

**Department of Earth Sciences and Petroleum**

**College of Science University of Salahaddin Subject: Industrial Geology**

**CourseBook–Year 4 / Second semester**

**Lecturer'sname: Ahmed M. Aqrawi(Ph.D.)**

**Ms. Aveen Ali**

**AcademicYear: 2022/**2023

**CourseBook**

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| **1.Coursename** | IndustrialGeology |
| **2.Lecturerincharge** | **Ahmed m. Aqrawi (Ph.D.)** |
| **3.Department/ College** | Geology/Science |
| **4.Contact** | **e-mail:ahmed.aqrawi@su.edu.krd**  **Tel: 07504470939** |
| **5.Time (in hours)per week** | Theory: 2  Practical:3 |
| **6.Office hours** | 15hoursper week |
| **7.Course code** |  |
| **8.Teacher'sacademic profile** | I graduated from University of Mosul on 1982, and then I got the M.Sc. in geochemistry and petrology from the Mosul University. I was engaged to work as an assistant lecture on 1992 at Salahaddin University/ College of Science. I hold Ph.D. in petrology and mineralogy on 2001 from Baghdad University. I awarded the assistant professor degree in 2009. During my work I carried out nine of published researches and scientific reports.  From 1992 till now I gave many courses in the Department of Geology such as Optical Mineralogy, Igneous petrology, metamorphic petrology , Petrology and many courses for M.Sc. students such as advanced petrology, Industrial rocks & minerals and geochemistry of igneous and metamorphic |
| **9.Keywords** | Nonmetallic,Features,Classification,Industrialrocks,  Industrialminerals,Uses. |
| **10. Course overview:**  Industrialgeologyisaconnectionsubject betweenallthetypesofrocksandmineralswith theirindustrialuses.Thereforeit'simportant tostudying theorigin,occurrenceand propertiesoftheserocksandminerals.Themainaimofthiscourseisfocusingon those rocks andmineralswhichcanbe usedinindustry. Thiswill needtostudy the treatment processesand procedures.Therearemany thingsaround the humanweremanufactured from rocksand mineralsorcontainit,such as; ceramics,cement,concrete,insulators, insecticides, plasterofparis,pharmaceuticals, abrasives,foodindustries,soap…etc.All thesesubjectsarestudy practicallyinthelaboratorypart.Therefore,thissubjectwillmake thestudentscarryan enoughideaonmany industriesandtheirrawmaterialsafter graduation. | |
| **11.Courseobjective:**  Theessentialobjectiveofthetheory courseis togiveanoverview for studentsonthe mineralsandrocks(sedimentary,igneous andmetamorphic)usedinindustryas raw materials,aswellasgivinganideaontheorigin,groups,sub-groups,andpropertiesofit. Inadditiontothat,giveanoverviewonthedifferentindustriesandtalkingabouttheir | |

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| procedures.In the practicalpartemphasizeonthestudymanymethodsforcalculatingthe  reserveestimation,quarryingandextracting, aswellasstudytheevaluationduring physical,mechanicalandchemicalproperties,inadditiontosomeproblemsaboutthe limeandcementindustries. |
| **12. Student'sobligation**  Throughout thiscourse,thestudentscontribute inthelecturesbyaskingandanswering. Alsotheyassign by homeworkduringeachlecture.Mostofthestudentsattendtothe lectureandlaboratory. Allof thestudents are committedintheirexamsandinstructions. |
| **13.Forms ofteaching**  Different formsof teachingare usedduringthe course,like:  Whiteboardandpowerpoint presentationforthe titles,sub-titlesandconclusions, inaddition tofigures andplates,inboththeory andpracticalparts.  Homework isgiven forstudentsduringcourseinboththeory andpractical parts.  Determineadiscussion timeat thelast of every lectureandlaboratory.  Thatisanimportanttogivealectureforstudentsbeforeatleastoneweekfrom thelecturedate. |
| **14.Assessment scheme**  **Grading:**  There are one theoretical exam at the mid, practical exam at the end of the semester ,in addition to quiz exams during course.  -The final mark of semesteris**50%**,anddivided to:  **32.5.5%**for theoretical part, and **17.5%**for practical part; also the practical mark is divided to two marks: exam and reports.  - Therefore the total mark will be**50%**. |
| **15.Student learning outcome:**  During this course the student learn detailsthings about the relation of all types of rocks and mineral swith their industrial ses. As wellas, will take a good idea in the practical part on the reserve methods and procedures which take place on the rocks and minerals. Many of the products are directly related with our life, this will make the student to be more active and excited. |
| **16.Course ReadingList and References‌:**  Robert L. Bates,1969:Geologyoftheindustrialrocks andminerals.  W. Ryan; Propertiesof ceramic raw materials.  Industrialmineralsand theiruses,1996.Ahandbook andFormulary.  Lecturesnotesandinternet preview. |

