Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

T5. COURSE REPORT (CR)

A separate Course Report (CR) should be submitted for every course and for each section or campus location where the course is taught, even if the course is taught by the same person. Each CR is to be completed by the course instructor at the end of each course and given to the program coordinator

A combined, comprehensive CR should be prepared by the course coordinator and the separate location reports are to be attached.

Course Report

For guidance on the completion of this template, refer to the NCAAA handbooks.

Institution : **Umm AL-Qurra University**	Date of CR ; **10/5/2018**
College/ Department; **Faculty of Applied Science / Physics Department**	

A Course Identification and General Information

1. Course title; **Physics of Nuclear Medicine** Code ; **403495-4** Section ; **G1, G2**						
2. Name of course instructor; **Ramadan Ali Hassan** Location; **Main campus(Abdiia)**						
3. Year and semester to which this report applies. **1438-1439, semester 2 (382)**						
4. Number of students starting the course? **14** Students completing the course? **14**						
5. Course components (actual total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	55hr	55 hr	55 hr			
Credit						

B- Course Delivery

1. Coverage of Planned Program			
Topics Covered	Planned Contact Hours	Actual Contact Hours	Reason for Variations if there is a difference of more than 25% of the hours planned
❖ **Basic of Nuclear Medicine Physics,** 1. Fundamental concepts 2. The power of nuclear medicine 3. Historical overview 4. Current practice of nuclear medicine 5. The role of physics in nuclear medicine	**1**	**3**	
❖ **Decay of Radioactivity**	**2**	**6**	

A. ACTIVITY 1. The Decay Constant ,2. Definition and Units of Activity B. EXPONENTIAL DECAY 1. The Decay Factor, 2. Half-Life, 3. Average Lifetime C. METHODS FOR DETERMINING DECAY FACTORS 1. Tables of Decay Factors, 2.Pocket Calculators, 3.Universal Decay Curve D. IMAGE-FRAME DECAY CORRECTIONS E. SPECIFIC ACTIVITY F. DECAY OF A MIXED RADIONUCLIDE SAMPLE G. PARENT-DAUGHTER DECAY 1. The Bateman Equations, 2.Secular Equilibrium 3.Transient Equilibrium , 4.No Equilibrium			
❖ **Radionuclide and Radiopharmaceutical Production** A. REACTOR-PRODUCED RADIONUCLIDES 1. Reactor Principles, 2. Fission Fragments , 3. Neutron Activation B. ACCELERATOR-PRODUCED RADIONUCLIDES 1. Charged-Particle Accelerators, 2. Cyclotron Principles 3. Cyclotron-Produced Radionuclides C. RADIONUCLIDE GENERATORS D. RADIONUCLIDES FOR NUCLEAR MEDICINE 1.General Considerations, 2. Specific Considerations E. RADIOPHARMACEUTICALS FOR CLINICAL APPLICATIONS 1.General Considerations, 2. Labeling Strategies 3.Technetium-99m-Labeled Radiopharmaceuticals 4.Radiopharmaceuticals Labeled with Positron Emitters 5.Radiopharmaceuticals for Therapy Applications 6.Radiopharmaceuticals in Clinical Nuclear Medicine	**2**	**6**	
❖ **Radiation Detectors** A. GAS-FILLED DETECTORS 1. Basic Principles 2. Ionization Chambers	**1**	**3**	

3. Proportional Counters 4. Geiger-Müller Counters B. SEMICONDUCTOR DETECTORS C. SCINTILLATION DETECTORS 1. Basic Principles 2. Photomultiplier Tubes 3. Photodiodes 4. Inorganic Scintillator 5. Considerations in Choosing an Inorganic Scintillator 6. Organic Scintillator			
❖ **The Gamma Camera: Basic Principles** A. GENERAL CONCEPTS OF RADIONUCLIDE IMAGING B. BASIC PRINCIPLES OF THE GAMMA CAMERA 1. System Components 2. Detector System and Electronics 3. Collimators 4. Event Detection in a Gamma Camera C. TYPES OF GAMMA CAMERAS AND THEIR CLINICAL USES **First Periodic Exam**	**1**	**3**	
❖ **The Gamma Camera: Performance Characteristics** A. BASIC PERFORMANCE CHARACTERISTICS 1. Intrinsic Spatial Resolution, 2. Detection Efficiency, 3. Energy Resolution, 4. Performance at High Counting Rates B. DETECTOR LIMITATIONS: NONUNIFORMITY AND NONLINEARITY 1. Image Nonlinearity, 2. Image Nonuniformity, 3. Nonuniformity Correction Techniques, 4. Gamma Camera Tuning C. DESIGN AND PERFORMANCE CHARACTERISTICS OF PARALLEL-HOLE COLLIMATORS 1. Basic Limitations in Collimator Performance, 2. Septal Thickness 3. Geometry of Collimator Holes, 4. System Resolution D. MEASUREMENTS OF GAMMA CAMERA PERFORMANCE 1. Intrinsic Resolution, 2. System Resolution, 3. Spatial Linearity 4. Uniformity, 5. Counting Rate Performance, 6. Energy Resolution 7. System Sensitivity	**2**	**6**	
❖ **Image Quality in Nuclear Medicine** A. BASIC METHODS FOR	**1**	**3**	

