UNIVERSITAS NEGERI JAKARTA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
CHEMISTRY STUDY PROGRAM

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Bachelor in Chemistry **MODULE HANDBOOK**

Module name:	Quantum Mechanic
Module level, if applicable:	Undergraduate
Code:	33250093
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	5th
Module coordinator:	Dr. Afrizal, M.Si
Lecturer(s):	Dr. Achmad Ridwan, M.Si Dr. Afrizal, M.Si
Language:	Indonesia
Classification within the curriculum:	Compulsory Courses in the third year (5th semester) Bachelor Degree
Class Size	40
Type of Teaching	In class activity : Team Based Project and Project based Learning Structured activity : Group Discussion using WorkSheet Independent activity : Individual task
Teaching format / class hours per week	Learning activity can be carried out in the form of: 1. Lecture or students response a. Face to face : 50 minutes/SKS b. Structured activity : 60 minutes/SKS c. Independent activity : 60 minutes/SKS
Workload:	1 CU (SKS) for bachelor degree equal to 4 work hours per week or 170 minutes. 3x50 minutes face to face 3x60 minutes structured tasks 3x60 minutes independent learning, for 16 weeks (including midterm and final examination), a total of 135,99 hours/semester.
Credit points:	3 SKS (4.5 ECTS)
Prerequisite course(s):	Thermodynamic and Kinetic

Course Outcomes:	After taking this course the students have ability to: CLO1. Categorizing the properties of particles and waves CLO2. Analyze the postulates of quantum mechanics CLO3. Determine Energy Levels on a quantum mechanical harmonic oscillator CLO4. Examine the Schrodinger wave equation in a Particle System in a three-dimensional box system CLO5. Examines the basic approximation method, disturbance theory, and the Variation and SCF method CLO6. Applying quantum mechanics to the structure and spectra of the hydrogen atom and the structure of the electron atom CLO7. Details the process of forming molecules from nuclei and electrons based on quantum mechanical treatment of diatomic and polyatomic systems CLO8. Implements the basic principles of quantum chemistry in chemical reactions based on electron functions CLO9. Classify molecules according to their symmetry and how to use this classification to discuss the molecular properties of properties. integral symmetry, we see that it is possible to derive the selection rules governing spectroscopic transitions
Content	1. Properties of particles and waves 2. Postulates of quantum mechanics 3. Energy levels in quantum mechanical oscillator harmonics 4. Schrodinger wave equation for a system of particles in a three-dimensional box system 5. Basic approximation method, Disruption theory, and Variation Method and SCF 6. Quantum mechanics on the structure and spectra of the hydrogen atom and the structure of the many-electron atom. 7. The process of forming molecules from nuclei and electrons based on quantum mechanical treatment of diatomic and polyatomic systems 8. The basic principles of quantum chemistry in chemical reactions based on electron functions 9. Molecular symmetry

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<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests (70%) and structured tasks (30%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO 1-4</td><td>Mid Test</td><td>Written test</td><td>40%</td></tr>
<tr><td>2</td><td>CLO 5-9</td><td>Final Test</td><td>Written test</td><td>40%</td></tr>
<tr><td>3</td><td>CLO 1-9</td><td>Assignment</td><td>Project</td><td>20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Powerpoint, LMS, Zoom, Google Classroom, Google Meet, Microsoft Teams.</td></tr>
<tr><td>Literatures</td><td>1. Atkins, P., Paula, J. d., and Keeler, J. 2018. Physical Chemistry, 11th edition. UK: Oxford University Press.
2. Mortimer, R.G. 2008, Physical Chemistry, 3th edition, London: Elsevier Inc.
3. Levine, Ira N. 2014, Quantum chemistry, 7th edition, New York: Pearson Education, Inc.</td></tr>
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PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CO1					√							
CO2					√							
CO3					√							
CO4					√							
CO5					√							
CO6					√							
CO7					√							
CO8					√							
CO9					√							