ประมวลรายวิชา (Course Syllabus)

เวชศาสตร์นิวเคลียร์ 1

Nuclear Medicine 1

นิสิตแพทย์ปีที่ 5

Fifth year medical students

1.	**รหัสรายวิชา**	**3011516**
	Subject Code	3011516
2.	**จำนวนหน่วยกิต**	**1(1-0-2)**
	Course Credit	1(1-0-2)
3.	**ชื่อวิชา**	**เวชศาสตร์นิวเคลียร์ 1**
	Course Title	Nuclear Medicine 1
4.	**คณะ/ภาควิชา**	**แพทยศาสตร์/รังสีวิทยา**
	Faculty/Department	Medicine/Radiology
5.	**ภาคการศึกษา**	**ภาคต้น-ปลาย**
	Semester	Year course
6.	**ปีการศึกษา**	**2547**
	Academic year	2004
7.	**ผู้สอน**	
	Instructor	
8.	**เงื่อนไขรายวิชา**	
	Condition	
9.	**สถานภาพของวิชา**	**วิชาบังคับ**
	Status	Compulsory
10.	**ชื่อหลักสูตร**	**แพทยศาสตร์บัณฑิต**
	Curriculum	Doctor of Medicine
11.	**วิชาระดับ**	**ปริญญาตรี**
	Degree	Doctor of Medicine
12.	**จำนวนชั่วโมงที่สอน**	**21 ชั่วโมง / กลุ่ม (x 8 กลุ่ม)**
	Teaching hours	21 hours / group (x 8 groups)
13.	**เนื้อหารายวิชา**	
	Course description	

Basic physics of radioactive materials, nuclear medicine instrumentation and quality control, the use of computer in nuclear medicine, radiation protection for nuclear medicine investigation and therapy. radionuclide organ imaging and function study. Nuclear hematology, thyroid function study and radionuclide treatment.

14. ประมวลการเรียนรายวิชา

14.1 General objectives

At the end of the course, the student should be able to :

14.1.1 Describe the basic principle of radionuclide applications in medicine including basic principle of nuclear medicine instruments and radiation protection, emphasizing on studying function and structure in normal and common disorders including radionuclide treatment.

14.1.2 Interpret normal and abnormal findings of the common disorders in nuclear medicine investigations.

14.1.3 Select the appropriate radionuclide investigations for diagnostic purposes and radionuclide treatment of certain diseases.

14.1.4 Educate the health personnel and public for proper management of patients with previous radionuclide treatment.

14.2 เนื้อหารายวิชาโดยละเอียด:

Department of Radiology

Division of Nuclear Medicine

Topic : Nuclear Medicine Instruments

Code : Nuclear Medicine 1 (3011516)

Learning objectives

At the end of the course, the student should be able to :

1. Describe the function of each component of scintillation counters such as scintillation camera, SPECT and PET.
2. Describe the methods of radiation measurement and imaging techniques.

Learning experience **1 hour**

Learning contents :

1. Scintillation counter system
   - 1.1 Scintillation detectors.
   - 1.2 Amplifiers

1.3 Pule height analyzer

1.4 Scalar

1.5 Timer

1.6 High voltage supplies

1.7 Ratemeter

1.8 Multichannel analyzers

2. Isotope measurements

2.1 Measurement of thyroid uptake

2.1.1 Principle

2.1.2 Geometry and collimator

2.1.3 Background measurement : rejection of extrathyroidal radiation

2.2 Time-concentration studies

2.2.1 Renogram

2.2.2 Organ surface counting

3. Scintillation camera ; basic principle and clinical applications

4. Computer in nuclear medicine imaging

4.1 Hardware and software

4.2 Clinical applications

5. SPECT and PET : basic principle and clinical applications

6. Radiation protection in nuclear medicine

Topic : Basic principle of radiopharmaceuticals.

Code : Nuclear Medicine I (3011516)

Learning objectives

At the end of the course, the student should be able to explain basic principles of radiopharmaceuticals, radioimmunoassay and related techniques.

