

# King Saud University

## College of Engineering

### Petroleum and Natural Gas Engineering Department

#### Capstone Design Project (Tentative) PGE 498 & PGE 499

#### Course General Information

| Code & Number | Title                           | Credit Hours |
|---------------|---------------------------------|--------------|
| PGE 498       | Capstone Design Project Part I  | 2            |
| PGE 499       | Capstone Design Project Part II | 3            |

#### Introduction:

The capstone design project provides the petroleum and natural gas engineering students with the opportunity to work on a realistic, industry-related design project.

#### Course Objective:

The objective of the capstone design project is to provide the graduating engineer with a smooth transition to the industry through the experience provided by the design project.

#### Course Scope:

Groups of students are provided with real data from an oil or gas reservoir, similar to that which would be available to an operator prior to a development decision. Through this exercise, students gain valuable insight into the use of imperfect and incomplete data, to the integration of the various taught components of the course and to problems of group interaction. It is also an opportunity to teach a range of transferable skills such as teamwork, presentation and negotiation. Engineering evaluation of the provided data set using all of the techniques learned in previous courses. Generation of proposals for optimizing operations for the given data set, including engineering design, economic analysis, and if relevant, an assessment of the risk associated with the proposed action. A typical design project includes several of the following components of petroleum engineering:

- Geological and reservoir characterization.
- Reserves estimation.
- Reservoir modeling and simulation.
- Drilling and well completion design.
- Production optimization.
- Pipeline design.
- Surface facility design.
- Economics and impact on society and environment.

During the project students have access to state-of-the-art computer technology and industry standard software. Several reports must be submitted according to the set time schedule.

## **Report Format:**

Each student will write a report and recommendations regarding development of the oil or gas reservoir, taking into account realistic constrains such as economic, environmental, safety, impact on local population, etc. A typical report should contain the following sections:

1. Executive Summary.
2. Introduction.
  - Objective(s) of the project.
  - Summary of available data.
  - Methodology for attaining the desired objective(s).
3. Results of data analysis with actual calculations.
  - Proposed project design.
  - Technical Specifications.
  - Economics.
  - Impact on Society and Environment.
4. Conclusions and Recommendations.
5. References.
6. Appendices.

## **Time Schedule:**

A timetable will be announced in the beginning of each semester showing design supporting lectures schedules and reports submission dates.

| Type  | Weeks |   |   |   |   |   |   |   |   |    |    |    |    |    |
|---|-------|---|---|---|---|---|---|---|---|----|----|----|----|----|
| <b>First Semester (PGE 498)</b>   |       |   |   |   |   |   |   |   |   |    |    |    |    |    |
|   | 1     | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| <b><u>Summary Report I:</u></b><br>Geology, Logging and Petrophysics    |       |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b><u>Summary Report II:</u></b><br>Drilling Engineering and Completion |       |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b><u>Progress Report:</u></b>  |       |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b><u>Presentation:</u></b>   |       |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b>Second Semester (PGE 499)</b>  |       |   |   |   |   |   |   |   |   |    |    |    |    |    |
|   | 1     | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| <b><u>Summary Report III:</u></b><br>Reservoir Engineering              |       |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b><u>Summary Report IV:</u></b><br>Production Engineering              |       |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b><u>Final Report:</u></b>   |       |   |   |   |   |   |   |   |   |    |    |    |    |    |
| <b><u>Presentation:</u></b>   |       |   |   |   |   |   |   |   |   |    |    |    |    |    |

## Advising (Ad-hoc) Committees

### Geology, Logging and Petrophysics:

Dr. Mohamed S. Benzagouta  
Dr. Eissa M. Shokir  
Dr. Emad S. Al-Homadhi

### Reservoir Engineering:

Dr. Mohamed A. Al-Saddique  
Dr. Ahmed A. Gawish  
Dr. Hazim N. Dmour  
Dr. Khaled A. Abdel-Fattah  
Dr. Mustafa M. Kinawy

### Economical Analysis:

Professor Musaed N. J. Al-Awad  
Dr. Khaled A. Abdel-Fattah  
Dr. Mohamed M. Amro

### Drilling Engineering:

Professor Musaed N. J. Al-Awad  
Dr. Emad S. Al-Homadhi  
Dr. Eissa M. Shokir  
Dr. Mohamed M. Amro  
Dr. Khaled A. ElShreef

### Production Engineering:

Professor Adel M. Hemeida  
Dr. Mohamed M. Amro  
Dr. Ahmed A. Gawish  
Dr. Osama L. Al-Mahdy

### Reporting and Presentations:

Professor Musaed N. J. Al-Awad  
Engineer AbduBari A. Al-Arefi

## Evaluation Methodology:

Assessment is done by means of a written report and by group presentation. The development plan is presented to a group consisting of faculty members and external examiners from the oil and gas industry.

