**UNIVERSITAS NEGERI YOGYAKARTA**
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF CHEMISTRY
1 Colombo Street Yogyakarta 55281
Phone (0274) 565411, Ext. 1398, Fax (0274)548203
Website: http://kimia.fmipa.uny.ac.id, E-mail: kimia@uny.ac.id



| | |
|---|---|
| Module name: | Geochemistry |
| Module level, if applicable: | Undergraduate |
| Code: | KMA 6249 |
| Sub-heading, if applicable: | - |
| Classes, if applicable: | - |
| Semester: | 6th |
| Module coordinator: | Sunarto, M.Si |
| Lecturer(s): | Sulistyani, M.Si |
| Language: | Bahasa Indonesia and English |
| Classification within the curriculum: | Elective Subject |
| 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 136 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 (3.28 ECTS) |
| Prerequisites course(s): | - |
| Course Outcomes | After taking this course, the students are expected:<br>CO1. Being able to show independent attitude and responsibility in carrying out structured and independent tasks.<br>CO2. Able to explain the basic principles of geochemical science and its history.<br>CO3. Able to explain the relationship between the earth and the universe.<br>CO4. Able to explain the structure of the earth and the minerals it contains.<br>CO5. Able to explain the role of thermodynamics and crystal chemistry.<br>CO6. Able to reason the events of magmatism and material that are formed.<br>CO7. Able to trace and analyze differences in the distribution of isotopes in various materials including: volcanic gas, rocks, wood, and bones.<br>CO8. Able to trace and analyze crude oil, its composition and its properties. |
| Content: | This lecture covers theories that include material; the principles and history of geochemistry, earth and its relationship to the universe, the structure and content of the earth, thermodynamics and crystals chemistry, magmatism and igneous rock, sedimentation and sedimentary rocks, |

<table>
<tr><td></td><td>and isotope geochemistry. Lecture emphasizes the mastery of lecture material logically and scientifically and the ability to use scientific methods to solve problems faced by students.<br><br>The course consists of:<ul><li>Geochemical Principles</li><li>Earth and Relationship with the Universe</li><li>Earth's Structure and Content</li><li>Thermodynamics and crystal chemistry for geochemistry</li><li>Magmatism</li><li>Precipitation and Deposition Rock</li><li>Isotope Geochemistry</li><li>Hydrocarbons</li></ul></td></tr>
<tr><td>Study / exam achievements:</td><td>Attitude assessment is carried out at each meeting by observation and/or self-assessment techniques using the assumption that basically every student has a good attitude. The student is marked very good or not good attitude if they show it significantly compared to other students in general. The result of attitude assessment is not taken into account in 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. 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,<br>CO2,<br>CO3,<br>CO4,<br>CO5,<br>CO6,<br>CO7,<br>CO8.</td><td>a. Assignments<br>b. Quiz<br>c. Midterm Exam<br>d. Final Exam</td><td>Presentation / written test</td><td>20%<br>20%<br>30%<br>30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Handout, Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>References:</td><td>Handbooks<ul><li>Terry J. McGenity, Kenneth N. Timmis and Balbina Nogales. (2017). Hydrocarbon and Lipid Microbiology Protocols: Petroleum, Hydrocarbon and Lipid Analysis. Berlin: Springer-Verlag.</li><li>Jochen Hoefs. (2015). Stable Isotope Geochemistry. 7th edition. Switzerland: Springer International Publishing.</li><li>Naotatsu Shikazono. (2015). Environmental and Resources Geochemistry of Earth System: Mass Transfer Mechanism, Geochemical Cycle and the Influence of Human Activity. Japan: Springer.</li><li>Kula C. Misra. (2012). Introduction to geochemistry: principles and applications. UK: Wiley-Blackwell.</li><li>John P. Raferrty. (2012). Minerals (Geology Landforms, Minerals, and Rocks). New York: Encyclopedia Britannica, Inc.</li></ul></td></tr>
</table>

| | |
|---|---|
| | • Ronald Louis Bonewitz. (2012). Nature Guide Rocks and Minerals. US: Dorling Kindersley Limited<br>• Walter L. Pohl. (2011). Economics geology principles and practice. metals, minerals, coal and hydrocarbons introduction to formation and sustainable exploitation of mineral deposits. UK: Wiley-Blackwell.<br>• HD Holland and KK Turekian. (2011). Geochemistry of Earth surface systems. UK: Elsevier Ltd.<br><br>**Journals**<br>• Steven J. Desch and Katharine L. Robinson. (2019). A unified model for hydrogen in the Earth and Moon: No one expects the Theia contribution. *Geochemistry*. **79.** 125546.<br>• C. Israel, et al. (2019). Formation of the Ce-Nd mantle array: Crustal extraction vs. recycling by subduction. *Earth and Planetary Sci. Lett.* https://doi.org/10.1016/j.epsl.2019.115941.<br>• Massimo Chiaradia, Othmar Müntener, Bernardo Beate. (2019). Effects of aseismic ridge subduction on the geochemistry of frontal arc magmas. *Planetary Sci. Lett.* https://doi.org/10.1016/j.epsl.2019.115984.<br>• Bruce Fegley Jr, Katharina Loddersa, Nathan S. Jacobson. (2019). Volatile element chemistry during accretion of the earth. *Geochemistry.* **80**. 125594.<br>• Cornelius Oertel, Jörg Matschullat, Kamal Zurba, Frank Zimmermann, Stefan Erasmi. (2016). Greenhouse gas emissions from soils—A review. *Chemie der Erde*, **76**. 327–352.<br>• Mrinal KB, Probhat K, and Gobin CB. (2014). Geochemical Association of $Ni^{2+}$, $Zn^{2+}$, $Pb^{2+}$, $Ag^{+}$, $Cu^{2+}$, and $Co^{2+}$ Ions in Natural Pyrite. *Journal of Geochemistry*. 161850. http://dx.doi.org/10.1155/2014/161850. |

**PLO and CO mapping**

| | PLO | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Attitude | General Skill | | Knowledge | | | | Specific Skill | | |
| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 | PLO10 |
| CO1 | | √ | | | | | | | | |
| CO2 | | | | | √ | | | | | |
| CO3 | | | | | √ | | | | | |
| CO4 | | | | | √ | | | | | |
| CO5 | | | | | √ | | | | | |
| CO6 | | | | | √ | | | | | |
| CO7 | | | | | | | | √ | | |
| CO8 | | | | | | | | √ | | |