**King Saud University, College of Science,**

**Department of Geology.**

**Geo 322 Course**

**Metamorphic Petrology**

**Academic Year 1430- 1431H (2009 – 2010**)

**Course Director:** Dr. Bassam A. Abu amarah

**Contributer:** Said Al shaltoni

**Course Title:** Metamorphic Petrology

**Course Code:** Geo 322.

**Credit hours:** 3 credit hours (2+1).

**Level/ year the course is offered:** 2nd semester of the fourth year.

**Course pre-requisites:** Geo 224 course (Optical mineralogy).

**Group Number:** 835.

**Lecture theater (room):** 60 AB.

**Course objectives and Learning Outcomes for this Course:**

1. Students should learn how to identify the metamorphism and the three motivating force in metamorphism heat, pressure, and chemically active fluids or gases.
2. This Course will expose students to different types and zones of metamorphic rocks.
3. The student will gain an understanding of the processes responsible for forming igneous and metamorphic rocks.
4. The student will gain an understanding of how the chemical composition, structure and texture of rocks can be used to interpret past geologic processes and the geologic history of the earth.
5. The student will be able to identify igneous and metamorphic rocks in hand specimen and thin section.

We expect from our students with a major in Geology to demonstrate that they have the ability to analyze and interpret scientific data, identify and interpret the origin of metamorphic rocks, and its minerals contents in both hand specimen and thin section, to use and interpret geologic maps in cross-sections in terms of the geologic and tectonic history of any region, as well as, to construct a geological map based on field studies.

**Course Evaluation:**

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| First Assessment Exam | Second Assessment Exam | Practical | | Final |
| 10 | 10 | Practical I | Practical II | 50 |
| 15 | 15 |

**Essential References and text books:**

1. **Required Text(s) :**

* **Best M.** (1982). *Igneous and Metamorphic Petrology*, W.H Freeman and company**, San francisco.**
* **Spray A..** (1969). *Metamorphic and Textures*. Pergamon Press.Ltd
* **Kornprobst**, J. (2002). *Metamorphic Rocks and Their Geodynamic Significanc:. A Petrological Handbook*. Petrology and Structural Geology Series Vol. 12. Kluwer , Dordrecht.
* **Yardley, B. W. D. (**1989) *An Introduction to Metamorphic Petrology***,** Longman, Harlow.
* **Shelley D.** (1993). *Igneous and metamorphic rocks under the microscope*. Chapman & Hall, London.
* **Yardley B.W.D., McKenzie W.S. & Guilford C.** (1990). *Atlas of metamorphic rocks and their textures*. Longman, Harlow.
* **Harker A.**, (1974). Metamorphism " Astudy of the transformation of rock-masses",Chapman And Hall, London.

1. **Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)**

       **Best M.G.** (2002). *Igneous and Metamorphic Petrology*, 2nd ed. Blackwell.

      **Bucher K. & Frey M.** (1994) *Petrogenesis of Metamorphic Rocks.*

      **Kretz R.** (1994). *Metamorphic Crystallisation*. John Wiley and Sons, Chichester.

      **Miyashiro A.** (1994). *Metamorphism and Metamorphic Belts*. Unwin Hyman, London.

      **Philpotts A.R.** (1990). *Principles of Igneous and Metamorphic Petrology*. Prentice Hall.

      **Desmons J. & Smulikowski W**. (2007). *A systematic nomenclature for metamorphic rocks. 4. High P/T metamorphic rocks. Recommendations by the IUGS Subcommission on the systematics of metamorphic rocks*.

      **Spear, F.S.** (1993). *Metamorphic Phase Equilibria and Pressure-Temperature Time Paths*. Mineralogical Society of America, Washington, D.C.

1. **Electronic Materials, Web Sites etc**

         [Journal of Metamorphic Geology](http://www.gly.bris.ac.uk/www/jmg/jmg.html)

         [MetPetDB](http://trinity.db.cs.rpi.edu/xwiki/bin/view/Main/MetPetDBWebsite): A database for metamorphic petrology.

         [Atlas of Igneous and metamorphic rocks, minerals, and textures](http://www.geolab.unc.edu/Petunia/IgMetAtlas/mainmenu.html)

         [Introduction to Metamorphic Rocks](http://teachserv.earth.ox.ac.uk/courses/es2-metrock/metrock.html) Dave **Waters**, Department of Earth Sciences, University of Oxford.

         [Phase Equilibria in Metamorphic Rocks:](http://www.mineralogie.uni-wuerzburg.de/will/phaseequilibria.html) Thermodynamic Background and Petrological Applications.

