SILABUS MATA KULIAH KIMIA 1 (4 SKS)

CHEMISTRY 1 COURSE SYLLABUS (4 CREDITS)

IDENTITAS MATA KULIAH ***COURSE IDENTITY***	**Nama Mata Kuliah** ***Course Name***	**:** **:**	**Kimia I** ***Chemistry 1***
	Kode MK ***Course Code***	**:** **:**	**SK234101** ***SK234101***
	Kredit ***Credits***	**:** **:**	**4 SKS (3/0/1)** ***4 Credits (3/0/1)***
	Semester ***Semester***	**:** **:**	**I/II** ***I/II***
	Rencana Tatap Muka **Teaching Schedule**	**:** **:**	**16 minggu (32 pertemuan tatap muka, 7 pertemuan lab/praktikum)** ***16 weeks (32 face-to-face meetings, 7 lab/practicum meetings)***
DESKRIPSI MATA KULIAH ***COURSE DESCRIPTION***	Matakuliah ini mempelajari prinsip prinsip dasar ilmu kimia meliputi teori atom, konfigurasi elektron, ikatan kimia, wujud zat dan perubahan fasa, reaksi kimia dan stoikhiomeri, Teori Asam Basa, Kesetimbangan Ionik dalam Larutan (Asam Basa, Kelarutan, Kompleks dan Pengendapan), Termodinamika Kimia, Kinetika Kimia dan Elektrokimia. *This course studies the basic principles of chemistry including atomic theory, electron configuration, chemical bonds, state of matter and phase changes, chemical reactions and stoichiometric, Acid-Base Theory, Ionic Equilibrium in Solutions (Acid-Base, Solubility, Complexes, and Precipitation), Chemical Thermodynamics, Chemical Kinetics, and Electrochemistry.*		
CAPAIAN PEMBELAJARAN LULUSAN YANG DIBEBANKAN MATA KULIAH ***LEARNING OUTCOME CHARGED TO THE COURSE***	1. Memiliki moral, etika, tanggung jawab dan kepribadian yang baik di dalam menyelesaikan tugasnya (A.1/CPL 1) 2. Bertanggungjawab pada pekerjaan sendiri dan dapat diberi tanggung jawab atas pencapaian hasil kerja organisasi (B.3/CPL 5) 3. Mampu mengaplikasikan pola pikir kimia dan memanfaatkan IPTEK pada bidangnya dalam menyelesaikan masalah yang dihadapi (D.1/CPL 8) 1. Able to report his/her own work in a good and disciplined manner (A.1/PLO 1) 2. Able to take responsibility for his/her own work and to give responsibility for the achievement of an organization (B.3/PLO 5) 3. Able to apply a chemistry mindset and utilize science and technology in their field and overcome problems that are faced. (D.1/PLO 8)		
CAPAIAN PEMBELAJARAN MATA KULIAH ***COURSE LEARNING OUTCAME***	1. Mahasiswa mampu menggunakan prinsip-prinsip dasar ilmu kimia sebagai dasar dalam mempelajari ilmu yang berkaitan dengan kimia. 2. Mahasiswa dapat melakukan perhitungan-perhitungan dasar kimia. 1. *The students should be able to use the principles of basic chemistry knowledge as a basis to learn chemistry which they will learn further throughout their whole studies.* 2. *The students should be able to do basic chemistry calculations.*		
POKOK BAHASAN ***SUBJECT***	**1. Struktur Atom** • Pengenalan mengenai materi (unsur, senyawa, sifat fisika, sifat kimia) • Hukum-hukum dasar penggabungan unsur (Proust, Lavoisier, Dalton) • Perkembangan model dan struktur atom • Percobaan-percobaan yang mendasarinya (Dalton, Thompson, Rutherford, Bohr dan Spektrum Atom Hidrogen) • Konfigurasi elektron suatu unsur dan ion • Sistem Periodik Unsur • Sifat periodisitas unsur		

