



Diponegoro University
Faculty of Science and Mathematics
Undergraduate Program Of Chemistry

Module designation	Biomaterial Design (BM)
Semester(s) in which the module is taught	4
Person responsible for the module	Tri Windarti, Msi
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	Chemical Energetics (ENG)

<p>Module objectives/intended learning outcomes</p>	<p>(S9) Demonstrates an attitude of being responsible for work in his field of expertise independently</p> <p>(KU1) 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</p> <p>(KU2) Able to demonstrate independent, quality, and measurable performance</p> <p>(PP1) 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</p> <p>(M1) can explain (C2) the part of the human body that is most often damaged and how biomaterials can be a solution to overcome them and can explain how biomaterials can be a solution to overcome them</p> <p>(M2) can explain the bulky and surface properties of a material</p> <p>(M3) can explain the physiological conditions of the human body and the functions of several organs</p> <p>(M4) can describe the properties of metals, polymers, ceramics, and composites as biomaterials along with their advantages and disadvantages, as well as examples of applications</p> <p>(M5) is capable of designing chemical engineering and biomaterial surfaces</p> <p>(M6) can determine the proper test for the characterization of biomaterials from material determination to biomaterials that can be applied to humans</p> <p>(M7) can design biomaterials for artificial bones to overcome bone damage due to osteoporosis by using calcium phosphate as a base material and perform chemical and surface engineering to increase the biomaterial's bioactivity</p>
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Content	<ol style="list-style-type: none"> 1. The concept of solids. Biomaterial needs at this time 2. Biomaterial properties. Regulation of the use of biomaterials 3. Material Properties: Bulky Material Properties 4. Material Properties: Material Surface Properties 5. Physiological Conditions: Human body systems, Functions of body organs 6. Material for Biomaterial: Metal 7. Material for Biomaterial: Polymer 8. Material for Biomaterial: Ceramic 9. Material for Biomaterial: Composite 10. Biomaterials Engineering: Chemical Engineering 11. Biomaterial Engineering: Surface Engineering 12. Biomaterial Characterization: Chemical Characterization, Physical Characterization 13. Characterization of Biomaterials: 1. In Vitro Test 2. In vivo Test 14. Biomaterial Design for Artificial Bone: Injectable Calcium Phosphate
Exams and assessment formats	Mid-Semester Exam and Final Exam
Study and examination requirements	Participatory Activities -10% Project Results -30% Cognitive/Task Knowledge -5% Quiz -5% Mid-semester -25% Final exams -25%
Reading list	<ol style="list-style-type: none"> 1. Ratner, B.D., Hoffman, S. S., Schoen, F.J., and Lemons, J.E., 1996, Biomaterials science: introduction to Materials in medicine, Academic Press, San Diego 2. Windarti, T, 2015, Buku Ajar: Biomaterial: Desain Tulang Artifisial 3. Zhang, J., Liu, W., Schnitzler, V., Tancret, F., Bouler, J-M., 2014, Review: Calcium phosphate cements for bone substitution: chemistry, handling and mechanical properties, Acta Biomaterialia, 10, 1035-1049