Diponegoro University
Faculty of Science and Mathematics
Undergraduate Program Of Chemistry

Module designation	**Nanomaterials (Nanomat)**
Semester(s) in which the module is taught	4
Person responsible for the module	Dra. Taslimah, M.Si. Pardoyo, S.Si.. M.Si.
Language	Indonesian
Relation to curriculum	~~Compulsory /~~ elective ~~/ specialisation~~
Teaching methods	Lecture
Workload (incl. contact hours, self-study hours)	Face to face : 1 x (2 x 50 min); Structured study: 1 x (2 x 60 min); Self study: 1 x (2 x 60 min)
Credit points	2
Required and recommended prerequisites for joining the module	Mano

Module objectives/intended learning outcomes	1. Work together and have social sensitivity and concern for society and the environment. (S6) 2. Demonstrate an attitude of being responsible for work in the field of expertise independently. (S9) 3. Internalize the spirit of independence, struggle, and entrepreneurship. (S10) 4. Able to apply logical, critical, systematic, and innovative thinking in the development or implementation of science and technology that pays attention to and uses humanities values by their field of expertise. (KU1) 5. Able to make decisions regularly in the context of solving problems in their area of expertise, based on the results of analysis of information and data. (KU5) 6. Able to produce appropriate conclusions based on the identification, analysis, isolation, transformation, and synthesis of chemicals that have been carried out. (KK1) 7. Able to solve science and technology problems in general and straightforward chemical fields such as identification, analysis, isolation, transformation, and synthesis of macromolecules through the application of knowledge of structure, properties, kinetics, and energetics of molecules and chemical systems, with analysis and synthesis methods in specific chemical fields, as well as the application of relevant technologies. (KK2) 8. Mastering the theoretical concepts of structure, properties, changes, kinetics, and energetics of molecules and chemical systems, identification, separation, characterization, transformation, synthesis of macromolecular chemicals, and their application. (PP1)
Content	1. Introduction: Nanoscience, Nanotechnology, and Nanostructure 2. Nanomaterial Properties and Applications 3. Atomic Surface Energy and Potential 4. Synthesis Method: Top Down 5. bottom-up 6. Nanostructure Type: Nanoparticles, Nanowire, Nanorods, Nanotube 7. Carbon Nanotube Synthesis 8. Nanomaterial Characterization: SEM and TEM 9. AFM and PSA 10. BET 11. Nanosilica Synthesis 12. Nanosilica Synthesis(continued) 13. Applications of Nanomaterials: the field of electronic devices and the environment 14. Applications of Nanomaterials: Health and Pharmaceutical fields

Exams and assessment formats	Mid-Semester Exam and Final Exam
Study and examination requirements	Participatory Activities 20% Project Results 30% Task 10% Quiz 10% Mid-semester 15% Final exams 15%
Reading list	1. Cao G. Nanostructures & Nanomaterials : Synthesis, Properties and Aplications, Imperial college Press, London, 2004 2. Edeilstein A. S. and Cammarata R.C. Nanomaterial : Synthesis, Properties and Aplications, Institut of Physics Publishing