Program SPECIFICATION FOR Master Degree in Radiobiology

Code: 1711700

University: Alexandria **Faculty:** Medical Research Institute

Program Specification

A- Basic information

1- Programtitle:Master in Radiobiology

2- Program type: **single** [√] **double** [ ] **multiple** [ ]

3- Department(s) :Radiation Sciences Department

4- Coordinator:Dr.MarwaSamehAbou El-Eneen

5- External evaluator(s): Prof. Samir Yousha El-khameesy

6- Last date of program specification approval:8/1/2017

B- Professional Information

1- Program aims:

1. Introduce the student to the various routs of exposure to radiation.
2. Provide the student with the physical basics underlying the process of radioactivity, quantum physics and its implementation in the field of radiation kinetics.
3. Provide knowledge of the basics of classical and molecular radiation chemistry.
4. Introduce the student to the detailed mathematics of radioactive decay, calculation for the assessment of radiolabelled compounds and internal and external dosimetries
5. Introduce the effects of low and high doses of radiation on the organism and at the cellular and subcellular levels.
6. Highlight the major applications of radioactive isotopes in the various aspects of life.
7. Introduce the nature, types and significance of radioactive waste, its sources and the major methods used for their management
8. Illustrate all aspects of personal and environmental dosimetry and monitoring for both ionizing and non-ionizing radiations.
9. Focus on the basic techniques used for radiolabeling, quality control and clinical uses of the radiolabeled pharmaceuticals.
10. Introduce the complex events that require an effective and careful response to a radiological emergency and extensive preparation.

11. Focus on safe and effective use of radioactive materials for the diagnosis of various pathological disease states and for the treatment of some specific disorders.
12. Define the principles and the types of decontamination dealing with each type of accidents for personnel, workplace and environment
13. Illustrate sources and routes of radioactivity in the environment, environmental surveillance and radiological impact assessment.
14. Upgrading research interest and abilities.

2- Intended learning outcomes (ILOS)

a- knowledge and understanding:

a1-Recall the basic physical and chemical concepts underlying the process of radioactivity.
a2- Describe the different ways by which charged particles and photons may interact with matter.
a3- Discuss the Effects of low and high doses of radiation on the biological systemat the molecular and subcellular levels.
a4- List the industrial, medical, agricultural and environmental uses of radioactive Sources**.**
a5- State the components of a radiological monitoring program for contamination control and common methods used to accomplish them.
a6-Define dosimetry quantities, units and instruments, maximum permissible and annual dose limits**..**
a7-List methods of radiolabeling, isotopes used for the process, and physical and biological properties of radiolabeled product.
a8-Describe a crisis according to the guidelines for Incident Command and Emergency Medical Management**.**
a9-Recall the methods of survey for contamination and decontamination for both facilities and personnel.
a10- Recall types, sources, packaging and transportation of radioactive waste.
a11-List the pathways and sources of radiation in nature and their impact on the environment.
a12-Review the environmental and ecological impact of radioactivity.

b- Intellectual skills:

b1-Differentiate between the types of radioactive decay based on their physical and chemical propertiesand with matter.
b2-Differentiate between directly and indirectly ionizing radiation.
b3-CompareAcute and Delayed Effects of Ionizing Radiation.
b4-Distinguish the different applications of radiation in medical and nonmedical field.
b5-Examine the protective measures and the contamination control program applied in the facility**.**
b6-Calculate the maximum permissible dose and dose limits for radiotherapy and nuclear imaging patients.
b7-Distinguish between occupational and non-occupational dose limits and different types of dosimetry.
b8-Compare exposures due to natural sources vs. man-made sources.
b9-Distinguish the uses, dosimetry and quality control of radiopharmaceuticals.

b10-Criticize an Emergency plane for the facility and personnel**.**

b11- Calculate the contaminationrisk to the environmentafter application of a waste management plane for the facility.

b12-Categorize the methods of internal and external decontamination.

b13-Derive the Radioactive Decay Low, activity and half-life Equations.

b14-Differentiate between direct and indirect radioimmunoassays.

c- professional and practical skills:

c1-Solve problems on nuclear binding energy and other quantum mechanical laws.

c2- Deduce the radioactive decay law and calculate activity and half-life.

c3-Practice radiation measurement using various survey meters and counters as gamma scintillation counter and GM survey meter..

c4- Solve problems involving basic units of radiation and radioactivity

c5-Calculate Internal and External dose equivalents.

c6- Practice how to useshields against penetrating radiations**.**

c7-Derive mathematical definitions ofradiation exposure and absorbed dose**.**

c8-Solve variable dosimetric parameters.

