UNIVERSITAS NEGERI JAKARTA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
CHEMISTRY STUDY PROGRAM

Jl. Rawamangun Muka, RT 11/RW 14, Rawamangun, Pulo Gadung,
East Jakarta City, Special Capital Region of Jakarta 13220
Phone/Fax: (021) 4894909, E-mail: kimia@unj.ac.id, http://fmipa.unj.ac.id/kimia/

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Bachelor in Chemistry **MODULE HANDBOOK**

Module name:	Green Chemistry
Module level, if applicable:	Undergraduate
Code:	33250202
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	Odd semester
Module coordinator:	Dr. Fera Kurniadewi, M.Si
Lecturer(s):	Prof. Dr. Erdawati, M.Sc.
Language:	Bahasa Indonesia
Classification within the curriculum:	Elective courses
Class Size	20
Type of Teaching	In class activity : Team Based Project and Project based Learning Structured activity : Group Discussion using WorkSheet Independent activity : Individual task
Teaching format / class hours per week	Learning activity can be carried out in the form of : 1. Lecture or students response a. Face to face : 50 minutes/SKS b. Structured activity : 60 minutes/SKS c. Independent activity : 60 minutes/SKS
Workload	1 CU (SKS) for bachelor degree equal to 4 work hours per week or 170 minutes. 2x50 minutes face to face, 2x60 minutes structured tasks, 2x60 minutes independent learning, for 16 weeks (including midterm and final examination), a total of 90.5 hours/semester.
Credit points:	2 SKS (3 ECTS)
Prerequisite course(s):	Analytical Chemistry

<table>
<tr><td>Course Outcomes:</td><td>After taking this course the students have ability to:
CLO 1. Apply various methods to measure the greenness of a chemical reaction
CLO 2. Classifying the components of NADES pelarut solvent components
CLO 3. Distinguishing the method of making NADES
CLO 4. Applying NADES solvent for extraction
CLO 5. Determining the environmental impact of a chemical process</td></tr>
<tr><td>Content:</td><td>1. Green Chemistry History
2. Green Chemistry Principal
3. Analysis of the Greenness Level of chemical processes based on the ecoscale value
4. Analysis of the Greenness Level of chemical processes based on the Green Chemistry Matrix
5. Analysis of the Greenness Level of chemical processes based on the Green Star Matrix
6. NADES eco-friendly solvent
7. Presentation of the extraction task with NADES solvent
8. LCA Analysis
9. Presentation task of LCA
10. Solvent Toxicity Analysis
11. Green chemistry-based product manufacture</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are twO-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests (60%) and structured tasks (40%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO 1-5</td><td>a. Individual assignments
b. UTS
c. UAS
d. Participation</td><td>Written test</td><td>30%
30%
30%
10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
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</td></tr>
<tr><td>Media</td><td>Power point presentation, Laptop, Whiteboard, Zoom, Google Classroom, Ms. Teams</td></tr>
</table>

Literatures	1. Agnieszka Gałuszka, Piotr Konieczka, Zdzisław M Migaszewski,Jacek Namies´nik,2012, .Analytical Eco-Scale for assessing the greenness of analytical procedures. *Trends in Analytical Chemistry*, 37, 2012 2. Gabriela T.C. Ribeiro , Dominique A. Costa & Adélio A.S.C. Machado.2010. "Green Star": a holistic Green Chemistry metric for evaluation of teaching laboratory experiments, *Green Chemistry Letters and Reviews*, 3:2, 149-159, 3. MarekTobiszewski, JacekNamieśnik.2015.Scoring of solvents used in analytical laboratories by their toxicological and exposure hazards . *Ecotoxicology and EnvironmentalSafety*120 :169-173 4. Dariane Trivisiol da Silvaa, Roberson Paulettob, Sabrina da Silva Cavalheirob,Vivian Caetano Bochic, Eliseu Rodriguesd, Julia Webere, Cristiane de Bona da Silvae,Fernando Dal Pont Morissof, Milene Teixeira Barciab, Tatiana Emanuellib, 2020Natural deep eutectic solvents as a biocompatible tool for the extraction of blueberry anthocyanins. *Journal of Food Composition and Analysis* 89 : 103470 5. Kenneth C. Hoffman, Andrew P. Dicks.2020. Shifting the paradigm of chemistry education by Greening the high school laboratory . *Sustainable Chemistry and Pharmacy* 16 :100242 6. M. Gabriela T.C. Ribeiro , Dominique A. Costa & Adélio A.S.C. Machado. "Green Star": a holistic Green Chemistry metric for evaluation of teaching laboratory experiments. *Green Chemistry Letters and Reviews* 7. Justyna Płotka-Wasylka, Vasil Simeonov, Jacek Namiesnik.2016. An in situ derivatization – dispersive liquid-liquid microextraction ´ combined with gas-chromatography – mass spectrometry for determining biogenic amines in home-made fermented alcoholic drinks, *Journal of Chromatography A* 1453 :1-18 8. Myrsini Papageorgiou, Dimitra Lambropoulou, Calum Morrison, Jacek Namieśnik and Justyna Płotka-Wasylka, Direct solid phase microextraction combined with gas chromatography – mass spectrometry for the determination of biogenic amines in wine, Talanta,183 : 276-282

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CO1						V	V					
CO2						V	V					
CO3						V	V					
CO4						V	V					
CO5						V	V					