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

ATTACHMENT 5.

T6. COURSE SPECIFICATIONS (CS)

Phys 685

(Neutron Scattering)

Dr. Mohamed Saleh Al Garawi

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Education Evaluation Commission

Course Specifications

Institution: ; **King Saud University**	Date: **Jan 2018**
College/Department : **College of Science - Physics and Astronomy Department**	

A. Course Identification and General Information

1. Course title and code: **Neutron Scattering (Phys 685)**
2. Credit hours: **3 (3+0+0)**
3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
Ph.D. Physics Program
4. Name of faculty member responsible for the **course** **Dr. Mohamed S. Al Garawi**
5. Level/year at which this course is offered: **Level 3 (Second year)**
6. Pre-requisites for this course (if any):): **Phys 506 (Statistical Physics)**
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?	20
✓ b. blended (traditional and online	√	What percentage?	80
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course?

The objective of this course is to acquaint students of science with the fundamental principles for methods of neutron scattering and their applications, and gives a theoretical introduction into how different neutron scattering techniques can be used for mapping and understanding the structure and operation of new functional materials. The topics to be covered include: (i)neutrons and their interaction with matter, (ii) sources of neutrons, (iii) refraction and reflection from interfaces, (iv) kinematical diffraction, and (v) diffraction by perfect crystals and molecular fluids.

Upon completion of the course the student should

•have a broad overview of concepts, methods and approaches within neutron scattering in condensed matter physics.
•realize how experimentally measured properties such as structure factors and linear response (susceptibility) is expressed theoretically.
•be familiar with the most important numerical methods used to calculate these quantities for theoretical models.
•have a good knowledge of how these quantities are measured experimentally and understand which factors must be considered in a quantitative comparison of theory and experiments.

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 was 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 neutron scattering
3- Encourage students to search in the specialized web sites in the internet to increase their knowledge about neutron scattering and to follow any result of new research in the field.

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

- Neutron sources, type of neutron sources, Diffraction, constituents of Diffractometer
- Introduction to elastic neutron scattering theory.
- Calculations of self-terms and form factors of some molecular structure.
- Small Angle Neutron Scattering,
- Polarised neutrons,
- Experimental Technique,
- Data treatment

1. **Topics to be Covered**

List of Topics	No. of Weeks	Contact hours
- Neutron sources, type of neutron sources, Diffraction, constituents of Diffractometer.	**5**	**15**
- Introduction to elastic neutron scattering theory .	**2**	**6**
- Calculations of self terms and form factors of some molecules.	**3**	**9**
- Small Angle Neutron Scattering, Polarized neutrons,	**3**	**9**
- Experimental Technique	**1**	**3**
- Data treatment.	**1**	**3**
Total	**15**	**45**

2. Course components (total contact hours and credits per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	Planed	**45**	**--**	**--**	**---**	**--**	**45**
	Actual	**45**	**--**	**--**	**---**	**--**	**45**
Credit	Planed	**45**	**--**	**--**	**---**	**--**	**45**
	Actual	**45**	**--**	**--**	**---**	**--**	**45**

3. Additional private study/learning hours expected for students per week. 2/Week

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

2 hours in average weekly for solving home work problems.

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	**The first chapters are devoted to the Neutron sources, type of neutron sources, Diffraction, constituents of Diffractometer The following Chapters are an Introduction to elastic neutron scattering theory and**	**In-class lecturing where the previous knowledge is linked with the current and future topics Homework assignments and solving the problems of each chapter. Tutorial discussions and Web search about new development in this area of research, and writing reports).**	**-Major and final examinations. Evaluation of the problems solutions of each chapter. Writing reports. Final Exam.**
1.2	**Calculations of self-terms and form factors of some molecules and an introduction to Small Angle Neutron Scattering, Polarised neutrons, Experimental Technique, Data treatment.**		
2.0	**Cognitive Skills**		
2.1	**Cognitive skills to be developed** • **Solve problems on the neutron scattering theory.** • **Identify the recent technological advances that have allowed careful and precise experiments and have stimulated new interest in the field.** • **Summarize the experimental findings that ultimately led to broad acceptance of neutron to be a good material probe tools** • **Search the web and write reports about advances in the field of neutron scattering.**	• **Homework assignments as well as problems solutions.** • **Problem solving in the tutorial.** • **The studies related to the course topics and relevant national industries.** **Discussions in the class during lectures**	**In class short MCQs quizzes. Major and final examinations. Checking the solution of problems as well as the homework assignments**
2.2			
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Description of the skills to be developed in this domain.** • **Use the computer for analysing and processing the experimental data.**	**•Writing summary reports.** **•Incorporating the computer as well as**	• **Evaluate written summary reports as well**

	• Use the computational tools. • Write reports. • Communicate results of the work to others	the computational tools in the course	as solution of the problems.
3.2	- Work within a group and Share research ideas and findings with other members of the group	- Set group assignments involving internet search, and essay writing	- Grading group assignments
4.0	**Communication, Information Technology, Numerical**		
4.1	- Strongly encourage the students to use the internet in search for knowledge .	- Send and receive homework through the lecturers electronic site - Encourage students to use the Internet to seek course related information.	-Grading the student homework
4.2	- Essay writing	- Set homework based on search through the inter-net with the help of key links provided by the lecturer through his electronic site	Grading essays
5.0	**Psychomotor**		
5.1	Not applicable		
5.2			

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Class activities (questions, discussion, and homework)	continuous	20%
2	Term exam I	6	20%
3	Term exam II	12	20%
4	Final exam	16	40%
5			

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 **- R.-J. Roe, *Methods of X-Ray and Neutron Scattering in Polymer Science*, Oxford University Press, 2000.** **- B.T.M. Willis and C.J. Carlile, *Experimental Neutron Scattering*, Oxford University Press, 2009.** **- Sears, V. F. (1992), "Neutron scattering lengths and cross sections", Neutron News, 3: 26–37** **- B.T.M. Willis and C.J. Carlile, *Experimental Neutron Scattering*, Oxford University Press, 2009.**
2. List Essential References Materials (Journals, Reports, etc.) **- Lovesey, S. W. (1984). Theory of Neutron Scattering from Condensed Matter; Volume 1: Neutron Scattering. Oxford: Clarendon Press. ISBN 0-19-852015-8.** **- Squires, G.L. (1996). Introduction to the Theory of Thermal Neutron Scattering (2nd ed.). Mineola, New York: Dover Publications Inc. ISBN 0-486-69447-X**
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **http://wwwrsphysse.anu.edu.au/nuclear** **http://nucleardata.nuclear.lu.se/database/masses** **http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html** **http://www.nndc.bnl.gov** **http://ie.lbl.gov/toi.html**
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. ---

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 10 seats.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **- Scientific calculator for each student - Personal Computer.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) ---

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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 Instructor or by the Department **- Peer consultation on teaching** **- Departmental council discussions** **- 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. **-The course material is periodically reviewed and the changes to be taken are approved in the departmental and higher councils.** **- The head of department and faculty take the responsibility of implementing the proposed changes.**

Name of Course Instructor: _ **Dr. Mohamed S. Al Garawi** _____

Signature: _____ Date Specification Completed: **Jan 2018**

Program Coordinator: _____

Signature: _____ Date Received: _____