NUPH 550: Introduction to Positron Emission Tomography (PET)

2 Credit Hours - Spring Semester

Course Outline

Week

1  - Principles of Radionuclide Imaging/Tracer Principle/Specific Activity
    - Gamma Imaging and Single Photon Emission Computed Tomography (64-70; 74-77; 242-284)

2  - Principles of Positron Emission Tomography (PET): Image Acquisition (77-79; 116-122)
    - PET Camera: Coincidence Counting and Selection of Detectors (pp. 285-296; 305-306))
    - Let's Play PET: Nuclear Physics and Tomography module (http://www.crump.ucla.edu/lpp)

3  - Attenuation of Gamma Photons; Transmission Scanning & Attenuation Correction (14-16, 297-299)
    - Positron-Emitting Nuclides (p.286)

4  - Principles of Cyclotron Operation/Radionuclide Production (157-160)
    - Let's Play PET: Radioisotope Production module

5  - Principles of Perfusion Imaging (Review from NUPH 530)
    - Synthesis & Applications of $^{15}$O-Radiopharmaceuticals (p. 72)

6  - Quiz 1 (30 minutes, 50 points)
    - Synthesis & Applications of $^{15}$O-, $^{13}$N-, and $^{11}$C-Radiopharmaceuticals (pp. 172-173)

7  - Synthesis & Applications of $^{11}$C-Radiopharmaceuticals, continued
    - Synthesis & Applications of $^{18}$F-Radiopharmaceuticals (pp. 173-174)

8  - Synthesis & Applications of $^{18}$F-fluorodeoxyglucose (pp. 173-174)
    - Applications of $^{18}$F-fluorodeoxyglucose & Other $^{18}$F-Radiopharmaceuticals

9  - Synthesis of $^{18}$F-FDG: Automation and Quality Control (pp. 175-177; 180-182)
    - GC and HPLC as tools for purification and quality assurance
    - Let's Play PET: Synthesis of Radiolabeled Compounds module

10 - Let's Play PET: Clinical PET – Cardiology (pp. 405-411; 436-439)
    - Let's Play PET: Clinical PET - Cardiology Clinical Case Studies

11 - Accepted Clinical Applications of PET

12 - Quiz 2 (30 minutes, 50 points)
    - Let's Play PET: Clinical PET - Neurology and Neurology Case Studies (pp. 328-344; 347-8)
    - Let's Play PET: Clinical PET - Oncology and Oncology Case Studies (pp. 309-327)

13 - Quantitation of Physiological Parameters with PET: Tracer Kinetic Modeling
    - Let's Play PET: Principles of Tracer Modeling module; Complete Clinical Case Studies

14 - Generator-Produced Radionuclides ($^{82}$Rb, $^{68}$Ga, $^{62}$Cu).(pp. 160-164)
    - Regulatory Issues in PET (180-182)

15 - cGMP Standards for Clinical PET Radiopharmaceuticals

TBA   Tour of PET Facility at the Indiana University School of Medicine (OPTIONAL ATTENDANCE)

16- Final Exam (100 points)

(Reading assignments from: Nuclear Medicine and PET, 5'th Edition