MODULE HANDBOOK

Course:	**Spectroscopy**
Module Level:	Undergraduate
Code:	FIM304
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/Term:	3rd / Second Year
Module Coordinator:	Drs. Adri Supardi, MS.
Lecturer(s):	Drs. Adri Supardi,MS. and Supadi, S.Si., M.Si.
Language:	Bahasa Indonesia
Classification within The Curriculum:	~~Compulsory Course~~ / Elective Course
Teaching format/ class hours per week during semester:	3 hours lectures (50 minutes/hour)
Workload:	3 hours of lectures, 3 hours of tutorial and structured activities, 3 hours individual activities, 13 weeks per semester, and total of 117 hours a semester ~ 3,9 ECTS*
Credit Points:	3
Requirement(s):	(FIT301) Quantum Physics
Learning Goals/Competencies:	**General Competence (Knowledge):** Analyse the spectrum of atoms and molecules to identify structure of matter. **Specific Competence:** 1. Calculate the energy levels of atomic, molecular vibration, rotation of molecules 2. Calculate nuclear magnetic moment and magnetic shielding of molecule 3. Understand the process of laser 4. Analyze the atomic spectrum, the vibrational-rotational, electronic, and NMR spectrum of molecules 5. Apply the laser spectroscopy system
Contents:	**Electromagnetic Radiation-Matter Interaction:** Time dependent perturbation theory , selection rule, absorpsion emission, line shape and line broadening; **Atomic Spectroscopy :** Hydrogen and hydrogen-like atom energy level, spectra of hydrogen and hydrogen-like atom , multielectron atomic energy level, spectra of multielectron atoms; **Vibration-rotation spectroscopy:** Rotation of rigid molecules, centrifugal distortion, harmonic vibration, anharmonicity, vibration-rotation spectra, Raman effect; **Electronic Spectroscopy :** Molecular orbital, vibrational structure, electronic transition; **NMR Spectroscopy *:*** Nuclear magnetic moment, Zeeman effect, Bloch equation, nuclear magnetic resonance principle, magnetic shielding, chemical shift , NMR application; **Optical Spectroscopy :**

	Instrumentation, spectral resolution, optical method for chemical analysis; **Laser and Laser Spectroscopy :** Basic principle of laser, laser fixed frequency, tunable laser, detection, high resolution laser spectroscopy, photoacoustic laser spectroscopy, application of laser psectroscopy.
Soft Skill Attribute:	Effort and ethic
Study/Exam Achievements:	Students are considered competent and eligible to pass the course upon obtaining at least 50% of maximum score for midterm test, final examination, quizzes and home work. Final score is calculated as follow: 20 % homework + 15% Quizzes + 30% midterm test + 30% final exam + 5% soft skill Final grade is defined as follow : A : 75 - 100 AB : 70 - 74.99 B : 65 - 69.99 BC : 60 - 64.99 C : 55 - 59.99 D : 40 - 54.99 E : 0 - 39.99
Forms of Media:	Powerpoint slides, LCD projectors and whiteboards
Learning Methods:	Lecture and discussion
Literature(s):	1. Bernath, Peter F., 1995, *Spectra of Atom and Molecules*, Oxford University Press, New York. 2. Chang, Raymond, 1971, *Basic Principles of Spectroscopy*, McGraw Hill. 3. Demtröder, W., 2005, *Atoms, Molecules and Photons*, Springer 4. Graybeal, Jack D., 1988, *Molecular Spectroscopy*, McGraw-Hill, New York. 5. Hollas, J.M., 1992, *Modern Spectroscopy*, 2 nd ed, John-Wiley & Sons. 6. Svanberg S., 1985, *Atomic and Molecular Spectroscopy*, John-Wiley & Sons, New York.
Notes:	*Total ECTS = {(total hours workload × 50 min) / 25 hours Each ECTS is equals with 25 hours.