c9- Apply the principles of maximum permissible dose and annual dose limits in calculating dose and dose rate for radiotherapy.

c10- Construct and use of Decay Tables.

c11- Apply Nuclear Counting Statistics.

c12- Perform assessment calculations of Radiolabeled Preparation.

c13- Apply radioanalytical techniques such as RIA and IRMA.

c14- Demonstrate radiolabeled compounds preparation.

d- General and transferable skills:

d1- Communicate Effectively Using Scientific Language and Reasoning.

d2- Understand the cumulative nature of scientific knowledge.

d3- Maintain an open and questioning mind toward ideas and alternative points of view**.**

d4-Enhance students' written and oral skills.

d5- Master access to web sites to perform a research or solve problems.

d6- Develop team work skills.

d7- Use information technology.

d8-Evaluate and solve problems based on scientific evidence team work skills.

3- Academic standards

3a External references for standards (Benchmarks)

Generic Academic Reference Standards if the National Authority for Quality Assurance and Accreditation of Education (NAQAAE)

Date of Academic Reference standards (ARS) approval by Institute Council: 12/2/2014

3b Comparison of provision to selected external references

NAQAAE	ARS for master in Radiobiology
A1-Basic facts , theories, of the specialty and related subjects/ fields	A1.Review the basics underlying the process of radioactivity and radiation kinetics. A2.Recognize the major applications of radioactive isotopes
A2-Mutual relation between professional practice and effects on environment	A3. Identify the nature, types and significance of radioactive waste. A4. Review the impact of contamination on the environment.
A3-Main scientific advances in the field of practice	A5. Review the recent industrial, medical and agricultural uses of radioactive sources.
A4-Fundamentals of ethical & legal practice	A6.Identify basic principles and ethics of scientific research
A5 -Quality standards of the practice	A7. Recognize quality standards in handling radioactive materials.
A6- Basics and ethics of scientific research	A6.Identify basic principles and ethics of scientific research.
B1 -Interpret, analyze & evaluate the information to solve problems.	B1. Assess the risk/benefit ratio of radiation use. B2. Derive dosimetric calculations involving internal and external doses.
B2- Solve some problems that do not conform to classic data (incomplete data)	B3. Analyze events that require an effective and careful response to a radiological emergencies.
B3- Integrate different information to solve professional problems.	B4. Apply different types of decontamination dealing with each type of accidents for personnel and workplace.
B4- Conduct a scientific research &/Or write scientific systematic approach to a research problem (hypothesis).	B5.Understand the cumulative nature of scientific knowledge.
B5- Evaluate risks imposed during professional practice.	B1. Assess the risk/benefit ratio of radiation use.
B6- Plan for professional improvement	B8.Plan for periodic self-enhancement of his/her skills Provide the student with practical skills of works to enhance his ability in the future employment
B7- Take professional decisions in wide range of professional situations	B3. Analyze events that require an effective and careful response to a radiological emergencies. B4. Apply different types of decontamination dealing with each type of accidents for personnel and workplace.
C1- Competent in all basic and some of theadvanced professional skills (to be determined according to the specialty board/ department)	C1. Practice radiation measurement using various survey meters and counters (as gamma scintillation counter and GM survey meter).
C2- Write and appraise reports	C2. Analyze, interpret and write reports on radioactive decay modes.

C3-Evaluate methods and tools used in specialty	C3. Enhance the skills of the student in handling radioactive materials. C4. Solve variable dosimetric parameters. C5. Perform assessment calculations of Radiolabeled compounds' Preparation.
D1- Communicate effectively using all methods	D1. Communicate Effectively Using Scientific Language and Reasoning. D2. Enhance students' written and oral skills.
D2- Use information technology to improve his/her professional practice	D3.Use information technology in handling data, information retrieval, document preparation, presentation and communication.
D3-Practice self-appraisal and determines his learning needs	D4.Develop an independent approach to learning as a preparation for continuous professional development
D4- Share in determination of standards for evaluation of others (e.g.: subordinates/ trainees etc.)	D5. Share in determination of standards for evaluating others (e.g. subordinates, trainees).
D5- Use different sources of information to obtain data	D6. Master access to web sites to perform a research or solve problems.
D6- Work in teams - Manage time effectively	D7. Establish working relationship with colleagues, work effectively as a part of a team and develop a culture of disseminating and sharing information with peers.
D7-Work as team leader in situations comparable to his work level	D8.Work as team leader in situations comparable to his work level
D8-Learn independently and seek continuous learning	D9.Develop an independent approach to learning as a preparation for continuous professional development

