Course No. PENG 301 Petroleum Geology & Exploration
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Catalog Description: PENG 301 Petroleum Geology & Exploration (3 crs)
Prerequisite: PENG 200. Offered in fall or spring
History of Petroleum Geology, Oil & Gas accumulation, Origin (Chemical, Biological, and Physical), Porosity, Source Rocks, Migration, Accumulation, Types of Traps (Structural Traps, Stratigraphic Traps, Hydrodynamic Traps and combination Traps), Timing and preservation of Traps, Subsurface Geology and mapping; well sitting (duties of well geologist, introduction to logging and formation testing), Oil and Gas Exploration (Seismic, Gravity and magnetic Methods), Exploration Risk and Analysis, Project.

Textbooks:
3. Handouts, lecture notes, assigned specific chapters and journal papers.
Although the reading material and slides are sufficient for basic understanding, students are expected to take notes and ask questions in class.

Additional References

Course Objectives
1. Familiarize the students with principles of petroleum geology.
2. Develop an understanding of the importance of geosciences to petroleum engineering.
3. Learn where and how to find hydrocarbons.
4. Introduce the students to the basic reservoir properties of porosity, permeability, saturations and pressure.
5. Introduce the students to the key oil and gas exploration methods of Magnetic, Gravity, Seismic, Drilling, Well Logging, Formation Testing, and Exploration Risk.
6. Students should be able to point out and interpret the geological features explained in the class room, through, practical examples and field trips.
7. Introduce the students to Subsurface Mapping of reservoir properties for modeling in two and three dimensions. Students will explore the techniques employed to interpret the geophysical, geological and engineering data collected for applied reservoir modeling purposes.
8. Learn more about the petroleum provinces in Egypt.
Course outcomes:
By completion of PENG 301 course and the field trips, students will be able to:
1. Understand the basic geological exploration methods and how they complement each other.
2. Appreciate the importance of geology and geophysics for good petroleum engineering.
3. View and imagine the Earth’s subsurface through interactive field trips.
4. Recognize the important reservoir rock and fluid properties.
5. Correlate between all exploration and well log data to determine formations continuity.
6. Draw contour and isopach maps showing the reservoir structure, thickness and properties distribution.
7. Interpret structural and stratigraphic elements in seismic sections.
8. Calculate the initial, reserve and remaining hydrocarbons in the reservoir.
9. Recognize the main petroleum provinces in Egypt.
10. Understand the basic geological exploration aspects and gain the requirements to carry on further petroleum engineering studies.
11. Integrate in multidisciplinary team approach of geology, geophysics and petroleum engineering to solve the reservoir heterogeneity challenge.

Course Contents
- Brief petroleum exploration history
- Where do we find oil?
- Sedimentary basins
- Sedimentary rock facies
- Clastic and carbonate rocks
- Depositional environments
- Origin of fossil fuels
- Generation, migration and trapping of hydrocarbons
- Physical and chemical properties/classification of hydrocarbons
- Review of structural geology, faults and folds
- Types of traps (structural traps, stratigraphic traps, hydrodynamic traps and combination traps); timing and preservation of traps
- Reservoir properties; Introduction to:
  ✓ Porosity
  ✓ Permeability
  ✓ Saturations
  ✓ Pressure
- Natural reservoir energies
- Exploration Methods; Introductions to
  ✓ Magnetic
  ✓ Gravity
  ✓ Seismic acquisition and interpretation
  ✓ Drilling
  ✓ Well Logging and Formation Testing
  ✓ Exploration Risk
- Well sitting; duties of well Sit geologist
- Subsurface mapping and cross sections

*Additional lecture time will be used for tests and revision.*
Field Trips

There will be two field trips to geological sites in Egypt as follows:

- Trip One: The Silicified Wood Forest and Wadi Degla in Maadi
- Trip Two: South Sinai for three days two nights

Policy on Academic Integrity and Attendance

Check [http://www.aucegypt.edu/academics/resources/acadintegrity/code/Pages/default.aspx](http://www.aucegypt.edu/academics/resources/acadintegrity/code/Pages/default.aspx)

- Students are expected to attend all class sessions. If a student misses six or more classes he will receive “F” for the course.
- Students are not allowed to enter the classroom five minutes after the instructor.
- If you leave the classroom during the lecture, quizzes or exams for any reason please do not come back.
- You will be asked to leave the classroom if you talk without permission or sleep during the lecture.
- No homework or assigned projects/reports will be accepted after the due date, a score of zero will be assigned.
- You are responsible about attending all classes, quizzes, exams and field trips. No exception.
- Class activities are more important than any other activities including sports, political and social.
- Homework must be submitted hand written with pencil on “Engineering Book”. Homework must be clean and neat.
- There will be no make-up quizzes or exams unless you have a very valid reason approved by the instructor.
- It shall be the general policy for this course that all work shall be graded on the basis of answers only — partial credit, if given, is given solely at the discretion of the instructor.
- All work requiring calculations shall be properly and completely documented for credit.
- All grading shall be done by the instructor, or under his direction and supervision, and the decision of the instructor is final.
- Only in very rare cases will work be considered for regrading; e.g., when the total number of points deducted is not consistent with the assigned grade. Partial credit (if any) is not subject to appeal.
- Work which, while possibly correct, but cannot be followed, will be considered incorrect — and will not be considered for a grade change.
- Cheating and plagiarism will not be tolerated.
Grading Policy

- Attendance and Class Participation 5%
- *In Class Quizzes* 15%
- Assignments (Homework) 10%
- Mid Term Exams (3) 30%
- Field Trips with Reports (2, 5% & 10%) 15%
- Final Exam 25%

Prepared by: Dr. Tarek El Kewidy Fall 2010