CHARACTERIZING IMAGE QUALITY B. SPATIAL RESOLUTION 1. Factors Affecting Spatial Resolution, 2. Methods for Evaluating Spatial Resolution C. CONTRAST D. NOISE 1. Types of Image Noise, 2. Random Noise and Contrast-to-Noise Ratio E. OBSERVER PERFORMANCE STUDIES 1. Contrast-Detail Studies, 2. Receiver Operating Characteristic Studies			
❖ **Single Photon Emission Computed Tomography** A. SPECT SYSTEMS 1. Gamma Camera SPECT Systems, 2. SPECT Systems for Brain Imaging, 3. SPECT Systems for Cardiac Imaging, 4. SPECT Systems for Small-Animal Imaging B. PRACTICAL IMPLEMENTATION OF SPECT 1. Attenuation Effects and Conjugate Counting, 2. Attenuation Correction, 3. Transmission Scans and Attenuation Maps, 4. Scatter Correction, 5. Partial-Volume Effects C. PERFORMANCE CHARACTERISTICS OF SPECT SYSTEMS 1. Spatial Resolution, 2. Volume Sensitivity, 3. Other Measurements of Performance, 4. Quality Assurance in SPECT D. APPLICATIONS OF SPECT	**1**	**3**	
❖ **Positron Emission Tomography** A. BASIC PRINCIPLES OF PET IMAGING 1. Annihilation Coincidence Detection, 2. Time-of-Flight PET, 3. Spatial Resolution: Detectors, 4. Spatial Resolution: Positron Physics, 5. Spatial Resolution: Depth-of-Interaction Effect, 6. Spatial Resolution: Sampling, 7. Spatial Resolution: Reconstruction Filters, 8. Sensitivity, 9. Event Types in Annihilation Coincidence Detection B. PET DETECTOR AND SCANNER DESIGNS 1. Block Detectors, 2. Modified Block Detectors, 3.Whole-Body PET Systems, 4. Specialized PET Scanners, 5. Small-Animal PET Scanner C. DATA ACQUISITION FOR PE 1. Two-Dimensional Data Acquisition, 2. Three-Dimensional Data Acquisition, 3. Data Acquisition for Dynamic Studies and Whole-Body Scans	**2**	**6**	

D. DATA CORRECTIONS AND QUANTITATIVE ASPECTS OF PET 1. Normalization, 2. Correction for Random Coincidences, 3. Correction for Scattered Radiation, 4. Attenuation Correction, 5. Dead Time Correction, 6. Absolute Quantification of PET Images E. PERFORMANCE CHARACTERISTICS OF PET SYSTEMS F. CLINICAL AND RESEARCH APPLICATIONS OF PET			
❖ **Radiation Safety and Health Physics** A. QUANTITIES AND UNITS 1.Dose-Modifying Factors, 2. Exposure and Air Kerma B. REGULATIONS THE USE OF RADIONUCLIDES 1. Nuclear Regulatory Commission Licensing and Regulations, 2. Restricted and Unrestricted Areas, 3.Dose Limits, 4.Concentrations for Airborne Radioactivity in Restricted Areas, 5.Environmental Concentrations and Concentrations for Sewage Disposal, 6.Record-Keeping Requirements, 7. Recommendations of Advisory Bodies C. SAFE HANDLING OF RADIOACTIVE MATERIALS 1. The ALARA Concept, 2. Reduction of Radiation Doses from External Sources, 3. Reduction of Radiation Doses from Internal Sources, 4.Laboratory Design, 5.Procedures for Handling Spills D. DISPOSAL OF RADIOACTIVE WASTE E. RADIATION MONITORING 1. Survey Meters and Laboratory Monitors, 2. Personnel Dosimeter, 3.Wipe Testing.	**1**	**3**	
Revision and Solved problems, Second Periodic Exam	**1**	**3**	

2. Consequences of Non-Coverage of Topics

For any topics where the topic was not taught or practically delivered, comment on how significant you believe the lack of coverage is for the course learning outcomes or for later courses in the program. Suggest possible compensating action.

Topics (if any) not Fully Covered	Effected Learning Outcomes	Possible Compensating Action

3. Course learning outcome assessment.

	List course learning outcomes	List methods of assessment for each LO	Summary analysis of assessment results for each LO
1			
2			
3			
4			
5			
6			
7			
8			

Summarize any actions you recommend for improving teaching strategies as a result of evaluations in table 3 above.

