MODULE HANDBOOK

Module Name	Thermodynamics of Chemistry
Module level	Bachelor
Abbreviation, if applicable	8420403140
Sub-heading, if applicable	-
Course included in the module, if applicable	-
Semester/term	4nd/Second Year
Module coordinator(s)	Dian Novita, ST., M.Pd.
Lecturer(s)	1. Prof. Dr. Harun Nasrudin, M.Pd. 2. Dian Novita, ST., M.Pd. 3. Findiyani Ernawati Asih, S.Pd., M.Pd.
Language	Indonesian
Classification within the curriculum	Compulsory Course
Teaching format/class hours per week during the semester:	3 hours lecturers (50 min per hours)
Workload:	1 CU for bachelor degree equals to 3 workhours per week or 170 minutes (50' face to face learning, 60' structured learning, and 60' independent learning). In one semester, courses are conducted in 14 weeks (excluding mid and end-term exam). Thus, 1 CU equals to 39.67 workhours per semester. One CU equals to 1.59 ECTS.
Credit points:	3 CU = 3 x 1.59 = 4.77 ECTS
Prerequisites course(s):	-
Targeted learning outcomes:	1. Understand the basic principles of thermodynamics and their application: the nature and behavior of gases; gas, energy, heat and work kinetics; inner energy and enthalpy; process direction and the concept of entropy; free energy and its relation to system stability, chemical equilibrium, electrochemical cell thermodynamics, solution thermodynamics, phase equilibrium 2. Able to solve science and technology problems in general and in simple scope such as through the application of knowledge of the properties and behavior of gases; gas, energy, heat and work kinetics; inner energy and enthalpy; process direction and the concept of entropy; free energy and its relationship with system stability, chemical equilibrium, electrochemical cell thermodynamics, solution thermodynamics, phase equilibrium, and the application of relevant technologies 3. Having the ability to take advantage of ICT-based learning resources and learning media in understanding energetic concepts. 4. Make decisions about the relationship between basic chemical concepts and laboratory activities, research results, and the existence of chemistry in everyday life.

	5. Demonstrate an attitude of responsibility for work in his field of expertise independently.
Content:	1. Ideal gas properties and real gas properties 2. Basic understanding and concepts of thermodynamics 3. The first law of thermodynamics. 4. Enthalpy function, enthalpy change and heat capacity. 5. Basic understanding and concepts of thermodynamics 6. The first law of thermodynamics. 7. Enthalpy function, enthalpy change and heat capacity. 8. Carnot loop process 9. Second law of thermodynamics 10. The change in entropy in a closed system 11. Third law of thermodynamics 12. Helmholtz free energy function 13. Gibbs free energy function 14. Fundamental equations and Maxwell's relationships 15. Chemical potential of open systems in mixtures 16. Equilibrium in the gas phase 17. Equilibrium in chemical reactions 18. Shifting equilibrium 19. Thermodynamics of solutions. 20. Thermodynamics of electrochemical cells
Study / exam achievements:	Students are considered to be competent and pass if at least get 55 Final score is calculated as follows: 20% participation + 30% assignment + 20% middle exam (UTS) & 30% final exam (UAS) Table index of graduation • A = 4 (85 ≤-≥ 100) • A- = 3,75 (80 ≤-< 85) • B+ = 3,5 (75 ≤- < 80) • B = 3 (70 ≤-< 75) • B- = 2,75 (65 ≤-<75) • C+ = 2,5 (60 ≤-<65) • C = 2 (55 ≤-<60) • D = 1 (40 ≤-<55) • E = 0 (0 ≤-<40)
Media:	Computer, LCD, White board
Learning Methods	Individuals assignment, group assignment, discussion, presentation, and practicum
Literature:	1. Atkins, Peter, and De Paula, Julio. 2010. Physical Chemistry. 9th edition. Oxford: ELBS Oxford University Press. 2. Nasrudin, H., Novita, D., dan Tjahjani, S., 2018. Termodinamika Kimia. Surabaya: Unesa University Press. 3. Bahl, A., Bahl, B.S., and Tuli, G.D. 2012. Essential of Physical Chemistry. 4th edition. New Delhi: S.Chand and Company Ltd. 4. Levine, N. Ira, 2009, Physical Chemistry, 6th edition, Singapore, McGraw-Hill.