|  |  |
| --- | --- |
| **Course Title:**  | Petrology |
| **Course Code:** | **Geo320** |
| **Program:** | **Geology** |
| **Department:**  | **Geology and Geophysical** |
| **College:** | **Of Sciences** |
| **Institution:** | **King Saud University** |

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# A. Course Identification

|  |  |
| --- | --- |
| **1. Credit hours:**  | **3(2+0+1)** |
| **2. Course type** |
| **a.** | University |  | College |  | Department | **X** | Others |  |  |
| **b.** | Required | **X** | Elective |  |  |
| **3. Level/year at which this course is offered:** | **Five/ 1439 - 1440** |
| **4. Pre-requisites for this course** (if any)**: (Geo 221) Mineralogy**  |
| **5. Co-requisites for this course** (if any)**:** |
|  |

## 6. Mode of Instruction (mark all that apply)

| **No** | **Mode of Instruction** | **Contact Hours** | **Percentage**  |
| --- | --- | --- | --- |
| **1** | **Traditional classroom** | 75 | 100 % |
| **2** | **Blended**  |  |  |
| **3** | **E-learning** |  |  |
| **4** | **Correspondence** |  |  |
| **5** | **Other**  |  |  |

**7. Actual Learning Hours** (based on academic semester)

|  |  |  |
| --- | --- | --- |
| **No** | **Activity** | **Learning Hours** |
| **Contact Hours** |
| **1** | **Lecture** | 45 |
| **2** | **Laboratory/Studio** | 30 |
| **3** | **Tutorial**  | - |
| **4** | **Others** (specify)  | - |
|  | **Total** | 75 |
| **Other Learning Hours\*** |
| **1** | **Study**  | 30 |
| **2** | **Assignments** | 10 |
| **3** | **Library** | 10 |
| **4** | **Projects/Research Essays/Theses (Small Project)** | 20 |
| **5** | **Others** (specify) small project+ presentation | - |
|  | **Total** | 70 |

**\*** The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

# B. Course Objectives and Learning Outcomes

|  |
| --- |
| 1. Course Description * The course content includes the description, classification, composition, occurrence, distribution, nature and origin of igneous- and metamorphic rocks. It is designed to provide the basic principles and fundamental concepts of petrology, in light of recent advances on the subject, via lectures and laboratory investigations. The latter include systematic identification of the various rock groups using both hand samples, and thin sections under the polarizing microscope. Weekly laboratory assignments involving detailed and systematic description of lithologic & petrographic varieties are given. A field report containing observation, analysis and interpretation of geological features introduced during the petrology field trip is required.
 |
|  |
| 2. Course Main Objective |
| * Describe all basic concepts of modern igneous and metamorphic petrology including

magma types, classification and distribution of igneous & metamorphic rocks.* Develop an understanding of petrogenetic processes involved in the formation of magmas.
* Describe factors controlling the process of metamorphism.
* Determine metamorphic zones and facies based on mineral assemblages and interpret the P/T conditions of metamorphism.
* Interpret the origin and evolutionary trends of igneous and metamorphic rocks based on chemical and mineralogical data.
* Identify, using hand samples, the various rocks within the plutonic/volcanic groups, and identify the various types of thermal and regional metamorphic rocks.
* Use the polarizing microscope to identify igneous and metamorphic rocks and their

textures, then describe and write scientific petrographic reports. |

## 3. Course Learning Outcomes

| **CLOs** | **Aligned****PLOs** |
| --- | --- |
| 1 | **Knowledge:** | Gain knowledge about origin of different and different types of rocks and minerals |
| 1.1 | **Define basic concepts related to Petrology evolution and its characteristics and processes** |
| 1.2 | **Recall, describe, analyze, prepare, and revise the concept and understanding the different behavior and forming different rocks type via different stages and processes.**  |
| 1.3 |  |
| 1... |  |
| **2** | **Skills :** |  |
| 2.1 | **List, define and state the magma behavior via different diagrams as AFM, Igneous rocks classifications and their field relations, Tectonic movement, Volcanism and volcanoes, thermodynamics of the rocks.** | Attain skills about different rocks types geologic features in relevant to their initiation environmental conditions  |
| 2.2 | **Basic concepts, theories, and observational findings related to igneous, metamorphic and sedimentary rocks and processes as they pertain to the student’s knowledge emphasis** |
| 2.3 |  |
| 2... |  |  |
| **3** | **Competence:** |  |
| 3.1 |  **The ability to work effectively in groups, to exercise leadership, to act responsibly in personal professional relationship.** | Communicate individually correctly, orally and written as well as acting properly in team-work or among a groups |
| 3.2 | **Planning and taking responsibility for grasping self-learning.** |
| 3.3 |  |
| 3... |  |

# C. Course Content

|  |  |  |
| --- | --- | --- |
| **No** | **List of Topics** | **Contact Hours** |
| 1 | Introduction to Petrology (Igneous, Metamorphic, and Sedimentary) | **4** |
| 2 | Igneous rock-minerals, and igneous rock’s chemistry classification | 6 |
| 3 | Origin and nature of magma,  | **6** |
| 4 | Factors influencing magma crystallization | **5** |
| 5 | Petrology of the mantle, igneous rocks of oceanic and continental. | 4 |
| 6 | Sedimentary rocks/environments | **4** |
| 7 | Clastic/detrital and chemical and biological sedimentary rocks | 5 |
| 8 | Metamorphic rocks, classification and descriptions, agents of metamorphism. | **5** |
| 9 | Types of metamorphism | **3** |
| 10 | The Distribution of Igneous, metamorphic and sedimentary rocks in the field | **3** |
| **Total** | 45 |