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| **17.The Topics:** | **Lecturer's name** |
| Week 1:  Courseoutlineandsomeinstructionsabouttheengagementand requirements.  Week 2:  Introduction;definition,importanceofnonmetallic,featuresof theindustrialrocks andminerals.  Week 3:  Classification; conventional treatment, genetic classification, Batesclassification.  Week 4:  Industrial sedimentary rocks;sand and gravel, sandstone, limestoneand dolomite,clays andclay minerals,gypsum, phosphaterocks.  Week 5:  Industrial sedimentary minerals; halite, other soluble salt, diamond,diatomite,sulphur.  Week 6:  Industrial metamorphic rocks; slate, marble, quartzite, serpentinite.  Week 7: Examination. Week 8:  Industrial metamorphic minerals; talc, asbestos, wollastonite,  kyanite,garnet,emery, graphite,vermiculite. Week 9:  Industrialigneousrocks;granite,basaltanddiabase,pumiceand pumicite,perlite.  Week 10:  Industrial igneousminerals; feldspar, mica, lithium minerals, beryl,cryolite. | **Ahmed m. Aqrawi (Ph.D.)**  2 hrs.per week |

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| Week 11:  Veinandreplacement minerals;quartzcrystal,fluorspar,barite. Week 12:  Ceramic industry; basic raw materials, chemical conversions, classification.  Week 13:  Cementindustry;typesofcement,rawmaterials,manufacturing procedure,settingand hardening.  Week 14:  Manufacture oflime, raw materials, physical operation and chemicalconversions.  Week 15:  Quarries andraw materials processing. |  |
| **18.Practical Topics(Ifthereis any)** |  |
| Week 1:  Courseoutlineandsomeinstructionsabouttheengagementand requirements.  Week 2:  *Orereserveestimation (regular area,by contourmap).*  Week 3:  *Orereserveestimation (regular area,bywellI ).*  Week 4:  *Orereserveestimation (regular area,bywellII).*  Week 5:  *Orereserveestimation (irregular area).*  Week 6:  Week 7: Examination.  *Assessmentof industrialrocksand minerals.* | **Ahmed m. Aqrawi (Ph.D.)**  Mrs. Avin Ali  3 hrs.per week |

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Week 8:

*Oilexploration.*

Week 9:

*Industrial rocksand minerals in hand specimens; uses and properties.*

Week 10:

*Industrial rocksand minerals in hand specimens; uses and properties(continue).*

Week 11:

*Calculation ofphysicalpropertiesfor differentrocks.*

Week 12:

*Assessmentof limestoneto limeindustry.*

Week 13:

*Calculation theclay and limestone ratio required to prepare*

*Portland cement.*

**19.Examinations:**

**Q/Completethefollowing sentences:**

1-Orthomarbleis----------------------------------------inorigin.

2----------------------------------hasahighest rolein settingandhardeningportlandcement.

3----------------------------------isadefectiveorbrokendiamond.

4-Sandfor foundryindustry mustcontain---------------------------------alittle.

5-Perlitecharacterized by----------------------------------------when heatedto(760-1200°C).

6----------------------------------isaweakly consolidatedmixtureof gypsum withsiltand clay.

7------------------------------------------classifiesthenonmetallics alphabetically.

8-In chemical conversions of ceramic industries,-----------------------------aremore complex.

9-Alltypesof feldsparare usedinceramic industry as-----------------------------materials.

10-CaO+H2O Ca(OH)2+--------------------------.

**Q/Givethe reasonof the following:**

1- Addinglimestoneandsodaash tothemixtureinglass industry.

2- Usinglimestoneaggregateasalternativetosandandpebblein concrete.

3- Using bariteindeepdrillingforoilandgas.

4- Pumice is more preferred than perlite as lightweight aggregate in concrete industry.

**Q/Explainbrieflythe following:**

1- Themanufacturingprocedureof portlancement?

2- Theplacevalueand unitvalueof nonmetallics.

**Q/ Talkaboutofthe following:**

1-Theindustrialpropertiesof clays.

2-Manufacturingprocedureofcement.

3-Thebasic raw materials inceramic industry.

**Q/Comparebetweenthe following:**

1-Hydraulic andhigh calciumlime.

2-Placeandunitvalue.

**20.Extra notes:**

Thecoursebook lackstotheproblemswhichaffecttheeducationalprocess. These

problemsinclude thelarge numberofstudentsin eachstage,diminution ofinstruments, andabsenceofappropriateroomsforlecturers to develop themselves. Finally, aboutthe department of geology absenceof financialsupporttocarry outscientifictripsandfield courseinatypicalsituation.

**21.Peer review**

Asst. Prof. Dr. Faraj H.Tobia

CollegeofScience/Department of Geology