Module II: Basic Science II

1.1. Module Data

Person in charge	Faculty of Natural Sciences and Mathematics
Total Credits	9
Course	FI 1202 Elementary Physics 2B
	KI 1201 General Chemistry 2A
	MA 1202 Mathematics 2B
Modul Examination	Written Test

1.1.1. Sub-module I: Elementary Physics 2B

Course Name:	Elementary Physics 2B
Course Level:	Undergraduate
Abbreviation, if applicable:	FI 1202
Sub-heading, if applicable:	
Courses included in the module, if applicable:	
Semester/term:	2
Course coordinator(s):	Dr. Enjang J. Mustopha
Lecturer(s):	to be determined in each semester
Language:	Bahasa Indonesia
Classification within the curriculum:	General Studies / Major Subject / Elective Studies
Teaching format / class hours per week during the semester:	3 hours lectures, 2 hours tutorial
Workload:	3 hours lectures, 2 hours tutorial and structured activities, 2 hours individual study, 2 hours laboratory work per week, 16 weeks per semester, and total 144 hours a semester
Credit Points:	3
Requirements:	-
Learning goals/competencies:	After the course students hopefully have the following: Knowledge – Define and describe the basic concepts and principles in electromagnetism and modern physics. Skills – demonstrate an ability to conduct experiments in measuring the magnitude of magnetic fields inside a solenoid – demonstrate an ability to conduct experiments in measuring effective current and potential of an alternating current (AC)

	– prepare ampere meter and voltmeter on a direct current (DC) source and analyze the Wheatstone bridge. – demonstrate an ability to conduct experiments in a interference and diffractions Competence – Calculate the Coulomb force and electric field generated by discrete and continuous charges, including the application of Gauss's law. – compute potential energy and electric potential due to discrete and continuous charges and apply it on capacitors – compute the magnetic field generated by a current-carrying wire (Biot-Savart law and Ampere law) – apply the Faraday and Lenz's law of magnetic induction to generate electromotive Force (EMF) – solve direct current (DC) and alternating current (AC) problems – explain the quantities of electromagnetic waves, wave energy, wave power and wave intensity – solve problems on interference pattern of *N*-slit and the diffraction pattern for width-slit and N-slit (interferention-diffraction) – solve problems on Einstein's special relativity and wave- particle dualism – analyze an experiment of modern Physics (photoelectric effect) – design a simple device that uses the concepts of elementary Physics IIA (RBL)
Content:	Electrostatic (electric field, Coulomb Law) , Electric Potential Energy, Electrical Potential, Capacitor. Magnetism, Electromotive force , Alternating Current, Electromagnetic Wave, Modern Physics, Atomic Physics
Study/exam achievements:	Students are considered to be competent and pass if at least get 50% of maximum mark of the exams, homework, laboratory work, and research based learning.
Forms of Media:	Slides and LCD projectors, blackboards, lab.
Literature:	1. Cutnell, J.D. & Johnson, K.W. *Physics*. John Wiley & Sons, 2001 2. Giancoli. *Physics*. Prentice Hall, 1998. 3. Bueche, F.J. & Jerde, D.A. *Principles of Physics*. McGraw-Hill, 1995.

Notes	The course is less calculus based as compared to FI1201 Elementary Physics 2A

1.1.2. Sub-module II: General Chemistry 2A

Course Name:	General Chemistry 2A
Course Level:	Undergraduate
Abbreviation, if applicable:	KI 1201
Sub-heading, if applicable:	
Courses included in the module, if applicable:	
Semester/term:	2
Course coordinator(s):	Dr. Bambang Prijamboedi
Lecturer(s):	to be determined in each semester
Language:	Bahasa Indonesia
Classification within the curriculum:	General Studies / Major Subject / Elective Studies
Teaching format / class hours per week during the semester:	3 hours lectures, 1 hour tutorial, 3 hours experimental works.
Workload:	3 hours lectures, 4 hours tutorial and experimental works, 3 hours individual study per week, 16 weeks per semester, and total 160 hours a semester
Credit Points:	3
Requirements:	-
Learning goals/competencies:	Knowledge – Understand the formation of solution and heat of solution, solubility, Henry's law, concentration units, colligative properties. – Understand the factors that affect reaction rates, rate laws and integrated laws, mechanism of reaction. – Understand the laws of equilibrium and Le Chatelier principles. – Indentify the acid-base properties of a molecule. – Understand the pH concept, equilibrium properties of acid-base in solution and principles of acid-base titration. – Identify the solubility of various compound and understand the selective precipitation – Understand the galvanic cell, electrolysis cell, concept of reduction potential and practical application of electrochemistry. – Understand the concept of nuclear binding energy, nuclear instability and radiation. – Identify the organic and biochemistry compounds, polymers, nucleic acid. Skills

