

Ministry of Higher Education and Scientific research



Department of: Earth Sciences and Petroleum

College of: Science

University of: Salahaddin

Subject: Crystallography

Course Book: 1st Year

Lecturer's name: Baran Hasan Mustafa (M.Sc.)

Academic Year: 2023/2024

Course Book

1. Course name	Crystallography
2. Lecturer in charge	Baran H. Mustafa (M.Sc.)
3. Department/ College	Department of Earth Sciences& petroleum/ College of Science
4. Contact	e-mail: baran.mustafa@su.edu.krd Tel: 07504728561
5. Time (in hours) per week	Theory: 2 hours Practical :10 hours
6. Office hours	5-6 hours
7. Course code	
8. Teacher's academic profile	I graduated from University of Salahaddin on 2005, and then I got the M.Sc. in geochemistry from the same university in 2015. From 2015 till now I gave many courses in the Department of Geology/ Science College and General science department/ Basic education College such as Mineralogy, Geochemistry, and minerals &Rocks.
9. Keywords	Crystallography, crystal, elements
10. Course overview:	This course focuses on the study of crystal, its definition, systems, forms, symmetry, and type of crystal projections. Crystallography is important for the minerals studying. There are six systems of crystal that minerals are crystallized on it. Atoms arranged according to these systems. <u>Crystal morphology, point group, crystal projection, miller indices</u> will be studied in details.
11. Course objective:	The successful student in this course will achieve the following: <ul style="list-style-type: none"> • Understand and familiarize with six systems and forms of crystal, the system of minerals, teaching them how to identify and realize crystallography. • Projection of wooden crystal sample on stereo net. • The relation between crystallography and Mineralogy.
12. Student's obligation	Students are expected to attend class regularly each week on exact time. Attendance and participation will be considered in the final grade. Students are expected to be prompt, attentive and prepared for lab. Students that arrive late for an exam will not be permitted to take the exam. Students must prepare a report at the end of the lab.
13. Forms of teaching	Different forms of teaching will be used to reach the objectives of the course: <ul style="list-style-type: none"> • Power point presentations for the titles, definitions and crystal systems, all figures, chart, table that related to the crystals. The classroom discussions at the beginning of the lab for the previous subject. • To get the best of the course, it is recommended that student attend each lab as much as possible, read all about crystals, and try saving and imagining crystal shape and systems. Try as much as possible to participate in classroom discussions.
14. Assessment scheme	Exams will be comprehensive, meaning that each exam will cover all material that precedes it. The exam has 7.5 marks.

15. Student learning outcome:

This course is intended to be the undergraduate student's course in crystallography. Crystallography provides information about the arrangement of atoms, ions, molecules, of mineral, which are the compositions of the outer part of the earth (crust) rocks. In this course student will be familiarize with the simple basic for studying mineral in the next course.

16. Course Reading List and References:

1. Allaby, M., Coenraad, R.R., Hutchinson, S., McGhee, K., O'Byrne, J., Rubin, K. (2008) The Encyclopedia of Earth, A Complete Visual Guide. Weldin Owen Group, Sydney, Australia. 608p.
2. Busch, R. M. (2006) Laboratory manual in physical geology. 7th Edition, Pearson Prentice Hall, Upper Saddle River, New Jersey. 302p.
3. Coenraad, R.R. (2008) Rocks & Fossils A visual Guide. 2nd Edition, Firefly Book, USA. 304P.
4. Klein, C. Cornelius, S. Hurlbut, Jr. (1985) Manual of Mineralogy. 20th Edition, John Wiley & Sons, New York, Chichester, Brisbane, Toronto, Singapore. (After James D. Dana) 596 p.
5. Sen, G. (2001) Earth's Materials Minerals and Rocks. 1st Edition, Prentice Hall, Upper Saddle River, New Jersey. 542p.
6. Plummer, C. C. McGary, D. Carlson, D. H. (2005) Physical Geology. 10th Edition, McGraw-Hill, New York. 580p.

17. The Topics: Crystallography course

Lecturer's name

Week 1: Definition and concept

Baran H. Mustafa

Definition, Crystal builds, Crystal morphology, Crystallographic elements.

2 hours

Week 2: Crystal systems and Symmetry in crystal

2 hours

The six systems of crystal and Symmetry of crystals

Types of operation, Axes of symmetry, Plane of symmetry, point of symmetry.

2 hours

Week 3: Miller indices

2 hours

Bravais lattices, Axial ratio, Weiss Parameters

Week 4: Forms of crystal

2 hours

Forms, classification of forms (**Examination**)

<p>Week 5: Forms of crystal</p> <p>Naming of form, Hermann-Mauguin</p> <p>Week 6: Crystal projection</p> <p>Crystal projection, Types of crystal projection, stereographic projection</p> <p>Week 7: Point group</p> <p>Point groups, crystallographic symbols</p> <p>Week 8: Examination</p>	<p>2 hours</p> <p>2 hours</p> <p>2 hours</p>
<p>19. Examinations:</p> <p>Q/ Compare between Euhedral and Anhedral crystals?</p> <p>Q/ In this crystal determine the number of Faces:</p> <p>Solid angles:</p> <p>Q/ Fill the blanks with correct words:</p> <ol style="list-style-type: none"> 1. <u>Unit cell</u> is the smallest three- dimensional portion of a complete space lattice. 2. <u>X-ray</u> crystallography of crystal led to the recognition of the unit cell. 3. Crystal projection are of three types- <u>Clinographic</u> , <u>Spherical</u> , <u>Stereographic</u> <p>Q/ If you know the unit cell dimensions for mineral Quartz (Trigonal system) are $a_1=a_2=a_3=4.504\text{\AA}$; $c=5.405\text{\AA}$; Find the axial ratio for the mineral?</p>	
<p>20. Extra notes:</p>	
<p>21. Peer review</p> <p>Dr. Faraj H. Tobia</p>	