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**Department of Geology**

**College of Science**

**University of Salahaddin**

**Subject: Industrial rocks and Minerals**

**Course Book – *4***

**Lecturer's name Avin Ali Mahmood**

**Academic Year: *2022-2023***

**Course Book**

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| **1. Course name** | **Industrial rocks and minerals** |
| **2. Lecturer in charge** | **Avin Ali Mahmood** |
| **3. Department/ College** | **Science** |
| **4. Contact** | **e-mail:Avin.Mahmood@su.edu.krd** **Tel: (optional)** |
| **5. Time (in hours) per week**  | **Practical: 6**  |
| **6. Office hours** |  |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **2012-2013/ BSc in Science college- Geology Dept. Salahaddin Uni.****2014-2016/ MSc in industrial rocks and minerals in Scence college- Geology Dept. Salahaddin Uni.****2019-current/ Phd student in Scence college- Geology Dept. Salahaddin Uni.** |
| **9. Keywords** |  |
| **10. Course overview:** The course covers rocks and minerals used in industry, their importance, extraction methods and ways, their properties (physical, chemical, petro-physical, mechanical, engineering, thermal, thermo-dynamical, and mineralogical), their quality and quantity, and workability. The student takes practical laboratory works on how to select a suitable industrial area in charge economically in terms of easy quarrying, quantity, near infrastructures, and without cover beds. The students will be able to measure how good quality bricks are obtained, raw material measurements for Portland cement manufacturing, and sand, gravel and limestone estimation for building material, measuring porosity, water absorption, density, specific gravity, moisture content, thermal conductivity, modulus of rupture, and compressive strength measuring procedures and plotting them on semi-log diagram for better understanding their relationships in brick manufacturing. Ore reserve estimation of different building materials used in industry measured according to standard specifications.  |
| **11. Course objective:**Industrial minerals are non-metals including crushed rock, sand, and gravel. They are essential for construction of buildings and highways, and are used in many household products and industrial processes. ur use of rocks and minerals includes as building material, cosmetics, cars, roads, and appliances. In order maintain a healthy lifestyle and strengthen the body, humans need to consume minerals daily. Rocks such as marble and granite are used in construction industries. They are cut into stones and are used for building houses, dams, roads, etc. Rocks also provide raw materials such as limestone and gypsum used in the manufacturing of cement. |
| **12. Student's obligation** The course is important for students in terms of practical physical, chemical, mechanical, petrophysical properties measurments in the laboratory |
| **13. Forms of teaching**The teaching methods used throughout the course represent; software and hardware data that will be solved by students in the form of exercises, using data shows for presenting the laboratory work theoretically,  |
| **14. Assessment scheme**3 quiz within the course book=3 marksPresence in the laboratory=2 marksReport preparation= 5 marksDaily activities=2 marksFinal exam= 25 marks‌ |
| **15. Student learning outcome:**This practical lab work helps students after their employment and investment in private and governmental companies in terms of selecting economic rock and mineral zones for different industrial works  |
| 16. Course Reading List and References‌:▪ <https://catalog.libraries.psu.edu/catalog/2616667><https://catalog.libraries.psu.edu/catalog/1668257><https://catalog.libraries.psu.edu/catalog/7060706>http://ezaccess.libraries.psu.edu/login?url=http://onlinelibrary.wiley.com/book/10.1002/0471238961 |
| **17. The Topics:** | **Lecturer's name** |
| 1. Industrial rocks and minerals in use
2. Ore reserve estimation
3. Building materials
4. Cover bed estimation
5. Cement manufacturing
6. Brick manufacturing
7. Lime Manufacturing
8. Sand and gravel use in the industry
9. Limestone use in the industry
10. Gradation and blending
11. Other industrial uses
12. Density estimation
13. Thermal condustivity
 | Lecturer's name avin ali mahmoodex: (2 hrs)ex: 14/10/2022 |
| **18. Practical Topics (If there is any)** |  |
| Ore reserve estimationRaw material mixture  | Lecturer's name avin aliex: (3-4 hrs)ex: 14/10/2023 |
| **19. Examinations:**1. ***1. Compositional*** Estimate the building material economy and cover bed extraction cost?
2. If you know that the volume of cover bed is 30m3 and volume of sandstone is 53m3, then estimate the project economically with cover bed extraction cost of 2$/cm3 and sand price 11$/m3
3. Why in most of the cases we neglect one or more wells before measuring area of the field economy?
4. In most of the cases we often add an extra well in one or more directions, why, on which bases we add this?
5. Whats the stripping ratio equation?

***True or false type of exams:***1. ***2.*** Estimate field project economy based on stripping ratio value?
2. Stripping ratio should be in which value for an economic filed project?
3. If the cover bed is 3m then the economic building sediment should be how much for an economic field project based on stripping ratio equation?
4. Find the mass of the deposit in tons if its in grams?
5. Find out the mass of sandstone with 1.568gm/cm3 density and 2374m3 volume?
6. Convert tons of the mass of gravel for cement manufacture to kg

***3. Multiple choices:***1. I If we have field of project made of cover sand and gravel, then crushing, separation, transportation processes are made for which of them?
2. How we can estimate ore reserve by coordination method?
3. Write down the coordination method rule and its benefits in the field quarry?
4. If the volume of clay is 567m3, and its selling price is 5$/m3, then find out its cost, if you know that 6% of the clay is lost during transportation?
5. For brick manufacturing what are the basic physical properties that should be find out before application in construction?
6. Write down the procedure for measuring the quality of brick?
7. How the dry weight, suspended weight and saturated weight measured for brick?
8. Good quality brick should have which aspects for using in construction?
9. Write down the apparent porosity and density relation of brick
10. Write down the apparent porosity and water absorption relation of brick
11. Whats the relation between density and heat conductivity of brick?
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| **20. Extra notes:**Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks. |
| **21. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ** This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.*(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).*ئه‌م کۆرسبووکه‌ ده‌بێت له‌لایه‌ن هاوه‌ڵێکی ئه‌کادیمیه‌وه‌ سه‌یر بکرێت و ناوه‌ڕۆکی بابه‌ته‌کانی کۆرسه‌که‌ په‌سه‌ند بکات و جه‌ند ووشه‌یه‌ک بنووسێت له‌سه‌ر شیاوی ناوه‌ڕۆکی کۆرسه‌که و واژووی له‌سه‌ر بکات.هاوه‌ڵ ئه‌و که‌سه‌یه‌ که‌ زانیاری هه‌بێت له‌سه‌ر کۆرسه‌که‌ و ده‌بیت پله‌ی زانستی له‌ مامۆستا که‌متر نه‌بێت.‌‌  |