Course:	**Quantum Physics**
Module Level:	Undergraduate
Code:	FIT301
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/Term:	4th / Second Year
Module Coordinator:	Febdian Rusydi, Ph.D
Lecturer(s):	Febdian Rusydi, Ph.D, Andi H. Zaidan, Ph.D, Arief Wibowo M.Si, Pujiyanto, MS
Language:	English
Classification within the Curriculum	Compulsory Course / ~~Elective Course~~
Teaching format / class hours per week during semester:	4 hours of lectures (50 minutes/hour)
Workload:	4 hours of lectures, 4 hours of structural activities, 4 hours of individual study, 14 weeks per semester, and total of 156 hours per semester 5.6 ECTS*
Credit Points:	4
Requirement(s):	FIT202 Mathematical Physics 2 and FID201 Modern Physics
Learning Goals/Competencies:	**General Competence (Knowledge) :** Students are able to describe the fine structure of hydrogen atom based on the Schrödinger equation. **Specific Competence:** 1. Ability to formalize the quantum theory in term of linear algebra. 2. Ability to apply quantum mechanics to construct hydrogen atom and predicts all its physical properties. 3. Ability to use time-independent perturbation theory to describe the fine structure of hydrogen.

Contents:	The course has four parts, which are Quantum Theory, Formalism of Quantum Mechanics, Angular Momentum, and Time-independent Perturbation Theory. The first part, Quantum Theory, is a review of the second part of FID201 Modern Physics. It taught students about the new common sense in the realm of 10^{-8} kg. The new common sense is called quantization of energy. The new common sense successfully explained what the ordinary common sense in the classical physics realm cannot. For example, the blackbody radiation, photoelectric effect, and the atomic model of Rutherford. To deal with that problem, quantum theory identifies a particle as a wave, and vice versa. This extra identity makes the certainty event in our daily life become an uncertainty in the quantum world. Time no longer need to go forward; a ball does not necessary bounce back when hitting a wall, it can pass through it; and a particle can be present and be absent at the same time. The last section is the introduction of the Schrödinger equation, the first equation of motion in quantum history that acknowledges a particle in a wave function. The second part, Formalism of Quantum Mechanics, students learn the Schrödinger equation in a powerful form: linear algebra, where the Dirac Notation plays an important role to describe a quantum state. Using formalism, students derive the hydrogen wave functions and predict the hydrogen spectrum. The third part, Angular Momentum, students uses the formalism to derive the angular equation of the hydrogen atom. This leads to the orbital wave function, spin wave function, and the case of electron behaviors in the external magnetic field, notably the great Stern-Gerlach experiment. The last part, Time-independent Perturbation Theory, students learn how to improve the electronic structure of hydrogen atom predicted by the Schrödinger equation. Here, students learn relativistic and LS-coupling correction (leads to the fine structure) and the effect of external and internal magnetic field (leads to the Zeeman effect and hyperfine splitting respectively). To put in simple, FIT301 Quantum Physics is all about the hydrogen atom studied in the perspective of quantum mechanics. ———————————————————— Competence Literature Chapter

1	1		3, Appendix
2	1		4
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3	1		6
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Soft Skill Attribute	Effort and ethic.
Study/Exam Achievements:	Passing grade is D (equivalent of score 40.0 of 100.0). The score is determined by 10 quizzes which are distributed in the semester. Maximum score for each quiz is 10. The quiz will take 15 –20 minutes. There will be 10 homework sets in the semester. Each homework set contains 10 problems. The homework is not to be submitted, but one of the problem will be asked in the quiz. Score to grade conversion: A : 75.00 — 100.00 AB : 70.00 — 74.99 B : 65.00 — 69.99 BC : 60.00 — 64.99 C : 55.00 — 59.99 D : 40.00 — 54.99 E : 00.00 — 39.99
Learning Methods:	Lecturing, homework, tutorial
Form of Media:	Whiteboard, projector.
Literature(s):	1. David Griffiths.Introduction to Quantum Mechanics, 2nd edition, Pearson Education, 2005 2. Robert Eisberg and Robert Resnick, Quantum Physics of Atomcs, Molecules, Solid, Nuclei, and Particles, 2nd edition, John Wiley and Sons, 1985
Notes:	*Total ECTS={(total hours workloadx50 min)/60 min}/25 hours Each ECTS is equals with 25 hours