	2. Atomic Structure • *Introduction to matter (elements, compounds, physical properties, chemical properties)* • *The basic laws of combining elements (Proust, Lavoisier, Dalton)* • *Development of atomic models and structures* • *The underlying experiments (Dalton, Thompson, Rutherford, Bohr and the Hydrogen Atomic Spectrum)* • *The electron configuration of an element and an ion* • *Periodic System of Elements* • *The periodicity of the elements* **2. Stoikhiometri** • Perhitungan konsep mol • Rumus empiris dan rumus molekul • Satuan Konsentrasi (M, N, %, m, F, ppm, ppb) • Stoikhiometri dalam Larutan • Standarisasi ***2. Stoichiometry*** • *Calculation of the concept of mole* • *Empirical formula and molecular formula* • *Concentration Units (M, N, %, m, F, ppm, ppb)* • *Stoichiometry in Solution* • *Standardization* **3. Ikatan Kimia** • Ikatan kovalen dan kovalen polar, momen dipol, ikatan logam, ikatan hidrogen, dan ikatan Van der Walls • Struktur dan bentuk geometri molekul (struktur Lewis, dan hibridisasi) ***3. Chemical Bond*** • *Polar covalent and covalent bonds, dipole moments, metallic bonds, hydrogen bonds, and Van der Walls bonds* • *Molecular geometry and structure (Lewis structure, and hybridization)* **4. Wujud Zat** • Wujud Gas (Hukum-hukum gas dan sifat fisiknya) • Wujud Cair (sifat fisik cairan: tekanan uap, titik didih, tegangan permukaan, viskositas) • Sifat Koligatif Larutan • Wujud Padat (kisi Kristal, kubus sederhana simple cube, kubus berpusat muka/*face centered cubic*, kubus berpusat badan/*body centered cubic*, indeks Miller, persamaan Bragg) ***4. State of Matter*** • *Forms of Gases (Laws of gases and their physical properties)* • *Liquid State (physical properties of liquids: vapor pressure, boiling point, surface tension, viscosity)* • *Colligative Properties of Solutions* • *Solids (Crystal lattice, simple simple cube, face centered cubic , body centered cubic , Miller index, Bragg equation)* **5. Larutan** • Teori Asam Basa (Teori Arrhenius, Brønsted-Lowry, Teori Lewis) • Derajat ionisasi dan tetapan ionisasi • Kekuatan Asam Basa • Kesetimbangan asam-basa lemah • Kesetimbangan ionik antara zat padat dan larutan • Sistem Buffer • Kelarutan

	5. Solution • *Acid-Base Theory (Arrhenius Theory, Brønsted-Lowry, Lewis Theory)* • *Degree of ionization and ionization constant* • *Acid Base Strength* • *Weak acid-base balance* • *Ionic equilibrium between solid and solution* • *Buffer System* • *Solubility* **6. Termodinamika** • Konsep termodinamika (prinsip, keadaan dan proses) • Hukum I Termodinamika: energi dalam, kerja dan kalor • Kapasitas panas, kalorimetri dan entalpi • Hukum II Termodinamika dan spontanitas • Termokimia serta penggunaannya untuk menjelaskan kespontanan reaksi kimia • Perhitungan yang berkaitan dengan aplikasi mesin Carnot ***6. Thermodynamics*** • *Thermodynamics concepts (principles, states and processes)* • *First Law of Thermodynamics: internal energy, work and heat* • *Heat capacity, calorimetry and enthalpy* • *Second Law of Thermodynamics and spontaneity* • *Thermochemistry and its use to explain the spontaneity of chemical reactions* • *Calculations related to the Carnot engine application* **7. Kesetimbangan Kimia** • Konsep Kesetimbangan Kimia dan Tetapan Kesetimbangan (Quotient reaksi, tetapan kesetimbangan Kp dan Kc) • Asas Le Chatelier • Faktor-faktor yang mempengaruhi kesetimbangan kimia ***7. Chemical equilibrium*** • *Concept of Chemical Equilibrium and Equilibrium Constant (Reaction quotient, equilibrium constant Kp and Kc)* • *Le Chatelier's Principle* • *Factors affecting chemical equilibrium* **8. Kinetika Kimia** • Konsep kinetika kimia • Laju dalam reaksi kimia • Penetuan laju reaksi, orde dan konstanta laju reaksi • Pengaruh suhu pada laju reaksi • Reaksi elementer • Katalis ***8. Chemical Kinetics*** • *Chemical kinetics concept* • *Rate in chemical reaction* • *Determination of reaction rate, order and rate constant of reaction* • *Effect of temperature on reaction rate* • *Elementary reaction* • *Catalyst* **9. Elektrokimia** • Konsep reaksi redoks • Sel elektrokimia (elektroda dan larutan elektrolit dalam sel elektrokimia) • Pengaruh konsentrasi dan persamaan Nerst • Penggunaan konsep elektrokimia untuk aplikasi sel volta (baterai dan Fuel Cells) serta elektrolisis • Korosi dan pencegahan korosi

