**UNIVERSITAS NEGERI YOGYAKARTA**
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF CHEMISTRY
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| Module name: | Membrane Technology |
| Module level, if applicable: | Undergraduate |
| Code: | KMA 6229 |
| Sub-heading, if applicable: | - |
| Classes, if applicable: | - |
| Semester: | 7th |
| Module coordinator: | Prof. Dr. Endang Widjajanti LFX |
| Lecturer(s): | 1. Prof. Dr. Endang Widjajanti LFX<br>2. Dr. Eli Rohaeti |
| Language: | Bahasa Indonesia and English |
| Classification within the curriculum: | Elective Course |
| Teaching format / class hours per week during the semester: | 100 minutes lectures, 120 structured activities and 120 individual study per week |
| Workload: | Total workload is 90,67 hours per semester which consists of 100 minutes lectures, 120 structured activities and 120 individual study per week for 16 weeks |
| Credit points: | 2 SKS (3,29 ECTS) |
| Prerequisites course(s): | 1. Mathematics for Chemistry<br>2. General Chemistry<br>3. Chemical Equilibrium |
| Course Outcomes | After taking this course the students have ability to:<br>CO1 — Apply membrane utilization in solving problems and chemical research<br>CO2 — Analyze membrane utilization in everyday life<br>CO3 — Apply the theory of membrane technology from the latest sources as an innovation activity |
| Content: | The course discusses the basic concepts of membrane technology, contain: the understanding of membranes, making membranes, processes and how membranes work and their utilization.<br>1. Definition of Membrane and History of Membrane Development<br>2. Membrane classification<br>3. Theory about membranes<br>4. Membrane transport theory<br>5. Membranes and modules<br>6. Microfiltration, Ultrafiltration, Nanofiltration, and RO<br>7. Applications about Microflitration, Ultrafiltration, Nanofiltration, and RO<br>8. Application of membranes in biomedicine |
| Study / exam achievements: | Attitude assessment is carried out at each meeting by observation and / or self-assessment techniques using the |

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<tr><td></td><td>assumption that basically every student has a good attitude. The student is given a value of very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not a component of the final grades, but as one of the requirements to pass the course. Students will pass from this course if at least have a good attitude.<br>The final mark will be weight as follow:<br><br>
<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO1, CO2 and CO3</td><td>a. Assignment<br><br><br>b. Participation<br>c. Midterm Exam<br>d. Final Exam</td><td>Presentation/ written assignment<br><br><br>Observation<br>Written test<br>Written test</td><td>30%<br><br><br>20%<br>20%<br>30%</td></tr>
<tr><td colspan="3"></td><td>Total</td><td>100%</td></tr>
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<tr><td>Forms of media:</td><td>White Board, LCD Projector, Laptop/Computer, stationery</td></tr>
<tr><td>References:</td><td>

1. Amusa, A.A.; Ahmad, A.L.; Adewole, J.K. Mechanism and Compatibility of Pretreated Lignocellulosic Biomass and Polymeric Mixed Matrix Membranes: A Review. *Membranes* **2020**, *10*, 370.
2. Xu, W.; Liu, D.; He, L.; Zhao, Z. A Comprehensive Membrane Process for Preparing Lithium Carbonate from High Mg/Li Brine. *Membranes* **2020**, *10*, 371.
3. Tadashi Uragami, 2017, Science and Technology of Separation Membranes, Wiley.
4. J. Bundschuh, Jan Hoinkis, Alberto Figoli, Sacide Alsoy Altinkaya, 2017, Application of Nanotechnology in Membranes for Water Treatment, Series: Sustainable Water Development. Vol. 5. CRC Press.
5. Norman N. Li, A.G. Fane, W.S. Wisnton Ho, Takeshi Matsuura (2008), *Advanced Membrane Technology and Applications*, John
6. Wiley & Sons, Inc. 2) U2. Cheryan, M. (1998), *Ultrafiltration and Microfiltration Handbook*, Technomic Publishing Company, Inc.
7. Mulder,M. (1996), *Basic Principles of Membrane Technology*, 2nd Edition, Kluwer Academic Publishers
8. Faisal I.Hai, Kazuo Yamamoto. Chung-Hak Lee (2014), *Membrane Biological Reactors*, International Water Association.

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**PLO and CO mapping**

| | PLO | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Attitude | General Skill | | Knowledge | | | | Specific Skill | | |
| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 | PLO10 |
| CO1 | | | | | √ | | | | | |
| CO2 | | | | | | | √ | | | |
| CO3 | | | | | | | | | √ | |