

**Department of Earth Sciences and Petroleum**

**College of Science**

**University of Salahaddin**

**Subject: Rock-Forming Minerals –Theoretical Part**

**Course Book –2nd Year**

**Lecturer's name:**

**Theoretical Part: Dr. Waleed Sulaiman Aswad**

**Academic Year: 2022-2023**

**Course Book**

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| **1. Course name** | **Rock Forming Minerals**  |
| **2. Lecturer in charge** | **Dr. Waleed Sulaiman Aswad** |
| **3. Department/ College** | **Earth Sciences and Petroleum/College of Science**  |
| **4. Contact** | **e-mail:** **waleed.aswad@su.edu.krd****Tel: (optional):**  |
| **5. Time (in hours) per week**  | **Theory: 2** **Practical: 6**  |
| **6. Office hours** | To be Return to the schedule on the office door |
| **7. Course code** |  |
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| **From - to** | **Degree** | **College-University** | **Country**  |
| 2013 to date | PhD in Geology, sedimentary, Department of Geology | College of Science- University of Mosul | Iraq |
| 2006 to 2013 | MSc. in Geology, Rock and Minerals, Department of Geology | College of Science- University of Salahaddin | Iraq |
| 2000 to 2006 | BSC. in Geology, Department of Geology | College of Science- University of Salahaddin | Iraq |

**8. Teacher's academic profile** Academic achievements and Qualifications: (starting from the most recent degree)I graduate from Salahaddin University in 2000 (Ranked 1st in Geology Dept., Collage of Science). I accepted in post graduate MSc in 2006 and I finished my MSc degree and start as assistant lecturer for teaching a practical part (Practical Geology, Practical Sedimentology, and Practical mineralogy). I start as an Assistant Lecturer in College of Science in 2006 and as a Lecturer in College of Science from 2013 – 2017. I get my Assistant Professor address in 2017. I worked as a Member of the Examination Committee for College of Science. I worked as a head of Central Examination Committee for Geology Dept. in College of Science in 2013-2014.   |
| **9. Keywords** | Geology, Mineralogy, Crystal systems, Mineral Chemistry  |
| **10. Course overview:** Course description, objectives, and format Since minerals are the basic building blocks of earth materials, this course is designed to give the student a fundamental background in minerals, necessary to understand earth materials.  The student will learn the basic principles behind the arrangement of atoms to form crystal structures, how these atoms are coordinated and bonded and how this is reflected in the external form, chemical composition, and physical properties of the crystals.  The student will learn how to identify the most common minerals in hand specimen and, by using optical techniques, learn how to identify the common minerals in thin section.The study of minerals from discovery of an ore body through extraction of minerals and finally to returning the land to its natural state consists of several distinct steps. The first is identification of the mineral, and second the discovery of the ore body, which is carried out through [prospecting](https://en.wikipedia.org/wiki/Prospecting) or [exploration](https://en.wikipedia.org/wiki/Mineral_exploration) to find and then define the extent, location and value of the ore body. This leads to a mathematical [resource estimation](https://en.wikipedia.org/wiki/Mineral_resource_classification) to estimate the size and [grade](https://en.wikipedia.org/wiki/Ore_grade) of the deposit.The Rock-Forming minerals course consists of 12 lectures (annually) and covers topics are integrated with the mineralogy, petrology, ore deposits, geochemistry, economic and industry. Course learning objectives  By the end of this course, students will be able to apply their basis background in mineralogy and mineral chemistry to the practice of metal industry, building materials, and in scientific research about type of metal and minerals in our country. Detailed learning objectives are provided for each lecture.  |
| **11. Course objective:** Each lecture is accompanied by a power point presentation. Information from the presentation and assigned reading is important for mastering the learning objectives which are the primary focus of exam questions.  |
| **12. Student's obligation** \*Exam policy: in addition to present a good report about metals in Kurdistan the student Should take 2 examinations during the course. \*Classroom polices: 1. Attendance: You are strongly encouraged to attend class on a regular basis, as participation is important to your understanding of the material. This is your opportunity to ask questions. You are responsible for obtaining any information you miss due to absence.
2. Lateness: Lateness to class is disruptive.
3. Electronic devices: All cell phones are to be turned off at the beginning of class and put awayduring the entire class.
4. Talking: During class please refrain from side conversations. These can be disruptive to your fellow students and your professor.
5. No Disrespectful to both the professor and to your fellow students.
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| **13. Forms of teaching** Course book, Power point, Soft and hard copy lectures, white board and black board. |
| **14. Assessment scheme** **Examinations** There will be at least two obligate exams through the course, each exam will contain multiple-choice, true-or-false, short answer questions, long answer questions, give the reasons, solving the problems, make the diagram, etc. . **Quizzes and weekly assignments:**  There are a series of 10 minutes quizzes or special take-home assignments totally (5) marks. The lowest grade is dropped.  The exam has (15) marks, the practical exam have (35) marks, so the final grade will be based upon the following criteria:  Mean of two examinations: 15%  Practical examination: 35%  Final examination: 50% **For Students**  After each exam (especially the 1st one), evaluate your performance and earning/study strategies. Did your performance reflect the effort you made and your confidence in knowing the material before the exam? Analyse the questions you missed, along with the challenges and responses, and try to figure out why you missed each one, e.g. couldn't remember the information, misunderstood the information, couldn't apply your knowledge to a problem solving question. Once you identify specific problems, you can implement specific solutions. If you want help with this type of evaluation, contact your lecturer.  |
| **15. Student learning outcome:** At the end of your undergraduate teaching you will be expected to be able to: * Recognize the mineral crystals and chemistry and the origin.
* Recognize pattern of distribution minerals within the rocks.
* Have a good knowledge about economic minerals and non-economic.
* To know the different types of minerals.
* Learned approaches which can be used for the developed mines based on mineralogy
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| **16. Course Reading List and References:** There are two required textbooks for this course. The first is required reading for the course and the second is a general reference that you will also use in Petrology next semester. * Klein - Manual of Mineral Science, 23rd edition, by Cornelis Klein and Barbara Dutrow.  This text covers crystallography, crystal structure, and crystal chemistry and has useful mineral identification tables. It will be used extensively for lectures at the beginning and end of the course.
* DHZ - An Introduction to the Rock Forming Minerals, 2nd Edition, by W.A. Deer, R.A. Howie, and J. Zussman. This is a general reference text covering identification of minerals with the petrographic microscope. It will be used in the lab during the second half of the course .
* An Introduction to Geology and Hard Rock Mining, ROCKY MOUNTAIN MINERAL LAW FOUNDATION, by Willard Lacy, 2015, Science and Technology Series, 147p.
* Applied Mining Geology, Modern Approaches in Solid Earth Sciences, v. 12, Abzalov, M., 2016, Springer, 443p.

