COURSE TITLE: RADIATION, MEDICAL IMAGING EQUIPMENT & CLINICAL PRACTICE

		MARKS	
STUDY HOURS:	**60+160**	**THEORY**	**120**
PAPER:	**01**	**PRACTICAL:**	**30**
Term :	**4th**	**TIME :**	**03HRS**

COURSE CONTENTS

STUDY HOURS (Theory +Practical)

A. Radiation Detectors **4+8**

A1. Ionization Chamber
A2. Geiger Muller Counter
A3. Scintillation Counter
A4. Solid State Detector

B. Nuclear Radiation Exposure **9+12**

B1. Natural sources of Radiation
B2. Man made Radiation Sources
B3. Biological Effect of Radiation
B4. Use of Nuclear Radiation
B5. Tracer Techniques
B6. Medical uses of Radioisotopes
B7. Biological uses
B8. Agricultural uses
B9. Industrial uses

C. Dose Distribution and Scatter Analysis **15+20**

C1. Phantoms
C2. Depth Dose Distribution
C3 Percentage Depth Dose
C4. Tissue Air Ratio
C5. Tissue Phantom Ratio
C6. Tissue Maximum Ratio
C7. Wedge Filter
C8. Wedge Angle
C9. Wedge Transmission Factor
C10. Isodose Chart
C11. Effect of Source Size
C12. SSD
C13. SDD
C14. Field Size Collimation

C15. Penumbra

D. MEDICAL IMAGING II 12+20

D1. Physical principles of MRI
D2. Equipment with images
D3. Physical principles of ultrasounds
D4. Diagnostic ultrasounds
D5. Principles of radiobiology
D6. Molecular & cellular radiobiology
D7. Early & late effects of radiation
D8. Health physics
D9. Design for radiological image facilities
D10. Design for radiological protection
D11. Radiation protection procedures

E. RADIATION PROTECTION 12+20

E1. Basic concepts of radiation protection
E2. Sources of radiation
E3. Radiation dose limits
E4. Risk estimation
E5. Personal and area monitoring survey
E6. Basic concepts of shielding
E7. Administration of regulation protection according to relevant regulatory body
E8. Radiation detector and equipments
E9. Personal monitor (film badge, pocket alarm dosimeters, TLD)
E10. Area monitoring (survey meters)

F. RADIOTHERAPY EQUIPMENTS 8+20

F1. Brachytherapy

F1.1 Principle of brachytheray
F1.2 Radioactive source
F1.3 HDR
F1.4 DR

F2. CT Simulator

F2.1 Principle
F2.2 Application

F3. Treatment Planning Computer

F3.1 Principle
F3.2 Application

G. PRACTICAL 60

G1. PLANNING AND DOSE CALCULATION PROCESS

G1.1 Planning & dose calculation

G1.1.1 Dimensions – 1D (one dimension)
G1.1.2 PDD (Precentage depth dose), TAR (Tissue air ratio),
G1.1.3 OAR (Organs at risk), TMR (Tissue maximum ratio), TPR (Tissue phantom ratio)
G1.1.4 Influence of shielding and FSD on the dose distribution
G1.1.5 2D (two dimension)
G1.1.6 3D (three dimension)
G1.1.7 Beam shaping and modification

G1.2 Calculations

G1.2.1 ICRU recommendation (International commission for radiological units)
G1.2.2 Dose limits
G1.2.3 Target volume and critical organ delineation
G1.2.4 Treatment plan analysis and evaluation
G1.2.5 Documentation

G1.3 Simulation

G1.3.1 Isocenter
G1.3.2 Planning data
G1.3.3 Documentation
G1.3.4 Generation of DRRs (Digitally reconstructed radiograph)

G1.4 Verification

G1.4.1 Portal Film

G1.5 MOULD ROOM

G1.5.1 Information and communication
G1.5.2 Materials in Radiotherapy used for Shielding
G1.5.3 Moulds
G1.5.4Customized Shielding
G1.5.5 Management of pollution and hazards

RECOMMENDED BOOKS

1. Radiological science for technologist (Stewart C.Bushong)
2. Techniques in diagnostic radiology (G.II white House B.S Worthington)
3. Atlas of AC.T /M.R Crossectional anatomy
4. The Physics of radiation therapy, Faiz M. Khan, Williams and Willkins 3rd Edition
5. Radiation Therapy Planning Gunilla C. Bental Megraw-Hill 2nd Edition
6. Manual of Clinical Oncology, Dennis A. Casciato Barry B.I.owitz, Little, Brown & Company. 3rd Edition

