

## University of Maryland Resident Radiation Biology Education Curriculum

Year 1 Curriculum Topics
<b>Lecture Title</b>
Radiation and Cancer Biology Course Overview
History of Radiation Therapy: 1895 to present
Interaction of Radiation with Matter (radiochemistry)
<b>Topic 1: Molecular and Cellular Damage and Repair</b>
Molecular mechanisms of DNA damage and repair
Chromosome and chromatin damage, cell cycle regulation, and radiation effects
Question and Answers Review Session
<b>Topic 2: Cellular Responses to Radiation</b>
Mechanisms of cell death and modes of cell survival - Part 1
Mechanisms of cell death and modes of cell survival- Part 2
Cell and tissue survival assays: measurement of response - Part 1
Cell and tissue survival assays: measurement of response - Part 2
Question and Answers Review Session
<b>Topic 3: Dose Rate and Fractionation</b>
History of dose fractionation
Time, dose, and fractionation in radiotherapy
Linear Quadratic Isoeffect Model – $\alpha/\beta$ Part 1
Linear Quadratic Isoeffect Model – $\alpha/\beta$ Part 2
Sublethal damage repair and dose rate effect
Question and Answers Review Session
<b>Topic 4: Linear Energy Transfer and Oxygen Effect</b>
The history of the oxygen effect
LET and RBE
The Five R's of Radiation Therapy
The Five R's of Radiation Therapy
Question and Answers Review Session
<b>Topic 5: Cancer Biology</b>
Cell and tissue kinetics
Molecular signaling
Mechanisms of cancer development
Question and Answers Review Session
<b>Topic 6: Tumor Biology and Microenvironment</b>
Model tumor systems
Molecular aspects of tumor hypoxia
Metastasis and tumor microenvironment
<b>Radiosensitizers, bioreductive drugs, and radioprotectors</b>
Question and Answers Review Session

<b>Year 2 Curriculum</b>
<b>Lecture Title</b>
<b>Radiation and Cancer Biology Course Overview</b>
<b>Topic 1: Radiobiology of Normal Tissues</b>
Clinically relevant normal tissue responses to radiation
Mechanisms of normal tissue responses to radiation
Total body Irradiation
Question and Answers Review Session
<b>Topic 2: Dose Delivery</b>
Therapeutic ratio
Time, dose, and fractionation
Brachytherapy
Radiobiological aspects of different radiation modalities
Question and Answers Review Session
<b>Topic 3: Combined Modality Therapy</b>
Chemotherapeutic agents and radiation therapy: Mechanisms of chemotherapy
Chemotherapeutic agents and radiation therapy: Classes of chemotherapeutics
Chemotherapeutic agents and radiation therapy: Drug resistance
Chemopotentiators/Radiosensitizers
Hyperthermia
<b>Topic 4: Immune Therapeutics</b>
Basics of Immunology
Immune Therapeutics
Combination of immune therapy and radiation
Abscopal effects
Question and Answers Review Session – Part 1
Question and Answers Review Session – Part 2
<b>Topic 5: Late effects and radiation protection</b>
Radiation carcinogenesis
Heritable effects of radiation and radiation effects in the developing embryo/fetus
Radiation protection
Question and Answers Review Session
<b>Topic 6: Additional Topics</b>
Radiation sensitivity syndromes and molecular DNA repair
Molecular imaging
Radiopharmaceuticals
Theranostics
Oligometastatic Disease
FLASH in the rearview mirror