



## MEDICAL DOSIMETRY CURRICULUM ANALYSIS

I. General Information	
Program Name	
JRCERT Program Number	
Date	

**DIRECTIONS:** Determine the course(s) in which each of the following content areas is covered and enter the course number(s) and/or title(s). For guidance in what should be covered for each content area, please refer to the Medical Dosimetry Curriculum Guide (2019) published by the American Association of Medical Dosimetrists.

This curriculum is designed for students who have no practical background or experience in the field of radiation oncology. The suggested curriculum contains introductory courses to the various technical and medical areas of radiation oncology, and program directors may choose to eliminate these courses for students who have had education or experience in these topics. However, program directors are encouraged to replace these introductory courses with refresher courses.

II. Clinical Competencies	
Professional Curriculum	Program Course(s)
Minimum Required Competencies	
Head and Neck	
Thoracic	

Abdomen	
Pelvis	
Extremities	
Brachytherapy	
Other	
Additional Recommended Activities	
Total Body Irradiation (TBI)	
Brachytherapy HDR Procedure	
Proton Treatment Planning	
Stereotactic Radiosurgery	
Anus or Vulva Conventional 3D Technique	

<b>III. Healthcare Ethics and Professional Conduct</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
What is Ethics?	
Professional and Legal Perspectives	
Continuum of Care	
Relationships and Insurance	

Reducing Liability/Defensive Medical Dosimetry and Physics	
Professional Conduct	
Professional Development	
Accreditation of Facilities	
Educational Accreditation	
Malpractice Issues	

<b>IV. Patient Care</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Communication	
Psychological Considerations	
Patient Assessment	
Health Safety	
Patient Safety	
Patient Transfer	
Patient Education – Role of Medical Dosimetrist	

## V. Radiation Protection and Safety

Professional Curriculum	Program Course(s)
Radiation Protection	
Radiation Safety	
Storage and Transportation	
Dose Limits	
Background Sources of Radiation	
Structural Shielding Design	
Personnel Monitoring	
Regulations	
Radiation Monitoring Instruments	
Radiation Surveys	
Radiation Safety and Quality Assurance Committees	

## VI. Pathophysiology and Oncology Management

Professional Curriculum	Program Course(s)
Cancer Treatment	
Oncology Management	
Radiation Treatment and Content for Neoplasms Originating in Following Sites: <ul style="list-style-type: none"> <li>• Head and Neck</li> <li>• Central Nervous System</li> <li>• Breast</li> <li>• Lymphoreticular</li> <li>• Hematopoietic</li> <li>• Respiratory</li> <li>• Integumentary</li> <li>• Gastrointestinal</li> <li>• Genitourinary</li> <li>• Reproductive</li> <li>• Musculoskeletal</li> <li>• Emergencies</li> <li>• Special Considerations</li> <li>• Metastatic and Palliative Treatment Approaches</li> </ul>	

## VII. Cross-Sectional Anatomy

Professional Curriculum	Program Course(s)
Anatomic Directional Terms	
Anatomic Position and Scan Planes	
Anatomy: <ul style="list-style-type: none"> <li>• Brain</li> <li>• Head and Neck</li> <li>• Thorax</li> <li>• Abdomen</li> <li>• Pelvis</li> </ul>	

• Extremities	
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<b>VIII. Imaging for Radiation Oncology</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Basic Principles of Radiographic Imaging	
Computed and Digital Radiography	
Computed Tomography (CT)	
Magnetic Resonance Imaging (MRI)	
Ultrasound	
Nuclear Medicine	
Medical Image Display and Storage	

<b>IX. Acquisition of Patient Data and Treatment Preparation</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Simulation and Localization	
Treatment Planning Preparation	

## X. Computers and Computer Networking

Professional Curriculum	Program Course(s)
Terminology and Data Representation	
Computer Hardware	
Computer Software	
Networking	

## XI. Atomic and Nuclear Physics

Professional Curriculum	Program Course(s)
Structure of Matter	
Atomic Mass/Energy Units	
Orbital Electrons	
Nuclear Forces	
Radiation	
Nuclear Transformations	
Radioactive Series	
Radioactive Equilibrium	
Modes of Radioactive Decay	