Learing experience 1 hour

Learning contents :

Basic principle of radiopharmaceuticals

1. Radionuclides
2. Labelled compounds
3. Properties
4. Mechanism of localization

5. Quality control of radiopharmaceuticals

Topic : Nuclear Medicine Thyroid Studies

Code : Nuclear Medicine I (3011516)

Learning objectives

At the end of the course, the student should be able to

1. Describe principles, usefulness, limitations and pitfalls of the tests.
2. Select appropriate test for the patient.
3. Distinguish normal from abnormal results.

Learning experience **1 hour**

Learning contents :

1. Review principle of radioimmunoassay (RIA) and immunoradiometric assay (IRMA)
2. Review function of thyroid gland.
3. In vitro thyroid function tests

   Measurement of thyroid hormones, TSH, and Thyroglobulin (Tg)

   3.1 Normal values of T_4, T_3, Free T_4, Free T_3, TSH, and Tg

   3.2 Causes of alteration of each values

   3.3 Clinical usefulness and choices of the tests in various thyroid disorders

4. In vivo thyroid function tests

   4.1 Thyroid uptake test

   4.1.1 Method of measurement

   4.1.2 Normal and abnormal uptake pattern

   4.1.3 Clinical usefulness

   4.2 Thyroid scintigraphy

   4.2.1 Method of the test

   4.2.2 Normal and abnormal uptake pattern

   4.2.3 Clinical usefulness

   4.3 TRH stimulation test

   4.3.1 Principle and method of measurement

   4.3.2 Interpretation

   4.3.3 Clinical usefulness

   4.4 T3 suppression test

   4.4.1 Principle and method of measurement

4.4.2 Interpretation

4.4.3 Clinical usefulness and contraindications

4.5 Perchlorate discharge test

4.5.1 Principle and method of measurement

4.5.2 Interpretation

4.5.3 Clinical usefulness

Topic : Radionuclide Organ Imaging

Code : Nuclear Medicine I (3011516)

Learning objectives

At the end of the course, the student should be able to :

1. Describe the principle of radionuclide organ imaging and function study
2. Explain the indication of radionuclide imaging and function study of thyroid gland, hepatobiliary system, spleen, bone, brain, lung, vascular and lymphatic system.
3. Distinguish normal from abnormal radionuclide imaging and function study of thyroid gland, hepatobiliary system, spleen, bone, brain, lung, vascular and lymphatic system.
4. Select appropriate radionuclide organ imaging and function study for diagnosis of various diseases.

Learning experience 4 hours

Learning contents :

1. Principle of radionuclide organ imaging and function study
2. Indications of the radionuclide imaging and function study of

2.1 Thyroid gland

2.2 Hepatobiliary system

2.3 Spleen

2.4 Bone

2.5 Bone marrow

2.6 Brain

2.7 Lung

2.8 Vascular system

2.9 Lymphatic system

3. Normal abnormal imaging and function study of

3.1 Thyroid gland

3.2 Hepatobiliary system

3.3 Spleen

3.4 Bone

3.5 Bone marrow

3.6 Brain

3.7 Lung

3.8 Vascular system

3.9 Lymphatic system

Topic : Nuclear Cardilogy

Code : Nuclear Medicine I (3011516)

Learning objectives

At the end of the course, the student should be able to :

1. Describe the procedures in cardiac imaging and function studies.
2. Demonstrate the clinical usage of the procedures.

Learning experience **2.5 hours**

Learning contents :

- Review of anatomy, physiology and relevant pathology
- Nuclear medicine procedures
- Interpretation of the results
- Limitations and advantages of the following procedures :
    1. First pass study
    2. Gated blood pool study
    3. Myocardial perfusion study
    4. Myocardial infarction avid study
    5. Other related studies

Topic : Nuclear Nephrology

Code : Nuclear Medicine I (3011516)

Learning objectives

At the end of the session, the student should be able to

1. Understand principle of radiopharmaceuticals in renal scintigraphy
2. Recognize normal and abnormal scintigraphic appearance of renal study

3. Know clinical indications for renal scintigraphy
4. Interpret renal scintigraphy in individual clinical study

Learning experience **3 hours**

Learning contents :

1. Principle of radiopharmaceuticals in renal scintigraphy.
   - 1.1 Glomerular agents
   - 1.2 Tubular agents
   - 1.3 Parenchymal agents
2. Normal and abnormal scintigraphic appearance of renal study.
3. Clinical applications
   - 3.1 Renal function study
   - 3.2 Obstructive nephropathy
   - 3.3 Upper urinary tract infection
   - 3.4 Vesico-ureteric reflux
   - 3.5 Renal transplantation
   - 3.6 Renovascular hypertension