4. Effectiveness of Planned Teaching Strategies for Intended Learning Outcomes set out in the Course Specification. (Refer to planned teaching strategies in Course Specification and description of Domains of Learning Outcomes in the National Qualifications Framework)		
List Teaching Methods set out in Course	Were They Effective?	Difficulties Experienced (if any) in Using the Strategy and Suggested

Specification	No	Yes	Action to Deal with Those Difficulties.
▪ Demonstrating the basic information and principles through lectures and the achieved applications ▪ Discussing phenomena with illustrating pictures and diagrams ▪ Lecturing method: ▪ Projector ▪ Power point ▪ e-learning ▪ Tutorials ▪ Revisit concepts ▪ Discussions ▪ Brain storming sessions ▪ Start each chapter by general idea and the benefit of it ▪ Learn the student background of the subject; ▪ Show the best ways to deal with problem; Keep the question "why" or "how" to explain always there		Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	
▪ Preparing main outlines for teaching ▪ Following some proofs ▪ Define duties for each chapter ▪ Home work assignments ▪ Encourage the student to look for the information in different references ▪ Ask the student to attend lectures for practice solving problem ▪ Doing small research		Yes Yes Yes Yes Yes Yes Yes Yes	

▪ Learn how to search the internet and use the library. ▪ Learn how to cover missed lectures. ▪ Learn how to summarize lectures or to collect materials of the course. ▪ Learn how to solve difficulties in learning: solving problems – enhance educational skills. ▪ Develop her interest in Science through :(lab work, field trips, visits to scientific and research. ▪ Encourage the student to attend lectures regularly by: ▪ Giving bonus marks for attendance assigning marks for attendance.		Yes Yes Yes Yes Yes Yes Yes	
▪ Know the basic mathematical principles. ▪ Use the web for research. ▪ Discuss with the student. ▪ Exams to measure the mathematical skill. ▪ Clear the weakness point that should be eliminated. ▪ Encourage the student to ask for help if needed. ▪ Computational analysis. ▪ Data representation. ▪ Focusing on some real results and its physical meaning. ▪ Lectures for problem solution. ▪ Encourage the student to ask good question to help solve the problem.		Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	

Note: In order to analyze the assessment of student achievement for each course learning outcome, student performance results can be measured and assessed using a KPI, a rubric, or some grading system that aligns student work, exam scores, or other demonstration of successful learning.

C. Results

1. Distribution of Grades

Letter Grade	Number of Students	Student Percentage	Analysis of Distribution of Grades
A	0	0%	
B	9	60%	
C	4	30%	
D	1	10%	
F	0	0%	
Denied Entry	0	0	
In Progress	0	0	
Incomplete	0	0	
Pass	14	100%	
Fail	0	0%	
Withdrawn	0	0	

2. Analyze special factors (if any) affecting the results

3. Variations from planned student assessment processes (if any) (see Course Specifications).

a. Variations (if any) from planned assessment schedule (see Course Specifications)

Variation	Reason

b. Variations (if any) from planned assessment processes in Domains of Learning (see Course Specifications)

Variation	Reason

4. Student Grade Achievement Verification (eg. cross-check of grade validity by independent evaluator).	
Method(s) of Verification	Conclusion
The instructors of the course are checking together and put a unique process of evaluation	TRUE
Check marking of a sample of papers by others in the department.	Equal with the level of student in written tests
Feedback evaluation of teaching from independent organization	TRUE

D Resources and Facilities

1. Difficulties in access to resources or facilities (if any)	2. Consequences of any difficulties experienced for student learning in the course.
Shortage the hand books in Arabic and WEB rooms available for student to be useful at any time between lectures	All students must take all of the requirements before start in this course

E. Administrative Issues

1 Organizational or administrative difficulties encountered (if any)	2. Consequences of any difficulties experienced for student learning in the course.

F Course Evaluation

1 Student evaluation of the course (Attach summary of survey results)
a. List the most important recommendations for improvement and strengths
b. Response of instructor or course team to this evaluation
2. Other Evaluation (eg. by head of department, peer observations, accreditation review, other stakeholders)
a. List the most important recommendations for improvement and strengths
b. Response of instructor or course team to this evaluation

G Planning for Improvement

1. Progress on actions proposed for improving the course in previous course reports (if any).			
Actions recommended from the most recent course report(s)	Actions Taken	Action Results	Action Analysis
a. New chapter was added to cover the the heat and life interaction	Was applied successfully		
b. New chapter was added to cover the nanoparticle applications	Was applied successfully		

2. List what other actions have been taken to improve the course (based on previous CR, surveys, independent opinion, or course evaluation).

3. Action Plan for Next Semester/Year				
Actions Recommended for Further Improvement	Intended Action Points (should be measurable)	Start Date	Completion Date	Person Responsible
a. Updating the course according to the recent publications				
b. Visit to Researches Lab.				
c.				

Name of Course Instructor: _ Ramadan Ali Hassan Ali _

Signature: _____ Date Report Completed: _2017-2018__

Program Coordinator: _____

Signature: _____ Date Received: __15/5/2018__