Nuclear Reactions	
Nuclide Activation	
Interactions of Radiation with Matter	

<b>XII. Dose Measurement-External Beam</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Exposure	
Absorbed Dose	
Phantom Materials	
National Standards	
Dose Measurement	
Instrumentation – External Beam Dose	
In Vivo Dosimetry	
Dynamic Dose Measurement Devices	
External Beam Data Collection	



### XIII. Treatment Machines and Simulators

Professional Curriculum	Program Course(s)
External Beam Delivery Machine Design and Theory of Operation	
Simulators	

### XIV. Isodose Distributions

Professional Curriculum	Program Course(s)
Documentation of Dose Distribution	
Central Axis (CAX) Depth Dose Distribution	
Isodose Curves	
Complex Factors Affecting Isodose Curves	
Common Discrepancies Found in Computer-Generated Plans	
Beam Modification	
Matching Adjacent Fields	
General Treatment Principles	
Integral Dose	
Calculation of Dose in Shielding Regions	
Out-of Field Doses	

## XV. Clinical Application of Electron Beams

Professional Curriculum	Program Course(s)
Production of Clinically Useful Electron Beams	
Beam Parameters	
Clinical Characteristics of Electron Beams	
Electron Beam Treatment Planning	
Dosimetric Considerations with Adjacent Fields	
Beam Algorithms for Electron Beam Calculations	
Shaping of Treatment Fields	
Electron Arc Therapy	

## XVI. External Beam Dose Calculations

Professional Curriculum	Program Course(s)
Dosimetric Quantities	
CAX Dose Calculations	
Set Up Calculation	
Dose Correction Calculations	

## XVII. Brachytherapy

Professional Curriculum	Program Course(s)
Introduction/History	
Brachytherapy Radionuclides/Basic Physical Characteristics	
Brachytherapy - Calculation of Dose Distribution	
Brachytherapy - Clinical Aspects	
Classical/Predictive Systems of Implant Dosimetry	
Treatment Planning	
Clinical Applications/Gynecologic Implants	
Clinical Applications/Prostate Brachytherapy	
Clinical Applications: <ul style="list-style-type: none"> <li>• Endobronchial</li> <li>• Breast</li> <li>• Sarcoma</li> <li>• Ocular Melanoma/Plaque Therapy</li> </ul>	
Quality Assurance in Brachytherapy	
Clinical Brachytherapy - Additional Aspects	

## XVIII. Radiation Biology

Professional Curriculum	Program Course(s)
Introduction	

Biophysical Events	
Radiation Effects	
Radiosensitivity and Response	
Biologic Principles of Radiation Therapy	

<b>XIX. Conformal Treatment Planning</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Patient Positioning and Immobilization	
Imaging	
Conformal Geometric Terminology and Concepts	
CT Treatment Planning	
Treatment Planning System Functionality	
Treatment Planning	
Plan/Dose Evaluation	
Plan Verification	
Chart Documentation	
IMRT and VMAT	
Advanced/Emerging Planning Techniques	

Additional Technologies	
New Technologies	
Plan Robustness	
Adaptive Planning	

<b>XX. Image-Guided Radiation Therapy (IGRT)</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Historical Development	
Rationale for Development	
Focus of Four Areas	
Managing Respiratory Motion	
Managing Inter-fraction Organ Movement	
Methods to Track Dose from IGRT During Treatment	
Coincidence of Imaging Isocenter and Treatment Isocenter	
AAPM Task Group 75 - 2007	
AAPM Task Group 104 - 2009	
AAPM Task Group 179 - 2012	

## XXI. Respiratory Motion Management

Professional Curriculum	Program Course(s)
Observing Respiratory Motion	
Respiratory Motion in CT Imaging	
Management of Respiratory Motion	
Gating Methods	
Patient Training and Queues	
Breath Hold Technique for Target and Critical Structure Separation	

## XXII. Proton Therapy

Professional Curriculum	Program Course(s)
Historical Development	
Proton Beam Physics – Nature of Proton Particle	
Treatment Planning	
Robust Optimization	
Treatment Equipment	
Dosimetry	
Treatment Planning	

