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

COURSE SPECIFICATIONS
(CS)

Laser Physics

PHYS 435

June 2018

Course Specifications

Institution	**King Saud University** Date 20/3/1439H
College/Department	**College of Sciences/ Department of Physics and Astronomy**

A. Course Identification and General Information

1. Course title and code: **Laser Physics (PHYS 435)**			
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) **BSc of Science in Physics**			
4. Name of faculty member responsible for the course: **Dr. Zeyad Alahmed**			
5. Level/year at which this course is offered: Level 7th/ 4th year			
6. Pre-requisites for this course (if any): **Optics (PHYS 331)**			
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	x	What percentage?	70
b. blended (traditional and online)	x	What percentage?	20
c. e-learning	x	What percentage?	10
d. correspondence		What percentage?	
f. other		What percentage?	
Comments:			

B Objectives

1. What is the main purpose for this course? • Familiarity with laser light phenomena and application areas • Understanding the scientific basis on which the interaction of the laser with the material and the properties of laser beams • Obtain the skills of dealing with optical devices through practical applications in laboratories
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) **-Create an interactive webpage between the instructors and students.** **- Explain strategy of the course in the beginning of the semester and the history of lasers** **- Develop materials and lessons from exercises on the site to be accessible by the students enrolled in the session** **- Encourage the students to see more details in the international web sites and reference books in the library.** **- Discussing some selected problems in each chapter.**

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

Course Description: Absorption and emission of light, Einstein Relations, Population inversion, Gain coefficient, Optical cavity, Modes of laser cavity. Solid-state lasers, Semiconductor lasers, Gas Lasers, Dye lasers, Free electron laser and some new lasers. Laser beam properties: Laser Line width, Beam Divergence, Coherence, Brightness, Focusing properties of laser, Q-Switching, Frequency Doubling, Phase Conjugation.Laser Applications: Medical application, Industrial application, Military application, Scientific application, Holography and communications.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Nature of Light • Introduction of the nature of light • Young's experiment • Photoelectric effect	1	3
Interaction matter-light • Energy levels in atom • Boltzmann distribution: thermal equilibrium • Spontaneous absorption and emission • Stimulated emission • Einstein Relations • Population inversion in two-level • Population inversion in three-level • Population inversion in four-level • Gain coefficient	4	12
Laser Oscillation • Types of the cavity • Homogeneous and Inhomogeneous broadening • Modes of laser cavity • Transverses modes of laser cavity • Modes density • Diagram of transverses modes TEM	2	6
Laser types • Solid-state lasers • Semiconductor lasers • Gas Lasers • Dye lasers • Free electron laser and some new lasers	3	9
Laser beam properties • Laser Line width • Beam Divergence • Coherence • Brightness • Focusing properties of laser Q-Switching Frequency Doubling Phase Conjugation	3	9

Laser Applications • Medical application • Industrial application • Military application • Scientific application • Holography and communications • In research report	2	6

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

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	45					45
Credit	45					45

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

2 hours a week for revision of courses and training exercises

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	Students are able to understand concepts of laser, its properties and generation based on various criteria	Through lectures Homeworks Text books	Home work Quiz's. Ask questions to students during the lecture and final exam

1.2	Students are able to apply lasers in different fields on the bases of their characteristics and Properties	Lectures Smart Board	Quiz Shrt Exam final exam
2.0	**Cognitive Skills**		
2.1	Set up experiment/ Measurements	Discussion	Ask questions to students during the experiment
2.2	Students are able to use physical laws and principles to solve related problems	1. Discussion 2. Problem solving during Lecture	Quizzes exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Self -learning	Inverted class.	Presentation and discussion
3.2	Work in groups to understand and solve problems	Solving problems in groups during tutorial at the end of each chapter enhance educational skills	Discussion
4.0	**Communication, Information Technology, Numerical**		
4.1	Perform physical calculations correctly using internet and software packages	Discussion	Presentation Discussion
4.2	Numerical skills through: solving problems-computation – data analysis – feeling physical reality of results.	Discussion. Lecture	Discussing report Home work
5.0	**Psychomotor**		
5.1	NA		
5.2			

6. 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	**Exam I**	**6**	**20%**
2	**Exam II**	**12**	**20%**
3	**HW and Report Research**	**14**	**20%**
4	**Final exam**	**15**	**40%**

5			
6			

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) 10 Office hours per week 5 hour per week for help sessions by Department

E Learning Resources

1. List Required Textbooks • Lasers : principles and applications, by J.Wilson and J.F.B. Hawkes, Prentice Hall (1992) • **M Alsalhi & A Aldwayyan, KSU(translation of: Laser Principles and applications J.F.A.Hawkes and J.Wilson**
2. List Essential References Materials (Journals, Reports, etc.) • Principles of laser by O.Svelto, 5th edition. Springer, 2010
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) **There are Several books available at the Central Library of King Saud University**
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **Web site of teacher and others web sites**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **Computer software about optics and simulaiton**

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 capacity of 30 students** • **Library**
2. Computing resources (AV, data show, Smart Board, software, etc.)
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **- Student evaluation electronically organized by the University** **- Polls of students on the quality of teaching** **-The opinion of students on the quality of teaching** **- The views of teachers**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **There is a departmental committee to evaluate the study plans and schedules section**
3 Processes for Improvement of Teaching **- Research report** **-To encourage self-learning.** **- To Sensitize students on the usefulness of learning** **- To know how Benefit from the experiences of other** **- To take Permanent learning process**
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) **To Conduct standardized tests and exam**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- **Review and update the course and textbook every five years**

Name of Instructor: Dr. Zeyad A. Alahmed_____

Signature:_____Date Report Completed:_20/3/1439H__

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received:_____