**Course Description Form**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Course Name: | | | | | | | | |
| Quantum and spectra | | | | | | | | |
| 1. Course Code: | | | | | | | | |
| 402CHQS | | | | | | | | |
| 1. Semester / Year: | | | | | | | | |
| Year 4 | | | | | | | | |
| 1. Description Preparation Date: | | | | | | | | |
| 1 October 2024 | | | | | | | | |
| 1. Available Attendance Forms: | | | | | | | | |
| Weekly | | | | | | | | |
| 1. Number of Credit Hours (Total) / Number of Units (Total) | | | | | | | | |
| 90 hours / 6 units | | | | | | | | |
| 1. Course administrator's name (mention all, if more than one name) | | | | | | | | |
| Name: Zaid Hameed Mahmoud  Email: zaidhamid@uodiyala.edu.iq | | | | | | | | |
| 1. Course Objectives | | | | | | | | |
| **Course Objectives** | | | | | **Introduce the students quantum chemistry**  **and its applications, as well as, the**  **the application of molecular spectrums** | | | |
| 1. Teaching and Learning Strategies | | | | | | | | |
| **Strategy** | | Lecture method and using data show  Explanation and clarification | | | | | | |
| 1. Course Structure | | | | | | | | |
| **Week** | **Hours** | | **Required Learning Outcomes** | | | **Unit or subject name** | **Learning method** | **Evaluation method** |
| 1 | 3 | | Theoretical to introduction quantum chemistry, and introduction to mathematics | | |  | Data show and expansion | Reports and home work |
| 2 | 3 | | Classical an mechanics Newton's laws | | |  | = | = |
| 3 | 3 | | Harmonic Oscillator by spherical coordinates | | |  | = | = |
| 4 | 3 | | Wave, particles, dual nature of light, Heisenberg uncertainty | | |  | = | = |
| 5 | 3 | | Black body radiation and photoelectric effect | | |  | = | = |
| 6 | 3 | | Bohr Rutherford theory | | |  | = | = |
| 7 | 3 | | Spectral lines of atoms | | |  | = | = |
| 8 | 3 | | Particle in a box problem | | |  | = | = |
| 9 | 3 | | Schrödinger equation and wave function | | |  | = | = |
| 10 | 3 | | Principles and postulates of Quantum mechanics | | |  | = | = |
| 11 | 3 | | Applications of Schrödinger equation | | |  | = | = |
| 12 | 3 | | Angular momentum and Hydrogen atom | | |  | = | = |
| 13 | 3 | | Degeneration of energy states | | |  | = | = |
| 14 | 3 | | Atomic structure and periodic law | | |  | = | = |
| 15 | 3 | | Rigid Rotor | | |  | = | = |
| 16 | 3 | | Molecular orbital theory | | |  | = | = |
| 17 | 3 | | Ground and excited states and molecular spectroscopy | | |  | = | = |
| 18 | 3 | | Rotation spectra, moment of inertia Molecules classifying | | |  | = | = |
| 19 | 3 | | Degree of freedom and types of vibrations | | |  | = | = |
| 20 | 3 | | Rotational spectra, theory and  applications | | |  | = | = |
| 21 | 3 | | Type of electronic transition | | |  | = | = |
| 22 | 3 | | Selection rules | | |  | = | = |
| 23 | 3 | | Electronic absorption spectra | | |  | = | = |
| 24 | 3 | | Fluorescence and Phosphorescence | | |  | = | = |
| 25 | 3 | | Electronic spectra in polyaromatic molecules | | |  | = | = |
| 26 | 3 | | Franck codon transition | | |  | = | = |
| 27 | 3 | | Intensity distribution within the band | | |  | = | = |
| 28 | 3 | | vibrational structure of electronic bands in diatomic molecules | | |  | = | = |
| 29 | 3 | | Theory of rotation and rotation vibration spectra | | |  | = | = |
| 30 | 3 | | Nuclear spin resonance, theory and practice | | |  | = | = |
| 1. Course Evaluation | | | | | | | | |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc | | | | | | | | |
| 1. Learning and Teaching Resources | | | | | | | | |
| Required textbooks (curricular books, if any) | | | | P.W.Atkins, Physical Chemistry, C.N.Banwell, Fundamental of Molecular Spectroscopy | | | | |
| Main references (sources) | | | | Lecture notes of MIT | | | | |
| Recommended books and references (scientific journals, reports...) | | | | Quantum Mechanics and Spectroscopy I and II by J. E. Parker | | | | |
| Electronic References, Websites | | | |  | | | | |