4- Curriculum structure and contents

4.a program duration: 2 - 4 years

4.b programstructure :

4.b.i- No. of hours per week in each year/semester:

Semester	Core Courses	Elective Courses
	No. of hours	No. of hours
First semester	9 CH	
Second semester	9 CH	8 CH
Third semester	8 CH	

+ 8 thesis hours

4.b.ii- No. of credit hours	**Lectures**	**23**	**Practical**	**7**	**Total**	**30**
	Compulsory	**18**	**Elective**	**12**	**Optional**	**0**

4.b.iii- No. of credit hours of basic science courses	**No.**	**4**	**%**	**13.3**
4.b.iv- No. of credit hours of courses of social sciences and humanities.	**No.**	**0**	**%**	**0**
4.b.v- No. of credit hours of specialized courses	**No.**	**22**	**%**	**73.4**
4.b.vi- No. of credit hours of other courses (e.g. statistics, computer)	**No.**	**4**	**%**	**13.3**
4.b.vii- Field Training	**No.**	**0**	**%**	**0**

4.b.viii- Program levels (in credit-hours system)

Student is required to pass at least 12 credit hours with CGPA not less than C+ before submitting a thesis proposal.

5- Program Courses

5.1- Compulsory (18Cr)

Code No.	Course Title	No. of credit hours	No. of hours /week	
			Lecture	Practical
1711701	Radiation physics	**3**	**2**	**2**
1711702	Basics of Radiation chemistry	**2**	**1**	**2**
1711703	Mathematics of radioactivity	**2**	**1**	**2**
1711704	Basics of Radiobiology	**2**	**2**	**-**
1711705	Applied radiation sciences	**2**	**2**	**-**
1711706	Waste management	**2**	**2**	**-**
1711707	Radiation protection	**2**	**1**	**2**
1711708	Dose measurements	**2**	**1**	**2**
1711709	Exposures to radiation	**1**	**1**	**-**

5.2- Elective I (4Cr)

Code No.	Course Title	No. of credit hours	No. of hours /week	
			Lecture	Practical
1711710	Radiopharmaceuticals	**2**	**2**	**-**
1711711	Nuclear medicine	**1**	**1**	**-**
1711712	Crisis management	**1**	**1**	**-**
1711713	Decontamination	**2**	**2**	**-**
1711714	Environmental radiations	**2**	**2**	**-**

5.3- Elective II (8 Cr)

Code No.	Course Title	No. of credit hours	No. of hours /week	
			Lecture	Practical
1701720	**Biochemistry**	**2**	**1**	**2**
1701721	**Molecular biology**	**2**	**1**	**2**
1721720	**Medical statistics**	**2**	**1**	**2**
1704720	**Pharmacology**	**2**	**1**	**2**
1721721	**Computer**	**2**	**1**	**2**

5.4- Optional – (none)

6- Program admission requirements

Graduate students with a M. B. Ch. B of Medicine, B.Sc. of Veterinary, Engineering, science, or Agriculture.

7- Regulations for progression and program completion

For the progression and completion of the program to obtain the degree of M.Sc. in Radiobiology, the student must

1. Complete 30credit hours with CGPA of at least C+
2. Submit a thesis validity report by an examination committee approved by the department council and their members include at least one external examiner.

8- Evaluation of Students enrolled in the program.

Tool evaluation	Intended learning outcomes being assessed
Written	ILOs a &b
Practical	ILOs c
Oral	ILOs a ,b &d
Semester Work	ILOs b & d

9- Evaluation of program intended learning outcomes

Evaluator	tool	Sample
1- Senior students	Questionnaire	All students
2- Alumni	Questionnaire	Selected representatives
3- Stakeholders (Employers)	Questionnaire	Representative sample
4- External Evaluator	Report	Prof. Samir Yousha El-khameesy

Dates of Previous editions/revisions:

Editions/Revisions Number	Date
Edition no.1	2009
Edition no. 2	2011
Edition no.3	5/6/2014
Edition no.3, revision no.1	12/2014
Edition no.3, revision no.2	10/2016
Edition no.3, revision no.3	9/2017

Programcoordinator:
Name:Dr.MarwaSamehAbou El-EneenSignature …….

Department head:
Name:Prof. Mohamed MorsiSignature …….