# D. Teaching and Assessment

## 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| **Code** | **Course Learning Outcomes** | **Teaching Strategies** | **Assessment Methods** |
| --- | --- | --- | --- |
| **1.0** | **Knowledge** |
| 1.1 | **Define basic concepts related to Petrology evolution and its characteristics and processes** | *Lecturing, Homework, projects, tests and assignments.*  | * **Preliminary qualifying quizzes and homeworks major and final exams.**
 |
| 1.2 | **Recall, outlines, analyze, prepare, and revise the concept and understanding the different behavior and forming different rocks type via different stages and processes.**  | **Lecturing and Lab works** | * **Preliminary qualifying examination.**
* **Pertain to the student’s research emphasis.**
* **Oral and presenting a small project presentation, Lab’s evaluation Reports.**
 |
| … |  |  |  |
| **2.0** | **Skills** |
| 2.1 | * **Compare and state the magma behavior via different diagrams as AFM, Igneous rocks classifications and their field relations, Tectonic movement, Volcanism and volcanoes, thermodynamics of the rocks.**
 | Homework assignments | * **Preliminary qualifying examination.**
* **Oral exams, Quizzes**
 |
| 2.2 | Explain, and interpret concepts, theories, and observational findings, or phenomena related to igneous, metamorphic and sedimentary rocks initiation processes as they pertain to the student’s knowledge emphasis | Students reading ability of library research, let students working in groups and discuss their ideasin solving complications | * Checking through homework assignments, library’s research, writing an assignments and carrying small projects.
 |
| … |  |  |  |
| **3.0** | **Competence** |
| 3.1 |  The ability to work effectively in groups, to exercise leadership, and to write scientific report. | Writing small project’s assignment, lab’s work reports | * Assignments of research library’s, writing.
* Writing and presenting a small projects
 |
| 3.2 | Planning and taking responsibility for grasping self-learning and working in a team work. | Combining the internet and utilizing the computers technologies in the course necessities | * Reading some articles and summarize it.
* Evaluating the laboratory written reports
 |
| … |  |  |  |

## 2. Assessment Tasks for Students

| **#** | **Assessment task\***  | **Week Due** | **Percentage of Total Assessment Score** |
| --- | --- | --- | --- |
| **1** | **Attendance, Homeworks (Questions, research on topics or a literature reviews ), and assignments** (class quizzes, scientific reports, field trip) | ***weakly*** | ***5%*** |
| **2** | **First Assessment Exam** | **6** | **10%** |
| **3** | **Presentation of Projects**  | **8** | **5%** |
| **4** | **Practical exam** | **4 – 8 - 12** | **30%** |
| **5** | **Second Assessment Exam** | **13** | **10%** |
| **6** | **Final Exam**  | **15** | **40%** |
| **7** | **Total** |  | 100% |
| **8** |  |  |  |

**\*Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

# E. Student Academic Counseling and Support

|  |
| --- |
| **Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :** |
| * ***The faculty member by role and college regulation has to allocate a six consultation office hours per week.***
* ***These consultation office hours should be scheduled, timed and to be put or hanged on front of the faculty member’s office door for seeking the students’ attention.***
 |

# F. Learning Resources and Facilities

## 1.Learning Resources

|  |  |
| --- | --- |
| **Required Textbooks** | * ***Roland, B. F. (2014). Essentials of igneous and metamorphic petrology, Cambridge, University Press***
* ***Gautom S. (2014). Petrology: principals and practice, Springer Heidleberg Newyork Dordrechi London.****.*
 |
| **Essential References Materials** | * ***Hadler, S. K. and Josp Tisljar. (2014). Introduction to mineralogy and petrology, Radarweg Amesterdam the Netherland.***
* ***Mauce, E. T. and Tisljar, J., (2001). Sedimentary petrology: an introduction to the origin of sedimentary rocks, Blackwell Science.***
 |
| **Electronic Materials** | <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/petrology> |
| **Other Learning Materials** |  |

## 2. Facilities Required

| **Item** | **Resources** |
| --- | --- |
| **Accommodation**(Classrooms, laboratories, demonstration rooms/labs, etc.) | * **Class room equipped with smart boards connected with networks, overhead projector.**
* **The Lab equipped with blackboard, data show projectors aligned with computer.**
* **The Lab facilitated with scientific materials such as hand specimen of rocks, rock-forming minerals, optical microscope, ……etc.**
 |
| **Technology Resources** (AV, data show, Smart Board, software, etc.) | * ***Computer Lab should be equipped with at least 15 hardware, assisted with suitable software, one data show, and one smart board. at least 15 systems.***
 |
| **Other Resources** (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | * ***Availability of chemicals, glassware and equipment relevant to the course material.***
* ***Safety facilities.***
 |

# G. Course Quality Evaluation

| **Evaluation****Areas/Issues**  | **Evaluators**  | **Evaluation Methods** |
| --- | --- | --- |
| * + *Student* course questionnaire evaluation
 | * students
 | Direct evaluation |
| * + -peer review
 | * Faculty members
 | Direct evaluation |
| * + *Periodical departmental revisions of its methods of teaching.*
 | * + Faculty members get-together for and course discussion.
	+ Program Coordinator.
 | Direct evaluation |
| * + *Course Coordinator assessment and course’s efficiency of teaching delivery .*
 | * + *Course Coordinator*
 | Direct evaluation |
| * + Committees of quality system review all deficiencies based on the students and faculty evaluation,
 | * + Program Coordinator.
 | Direct evaluation |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

**Assessment Methods** (Direct, Indirect)

# H. Specification Approval Data

|  |  |
| --- | --- |
| **Council / Committee** | **Department of Geology and Geophysics** |
| **Reference No.** |  |
| **Date** | **29/10/2019** |