Subject Description Form

Subject Code	HTI5725
Subject Title	Advanced Technology and Clinical Application in Nuclear Medicine Imaging
Credit Value	3
Level	5
Pre-requisite / Co-requisite/ Exclusion	This subject assumes some familiarity with general principles of physics, key techniques of radiological imaging, and basic knowledge of human anatomy and pathology. It is recommended to take 'Radionuclide Imaging' or equivalent subject in undergraduate study.
Objectives	This subject aims to deliver the advanced knowledge and the state-of-the-art technologies of nuclear medicine imaging in clinical practice and preclinical research. It is intended to be useful for medical professionals and post-graduate students seeking to refresh or expand their knowledge in the areas of nuclear physics, radiochemistry, and clinical imaging applications for nuclear medicine.
Intended Learning Outcomes (ILOs)	Upon completion of the subject, students will be able to: 1. Demonstrate an in-depth understanding of ionizing radiation, atomic and nuclear transitions, and interaction of radiation with matter as related to nuclear medicine 2. Acquire advanced levels of knowledge for scientific principles and state-of-the-art instrumentation technologies of planar scintigraphy, SPECT, PET, and multimodalities 3. List representative radioisotopes and radiopharmaceuticals for nuclear medicine imaging and identify their characteristics and development process 4. Develop image analysis skills for radioactivity quantification by applying mathematical modeling 5. Discuss indications and the appropriate imaging protocols for diagnostic imaging with planar scintigraphy, SPECT, and PET in cardiology, neurology, and oncology 6. Critically discuss how nuclear medicine imaging can contribute to advances in molecular imaging and drug development
Subject Synopsis/ Indicative Syllabus	**1. Physics and Instrumentation** 1) Atomic and Nuclear Physics 2) Principles and Instrumentation of Planar Scintigraphy 3) Principles and Instrumentation of SPECT 4) Principles and Instrumentation of PET 5) Principles and Evolution of Multimodality Imaging – PET/CT, PET/MRI, SPECT/CT, SPECT/MRI **2. Radiochemistry** 1) Production and Properties of Radioisotopes 2) Radio-synthesis, Characteristics, and Quality Control of Radiopharmaceuticals 3) Principles of Trace Modeling – Kinetic Imaging, Image Quantification, and Mathematical Modeling **3. Clinical Applications** 1) Clinical Applications in Cardiology 2) Clinical Applications in Neurology 3) Clinical Applications in Oncology **4. Future Applications** 1) Applications for Molecular Imaging and Drug Development **5. Clinical Visit for PET Centre**

<table>
<tr><td></td><td>1) Understanding Workflow of PET/CT and PET/MRI
2) Safety Issues</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>The core contents will be delivered by lectures covering the underlying physics and radiochemistry principles which form the basis of nuclear medicine imaging as well as advances in instrumentation, image analysis skills, and clinical applications. The students' active involvement by tutorial activities and seminar presentations will enhance learning efficacy.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>1. Seminar Presentation</td><td>30 %</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Written Test</td><td>60 %</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Tutorial activities</td><td>10 %</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
</table>
Students can choose either a case study or literature review for seminar presentation which is intended to evaluate the independent learning capability.
The written test will be used to assess the students' overall understanding of the key areas discussed in the subject spanning from physical principles and instrumentation to imaging agents and clinical applications.
The tutorial activities will assess the integrative knowledge and the learning attitude of the students, which require their active participation.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Lecture</td><td>30 Hrs.</td></tr>
<tr><td>Seminar</td><td>6 Hrs.</td></tr>
<tr><td>Clinical Visit</td><td>3 Hrs.</td></tr>
<tr><td>Self-study</td><td>60 Hrs.</td></tr>
<tr><td>Preparation of presentation</td><td>20 Hrs.</td></tr>
<tr><td>Total</td><td>119 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>References:
1. Appelbaum D, Miliziano J (2011) Nuclear Medicine (RadCases), 1 Pap/Psc edition, Thieme
2. Mettler FA, Guiberteau MJ (2012) Essentials of Nuclear Medicine Imaging, 6th edition, Saunders
3. Ell P, Gambhir SS (2004) Nuclear Medicine in Clinical Diagnosis and Treatment, 3rd edition, Churchill Livingstone
Journals:
1. Journal of Nuclear Medicine
2. Radiology
3. European Journal of Medicine and Molecular Imaging
4. Clinical Nuclear Medicine
5. European Radiology
6. Radiographics</td></tr>
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	Websites: 1. http://www.snmmi.org (Society of Nuclear Medicine and Molecular Imaging) 2. http://www.eanm.org (European Association of Nuclear Medicine) 3. http://www.wmis.org (World Molecular Imaging Society)