BROWARD COMMUNITY COLLEGE
COURSE OUTLINE

LAST REVIEW: **2008-2009** *(i.e. 2003-2004)* **NEXT REVIEW:** **20013-2014** *(i.e. 2008-2009)* **STATUS:** **A** *(A, I, D)*

COURSE TITLE: **Nuclear Medicine Radiopharmacy**

COMMON COURSE NUMBER: **NMT 2130**

CREDIT HOURS: 3

CONTACT HOUR BREAKDOWN
(per 16 week term)

CLOCK HOURS:
(Voc. Course ONLY)

Lecture: *48* Lab: *0*

Clinic: *0* Other: *0*

PREREQISITE(S):
COREQUISITE(S):
PRE/COREQUISITE(S): **NMT 2485; NMT 2705L; NMT 2834**

COURSE DESCRIPTION
The student will understand how to maintain radiopharmaceutical laboratory records and materials; obtain a generator eluate; prepare radiopharmaceuticals and perform quality control tests; dispose of radioactive waste appropriately; demonstrate an understanding of ordering pharmaceuticals in appropriate dosage and effective time frame.

UNIT TITLES

1. Introduction
2. Generators
3. Commercially Prepared Kits
4. Positron Emitters, Produced by Cyclotron
5. Radiopharmaceutical Properties
6. NRC, DOH, DOT and FDA Regulations
7. Hands on Practicum

ASSESSMENT:

Please provide a brief description (250 characters maximum) that details how students will be assessed on the course outcomes.

1. **Announced and unannounced quizzes and Unit examinations:**
2. **Mid term and/or Final Exam (cumulative/comprehensive);**
3. **Assessment of reading and online assignments via submission of homework projects.**

****** Complete the following only if course is seeking general education status ******

GENERAL EDUCATION Competencies and Skills *:

Please highlight in green font all Competencies/Skills from the list below that apply to this course. In the box to the right of the
Competency/Skill, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 5.12) that apply.

1. Read with critical comprehension	
2. Speak and listen effectively	
3. Speak and listen effectively	
4. Think creatively, logically, critically, and reflectively (analyze, synthesize, apply, and evaluate)	
5. **Demonstrate and apply literacy in its various forms:**	
6. Apply problem solving techniques to real-world experiences	
7. Apply methods of scientific inquiry	
8. Demonstrate an understanding of the physical and biological environment and how it is impacted by human beings	
9. Demonstrate an understanding of and appreciation for human diversities and commonalities	
10. Collaborate with others to achieve common goals.	
11. Research, synthesize and produce original work	
12. Practice ethical behavior	
13. Demonstrate self-direction and self motivation	
14. Assume responsibility for and understand the impact of personal behaviors on self and society	
15. Contribute to the welfare of the community	

** General Education Competencies and Skills endorsed by '05-'06 General Education Task Force*

Common Course Number: NMT 2130

Unit 1 Introduction

General Outcome:

1.0 The student shall able to demonstrate an understanding of general terminology and theories regarding the use of radiopharmaceuticals.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

1.1 Define terminology associated with the understanding of radiopharmaceuticals:

a. radiopharmaceutical
b. pharmaceutical
c. radionuclide
d. Curie (and associated
e. Becquerel (and associated units)
f. specific activity units
g. toxicity
h. progenicity

1.2 Explain the tracer theory as applied to diagnostic uses of radiopharmaceuticals.

1.3 List and describe methods of radionuclide production, stating advantages and disadvantages of each method.

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Unit 2 Generators

General Outcome:

2.0 The student shall be able to demonstrate an understanding of the various generators used in the field of nuclear medicine.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

2.1 Discuss in detail the composition, construction, and technical theory of wet and dry generators with specific emphasis on the Mo99/tc99m generator systems.

2.2 List step by step procedure for eluting a generator.

2.3 Describe problems associated with wet and dry generator systems and discuss methods that can be used to detect and/or prevent problems such as “breakthrough”..

2.4 Given appropriate data, calculate generator activity that should be present a given time.

2.5 Define secular and transient equilibrium in terms of parent/daughter half-lives and regeneration cycles for the daughter products.

