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

**ATTACHMENT 5.**

# T6. COURSE SPECIFICATIONS (CS)

# Laser-matter interaction

# Phys 633

هيئة تقويم التعليم
Education Evaluation Commission

# Course Specifications

| | |
|---|---|
| Institution: **King Saud University** | Date: **8 Jan 2018** |
| College/Department: **Faculty of Science/Physics and Astronomy Department** | |

## A. Course Identification and General Information

1. Course title and code: l**aser-matter interaction, PHYS 633**
2. Credit hours: **3 (2+1)**
3. Program(s) in which the course is offered: **PhD in physics**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: **Reem A. B. Alraddadi**
5. Level/year at which this course is offered: **2nd term / First Year**
6. Pre-requisites for this course (if any): **None**
7. Co-requisites for this course (if any): **None**
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 | | What percentage? | |

Comments:

## B Objectives

1. What is the main purpose for this course?

**Gives a brief introduction to the laser-matter interaction. Much of the physics interest stems from the fact that at high laser intensities, the optical properties of materials behave in altogether new ways. The course covers the theoretical principles and important application of laser-matter interactions.**

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)

**Short pulse laser interactions with matter might be given as an additional material. Since the invention of CPA, progress in the laser pulse laser technology has been unrelenting. Pulse durations have come down from ps to fs.**

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

Course Description:

**A cumulative definition of laser-matter interaction based on the physical phenomena which occur when a large number of laser-photons impinge on ordinary matter over time duration.**

1. Topics to be Covered

| List of Topics | No. of Weeks | Contact hours |
|---|---|---|
| **Laser beam characteristics- Beam focusing effects** | **2** | **2** |
| **Semi classical theory of absorption and emission – Reflectivity & transmission of matter** | **4** | **4** |
| **Photon transport theory.** | **3** | **3** |
| **Laser beam heating, melting, vaporization – Plasma formation- Rate of heating and cooling** | **6** | **6** |
| **Operational regimes in material processing -Depth of penetration – Key hole effect – Surface treatment (modification, cladding, alloying and hardening)** | **6** | **6** |
| **High power laser int. with solids (welding, cutting)** | **5** | **5** |

| | | |
|---|---|---|
| **Optical properties of tissue - Laser tissue interaction (thermal, photochemical, photo mechanical, photo ablation plasma induced ablation and photo description).** | **4** | **4** |

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

| | | Lecture | Tutorial | Laboratory/ Studio | Practical | Other: | Total |
|---|---|---|---|---|---|---|---|
| Contact Hours | Planed | **30** | | | **15** | | **45** |
| | Actual | **30** | | | **15** | | **45** |
| Credit | Planed | **2** | | | **1** | | **3** |
| | Actual | **2** | | | **1** | | **3** |

3. Additional private study/learning hours expected for students per week. 8

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 | **Define plasma, depth of penetration** | **Lectures using smart-board.** | **Quizzes, Written exams** |
| 1.2 | **Recognize laser beam characteristics** | **Lecture with visual animation** | **Lectures using smart-board.** |
| 1.3 | **Recognize laser beam heating, melting, vaporization** | **Lecture with visual animation** | **Quizzes, Written exams, Homework** |
| **2.0** | **Cognitive Skills** | | |
| 2.1 | **Explain photon transport theory.** | **Lectures using smart-board, Tutorials** | **Quizzes, Written exams, Homework** |

| | | | |
|---|---|---|---|
| 2.2 | **Explain semi classical theory of absorption and emission** | **Lectures using smart-board.** | **Quizzes, Written exams** |
| 2.3 | **Compare between the rate of heating and cooling** | **Lectures using smart-board, Tutorials** | **Quizzes, Written exams** |
| **3.0** | **Interpersonal Skills & Responsibility** | | |
| 3.1 | **Not applicable** | | |
| **4.0** | **Communication, Information Technology, Numerical** | | |
| 4.1 | **Calculate numerically the reflectivity & transmission of matter** | **Tutorials** | **Quizzes, Written exams** |
| 4.2 | **Analyze related scientific papers** | **Library** | **Presentation** |
| 4.3 | **Apply Optical properties of tissue** | **Tutorials** | **Quizzes, Written exams** |
| **5.0** | **Psychomotor** | | |
| 5.1 | **Not applicable** | | |

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 | **1st Midterm Exam** | **5** | **15%** |
| 2 | **2nd Midterm Exam** | **10** | **15%** |
| 3 | **Class Activities (Quizzes- Essay- presentation)** | **weekly** | **15%** |
| 4 | **Homework** | **weekly** | **15%** |
| 5 | **Final Exam.** | **15** | **40%** |

## D. Student Academic Counseling and Support

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| 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)<br><br>**6 Office hours per week, teaching staff will be available** |

## E Learning Resources

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|---|
| 1. List Required Textbooks<br><br>**1- Shor pulse laser interactions with matter, an introduction, Paul Gibbon (2005), Imperial college press.**<br>**2- Laser-plasma interactions and application, Paul Mckenna et al., Scottish Graduate Series(2013), Springer.**<br>**3- Extreme physics, Jeff Colvin and Jon Larsen, Cambridge, (2013**). |
| 2. List Essential References Materials (Journals, Reports, etc.) |
| 3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. |
| 4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.<br><br>**Super-computer (workstation).**<br>**TOPS opacity online code**<br>**MATLAB 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.)<br><br>**- Lecture room for 10 students** |
| 2. Technology resources (AV, data show, Smart Board, software, etc.)<br><br>**- Smartboard**<br>**- Computers for the software application.** |
| 3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) |

## G Course Evaluation and Improvement Processes

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|---|
| 1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching<br><br>- **Questioner giving to student through KSU-edugate at the end of the semester.** |
| 2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department<br><br>**- Last year evolution application filled by the chairman of the department.** |
| 3. Processes for Improvement of Teaching<br><br>**- Updating the teacher knowledge by following up the new ideas through relevant data bases.** |
| 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)<br><br>**Department chairman will evaluate the final results of students.** |
| 5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. |

Name of Course Instructor: _____REEM A B ALRADDADI_____

Signature: _____ Date Specification Completed: **8 Jan 2018**__

Program Coordinator: _____

Signature: _____ Date Received: _____