| Information    |                   | Applicable Outcomes                | Grading Criteria |       |    |
|----------------|-------------------|------------------------------------|------------------|-------|----|
|                |                   |                                    | Distribution     | Total |    |
| First Semester | Course Work I     | a, b, c, d, e, f, i, j and k       | 20               | 25    | 50 |
|                | Summary Report I  | g and h                            | 5                |       |    |
|                | Course Work II    | a, b, c, d, e, f, i, j and k       | 20               | 25    |    |
|                | Summary Report II | g and h                            | 5                |       |    |
|                | Progress Report   | g and h                            | 20               | 50    |    |
|                | Presentation      | g and h                            | 10               |       |    |
|                | Q&A               | a, b, c, d, e, f, g, h, i, j and k | 20               |       |    |
|                | Final Grade       |                                    | 100              | 100   |    |

| Information    |                    | Applicable Outcomes                | Grading Criteria |       |    |
|----------------|--------------------|------------------------------------|------------------|-------|----|
|                |                    |                                    | Distribution     | Total |    |
| First Semester | Course Work III    | a, b, c, d, e, f, i, j and k       | 20               | 25    | 50 |
|                | Summary Report III | g and h                            | 5                |       |    |
|                | Course Work IV     | a, b, c, d, e, f, i, j and k       | 20               | 25    |    |
|                | Summary Report IV  | g and h                            | 5                |       |    |
|                | Final Report       | g and h                            | 20               | 50    |    |
|                | Presentation       | g and h                            | 10               |       |    |
|                | Q&A                | a, b, c, d, e, f, g, h, i, j and k | 20               |       |    |
|                | Final Grade        |                                    | 100              | 100   |    |

### **Faculty Load Distribution:**

The academic load assigned for faculty members participating in supervising capstone design project is calculated as follows:

$$\text{Load/Faculty/Semester} = \left[ \frac{(\text{No. of PGE 498 Students}) * 2 + (\text{No. of PGE 499 Students}) * 3}{\text{No. of Participating Faculty Members}} \right]$$

Knowing that the minimum load of every participating faculty per semester is 5 credits regardless of the number of the enrolled students.

### **Students Advising:**

Each semester, two different capstone design groups are running. The first one is PGE 498 and the second is PGE 499. Students will be divided into groups of 3 or 4. Two scheduled lectures will be held each week for both groups as shown below. Additionally, students are able to consult the appropriate ad-hoc committee during office hours. Throughout these periods, members of ad-hoc committee will be available to provide guidance for students to complete their scheduled design tasks. Chairman of the department will be the coordinator of the capstone design project.

The Ad-hoc committee member will meet students regularly to guide, assess progress, provide theoretical foundation and troubleshoot potential problems. Additionally, he will evaluate student's reports and presentations according to the predetermined outcomes.

The capstone design project coordinator is responsible for introducing the students to the design of a capstone project, acquiring real data from the industry, arranging with the external examiners and facilitating any problems may be encountered during the project.

| Advising Schedule |                      | Capstone Group 1<br>PGE 498 | Capstone Group 2<br>PGE 499 |
|-------------------|----------------------|-----------------------------|-----------------------------|
| Lectures          | Sunday<br>1pm – 5pm  | ✓                           | ✓                           |
|                   | Tuesday<br>1pm – 5pm | ✓                           | ✓                           |
| Office Hours      |                      | ✓                           | ✓                           |

All lectures will be held in the seminar room.

### **Requirements:**

Students failing to meet the following requirements will be prohibited from attending the final examination and will have F (Fail) grades:

- Attending less than 75% of the scheduled lectures.
- Submitting a progress or final report on time.
- Summarizing and presenting his work orally.

٤٩٩ هبغ مجموعة -١-

- ١- عبدالعزيز عبداللطيف الرويجح
- ٢- فيصل عبدالعزيز قنديل
- ٣- فيصل محمد الخميس

٤٩٩ هبغ مجموعة -٢-

- ١- أحمد حمد العيد
- ٢- هلال محمد العتيبي
- ٣- وليد صالح الكربي

٤٩٩ هبغ مجموعة -٣-

- ١- أحمد صالح النويصر
- ٢- عبدالرحمن حمد المقبل
- ٣- طيار سليمان الطيار

٤٩٨ هبغ (مجموعة -١-

- ١- معتز رشيد الغبيني
- ٢- فيصل أسعد عثمان
- ٣- عبدالعزيز فهد الشمري

٤٩٨ هبغ مجموعة -٢-

- ١- عماد عبدالرحمن الأحيدب
- ٢- محمد سعد القحطاني
- ٣- علي عوض اليامي

٤٩٨ هبغ مجموعة -٣-

- ١- محمد فؤاد حكمي
- ٢- عبدالعزيز صالح الحربي
- ٣- سعود خالد الهاجري

٤٩٨ هبغ مجموعة -٤-

- ١- محمد سعد الغامدي
- ٢- طلال منصور الحصيني
- ٣- ذياب عويد العنزي

٤٩٨ هبغ مجموعة -٥-

- ١- فهد محمد القحطاني
- ٢- عبدالعزيز جمعان الدوسري
- ٣- محمد سعد المسعود

٤٩٨ هبغ مجموعة -٦-

- ١- سلمان محمد العويض
- ٢- صالح حجي السالم
- ٣- محمد علي الحماد

٤٩٨ هبغ مجموعة -٧-

- ١- محمد طلال الذهبي
- ٢- سلمان عبدالله الدغيشم
- ٣- عزمي سند الفليت