1. **Other learning material such as computer-based programs/CD, professional standards/regulations**

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| *No. of Wk* | *Lecture Time* | *Date* | *Lecture's Title* | No. Of Weeks | Contact hours |
| *1* | *4-5 pm* | *Sun*  *7/3/1431*  *21/2/2010* | ***Introduction to metamorphism: its processes and categories*** | **1** | **2** |
| *4-5 pm* | *Tue*  *9/3/1431*  *23/2/2010* |
| *2* | *4-5 pm* | *Sun*  *14/3/1431*  *28/2/2010* | ***Review of the mineralogy of metamorphic rocks*** | **1** | **2** |
| *4-5 pm* | *Tue*  *16/3/1431*  *2/3/2010* |
| *3* | *4-5 pm* | *Sun*  *21/3/1431*  *7/3/2010* | **Classification schemes and metamorphic textures** | **1** | **2** |
| *4-5 pm* | *Tue*  *23/3/1431*  *9/3/2010* |
| *4* | *4-5 pm* | *Sun*  *28/3/1431*  *14/3/2010* | **Radiometric dating of metamorphic rocks** | **1** | **2** |
| *4-5 pm* | *Tue 30/3/1431*  *16/3/2010* |
| *5* | *4-5 pm* | *Sun*  *5/4/1431*  *21/3/2010* | **The phase rule and composition-assemblage diagrams** | **1** | **2** |
| *4-5 pm* | *Tue*  *7/4/1431*  *23/3/2010* |
| *6* | *4-5 pm* | *Sun*  *12/4/1431*  *28/3/2010* | **Metamorphic facies** | **1** | **2** |
| *4-5 pm* | *Tue*  *14/4/1431*  *30/3/2010* |
| *7* | *4-5 pm* | *Sun*  *19/4/1431*  *4/4/2010* | ***First assessment exam*** | **1** | **2** |
| *4-5 pm* | *Tue*  *21/4/1431*  *6/4/2010* | **Micro-analytical techniques and recalculation of mineral analysis** |

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| *8* | *4-5 pm* | *Sun*  *26/4/1431*  *11/4/2010* | **Micro-analytical techniques and recalculation of mineral analysis** | **1** | **2** |
| *4-5 pm* | *Tue*  *28/4/1431*  *13/4/2010* | **Geothermometry and geobarometry** |
| *9* | *4-5 pm* | *Sun*  *4/5/1431*  *18/4/2010* | ***2nd semester Med –year vacation*** | - | - |
| *4-5 pm* | *Tue*  *6/5/1431 20/4/2010* |
| *10* | *4-5 pm* | *Sun*  *11/5/1431*  *25/4/2010* | **Geothermometry and geobarometry** | **1** | **2** |
| *4-5 pm* | *Tue*  *13/5/1431*  *27/4/2010* | **Contact metamorphism** |
| *11* | *4-5 pm* | *Sun*  *18/5/1431*  *2/5/2010* | **Contact metamorphism** | **1** | **2** |
| *4-5 pm* | *Tue*  *20/5/1431*  *4/5/2010* | **Dynamic metamorphism** |
| *12* | *4-5 pm* | *Sun*  *25/5/1431*  *9/5/2010* | **Dynamic metamorphism** | **1** | **2** |
| *4-5 pm* | *Tue*  *27/5/1431*  *11/5/2010* | **Metamorphism in subduction zones** |
| *13* | *4-5 pm* | *Sun*  *2/6/1431*  *16/5/2010* | **Metamorphism in subduction zones** | **1** | **2** |
| *4-5 pm* | *Tue*  *4/6/1431*  *18/5/2010* | **Ocean-floor metamorphism** |
| *14* | *4-5 pm* | *Sun*  *9/6/1431*  *23/5/2010* | **Ocean-floor metamorphism** | **1** | **2** |
| *4-5 pm* | *Tue*  *11/6/1431*  *25/5/2010* | **Metamorphism in collision zones***.* |
| *15* | *4-5 pm* | *Sun*  *16/6/1431*  *30/5/2010* | **Metamorphism in collision zones** | **1** | **2** |
| *4-5 pm* | *Tue*  *18/6/1431*  *1/6/2010* | ***Second assessment exam*** |

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| *16* | *4-5 pm* | *Sun*  *23/6/1431*  *6/6/2010* | **Meteorite impacts and shock metamorphism** | **1** | **2** |
| *4-5 pm* | *Tue*  *25/6/1431*  *8/6/2010* |
| *17* | *4-5 pm* | *Sun*  *1/7/1431*  *13/6/2010* | **Metamorphic and tectonic evolution of the Arabian Shield** | **1** | **2** |
| *4-5 pm* | *Tue*  *3/7/1431*  *15/6/2010* |