	– Apply and converse various concentration units. – Define the reaction mechanism. – Define equilibrium constant and concentration at equilibria. – Define the strength of acid and base compounds, concentration at equilibria state and using acid-base titration methods. – Define the solubility of various compound and use selective precipitation principle to separate various ions and compounds. – Apply electrochemical properties of compounds to obtain electrical energy and to modify some materials properties. – Define the unstable nuclei and the radiation types that were emitted from unstable nuclear. – identify various organic and biochemical compound. Competences – Reason the interaction among the molecules that form solution and use it to predict the properties of solution. – Reason the rate laws and construct the mechanism of reactions. – Reason the nature of acid-base properties and determine the acidity or basicity of a compound. – Apply oxidation and reduction properties of atoms and compounds explain the change of compound connected with the electron movements. – Reason the nuclear instability and activities. – Reason the properties of organic and biochemical compounds from its structural properties.
Content:	Physical properties of solution, Chemical equilibrium, Molecular concept of acid and base, Acid-base equilibria, Solubility and simultaneous equilibria, Electrochemistry, Nuclear chemistry, Organic and biochemical chemistry.
Study/exam achievements:	Students are considered to be competent and pass if at least get 48% of maximum mark of the exams and tasks. Final grades are calculated from 40% of mid-term exam, 40% of end semester exam, 10% of quizzes and 10% of experimental works.
Forms of Media:	Slides, Beamer, boards, internet, exercises, laboratory.
Literature:	1. James E. Brady, Neil D. Jespersen and Alison Hyslop, Chemistry 6th Edition, John Wiley and Sons, 2012.

	2. Raymond Chang, Chemistry 10th Edition, McGraw-Hill, 2010.

1.1.3. Sub-module III: Mathematics 2B

Course Name:	Mathematics 2B
Course Level:	Undergraduate
Abbreviation, if applicable:	MA 1202
Sub-heading, if applicable:	
Courses included in the module, if applicable:	
Semester/term:	2
Course coordinator(s):	Drs. Warsoma Djohan, M.S.
Lecturer(s):	to be determined in each semester
Language:	Bahasa Indonesia
Classification within the curriculum:	General Studies / Major Subject / Elective Studies
Teaching format / class hours per week during the semester:	3 hours lectures, 2 hours tutorial
Workload:	3 hours lectures, 3 hours tutorial and structured activities, 3 hours individual study, 16 weeks per semester, and total 144 hours a semester
Credit Points:	3
Requirements:	-
Learning goals/competencies:	After the course students hopefully have the following: Knowledge – An appreciation on the interaction between mathematics and other fields that they will learn in their study programs – Basic technical ability on the appropriate concepts, formulae, methods, and thinking Skills – Systematic, logical, and critical thinking; creative in solving problems related to concepts in Mathematics iB – Ability to communicate their works and their thinking orally and in written papers. Competence – Readiness to learn other courses that need calculus for life sciences as the prerequisite.
Content:	This course differs substantially from the usual second calculus course. It includes material on modeling biological systems with differential

	equations, dynamical systems, and omits some of the standard calculus topics infinite series, conic sections, etc. The course includes a brief introduction to the matrix and its application in the study of age-structure population, Taylor approximations, multivariable calculus, topics needed to study systems of differential equations that model such phenomena as competition, predator/prey interaction, and epidemics.
Study/exam achievements:	Students are considered to be competent and pass if at least get 50% of maximum mark of the exams, homework, and other assignments.
Forms of Media:	Slides and LCD projectors, blackboards
Literature:	1. Marvin L. Bittinger, Neal Brand, dan John Quintanilla, *Calculus for the Life Sciences,* Pearson, 2005. (main reference) 2. Claudia Neuhauser, *Calculus for Biology and Medicine,* International Edition., Prentice Hall, 2004. 3. George B. Thomas, Maurice D. Weir, Joel Hass, *Thomas' Calculus*, 12th edition, Pearson, 2010. 4. Dale Purcell, Edwin J. Purcell, Steven E. Rigdon, *Calculus*, 9th Edition, Pearson Prentice Hall, 2007.
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