# TEMPLATE FOR COURSE SPECIFICATION

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| HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW |

**COURSE SPECIFICATION**

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| This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification. |

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| 1. Teaching Institution | Al‐Nahrain University |
| 2. University Department/Centre | Department of Chemistry |
| 3. Course title/code | Physical chemistry (Quantum chemistry) |
| 4. Modes of Attendance offered | The attendance from Google classroom in addition to the telegram program |
| 5. Semester/Year | First semester fourth year/2022/2023 |
| 6. Number of hours tuition (total) | 45 |
| 7. Date of production/revision of this specification | 7/10/2022 |
| 8. Aims of the Course | |
| 1. Familiarize students with the basic concepts of quantum chemistry | |
| 1. Focusing on the basic principles of quantum chemistry and that specialized with computational methods in vibrational functions and electron energies | |
| 1. Interpretation some of effects such as photoelectric effect ,the Atomic spectra of hydrogen | |
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| 9· Learning Outcomes, Teaching ,Learning and Assessment Methode |

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| A- Cognitive goals . A1.familiarize the students for the quantum chemistry  A2.Understand the movement of electrons in mediums  A3.Understanding the students about the vibrational and rotational energies  A4.Studing the microsystem such as electron ,proton  A5.  A6 . |
| B. The skills goals special to the course. B1. Theoretical skills  B2. Focusing and reasoning skills  B3.The development skills |
| Teaching and Learning Methods |
| 1. Providing the students with the basics and additional topics related to thinking outcomes 2. Discuss the topics of the lesson that require focus and thinking 3. Ask a set of intellectual questions during the lecture, which motivates the students to focus and conclusions 4. Giving the students homework to motivate them to search by solving them |
| Assessment methods |
| - Oral exams for the previous lecture.  -Participation scores for competition questions related to the subject  -Specific grades for homework  -Semester exams |
| C. Affective and value goals  C1. Helping students to solve problems related to the intellectual framework of  the course material  C 2- Motivating students to participate with intellectual questions from the course  material  C3- Linking the lecture curriculum with practical applications, especially with  our daily life |
| Teaching and Learning Methods |
| -Providing students with the basics and topics approved in the lecture  -Discussing the vocabulary of the lesson with the students  - Raising a set of thinking questions during the lectures, which increases and motivates students to analyze and conclude  Giving students homework that requires self-explanations |
| Assessment methods |
| -Oral exams for the previous lecture  -Participation scores for competition questions related to the subject  -Specific grades for homework  - Semester exams |

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| D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)  D1. Using the Internet to get acquainted with books and new scientific research to follow up on scientific development  D2 . Participation in scientific conferences inside and outside the country  D 3. Participation in workshops and scientific symposia inside and outside the country |

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| 10. Course Structure | | | | | |
| Week | Hours | ILOs | Unit/Module or Topic Title | Teaching Method | Assessment Method |
| 1 | 2 hours | What is the quantum chemistry | -Introduction to quantum chemistry | Explanation and demonstration tools | Short oral and written exams |
| 2 | 2 | Explanation for the black body radiation | -Black body radiation |  | Short oral and written exams |
| 3 | 2 | Explain the theory of quantisation | The photoelectric effect- | Explanation and demonstration tools |  |
| 4 | 2 | Explained the commutator and given the examples | **-Commutator operator**  **-Examples** | Explanation and demonstration tools | Short oral and written exams |
| 5 | 2 | Explained the emission spectrum of Hydrogen | -Atomic spectra | Explanation and demonstration tools | Short oral and written exams |
| 6 | 2 | Interpreted the spectral lines | -Bohr model | Explanation and demonstration tools | Short oral and written exams |
| 7 | 2 | Uncertainity of for the position of the electron | - The Heisenberg Uncertinity Principle with examples |  | Short oral and written exams |
| 8 | 2 | Postulates explained the microsystem | -Basic postulate of quantum mechanics | Explanation and demonstration tools |  |
| 9 | 2 | What is the operators and its tyoes | -Operater | Explanation and demonstration tools | Semester written exam |
| 10 | 2 | Explained the angular operators and its types | -The angular operator | Explanation and demonstration tools |  |
| 11 | 2 | What is the linear operator | -linear operator | Explanation and demonstration tools | Short oral and written exams |
| 12 | 2 | Explain the commutator and its basis equations | -Commutator operator | Explanation and demonstration tools |  |
| 13 | 2 | Exlaination of examples | -Examples | Explanation and demonstration tools | Short oral and written exams |
| 14 | 2 | Explain the Schrodinger equation as an eigenvalue equation | -Schrodinger equation as an eigenvalue equation | Explanation and demonstration tools |  |

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| 11. Infrastructure | | |
| 1. Books Required reading: | | 1-Physical chemistry, Peter Atkins 8th  edition  2- Physical chemistry, Peter Atkins 9th  edition |
| 2. Main references (sources) | | 1-Physical chemistry, Peter Atkins 8th  edition  2- Physical chemistry, Peter Atkins 9th  edition |
| A- Recommended books and references (scientific journals, reports…). | | Physical chemistry |
| B-Electronic references, Internet sites… | |  |
| 12. The development of the curriculum plan | |
| Development and updating are carried out according to the information available from modern sources, in addition to developing illustrations to increase the student's understanding and awareness of the course material. | |

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