Treatment Delivery	
Treatment Facilities	
Quality Assurance	
Reports	

<b>XXIII. Stereotactic Radiotherapy (SRT)/Stereotactic Radiosurgery (SRS)</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Historical Development	
Definitions	
Diseases Treated	
Radiobiology	
Image Acquisition	
Planning Process	
Radiation Treatment Delivery	
Physics Acceptance Testing and Commissioning	
Quality Assurance	
AAPM Task Group 42 and AAPM Task Group 68	

## XXIV. Stereotactic Body Radiotherapy (SBRT)/Stereotactic Body Radiosurgery (SBRS)

Professional Curriculum	Program Course(s)
Historical Development	
SBRT Definition	
SBRT Radiobiology	
Accurate/Reproducible Patient Immobilization	
Account for Tumor Motion	
Anatomic Applications	
Dose	
Protocol Compliances	
Expert Dosimetry	
SBRT Quality Assurance	
AAPM Task Group 101	

## XXV. Craniospinal Irradiation (CSI)

Professional Curriculum	Program Course(s)
Diseases Treated with CSI	
Patient Positioning and Immobilization	



Treatment Techniques	
Boost	
Dose Prescription	

<b>XXVI. Total Body Irradiation (TBI)</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Historical Evolution	
TBI Rationale	
BMT Types	
Diseases Treated with TBI	
Challenges of Treatment	
Methods of Treatment Delivery with Mega-Voltage Equipment	
Partial Transmission Normal Tissue Shielding	
Planning Considerations	
Pediatric TBI	
Quality Assurance	
AAPM Report #17	

## XXVII. Total Skin Electron Irradiation (TSEI)

Professional Curriculum	Program Course(s)
Historical Development	
Diseases Treated	
Physical and Clinical Requirements	
Selection of Treatment Techniques	
Simulation and Immobilization	
Treatment Verification	
Physics Measurements for Commissioning	
Monitor Unit Calculations	
TSEI Quality Assurance	

## XXVIII. Intra-Operative Radiation Therapy (IORT)

Professional Curriculum	Program Course(s)
Rationale	
History	
Types	
Procedure	

Dose Prescription	
Energy	
Body Sites	
Quality Assurance	
Safety	
Patient Care	
Best Practice	
Research	
AAPM TG 72	

<b>XXIX. Continuous Quality Improvement Program</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Continuous Quality Improvement (CQI) Program	

<b>XXX. Quality Assurance of Equipment</b>	
<b>Professional Curriculum</b>	<b>Program Course(s)</b>
Radiographic Simulator Quality Assurance	
Quality Assurance testing for CT Simulation	

QA in the Fabrication of Radiotherapy Treatment Aids	
Linear Accelerator	
MV Imaging Quality Assurance	
Linear Accelerator Planar kV X-ray Imaging	
Linear Accelerator Cone Beam Computed Tomography (CBCT)	
Linear Accelerator Special Procedures Equipment	
Linear Accelerator SRS Quality Assurance	
Target Detection Devices	
Gamma Knife Quality Assurance	
Quality Assurance of Co <sup>60</sup> Teletherapy Unit	
QA of Superficial and Other Low Energy X-ray Treatment Units	
Brachytherapy Intracavity Sources and Applicators	
Interstitial Brachytherapy Sources and Applicators/Templates	
Quality Assurance of Brachytherapy Remote After-loaders	
QA for Trans-Rectal Ultrasound Unit	
QA Program for Dose Planning Computers	
Dose Measurement Systems and Test Equipment Quality Assurance	

Educational programs in medical dosimetry are **recommended** to incorporate college-credit bearing general education courses in efforts to build a solid foundation for the medical dosimetry curriculum. It is recommended that the following postsecondary general education coursework be delivered prior to the professional curriculum.

Recommended Post-secondary General Education	Credit Hour	Course Number	Course Title
Anatomy & Physiology			
Biology			
Mathematics			
General Physics			
Written or Verbal Communication			
Total Hours for Recommended Postsecondary General Education			