7. Practical Radiotherapy Planning, Dobbs J & Barrate, Arnold
8. Radiation Therapy Simulation Work Book, Sue Mizc, Rhonda, Pergamon Press
9. Oxford Tectbook of Oncology – Souhami, Tannock, Hohenberger & Horiot
10. Clinical Epidemiology: A Basic science for clinical Medical – Sackett
11. The Basic science of oncology – Tannock, Hill Bristow & Harrington
12. Medical Physicists
    - Mr. Akbar Ali (Sr. Scientist), INOR Abbottabad)
    - Mr. Karim Khan (Sr. Scientist, SINOR, Swat)
    - Mr. Misbah ul Haq (Sr. Scientist, SINOR, Swat)
13. Radiation Oncologists
    - Dr. Rubina Ali (Pr. Medical Officer, NORI, Islamabad)
    - Dr. Kokab (Pr. Medical Officer, BINO, Bhawalpur)
    - Dr. Naeem Leghari (Deputy Chief Medical Officer, NIMRA, Jamshoro)

COURSE TITLE: RADIOTHERAPY, TREATMENT & CLINICAL PRACTICE

STUDY HOURS:	**60+160**	**THEORY**	**120**
PAPER:	**02**	**PRACTICAL:**	**30**
TERM:	**4th**	**TIME :**	**03HRS**

A. RADIOTHERAPY I 20+30

A.1 Oncology and Epidemiology

A2 For each identified site the etiology and epidemiology, signs and symptoms, Diagnosis and general management must be covered

A3 **Region for radiotherapy**

- A3.1 Head and neck
- A3.2 Prostate
- A3.3 Lung
- A3.4 Lymphomas
- A3.5 Bladders
- A3.6 CNS
- A3.7 Sarcomas

A4. For the above mentioned system the following aspects have to be needed

- A4.1 Cancer prevention and public education
- A4.2 Promoting a healthy lifestyle
- A4.3 Early detection
- A4.4 Screening
- A4.5 Benign and malignant diseases
- A4.6 Methods of spread of malignant disease
- A4.7 Staging and grading systems
- A4.8 Introduction to genetics, genetic predisposition and high risk groups

B. TREATMENT DELIVERY TECHNIQUES 20+30

B1 Treatment techniques of the following sites on simulation & treatment machines

- B1.1 Head and neck
- B1.2 Prostate
- B1.3 Lung
- B1.4 Lymphomas
- B1.5 ladders
- B1.6 CNS
- B1.7 Sarcomas

B2 Others as considered appropriate

- B2.1 Treatment
- B2.2 Information
- B2.3 Set-up
- B2.4 Manual
- B2.5 Computer assisted
- B2.6 Data verification, registration or recoding

B3. Verification
- B3.1 EPID Electronic Portal imaging device
- B3.2 EPID Protocol and decision.

B4. Patient positioning, immobilization and reproducibility
- B4.1 Set-up procedures
- B4.2 Manual
- B4.3 Computer assisted
- B4.4 Data verification, registration or recording
- B4.5 Verification (portal imaging)
- B4.6 Documentation

B5. Patient management on treatment
- B5.1 Side effect related to radiation and dose
- B5.2 Acute
- B5.3 Late
- B5.4 Monitoring of side effects
- B5.5 Information and communication
- B5.6 Documentation of side effects

C. RADIOTHERAPY II 20+30

C1. Oncology and Epidemiology

For each identified site the etiology and epidemiology, signs and symptoms, diagnosis and general management must be covered

- C1.1 Breast
- C1.2 Gynecological
- C1.3 Gastro-intestinal tract
- C1.4. Skin
- C1.5 Eye tumours

For the above mentioned system the following aspects have to be needed

- C1.6 Cancer prevention and public education
- C1.7 Promoting a healthy lifestyle
- C1.8 Early detection
- C1.9 Screening
- C1.10 Benign and malignant disease
- C1.11 Methods of spread of malignant disease
- C1.12 Staging and grading systems
- C1.13 Introduction to genetics, genetic predisposition and high risk groups

D. PRACTICAL 70

D1. Clinical Experience

This session is designed to provide the aspiring radiation therapy technologist with a general overview of the activities in a modern radiation therapy department

D2. TREATMENT PLANNING PROCESS

D2.1 Radiation therapy preparatory phase

D2.1.1 2Patient file
D2.1.2 Anamnesis (taking information directly from the clinicians medical history notes)
D2.1.3 Medical aspects
D2.1.4 Information
D2.1.5 Treatment proposal

D2.2 Localization

D2.2.1 Information and communication
D2.2.2 Dimensions
D2.2.3 Patient positioning, immobilization and reproduction
D2.2.4 Localization data
D2.2.5 Contours
D2.2.6 Documentation
D2.2.7 Lasers/Markings

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