**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
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| **Course Objectives** |  **Introduce the students quantum chemistry****and its applications, as well as, the** **the application of molecular spectrums**  |
| 1. Teaching and Learning Strategies
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| **Strategy** | Lecture method and using data showExplanation 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 andapplications |  | = | = |
| 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
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| 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
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| 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 |  |