

المركز الوطني للتقويم والاعتماد الأكاديمي

**National Center for Academic Accreditation and Evaluation**

### ATTACHMENT 5.

**T6. COURSE SPECIFICATIONS**

**(CS)**

M 611(QUANTUM MECHANICS (II))

**Course Specifications**

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| Institution: King Saud University | Date: 18/10/2018 |
| College/Department : Science/Mathematics | |

**A. Course Identification and General Information**

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| 1. Course title and code: Quantum Mechanics II M 611 |
| 2. Credit hours: 4 credit hours |
| 3. Program(s) in which the course is offered.  (If general elective available in many programs indicate this rather than list programs) |
| 4. Name of faculty member responsible for the course: Dr. |
| 5. Level/year at which this course is offered: First Year Ph.D. |
| 6. Pre-requisites for this course (if any): M 514 (Quantum Mechanics) |
| 7. Co-requisites for this course (if any): Partial differential Equations |
| 8. Location if not on main campus: |
| 9. Mode of Instruction (mark all that apply):  a. traditional classroom What percentage?  100%  X  b. blended (traditional and online) What percentage?  c. e-learning What percentage?  d. correspondence What percentage?  f. other What percentage?  Comments: |

**B Objectives**

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| 1. What is the main purpose for this course?   * Students study the definition of the angular momentum and its relation with momentum and the Cartesian coordinates, as well as the polar coordinates. This in addition to some of the other coordinates. * We give the student the main properties of Lie groups and the isospin groups. * To study the quarks and SU(3) representations of the permutation group. This besides the Mathematical excursion and the quantization of the field. * To study quantum theory of relaxation, quantum theory of scattering, this in addition to the one centre point interaction in three dimensions. |

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| 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)  Since it is an advance course it is important that every student should develop the skill of solving mathematical problems independently.  For understanding certain problems relating to sketching student can take advantage of graphic software and heavily using of the computer facilities. |

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

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| Course Description: |

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| 1. Topics to be Covered | | |
| List of Topics | No. of  Weeks | Contact hours |
| The angular momentum | 2 | 8 |
| The basic properties for Lie group | 3 | 12 |
| The isospin groups and quarks | 2 | 8 |
| SU(3) Representations of permutation group and Mathematical excursion | 3 | 12 |
| Field quantization and Quantum theory of relaxation | 2 | 8 |
| Quantum theory of scattering and the one centre point interaction in three dimensions. | 3 | 12 |
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| 2. Course components (total contact hours and credits per semester): | | | | | | | |
|  | | Lecture | Tutorial | Laboratory/  Studio | Practical | Other: | Total |
| Contact  Hours | Planed | 60 |  |  |  |  | 60 |
| Actual |  |  |  |  |  |  |
| Credit | Planed | 4 |  |  |  |  | 4 |
| Actual |  |  |  |  |  |  |

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| 3. Additional private study/learning hours expected for students per week.  10 |