Topic : Radionuclide Therapy

Code : Nuclear Medicine I (3011516)

Learning objectives

At the end of the session, the student should be able to

1. Recognize basic principle and usefulness of radionuclide treatment of benign and malignant diseases
2. Select appropriate patients for radionuclide therapy.
3. Handle patients with previous history of radioiodine treatment for thyroid diseases

Learning experience **4 hours**

Learning contents :

1. Radioiodine treatment of thyroid disorders, i.e. Graves'disease, toxic nodular goiter and well differentiated thyroid carcinoma
   - 1.1 Basic principle, indications, contraindications, potential complications and results of treatment
   - 1.2 Radiation dose for treatment of hyperthyroidism and well differentiated thyroid carcinoma.

1.3 Follow-up of patients post radioiodine treatment

2. Radionuclide treatment of some other benign and malignant diseases. i.e. polycythemia vera, malignant tumors, malignant effusion and painful bone metastasis.

Topic : Nuclear Oncology

Code : Nuclear Medicine I (3011516)

Learning objectives

At the end of the session, the student should be able to

1. Describe the principles of radionuclide tumor imaging
2. Explain normal and abnormal studies of various radionuclide tumor imaging
3. Explain the clinical uses of radionuclide tumor imaging

Learning experience **1 hour**

Learning contents :

1. Principles of radionuclide tumor imaging of
   1.1 Ga-67
   1.2 Tl-201 and Tc99m-MIBI
   1.3 I-131-MIBG
   1.4 Radiolabelled monoclonal antibodies
   1.5 Radiolabelled receptor agents
   1.6 Positron emitter tracers
2. Normal and abnormal studies of various radionuclide tumor imaging.
3. Clinical uses of radionuclide tumor imaging for
   3.1 Head and neck
   3.2 Breast
   3.3 Lung
   3.4 Liver
   3.5 Gastrointestinal tract
   3.6 Genitourinary tract
   3.7 Bone and soft tissue
   3.8 Neuroendocrine tumors
   3.9 Lymphoma

Topic : Pediatric Nuclear Medicine

Code : Nuclear Medicine I (3011516)

Learning objectives

At the end of the session, the student should be able to

1. Describe the principles of nuclear medicine investigation in pediatric patients
2. Explain normal and abnormal studies of nuclear medicine investigation in pediatric patients
3. Explain the clinical uses of nuclear medicine investigation in pediatric patients.

Learning experience 2.5 hours

Learning contents :

1. The principles of nuclear medicine investigation in pediatric patients
   - 1.1 Physiological difference from adults
   - 1.2 Patient preparation
   - 1.3 Patient handling
2. Normal and abnormal studies of nuclear medicine investigation in pediatric patients
3. The clinical uses of nuclear medicine investigation in pediatric patients
   - 3.1 CNS e.g. seizure disorder, infection, CSF study, etc.
   - 3.2 Endocrine system e.g. neonatal hypothyroid, etc.
   - 3.3 Cardiovascular and respiratory system e.g. various congenital anomalies, etc.
   - 3.4 Hepatobiliary system e.g. neonatal jaundice, various congenital anomalies, etc.
   - 3.5 Gastrointestinal system e.g. GE reflux, Gl bleeding, etc.
   - 3.6 Genitourinary system e.g. UTI, VUR, testicular pain, etc.

Topic : Non-imaging Studies

Code : Nuclear Medicine I (3011516)

Learning objectives

At the end of the session, the student should be able to

1. Recognize some radionuclide investigations in hematology using non-imaging studies.
2. Describe principles of blood volume determination and red blood cell survival/sequestration study.
3. Describe principle and indications for bone densitometry using dual-energy x-ray absorptiometry (DEXA).
4. Interpret result of bone densitometry using DEXA.

Learning experience **1 hour**

Learning contents :

1. Non-imaging radionuclide investigations in hematology.
   - 1.1 Blood volume determination
   - 1.2 Red blood cell survival and sequestration study
2. Bone densitometry
   - 2.1 Principle (DEXA)
   - 2.2 Indications
   - 2.3 Interpretation