Diponegoro University
Faculty of Science and Mathematics
Undergraduate Program Of Chemistry

Module designation	**Sol Gel Chemistry (Solgel)**
Semester(s) in which the module is taught	6
Person responsible for the module	Dra. Sriyanti, M.Si Dr. Choiril Azmiyawati, 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	Kano2
Module objectives/intended learning outcomes	1. Demonstrate an attitude of being responsible for work in their field of expertise independently 2. 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 3. You are mastering the basic principles of software for analysis, synthesis, and molecular modeling in general or more specific chemical fields. 4. Able to apply logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and uses humanities values by their field of expertise 5. Able to analyze several alternative solutions in identification, analysis, isolation, transformation, and synthesis of available chemicals and present analysis conclusions for appropriate decision making.

Content	1. Inter-molecular Interaction (BK8)/ Introduction (PB1) a. Understanding of the sol-gel process b. The history of sol-gel and its development 2. Compound Reaction (BK7)/Non-Silicate Hydrolysis and Condensation Reaction (PB2) a. Transition Metal 3. Compound Reaction (BK7)/Non-Silicate Hydrolysis and Condensation Reaction (PB2) b. Aluminate c. Borate System 4. Compound Reaction (BK7)/ Silicate Hydrolysis and Condensation Reaction (PB3) a. Aqueous Silicate (Aqueous Silicate) 5. Compound Reaction (BK7)/ Silicate Hydrolysis and Condensation Reaction (PB3) b. Silicon alkoxide c. Multi Component Silicate 6. Inter-molecular Interaction (BK8)/ Gel Formation Stages (PB4) a. Gelasi b. Aging (aging) c. Drying 7. Molecular Structure (BK5)/Evolution of Structure During Consolidation (PB5) a. Porous Gel Structure: Serogel and airgel b. Structure Change During Heating 8. Molecular Structure (BK5)/Sol-Gel Application (PB6) a. Thin Film and Coating b. Monolith 9. Molecular Structure (BK5)/Sol-Gel Application (PB6) c. Fiber d. Porous Gel and membrane 10. Intermolecular Interaction (BK8)/Encapsulation (Encapsulation) of Organic Materials (PB7) a. Production of ORMOSIL (Organic Modified Silica) 11. Intermolecular Interaction (BK8)/Encapsulation (Encapsulation) of Organic Materials (PB7) b. Examples of making ORMOSIL 12. Inter-molecular Interaction (BK8)/ Encapsulation (Encapsulation) Biomolecules (PB8) a. Encapsulation of proteins, antibodies, and vitamins 13. Inter-molecular Interaction (BK8)/ Encapsulation (Encapsulation) Biomolecules (PB8) b. Examples of Encapsulation of proteins, antibodies, and vitamins 14. Inter-molecular Interaction (BK8)/ Encapsulation (Encapsulation) Biomolecules (PB8) c. Enzyme Encapsulation in Silica d. Examples of enzyme encapsulation in silica

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. Brinker, C.J. & Scherer, G. W., 1990, Sol-Gel Science, The Physics and Chemistry of Sol-Gel Processing, Academic Press, California 2. Sumio Sakka, Sol-Gel Science and Technology, Processing, Characterization and Applications, Kluwer Academic Publisher, New York.