هيئة تقويم التعليم
Education Evaluation Commission
المركز الوطني للتقويم والاعتماد الأكاديمي
National Center for Academic Accreditation and Evaluation

COURSE SPECIFICATIONS
(CS)

Nuclear Reactors Physics

PHYS 488

June 2018

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Education Evaluation Commission

Course Specifications

Institution: **King Saud University**	Date of Report**: 2017**
College/Department : **Physics and Astronomy Department- College of Science**	

A. Course Identification and General Information

1. Course title and code: **Nuclear Reactor Physics (Phys 488)** **Elective**

2. Credit hours: **2(2+0+0)**

3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs):

B.Sc. Physics program

4. Name of faculty member responsible for the course:
Dr. Mohamed S. ALGARAWI and Dr. S. Al-Ghamdi

5. Level/year at which this course is offered : **Level 7 (fourth year)**

6. Pre-requisites for this course (if any): **Nuclear Physics 1 (Phys 481)**

7. Co-requisites for this course (if any): ----

8. Location if not on main campus: ------

9. Mode of Instruction (mark all that apply)

a. traditional classroom	√	What percentage?	90
b. blended (traditional and online)		What percentage?	
c. e-learning	√	What percentage?	10
d. correspondence		What percentage?	
f. other			

Comments:

B Objectives

1. What is the main purpose for this course?

To give students a detailed background on the physics of nuclear reactors, i.e. what happens inside the reactor from the reactions of neutrons with nuclear fuel material and neutron moderating material inside the reactor, and to derive the factors affecting the operation of the reactor critically.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

1- The course content has been revised and a new syllabus is written.
2- Students are encouraged to communicate through the e-mail of the lecturer site which has many links to important sources of knowledge in the field of Nuclear Reactors Physics.
3- Encourage students to search in the specialized web sites in the internet to increase their knowledge about nuclear reactors and to follow any result of new research in the field.

C Course Description:

- Neutron reactions: cross-sections, attenuation, reaction rate, fission cross-section.
- Nuclear fission, fission yield, Energy distribution among fission neutrons and fragments, Re-production factor.
-Thermal neutrons: energy distribution, effective cross section, moderation, average energy loss. Average energy logarithmic decrement, SDP, MR and resonance escape probability.
-The Nuclear chain reaction: neutron cycle, thermal utilization factor and calculating the four factors formula.

1 Topics to be Covered

Topic	No of Weeks	Contact hours
- Neutron reactions: cross-sections, attenuation, reaction rate, fission cross-section	**3**	**6**
- Nuclear fission, fission yield, Energy distribution among fission neutrons and fragments, regeneration factor	**3**	**6**
- Thermal neutrons: energy distribution, effective cross section, moderation, average energy loss, Average energy logarithmic decrement, SDP, MR and resonance escape probability.	**5**	**10**

- The Nuclear chain reaction: neutron cycle, thermal utilization factor and calculating the four factors formula.		**4**	**8**
2 Course components (total contact hours per semester):			
Lecture: **30** hours	Tutorial: ---	Practical/Fieldwork/Internship: -----	Other: -----

3. Additional private study/learning hours expected for students per week. **Average weekly for solving homework problems**:	**3 h/Week**

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**This is an introductory course, which gives the student a wide and general look at the different aspects of nuclearreactors physics that related to neutron nuclear reactions and the nuclear fission, and to be able to solve related problems in this subject.**	**1- Give notes 2- Text books 3- Homework 4- Encourage students to seek information through the Internet**	**• In class short MCQs quizzes. •2 Midterms and final Exams.**
2.0	**Cognitive Skills**		
2.1	**-Ability to solve problems related to Topics Covered. -Write one or two essays about a nuclear reactors topic**	**-Problem solving -Discussions in the class during lectures - Seek information through the**	**-In class short MCQs quizzes. - Checking the - Solution of problems as well as homework**

		Internet	**assignments**
2.2			
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Work independently**	**Solving problems in groups during tutorial at the end of each chapter**	**-Through discussions in the lectures** **- Checking reports** **- Asking questions** **- Quizzes and Exams**
3.2	**Work within a group**		
4.0	**Communication, Information Technology, Numerical**		
4.1	**Strongly encourage the students to use the internet in search for knowledge**	**1-Set and receive homework through the lecturers electronic Web-site** **2- Encourage students to use the Internet to seek course related information**	**1- Grading the student homework** **2- Grading essays**
4.2	**Write essays**		
5.0	**Psychomotor**		
5.1	NA		
5.2			

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Class activities (questions, discussion, and homework)**	**weekly**	**20%**
2	**Term exam I**	**6**	**20%**
3	**Term exam II**	**12**	**20%**
4	**Final exam**	**16**	**40%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week) **Office hours: 10 hours/ week**

E. Learning Resources

1. List Required Textbooks 1- Elementary Introduction to Nuclear Reactor Physics, S. E. Liverhant, John Wiley, (1960). 2- Introduction to Nuclear Reactor Theory, John R. Lamars, Addison-Wesley Publishing Company, (1972). 3- Nuclear Reactor Physics, by Prof. Weston M. Stacey. John Wiley & Sons, 2007
2. List Essential References Materials (Journals, Reports, etc.) Nuclear Physics by Irving Kaplan, 1979
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) **- Introduction to Nuclear Physics, by Enge, Publisher: Addison Wisley, 1975.**
4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.) **Websites on the internet that are relevant to the topics of the course such as:** **http://wwwrsphysse.anu.edu.au/nuclear** **http://nucleardata.nuclear.lu.se/database/masses** **http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **Not applicable**

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **Lecture room with at least 30 seats**.

2. Computing resources (AV, data show, Smart Board, software, etc.) **a- Scientific calculator for each student** **b- Personal Computer**.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Not applicable**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **-Examination results and type of questions answered** **-Course evaluation by student.**
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor **a- Peer consultation on teaching** **b- Departmental council discussions** **c- Discussions within the group of faculty teaching the course**
3 Processes for Improvement of Teaching **Workshops on teaching and learning methods**.
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **Providing statistical information based on examination results.**

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **a- The course material is periodically reviewed and the changes to be taken are approved in the departmental and higher councils.** **b- The head of department and faculty take the responsibility of implementing the proposed changes**.

Faculty or Teaching Staff: _____

Signature: _____ **Date Report Completed:** _____

Received by: _____ **Dean/Department Head**

Signature: _____ **Date:** _____