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| 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 | We give a complete description about Quantum Mechanics and its relation with Lie groups. This in addition to seek a solution for the wave functions which satisfies the properties of this group where one needs to employ the differential equations to reach this goal. | 1. Each topic begins with the explanation of various basic ideas giving plenty of examples so that the students can understand the ideas and solve some exercises. Provided with a problem sheets at the beginning of the semester and ask the students to solve these exercises 2. Students are encouraged to ask questions during the lectures and in the tutorial classes to come on the board and solve some given problems 3. Students are advised to go to the Library and consult the relevant books on the topic | 1. Sometime surprise quizzes are given in the class room 2. Homework 3. Two Mid Term exams are conducted one after 5 to 6 weeks of teaching and the other after 12 to 13 weeks of teaching 4. Final Semester examinations   The salient features: Since there are a number of groups of students in this course, the question papers for midterm examinations and final semester examination are set collectively by all the teachers teaching the course through common discussion and every teacher evaluates one or two questions of all the students irrespective of group of his own students |
| 1.2 | The knowledge with the basic concepts of the isospin group this besides group Quarks and the SU(3) representations of the permutation group. | 1. Each topic begins with the explanation of various basic ideas giving plenty of examples so that the students can understand the ideas and solve some exercises. Provided with a problem sheets at the beginning of the semester and ask the students to solve these exercises 2. Students are encouraged to ask questions during the lectures and in the tutorial classes to come on the board and solve some given problems 3. Students are advised to go to the Library and consult the relevant books on the topic | 1. Sometime surprise quizzes are given in the class room 2. Homework 3. Two Mid Term exams are conducted one after 5 to 6 weeks of teaching and the other after 12 to 13 weeks of teaching 4. Final Semester examinations   The salient features: Since there are a number of groups of students in this course, the question papers for midterm examinations and final semester examination are set collectively by all the teachers teaching the course through common discussion and every teacher evaluates one or two questions of all the students irrespective of group of his own students |
| 1.3 | To study and understand the Mathematical excursion and field quantization. | 1. Each topic begins with the explanation of various basic ideas giving plenty of examples so that the students can understand the ideas and solve some exercises. Provided with a problem sheets at the beginning of the semester and ask the students to solve these exercises 2. Students are encouraged to ask questions during the lectures and in the tutorial classes to come on the board and solve some given problems 3. Students are advised to go to the Library and consult the relevant books on the topic | 1. Sometime surprise quizzes are given in the class room 2. Homework 3. Two Mid Term exams are conducted one after 5 to 6 weeks of teaching and the other after 12 to 13 weeks of teaching 4. Final Semester examinations   The salient features: Since there are a number of groups of students in this course, the question papers for midterm examinations and final semester examination are set collectively by all the teachers teaching the course through common discussion and every teacher evaluates one or two questions of all the students irrespective of group of his own students |
| 1.4 | The knowledge of the quantum theory of relaxation as well as quantum theory of scattering in the addition to the one centre point interaction in three dimesions. | 1. Each topic begins with the explanation of various basic ideas giving plenty of examples so that the students can understand the ideas and solve some exercises. Provided with a problem sheets at the beginning of the semester and ask the students to solve these exercises 2. Students are encouraged to ask questions during the lectures and in the tutorial classes to come on the board and solve some given problems 3. Students are advised to go to the Library and consult the relevant books on the topic | 1. Sometime surprise quizzes are given in the class room 2. Homework 3. Two Mid Term exams are conducted one after 5 to 6 weeks of teaching and the other after 12 to 13 weeks of teaching 4. Final Semester examinations   The salient features: Since there are a number of groups of students in this course, the question papers for midterm examinations and final semester examination are set collectively by all the teachers teaching the course through common discussion and every teacher evaluates one or two questions of all the students irrespective of group of his own students |
| **2.0** | **Cognitive Skills** | | |
| 2.1 | Things are tried to explain in the perspective of the students earlier acquired knowledge | Generally diagrams, pictorial notation wherever possible are given to explain the complete and clear ideas | Please refer to method of assessments of knowledge |
| 2.2 | In each lecture it is thoroughly explained as to why the current topic is being discussed | Generally diagrams, pictorial notation wherever possible are given to explain the complete and clear ideas | Please refer to method of assessments of knowledge |
| 2.3 | What relationship the current topic has with the previous topic and what should be the natural subsequent topic | Generally diagrams, pictorial notation wherever possible are given to explain the complete and clear ideas | Please refer to method of assessments of knowledge |
| **3.0** | **Interpersonal Skills & Responsibility** | | |
| 3.1 | To study, learn and work independently. |  |  |
| 3.2 | To work effectively in teams. |  |  |
| 3.3 | To meet deadlines and manage time properly. |  |  |
| 3.4 | To exhibit ethical behaviour and respect different points of view. |  |  |
| **4.0** | (iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility  Please refer to 1.0 knowledge | | |
| 4.1 |  |  |  |
| 4.2 |  |  |  |
| **5.0** | **Psychomotor** N/A | | |
| 5.1 |  |  |  |
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| 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 | First Mid Term Examination | 5/6 | 25% |
| 2 | Second Mid term Examination | 12/13 | 25% |
| 3 | Home work over the whole semester |  | 10% |
| 4 | Final Semester Examination | 16/17 | 40% |
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**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)  Every teaching faculty displays at his office his class schedule at least 10 hours per week as his office hours for consultation with the students; students are encouraged to come during these office hours to discuss their mathematical problems and difficulties they face |

**E Learning Resources**

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| 1. List Required Textbooks  Quantum Mechanics II by Albert Messiah: North-Holland publishing company, 2) Lie Group By Daniel Bump: Springer New York |
| 2. List Essential References Materials (Journals, Reports, etc.)  Any book deal with Quantum Mechanics and Lie groups.  which is available in the library on the same topics |
| 3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.  Students are advised to visit the website of Quantum Mechanics and its application in Lie group |
| 4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.  These days CD’s are available with all text books and students are advised to go thorough these CD’s |

**F. Facilities Required**

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| 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 rooms normally with a sitting capacity of 50 students  Chuck and markers and the writing board and the duster |
| 2. Technology resources (AV, data show, Smart Board, software, etc.)  The students are encouraged to develop a verbal computing skill, however, in case of absolute necessity the students are allowed the use of nonprogrammable simple calculator |
| 3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)  N/A |

**G Course Evaluation and Improvement Processes**

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| 1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching  At the end of the semester feedback is taken from the students on a prescribed Performa |
| 2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department  Departmental meetings, frequent meetings/ consultation among the teaching staffs  Meeting between course coordinators and the tutors |
| 3. Processes for Improvement of Teaching  This may be done from time to time by the course coordinator in consultation with other faculty members teaching this course, and expert opinion may be taken |
| 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)  Please refer to The Salient features |
| 5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.  1-The course material and knowledge acquired by the students are periodically reviewed and changes if necessary are approved by the department  2- The chairman and the faculty implement the proposed changes if any |

Name of Course Instructor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date Specification Completed: \_\_\_\_\_\_\_\_\_\_\_\_

Program Coordinator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date Received: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_