Date of Department Council Approval:6/9/2017

- ***M.Sc. of Radiobiology Program Aims vs ILOs matrix***

Program Aims	a 1	a 2	a 3	a 4	a 5	a 6	a 7	a 8	a 9	a 10	a 11	a 12	b 1	b 2	b 3	b 4	b 5	b 6	b 7	b 8	b 9	b 10	b1 1	b 12	b 13	b 14
1. Introduce the student to the various routs of exposure to radiation.												x								x						
2. Provide the student with the physical basics underlying the process of radioactivity, quantum physics and its implementation in the field of radiation kinetics.	x												x													
3. Provide knowledge of the basics of classical and molecular radiation chemistry.	x	x											x	x												
4. Introduce the student to the detailed mathematics of radioactive decay, calculation for the assessment of radiolabelled compounds and internal and external dosimetries			x												x											
5. Introduce the effects of low and high doses of radiation on the organism and at the cellular and subcellular levels.				x												x										
6. Highlight the major applications of radioactive isotopes in the various aspects of life.										x													x			
7. Introduce the nature, types and significance of radioactive waste, its sources and the major methods used for their management						x												x	x							
8. Illustrate all aspects of personal and environmental dosimetry and monitoring for both ionizing and non-ionizing radiations.							x														x					
9. Focus on the basic techniques used for radiolabeling, quality control and clinical uses of the radiolabeled pharmaceuticals.								x														x				
10. Introduce the complex events that require an effective and careful response to a radiological emergency and extensive preparation.						x													x					x	x	
11. Focus on safe and effective use of radioactive materials for the diagnosis of various pathological disease states and for the treatment of some specific disorders.				x	x												x									x
12. Define the principles and the types of decontamination dealing with each type of accidents for personnel, workplace and environment									x															x		
13. Illustrate sources and routes of radioactivity in the environment, environmental surveillance and radiological impact assessment .											x															
14.Upgrading research interest and abilities.																										

Program Aims	c 1	c 2	c 3	c 4	c 5	c 6	c 7	c 8	c 9	C1 0	C1 1	C1 2	C 13	C 14	d 1	d 2	d 3	d 4	d 5	d 6	d 7	d 8
1. Introduce the student to the various routs of exposure to radiation.																						
2. Provide the student with the physical basics underlying the process of radioactivity, quantum physics and its implementation in the field of radiation kinetics.	x	x	x																			
3. Provide knowledge of the basics of classical and molecular radiation chemistry.				x	x																	
4. Introduce the student to the detailed mathematics of radioactive decay, calculation for the assessment of radiolabelled compounds and internal and external dosimetries												x		x								
5. Introduce the effects of low and high doses of radiation on the organism and at the cellular and subcellular levels.																						
6. Highlight the major applications of radioactive isotopes in the various aspects of life.													x									
7. Introduce the nature, types and significance of radioactive waste, its sources and the major methods used for their management							x	x	x													
8. Illustrate all aspects of personal and environmental dosimetry and monitoring for both ionizing and non-ionizing radiations.																						
9. Focus on the basic techniques used for radiolabeling, quality control and clinical uses of the radiolabeled pharmaceuticals.												x		x								
10. Introduce the complex events that require an effective and careful response to a radiological emergency and extensive preparation.		x								x	x											
11. Focus on safe and effective use of radioactive materials for the diagnosis of various pathological disease states and for the treatment of some specific disorders.			x		x	x																
12. Define the principles and the types of decontamination dealing with each type of accidents for personnel, workplace and environment																						
13. Illustrate sources and routes of radioactivity in the environment, environmental surveillance and radiological impact assessment .																						
14.Upgrading research interest and abilities.															x	x	x	x	x	x	x	x

- ***M.Sc. of Radiobiology Courses vs Program ILOs matrix***

Courses	a1	a2	a3	a4	a5	a6	a7	a8	a9	a 10	a 11	a 12	b1	b2	b3	b4	b5	b6	b7	b8	b9	b1 0	b1 1	b1 2	b1 3	b1 4
1711701 Radiation physics	x												x													
1711702 Basics of Radiation chemistry	x	x											x	x												
1711703 Mathematics of radioactivity			x																						x	
1711704 Basics of Radiobiology			x												x											
1711705 Applied radiation sciences				x												x										
1711706 Waste management										x													x			
1711707 Radiation protection					x												x									
1711708 Dose measurements						x												x								
1711709 Exposures to radiation							x												x	x						
17117010Radiopharmaceuticals							x														x					
17117011Nuclear medicine				x																						x
17117012Crisis management								x														x				
17117013Decontamination									x															x		
17117014Environmental radiations											x	x								x						