2.6 Describe the physical and chemical properties of technetium.

2.7 Identify the physical and chemical properties and uses of other radionuclides, included by not limited to isotopes of iodine, xenon, indium, thallium, gallium, chromium, cobalt, krypton, fluorine, and phosphorus.

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Unit 3 Commercially Prepared Kits

General Outcome:

3.0 The student shall be able to demonstrate an understanding of how to utilize commercially prepared kits.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

3.1 Describe the procedure for preparation of radiopharmaceuticals kits from TC99m pertechnetate.

3.2 Outline in considerable detail the quality control procedures that should be done on the generator eluate and the kit product when preparing in house 99mTC radiopharmacueticals.

3.3 Describe methods of quality control that should be used to check commercially prepared radiopharmaceuticals.

3.4 Differentiate between radionuclide and radiochemical purity.

3.5 Describe several methods of separation that can be employed in the preparation of radioactive compounds.

3.6 Describe several methods of separation that can be employed in the preparation of radioactive compounds.

3.7 Describe USP approved methods that can be used to test for sterility apyrogenicity of pharmaceutical.

3.8 Outline a record keeping system that is consistent with NRC and HRS requirements for proper ordering, dispensing, labeling, storage, and disposal of radioactive materials.

3.9 Design a laboratory area for use as a radiopharmacy, including areas for preparation, dispensing, and storage, giving full consideration to radiation safety requirements.

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Unit 4 Positron Emitters Produced By Cyclotron

General Outcome:

4.0 The student shall be able to demonstrate an understanding of positron emitters that are produced by cyclotron.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

4.1 List positron emitters that are produced by generator systems and those produced by cyclotron systems.

4.2 Discuss the physical and chemical characteristics of positron emitters that make them appropriate isotopes for imaging radiopharmaceuticals.

4.3 Trace the biochemical pathways of radiopharmaceuticals labeled with commonly use positron emitters.

4.4 Describe the technical tasks associated with synthesis of radiopharmaceuticals that are labeled with positron emitters.

4.5 State the requirements for quality control of PET imaging agents.

4.6 Describe techniques for administration of PET imaging agents that are unique due to the nature of the agents.

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Unit 5 Radiopharmaceutical Properties

General Outcome:

5.0 The student shall be able to demonstrate an understanding of radiopharmaceutical properties.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

5.1 List characteristics that make a radiopharmaceutical a good diagnostic agent or a good therapeutic agent.

5.2 Differentiate between a diagnostic and therapeutic radiopharmaceutical in terms of patient dose, energy emissions, and toxicity.

5.3 Name and describe several methods of localization that are employed in the use of radiopharmaceuticals.

5.4 Given the name of a radiopharmaceutical, indicate the method of localization and biorouting of the compound.

5.5 Discuss compartmentalization and kinetics of the various radiopharmaceutical compounds.

5.6 Discuss the concept of target-to-nontarget ratios and state relative ratios for various radiopharmaceuticals.

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Unit 6 NRC, DOH, DOT and FDA Regulations

General Outcome:

6.0 The student shall be able to demonstrate an understanding of regulations that apply to the nuclear medicine field.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

6.1 State NRC, DOH, and FDA regulations governing the use of radiopharmaceuticals.

6.2 Differentiate between an investigational new drug (IND) and a new drug application (NDA) and describe the steps that must be taken in the development and approval of new radiopharmaceuticals.

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Unit 7 Hands on Practicum

General Outcome:

7.0 The student shall be able to demonstrate an ability to complete tasks as assigned related to the practice of nuclear medicine.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

7.1 In a clinical practice setting or laboratory exercise, complete the following tasks:

a. elute a 99Mo/99mTc generator
b. Perform quality/control procedures on the generator eluate
c. assay the eluate
d. prepare sulfur colloid, MAA, and other 99mTc compounds from kits
e. perform all mathematical calculations needed to determine quantities to use in making kits and in preparing patient doses
f. Use sterile techniques throughout all steps of the radiopharmaceutical preparation
g. maintain all required records
h. use radiation safety techniques throughout all steps of the radiopharmaceutical preparation
i. perform appropriate quality control procedures (chromatography) on all kit compounds
j. given a request for a patient study, identify the appropriate radiopharmaceutical and calculate the patient dose
k. prepare the patient dose in a syringe using gloves, syringe shields, and sterility techniques