	9. Electrochemistry • *Redox reaction concept* • *Electrochemical cell (electrode and electrolyte solution in electrochemical cell)* • *Effect of concentration and Nerst . equation* • *Use of electrochemical concepts for voltaic cell applications (battery and fuel cells) and electrolysis* • *Corrosion and corrosion prevention* **10. Pengayaan** Topik sesuai dengan bidang minat fakultas (per fakultas) ***10. Enrichment*** *Topics according to the faculty's area of interest (per faculty)* **Rencana Modul Praktikum yang Ditawarkan** 1. Oksidasi hidrogen 2. Stoikhiometri: Hukum kekekalan massa 3. Pemisahan campuran 4. Uji pH oksida 5. Pengaruh konsentrasi terhadap laju reaksi 6. Uji BOD/COD 7. Titrasi asam basa 8. Sifat larutan: elektrolit dan non-elektrolit 9. Energi bahan bakar 10. Hujan asam 11. Penentuan kandungan asam fosfat dalam *soft drink* 12. Reaksi eksotermis dan endotermis 13. Baterai berbasis timbal 14. Waktu Pelepasan Vitamin C 15. Rumus Empiris Tembaga Oksida 16. Topik-topik lain disesuaikan dengan materi pengayaan ***Practicum Module Plans Offered*** 1. *Hydrogen oxidation* 2. *Stoichiometry: Law of conservation of mass* 3. *Mixed separation* 4. *Oxide pH test* 5. *Effect of concentration on reaction rate* 6. *BOD/COD Test* 7. *Acid base titration* 8. *Solution properties: electrolyte and non-electrolyte* 9. *Fuel energy* 10. *Acid rain* 11. *Determination of phosphoric acid content in soft drinks* 12. *Exothermic and endothermic reactions* 13. *Lead Storage Batteries* 14. *Time-Release Vitamin C Tablets* 15. *The Empirical Formula of a Copper Oxide* *Other topics are adapted to enrichment material*
PRASYARAT ***Pre-Requisite Courses***	-
PUSTAKA ***REFERENCE***	1. Diktat Kimia 1 (disusun oleh Tim Dosen Departemen Kimia) 2. Oxtoby, D.W., Gillis, H.P. and Campion, A., ”Principles of Modern Chemistry”, 7th Edition, Brooks/Cole, 2012. 3. Chang, R. and Goldsby, K., “Chemistry”, 11th Edition, McGraw-Hill, USA, 2012.

	4. Goldberg, D. E., "Fundamental of Chemistry", 4th Edition, McGraw-Hill Companies, 2007. *1. Chemistry 1 (compiled by the Lecturer Team of the Department of Chemistry)* *2. Oxtoby, DW, Gillis, HP and Campion, A. , "Principles of Modern Chemistry", 7th Edition, Brooks/Cole, 2012.* *3. Chang, R. and Goldsby, K., "Chemistry", 11th Edition, McGraw-Hill, USA, 2012.* *4. Goldberg, DE, "Fundamentals of Chemistry", 4th Edition, McGraw-Hill Companies, 2007.*