Courses	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10	c11	c12	C13	C14	d1	d2	d3	d4	d5	d6	d7	d8
1711701 Radiation physics	x	x	x												x	x	x					
1711702 Basics of Radiation chemistry				x	x								x					x	x	x		
1711703 Mathematics of radioactivity		x								x	x	x		x	x	x					x	
1711704 Basics of Radiobiology																	x			x	x	
1711705 Applied radiation sciences															x	x	x					
1711706 Waste management															x			x	x			x
1711707 Radiation protection			x		x	x									x		x	x				
1711708 Dose measurements							x	x	x						x	x	x					
1711709 Exposures to radiation															x	x					x	
17117010Radiopharmaceuticals															x			x			x	
17117011Nuclear medicine																	x			x	x	
17117012Crisis management															x			x				x
17117013Decontamination															x	x	x					
17117014Environmental radiations															x	x					x	

- ***M.Sc. of Radiobiology Program ARS vs ILO's Matrix***

Program ARS	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	Thesis
A1- A1.Review the basics underlying the process of radioactivity and radiation kinetics.	x												
A2.Recognize the major applications of radioactive isotopes.		x	x	x									
A3. Identify the nature, types and significance of radioactive waste.										x	x		
A4. Review the impact of contamination on the environment.					x	x			x			x	
A5. Review the recent industrial, medical and agricultural uses of radioactive sources.			x	x							x		
A6.Identify basic principles and ethics of scientific research.						x							x
A7. Recognize quality standards in handling radioactive materials.					x		x	x	x				
A6.Identify basic principles and ethics of scientific research.													x

Program ARS	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	Thesis
B1. Assess the risk/benefit ratio of radiation use.		x	x	x	x	x	x	x	x						
B2. Derive dosimetric calculations involving internal and external doses.						x									
B3. Analyze events that require an effective and careful response to a radiological emergencies.					x					x	x				
B4. Apply different types of decontamination dealing with each type of accidents for personnel and workplace.					x					x	x	x			
B5- Understand the cumulative nature of scientific knowledge.															x
B7- Plan for periodic self-enhancement of his/her skillsProvide the student with practical skills of works to enhance his ability in the future employment															x

Program ARS	**c1**	**c2**	**c3**	**c4**	**c5**	**c6**	**c7**	**c8**	**c9**	**c 10**	**c 11**	**C 12**	**c 13**	**c 14**
C1. Practice radiation measurement using various survey meters and counters (as gamma scintillation counter and GM survey meter).			**x**			**x**			**x**					
C2. Analyze, interpret and write reports on radioactive decay modes.		**x**								**x**				
C3. Enhance the skills of the student in handling radioactive materials.						**x**								
C4. Solve variable dosimetric parameters.	**x**			**x**				**x**						
C5. Perform assessment calculations of Radiolabeled compounds' Preparation.												**x**	**x**	x

Program ARS	**d1**	**d2**	**d3**	**d4**	**d5**	**d6**	**d7**	**d8**
D1. Communicate Effectively Using Scientific Language and Reasoning.	**x**							
D2. Enhance students' written and oral skills.				**x**				
D3.Use information technology in handling data, information retrieval, document preparation, presentation and communication.		**x**	**x**		**x**	**x**	**x**	**x**
D4.Develop an independent approach to learning as a preparation for continuous professional development					**x**		**x**	
D5. Share in determination of standards for evaluating others (e.g. subordinates, trainees).			**x**			**x**		**x**
D6. Master access to web sites to perform a research or solve problems.					**x**			
D7. Establish working relationship with colleagues, work effectively as a part of a team and develop a culture of disseminating and sharing information with peers.			**x**			**x**		**x**
D8.Work as team leader in situations comparable to his work level						**x**		**x**
D9.Develop an independent approach to learning as a preparation for continuous professional development					**x**		**x**	

- ***M.Sc. of Radiobiology Teaching and Learning Methods Vs Courses Matrix***

	1711701	**1711702**	**1711703**	**1711704**	**1711705**	**1711706**	**1711707**	**1711708**	**1711709**	**1711710**	**1711711**	**1711712**	**1711713**	**1711714**
Lecture	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
Practical	**x**	**x**	**x**				x	**x**						
Brainstorming	x	**x**	x	**x**	x	**x**	**x**	x	x	x		**x**	**x**	**x**
Discussion Groups	x		x	x	x			x		**x**	x	**x**	**x**	**x**
Problem Solving	x	**x**	x			x	x						**x**	
Case Study			x										**x**	
Field Training														
Role playing													**x**	
Training Workshops														
Self-Directed Learning	x		x	x	x		x	x	x		x	**x**	**x**	
e-learning														
Project		x							x					