Module name	Material Computation
Module level, if applicable	Bachelor of Physics
Code, if applicable	18H02134002
Subtitle, if applicable	-
Semester(s) in which the module is taught	6th
Person responsible for the module	Prof. Dr. Dahlang Tahir, M.Si
Lecturer	1. Prof. Dr. Dahlang Tahir, M.Si 2. Heryanto, S.Si, M.Si
Language	Indonesian Language [Bahasa Indonesia]
Relation to Curriculum	This course is an elective course and offered in the 6th semester.
Type of teaching, contact hours	Teaching methods: [group discussion], [project-based learning], [problem-based learning]. Teaching forms: [lecture], [tutorial], [practicum] CH : 08.00 - 16.00
Workload	For this course, students are required to meet a minimum of 90.67 hours in one semester, which consist of: - 26.67 hours for lecture, - 32.00 hours for structured assignments, - 32.00 hours for private study
Credit points	2 credit points (equivalent with 3.4 ECTS)
Requirements according to the examination regulations	Students have participated in at least 80% of the learning activities (Academic Regulations, Chapter VII)

Module objectives/intended learning outcomes	After completing the course, Students are able: **Intended Learning Outcomes (ILO):** **ILO 1 :** Students have relatively deep understood in classical and basic quantum physics. **ILO 2 :** Students are able to use the fundamental principles of physics in modeling and computation to solve the complex physical problem. **ILO 6 :** Students are able to use the mathematical method to solve the physical related- problem. **Course Learning Objective (CLO):** After completing this course, students are expected to be able to apply the mathematical and computational method to help describe the structure and properties of material and to solve complex problem in material science. **Sub CLO :** ILO 2 ⇒ CLO 1 : Students are able to explain the importance of computational simulation and its applications. ILO 1 ⇒ CLO 2 : Students are able to understand the Many-Body Hamiltonian formulation of atoms. ILO 6 ⇒ CLO 3 : Students are able to apply the Born Oppenheimer approximation in the Many-Body Hamiltonian of atoms. ILO 6 ⇒ CLO 4 : Students are able to apply the Hartree-Fock method to solve the ground state energy calculation. ILO 6 ⇒ CLO 5 : Students are able to explain the various post Hartree-Fock methods in the ground state energy calculation. ILO 1 ⇒ CLO 6 : Students are able to explain the correlation energy in wave functions. ILO 2⇒ CLO 7 : Students are able to explain the Hohenberg-Kohn and Kohn-Sham Density Functional Theory.
Content	Students will learn about : 1. Many Particle Hamiltonian 2. Born Oppenheimer's approximation 3. Hatree and Fock approximation 4. Pseudopotential 5. Plane Wave Set Base 6. Density Functional Theory

	Assessment forms: [midterm exam], [assignment], [presentation] Mid term exam = 30%, Presentation = 40%, Assignment = 30% CLO 1 => ILO 2: 10% (Mid term exam: Number 1) CLO 2 => ILO 1: 10% (Mid term exam: Number 2) CLO 3 => ILO 6: 10% (Mid term exam: Number 3) CLO 4 => ILO 6: 10% (Assignment 1) CLO 5 => ILO 6: 10% (Assignment 2) CLO 6 => ILO 1: 10% (Assignment 3) CLO 7 => ILO 2: 40% (Final Presentation)
Study and examination requirements and forms of examination	**Study and examination requirements:** - Students must attend 15 minutes before the class starts. - Students must switch off all electronic devices. - Students must inform the lecturer if they will not attend the class due to sickness, etc. - Students must submit all class assignments before the deadline. - Students must attend the exam to get final grade. **Form of examination:** Written exam: Essay
Media employed	Text book, Image Processing Toolbox, Zoom, Gmeet, Video Conference, Video and Power Point Presentation.
Reading list	**Main :** 1. June Gunn Lee, Computational Material Science (second edition). 2017 by Taylor & Francis Group, LLC. 2. William D. Callister, Jr., 2007, Materials Science and Engineering, seventh edition, Jhon Wiley and Son, inc, Utah University. 3. B Cullity, 1956, elementary X-Ray Diffraction, Addison-wesley company, united state of America. **Support :** 1. A. Khorsand Zak et al., X-ray analysis of ZnO nanoparticles by Williamson Hall and size strain plot methods Solid State Sciences 13 (2011) 251-256 2. Suryani, et al. Quantitative analysis of diffraction and infra-red spectra of composite cement/BaSO4/Fe3O4for determining correlation between attenuation coefficient, structural and optical properties Ceramic International 46 (2020) 18601-18607

	detected in different electron scattering angles Microelectronics Reliability 108 (2020) 113628