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 542)
Physics and Technology of Semiconductors

by

Prof. Amanullah Fatehmulla
2018

هيئة تقويم التعليم
Education Evaluation Commission

Course Specifications

Institution: King Saud University	Date:
College/Department : College of Science, Department of Physics and Astronomy	

A. Course Identification and General Information

1. Course title and code: Physics and Technology of Semiconductors (PHYS 542)
2. Credit hours: 2
3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
Physics and other science and engineering programs
4. Name of faculty member responsible for the course
Prof. Amanullah Fatehmulla
5. Level/year at which this course is offered: 3rd level (Post-graduate)
6. Pre-requisites for this course (if any): Phys 505
7. Co-requisites for this course (if any): None
8. Location if not on main campus: Main campus in Diriyah , College of Science, Department of Physics & Astronomy (Boys and Girls sections)
9. Mode of Instruction (mark all that apply):

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

Comments: Lectures were delivered through web telecast. Course material was supplied through correspondence as well.

B Objectives

1. What is the main purpose for this course?
   This course aims to give students an overview of semiconductor physics in general and will provide an initial platform for thoughtful technological aspects towards device fabrication.

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)
   - Electronic materials and computer based programs will be utilized to support the lecture course material.
   - As a result of new research in the field, apart from power point presentations, course material and web based reference material was provided.

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

Course Description: Semiconductor Materials, Energy bands and Carrier Concentration, Carrier Transport Phenomena, p-n junctions, Metal- Semiconductor junctions (Unipolar Devices), Diffusion and Ion Implantation, Photonic Devices (Optical Absorption, Luminescence, and Carrier Lifetime and Photoconductivity) and other technical Topics: Photolithography, Etching, Bulk Crystal Growth, Thermal Oxidation, Epitaxial Growth, Metallization, MIS devices, LEDs, Semiconductor Lasers and Microwave devices.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Semiconductor Materials Energy bands and carrier concentration	2	4
Carrier transport phenomena	2	4
p-n junctions, Metal semiconductor junctions	2	4
Diffusion and Ion implantation	2	4
Photonic devices(Optical absorption, Luminescence, Carrier lifetime and Photoconductivity)	2	4
Photolithography and Etching	1	2
Bulk crystal growth and Epitaxial growth	1	2
Thermal oxidation and Metallization	1	2
MIS devices and LEDs	1	2
Semiconductor Lasers and Microwave devices	1	2

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	Planed	30					30
	Actual	30					30
Credit	Planed	30					30
	Actual	30					30

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

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	The students get acquainted with the semiconductor properties	In-class lecturing where the previous knowledge is linked to the current and future topics	In class short MCQs quizzes, Major and final exams
1.2	Identified the technologies to fabricate various devices.	Homework assignments	Evaluation of mini project reports
2.0	**Cognitive Skills**		
2.1	Solve problems using standard relations in a structured process.	Homework assignments	Class activities Homework assignments
2.2	Ability to deal with standard instruments	Problem solving in the case studies related to the course topics and relevant national industries	Midterm exams. Final exam
3.0	**Interpersonal Skills & Responsibility**		

3.1	Work independently and as part of a team. Manage resources, time and other members of the group.	Conducting group experiments and writing group reports.	Assessment of the mini project reports.
3.2	Communicate results of work to others	Solving problems in groups during tutorial	Grading homework assignments.
4.0	**Communication, Information Technology, Numerical**		
4.1	Use the computer for analyzing and processing the data.	Writing reports.	Evaluating the written reports.
4.2	Use computational tools. Report writing.	Incorporating the use and utilization of computer in the course requirements	Making discussion on some explored points and conducting Exams
5.0	**Psychomotor**		
5.1	The student should be able to : imitate the steps of the theory and manipulate the results and its analysis.	Response of the student should be observed and advised.	Observations - Discussions - exams
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 (in class quizzes, and homework)	weekly	10%
2	Mid Exam	6	25%
3	Mini Project	12	25%
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: 6 hr/ week**

E Learning Resources

1. List Required Textbooks (i) Semiconductor Devices-Physics and Technology -S.M. Sze, AT& T Bell Laboratories, Murray Hill, New Jersey. John Wiley & Sons. ISBN: 0-471-87424-8 (ii)Semiconductor Physics & Devices- Basic Principles, Third Edition -Donald A. Neaman , TATA McGRAW-Hill, ISBN: 0-07-052905-1 (iii) Semiconductor Measurements and Instrumentation -W. R. Runyan International Student Edition- McGRAW-Hill KOGAKUSHA, LTD **ISBN:0-07-054273-2**
2. List Essential References Materials (Journals, Reports, etc.) (i) Solid State Electronic Devices, Third Edition -Ben G. Streetman Prentice-Hall International, Inc. ISBN: 0-13-824749-8 (ii) Journal of Semiconductors and Material Processing
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. • Websites on the internet that are relevant to the course topics
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. • Multimedia associated with the text book and the relevant websites

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 25 seats (At present, the e-telecast studio is used for delivering/transferring the lectures to the female section/campus) • Auditorium of a capacity of not less than 100 seats for large lecture format classes • Physics laboratory with at least 25 places
2. Technology resources (AV, data show, Smart Board, software, etc.) • Computer room containing at least 15 systems • Scientific calculator for each student
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) • Availability of equipment relevant to the course material • Safety facilities

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Course evaluation by student • Students- faculty meetings
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 • Conducting workshops given by experts on the teaching and learning methodologies • Periodical departmental revisions of its methods of teaching • Monitoring of teaching activates by senior faculty members

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 samples of all kind of assessment in the departmental course portfolio of each course
- Assigning group of faculty members teaching the same course to grade same questions for various students. Faculty from other institutions are invited to review the accuracy of the grading policy
- Conducting standard exams

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- The course material and learning outcomes are 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: **Prof. Amanullah Fatehmulla**

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Signature: _____ Date Specification Completed: 2-1-2018

Program Coordinator: _____

Signature: _____ Date Received: _____