical dosimeter - viz diode dosimeters, Thermoluminicent dosimeter.

2.Acceptance testing of teletherapy machines - telecobalt,- beam congruence test - isocenter check - laser alignments - timer error - shutter error - periodic output calculations - monthly checks - quarterly checks - annual checks

3.Linear accelerators - acceptance testing - isocentre accuracy - gantry collimator and couch - beam congurence test - accuracy of mechanical or digital readout for gantry, couch, collimator rotation. Beam symmetry - jaw symmetry - uniformity checks - field flatness - wedges - wedge angle checking - mechanical safety - collision devices check
Equipment - Radiation field analyzer - film densitometry -

4.Simulator - Mechanical movements - isocentre - gantry - collimator couch check - beam congruence of field delineators and collimators. Mechanical safety devices - installation of collision devices - auto centering of image intensifier camera

5.Beam quality checks – x-ray out put check - KV check - focal spot size - angle - timer - mAs - high low contrast resolution - cassette leak check - safe light test - field alignment for fluoroscopic devices. Quality assurance for films

6.Brachytherapy: Aim - manual after loading - intracavitary sources - leak tests - uniformity of activity checks - auto radiograph swipe test - source identity - activity calibration - applicators - quality control of applicators -
Interstitial sources - source uniformity - auto radiograph - activity calibration - source identity
Remote after loading - source calibration - commissioning and acceptance of remote after loading equipments - source movements - pneumatic system air pressure check -

7.Treatment planning system: Quality assurance - accuracy of data - percentage depth dose - tissue maximum ratio - scattered factors - collimator factors - etc - accuracy of interpolation techniques - accuracy of input and output devices such as digitizer, printer, plotter.

8.Test cases - periodic checks of decay correction of output - repetition of quality assurance tests after software up gradation - speed of processor. Measurement of entry and exit doses - doses to critical organs.

Books for study

Text book

1.The physics of radiotherapy – I edn. Faiz M Khan

Subject: 10. RECENT ADVANCES IN RADIOTHERAPY TECHNIQUES

(The suggested number of teaching hours 100 including tutorials and demonstrations) :

1.Wedges-tissue compensator-irregular field-SSD&SAD technique-oblique field-arc-rotational and moving field

Mantle field-irregular field-Hemi body irradiation-whole body irradiation-total body skin irradiation

2.Special techniques in Radiation Therapy, Stereo tactic radiation Therapy (SRT) – Stereo tactic Radio surgery (SRS) –. Methods – BRW and CRW frames – angiographic localizer box – preparation of target sheets – Quality Assurance – Isocentric check – Treatment execution – care to be taken – check list.

3.Conformal Radiotherapy : Principles of 3 D treatment.

4.Recent developments in radiotherapy and treatment echniquest

Books for study

Text book

1.Moss: Radiation Oncology – Rationale technique results

Reference book

.Walter and Miller : Short text book of radiotherapy

SUBJECT 11 : RADIATION HAZARDS,CONTROL AND SAFETY

(Suggested number of teaching hours 80 including tutorials and demonstrations).

1.Radiation protection; principle, history& development-National & international agencies; AERB, BARC,ICRP,WHO,IAEA and their role. Equivalent dose-effective dose-sievert-rem. Sources of radiation-natural-man made & internal exposures.

2. Biological effects of radiation; effects on cell-stochastic & deterministic effects-radiation risk-tissues at risk-genetic, somatic & fetus risk-risk at other industries. Dose equivalent limits-philosophy-ICRP(60) concepts-AERB guidelines.

3.Planning of radiation installation-protection from primary, leakage and scattered radiation. Concepts of work load, use factor ,occupancy factor & distance. Barrier design-barrier materials-concrete, brick& lead. Primary & secondary barrier design calculations. Design of doors. Control of radiation-effects of time, distance and shielding.

4.Personnel monitoring systems; principle and objective-film badge-guidelines for use-thermoluminecent dosimeter badge-pocket dosimeter. Area monitoring and radiation survey, practical use of survey meter, zone monitors and phantoms. Survey in teletherapy, brachytherapy and simulator units.

5.AERB safety code and ethics; Built in safety specification for teletherapy and brachytherapy units-treatment room and control room safety-operational safety-radiation protection program-personnel requirements and responsibilities-regulatory controls

6. Patient protection; Safe work practice in teletherapy and brachytherapy-quality assurance-equipment and accessories-treatment records.

7.Radiation emergencies-situation preparedness, safety and prevention-legal requirements. Recent developments in radiation safety related topics.

Books for study

Text book

1.Radiation Protection in Hospitals. Richard F.Mould

Reference book

2.Basic radiological physics:K.Thayalan Jaypee bothers pvt ltd, New Delhi
3.An Introduction to Radiation Protection. Allen Martin & Samuel
4.Radiation safety in Medical practice. M.M. Rchami.
5.Radiation Protection. Ronald L. Kathren
6.AERB safety code, Mumbai

ALLIED HEALTH SCIENCES

EXAMINATION QUESTION PAPER PATTERN

B.Sc. DEGREE COURSES

Essay	3 x 10 = 30 Marks
Short Notes	8 x 5 = 40 Marks
Short Answers	10 x 3 = 30 Marks
Total	100 Marks

B.Sc. ALLIED HEALTH SCIENCES

B.Sc. Degree in Radiotherapy Technology

IST YEAR

S.No.	Paper - Subject	Internal Assessment (IA)		Theory		Practical		Viva	
		Max	Min	Max	Min	Max	Min	Max	Min
1.	Paper – I Human Anatomy & Physiology	50	25	100	50	50	25	-	-
2.	Paper II Basic Physics & Radiation Physics	50	25	100	50	-	-	-	-
3.	Paper III Radiographic Photography	50	25	100	50	50	25	-	-
4.	Paper IV General Principle of Hospital Practices	50	25	100	50	-	-	-	-

Sl.No.	Practical Subjects
Paper I	Human Anatomy Bones
Paper II	Radiographic Photography Equipment

B.Sc. ALLIED HEALTH SCIENCES

EXAMINATION PATTERN – II YEAR

B.Sc. Degree in Radiotherapy Technology

S.No.	Paper - Subject	Internal Assessment (IA)		Theory		Practical		Viva	
		Max	Min	Max	Min	Max	Min	Max	Min
1.	Paper – I Physics of Radiotherapy & equipment	50	25	100	50	50	25	-	-
2.	Paper - II. Principles of Radiotherapy	50	25	100	50	-	-	-	-
3.	Paper – III Radiotherapy Techniques	50	25	100	50	50	25	-	-
4.	Paper – IV Patient care Relevant to Radiotherapy	50	25	100	50	50	25	-	-

B.Sc. ALLIED HEALTH SCIENCES

EXAMINATION PATTERN – III YEAR

B.Sc. Degree in Radiotherapy Technology

S.No.	Paper - Subject	Internal Assessment (IA)		Theory		Practical		Viva	
		Max	Min	Max	Min	Max	Min	Max	Min
1.	Paper – I Quality Assurance in Radiotherapy	50	25	100	50	50	25	-	-
2.	Paper - II Recent Advances in Radiotherapy Techniques	50	25	100	50	50	25	-	-
3.	Paper – III Radiation Hazards, Control & Safety.	50	25	100	50	-	-	-	-

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