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| **17. The Topics:**

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| **Week** | **Subject** |
| **C.B** | **Rock Forming Minerals**  |
|  | **Atoms** |
|  | **Bonds**  |
|  | **Coordination and Pauling's Rules** |
|  | **Mineral Chemistry** |
|  | **Twinning, Polymorphism, Polytypism, Pseudomorphism** |
|  | **Mineral Stability and Phase Diagrams** |
|  | **TWO COMPONENT (BINARY) PHASE DIAGRAMS** |
|  | **Silicate Structures, Structural Formula, Neso-, Cyclo-, and Soro- Silicates** |
|  | **Inosilicsates (Pyroxenes and Amphiboles)** |
|  | **Phyllosilicates (Micas, Chlorite, Talc, & Serpentine)** |
|  | **Tectosilicates,**  |
|  | **Carbonates, Oxides, & Accessory Minerals** |
|  | **Weathering & Clay Minerals** |
|  | **X-ray** |

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|  **18. Examinations:** 1. *Compositional: In this type of exam the questions usually starts with Explain how, What are the reasons for…?, Why…?, How….?*
2. *True or false type of exams: In this type of exam a short sentence about a specific subject will be provided, and then students will comment on the trueness or falseness of this particular sentence.*
3. *Multiple choices: In this type of exam there will be a number of phrases next or below a statement, students will match* the correct *phrase.*
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| **19. Extra notes:** **In end of this course every student need to prepare a short report about one of the economic metal.** |
| **20. Peer review** This course about Mining geology is perfect for BSc student. It will make them familiar with mining and economic metals and all the process related to them Professor *Dr. Faraj Habib Tobia*  |