

# **ADVANCED RADIATION PHYSICS INC.**

2888 NW 30<sup>th</sup> Street, Boca Raton, FL 33434; Phone: 561-789-6642

## **Part 1 Review Course Outline**

### **Course fee:**

- \$1,600
- A non-refundable fee of \$600 is required
- Students who take Part 1 with us will pay only \$1200 for Part 2 and \$800 for Part 3.
- Retake the course for free if you don't pass.
- \$200 discount per course for Veterans and Military personnel.
- \$200 discount per person for a group of 4 or more.
- \$100 referral bonus to a review course or \$50 referral bonus to a mock exam for each student recommended.
- Remaining balance due two weeks before the class starts
- Use PayPal or send a check to:

### **Advanced Radiation Physics Inc.**

2888 NW 30<sup>th</sup> Street  
Boca Raton, FL 33433-2432

- Send registration form by email to [registration@thearpi.com](mailto:registration@thearpi.com)

### **Course fee will include:**

- Two days course review: 9:30 AM to 5:30 PM
- Electronic file with the course material
- Continuous attendance to the classes online until pass the exam review of exam like questions in the last half of the second day
- Study group organized from the first day of the course, with proposed structured schedule and mock tests monitored by an ARPI professor active up to the exam date.

### **Course:**

- Offered online only
- Webinars are recorded and you can have them and listen as many times as you wish.
- Chat, recordings, and documents will be shared by all the attendants from the first class of the year till the last one of the same year.

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## **Course content:**

### **Day 1**

#### **1. Clinical**

##### **a. Anatomy and physiology**

- i. Breast
- ii. Cardiovascular
- iii. Digestive System
- iv. Musculoskeletal
- v. Neurological System
- vi. Reproductive/Endocrine
- vii. Thoracic Cavity
- viii. Urinary System
- ix. Lymphatic System

##### **b. Radiation Biology**

- i. Physics and chemistry of radiation interactions with matter
- ii. Molecular and cellular radiobiology
- iii. Tumor radiotherapy
- iv. Normal tissue response to radiotherapy
- v. Time dose fractionation
- vi. Radiobiological basis of radiation protection
- vii. Radiation accidents and environmental radiation exposure
- viii. Diagnosis and medical management of radiation syndromes
- ix. Deterministic effects
- x. Stochastic effects
- xi. Radiation carcinogenesis
- xii. Effects on the developing embryo

##### **c. Human physiology**

- i. Nervous system
- ii. Musculoskeletal system consists of?
- iii. Cardiovascular system
- iv. Respiratory system
- v. Digestive system
- vi. Integumentary system
- vii. Urinary system
- viii. Reproductive system

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- ix. Immune system
  - x. Endocrine system
  - d. **General Medical/Radiology/Radiation Therapy Terminology**
    - i. Medical Root words
    - ii. Diagnostic Radiology terminology
    - iii. Radiation Therapy terminology
  - e. **Clinical Procedure Applications**
    - i. Diagnostic radiology
    - ii. Radiation therapy
  - f. **Pathology**
    - i. Neoplastic diseases
    - ii. Benign diseases
    - iii. Infectious diseases
    - iv. Congenital and hereditary diseases
    - v. Inflammatory
    - vi. Trauma
    - vii. Cardiovascular disease
    - viii. Neurological
  - g. **Radiobiology**
    - i. Adverse effects of radiation
      - 1. Deterministic effects
      - 2. Stochastic effects
    - ii. Weight factor
    - iii. Quality factor
    - iv. Tissue/organ sensibilities
    - v. Fetal dose
    - vi. Medical events
    - vii. Recordable events
    - viii. Spills
    - ix. Biochemistry
    - x. Radiation area levels
    - xi. Transportation labels
2. **General**
- a. **Atomic/Nuclear Physics, Sources of Radiation, Interaction of radiation with Matter**
    - i. Basic atomic and nuclear physics
    - ii. Radioactivity

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- iii. Sources of radioactive material
- iv. Radioactive material uses and safety
- v. Radiation generating equipment: photons, electrons and heavy particles
- vi. Interactions of photons and particle radiation with matter
- vii. Dosimetry concepts and units
- viii. Dosimetry concepts and units
- ix. Spatial distribution/transmission of radiation (photons, protons and electrons)

## Day 2

### **b. Radiation Instrumentation and measurement**

- i. Gas filled detectors
- ii. Scintillation detectors
- iii. Solid state detectors
- iv. Neutron detectors
- v. Emerging and miscellaneous detectors
- vi. Measurement procedures
- vii. Quality control and quality assurance
- viii. Applications in imaging, nuclear medicine, therapy & safety

### **c. Diagnostic Medical Physics**

- i. Radiography
- ii. Computed tomography
- iii. Ultrasound
- iv. Magnetic Resonance
- v. Modality comparison, image features and artifacts
- vi. Endogenous and exogeneous contrast
- vii. Modality facility considerations, safety
- viii. Methods of quality control and quality assurance

### **d. Nuclear Medical Physics**

- i. Scintillation camera
- ii. Image acquisition and reconstruction
- iii. Common radionuclides
- iv. SNR, subject/image contrast
- v. Spatial resolution
- vi. Mechanical aspects: accuracy, precision
- vii. Single photon emission computed tomography (SPECT)
- viii. Positron emission tomography (PET)

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- ix. Modality comparison, image features and artifacts
- x. Image processing and analysis
- xi. Applications, dose, facilities and safety
- xii. Hybrid imaging (SPECT/CT, PET/CT, PET/MR)
- xiii. Methods of quality control and quality assurance
- xiv. Counting principles
- xv. Physical, biological, and effective half-life

## **e. Therapeutic Medical Physics**

- i. Clinical linear accelerator principles, collimation, and mechanical aspects
- ii. Clinical kV and MV photon beam characteristics
- iii. Clinical megavoltage electron beam characteristics
- iv. Clinical proton beam characteristics
- v. Comparison of clinical photon, electron and proton beams
- vi. Dose functions: PDD, TAR, TPR, TMR, SMR
- vii. Principles of radiation treatment planning
- viii. Basic, dose (monitor unit) calculation
- ix. Brachytherapy
- x. Radiation safety and protection, patients and personnel
- xi. Methods of quality control and quality assurance

## **f. Radiation protection, safety, Professionalism and Ethics**

- i. Principles of radiation safety
- ii. Radiation risk and epidemiological data
- iii. Radiation protection regulations: NRC and Agreement States
- iv. Radiation areas
- v. Regulatory exposure limits
- vi. Radiation protection program
- vii. Radioactive source management and security
- viii. Transportation of radioactive materials
- ix. Shielding design for diagnostic, nuclear medicine and therapeutic installations
- x. Signage for diagnostic, nuclear medicine and therapeutic installations
- xi. Nonionizing radiation safety
- xii. Mechanical and electrical safety
- xiii. Principles of quality assurance and quality control

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- xiv. Management of radiation accidents and large-scale radiobiological events
- xv. Professionalism and ethics
- g. Informatics, Mathematics, Statistics, Image Processing & Analysis**
  - i. Mathematics relevant to medical physics
  - ii. Statistics and biostatistics
  - iii. Medical image analysis and processing
  - iv. Observer performance and ROC analysis
  - v. Informatics
- h. Mock test**

**Silvia Pella, PhD, DABR**

***President & CEO of Advanced Radiation Physics Inc.***

***Adjunct Research Professor, Florida Atlantic University***