KOMAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
(KUST)

FORMATION EVLAUATION WITH WELL LOGS SYLLABUS			
Course Title	Formation Evaluation with Well Logs		
Course Code	PTE 3325	**No. of Credits**	3 CR
Department	Petroleum Engineering	**College**	Engineering
Pre-requisites Course Code	PTE3310C	**Co-requisites Course Code**	PTE3335
Course Coordinator(s)	Fouad M. Qader		
Email	fouad.qader@komar.edu.iq	**IP No.**	
Other Course Teacher(s)/Tutor(s)	None		
Class Hours	Monday//Wednesday: 12:00 – 13:30 Classroom: 103		
Contact Hours	Wednesday: 11:00 - 12:00 Office: 236		
Course Type	Departmental Requirement		
Offer in Academic Year	Spring 2016		

COURSE DESCRIPTION

This course includes information about principles and applications of well logging, types of logging tools, basics and applications of each tool, factors affecting the measurements with analysis of the log outputs. The course also provides information about formation evaluation process and the techniques used in evaluating reservoirs with a focus on well log data. Students also learn about the properties of carbonate and clastic reservoirs and methods to evaluate potentiality of each type.

COURSE OBJECTIVES

The objectives of this course are for students to
1. Become familiar with log types and their techniques.
2. The mechanism of wireline log running, and the function of each log.
3. Interpretation of the log curves and their behaviors opposite the different subsurface geolological conditions.
4. Estimation of the essential reservoir parameters from logs such as lithology, borehole condition, porosity, permeability, fluid saturations (reservoir characterization).

COURSE LEARNING OUTCOMES

After participating in the course, students should be able to:

1. Identify the different types of logging data (ABET A & K),
2. Measure shale volume and porosity in reservoir beds from log data (ABET A, E & K),
3. Determine type of shale distribution in reservoirs (ABET B),
4. Detect lithology of the reservoir beds using porosity logs (ABET B),
5. Determine permeable and impermeable horizons in wells (ABET B),
6. Identify hydrocarbon and water bearing zones in reservoirs (ABET E),
7. Determine water and hydrocarbon saturations in reservoirs (ABET A & E),

8. Determine productive and non-productive horizons of the reservoirs (ABET A & E),
9. Determine formation (reservoir) properties using core test and well test data (ABET A & E), and,
10. Calculate net/gross reservoir and pay ratios and estimate reserves (ABET A, E & K).

RELATED PROGRAM OUTCOMES:

A	An ability to apply knowledge of mathematics, science, and engineering
B	An ability to design and conduct experiments, as well as to analyze and interpret data
E	An ability to identify, formulate, and solve engineering problems
K	An ability to use the techniques, skills, and modern tools necessary for engineering practice.

Reference:http://www.abet.org/eac-criteria-2014-2015/

GUIDELINES ON GRADING POLICY

Points	Percentage Scores	Grade
A	95–100	4.0
A-	90-94	3.7
B+	87–89	3.3
B	83-86	3.0
B-	80-82	2.7
C+	75–79	2.3
C	70-74	2.0
C-	65-69	1.7
D+	60–64	1.3
D	55-59	1.0
D-	50-54	0.7
F	0–49	0
I	Incomplete Course Work	
W	Official Withdrawal	

Passing Grade is 65% or above

COURSE CONTENTS

1. Introduction
2. borehole environment
3. Caliper log, Gamma Ray Logs, and BHT
4. Porosity Logs:
   - Sonic log
   - Density Log
   - Neutron Log (Neutron-Density combination porosity (ΦN-D)
5. Self potential (SP) log
6. Resistivity and conductivity logs (Laterolog, Induction Logs, Microresistivity Logs)
7. Dipmeter log and Image logs

8- Reservoir geology:
- Carbonate and Clastic reservoirs
- Static and Dynamic properties of reservoirs

9- Reservoir Characterization or Formation Evaluation:
- Core Test Analysis
- Net Pay Cut-Offs
- N/G reservoir and pay ratio calculation, and,
- Reserve Estimation.

Note: Adding more chapters is governed by the time.

Course Teaching and Learning Activities:

Lectures: during week, the theoretical lectures will be presented throughout the semester.

Assignments: occasionally after the lectures, assignment will be explained and given to students.

Quizzes: the contents of each lecture will be discussed during class for open question and answer to make sure every student will participate and active.

In class brainstorming sessions: provide students with enough sources and background knowledge briefly within the topics during class to top up their challenge packs to be more active.

CLASS REQUIREMENT

- Notebook

Assessment Tool	Description	Weight
Quizzes (5)	The open question and answer during class and participation (ABET A & E)	10%
Test 1	Examination of all chapters covered to the date of the test (ABET A & E)	15%
Test 2	Examination of all chapters covered to the date of the test (ABET A & E)	15%
Mid- Term Examination	Examination questions from all lecture reviews and all topics (ABET A & E)	20%
Assignments (5)	Homework, related to the case study reservoir evaluation (ABET A, B, E & K)	10%
Final Examination	Examination questions from all lecture reviews and all topics (ABET A & E)	30%

ESSENTIAL READINGS: (Journals, textbooks, website addresses etc.)

Text books:
1. The Geological Interpretation of well logs (2000), Malcolm Rider (second edition), Whittles Publishing.
2. Darling, T., 2005, Well logging and Formation Evaluation, Elsevier, Amsterdam, 326p.
3. Asquith, G., and Krygowski, D., 2004, Basic Well Log Analysis, AAPG Methods in exploration 16, Tulsa, Oklahoma, USA, 244p.

Additional References
1. Schlumberger publications.
2. Asquith, G. B., 1985, Handbook of Log Evaluation Techniques for Carbonate Reservoirs, AAPG, Tulsa, Oklahoma, USA, 53p

KOMAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
(KUST)

3. Bateman, R. M., 1985, Open-Hole Log Analysis and Formation Evaluation, International Human Resources (Development Cooperation), Boston, USA, 647p.
4. Bowen, D. G., 2003, Formation Evaluation and Petrophysics, Core laboratories, Jakarta, Indonesia, 210p.
5. Principles of Wireline Logging Technology, China National Logging Corporation (CNLC).
6. Log Analysis of Subsurface Geology (1985) John H. Doveton.
7. Well Logging for Earth Scientists, 2nd Edition (2008), by Darwin V. Ellis and Julian M. Singer.

COURSE POLICY *(including plagiarism, academic honesty, attendance etc)*

KUST Academic Policy

http://sar.komar.edu.iq/files/Student%20hand%20Book%202013.pdf

Attendance:
- Students are expected to attend all lectures and must attend all examinations, quizzes
- There is no make-up work for students who miss classes without official permission.
- Student must arrange with the faculty to make-up the missed class.
- Students are subject to the regulation and policies mentioned in the KUST Student Handbook.
- KUST guidelines for lateness are as follows: Three occasions of lateness count as one absence. (You can be considered late the first minute of the lecture time).

GUIDELINES FOR SUCCESS
1. Be able to work independently and in groups,
2. Pay-attention in the classes is the guarantee of success,
3. Extend your knowledge beyond the given textbooks in order to master the subject, and
4. Try not to miss the classes

KOMAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
(KUST)

Course calendar: Please check the academic calendar for 2015/2016

Week	Beg/End Dates	Topics (Chapters)	Course Discussion	
1	28 FEB-03 MAR	Introduction to Well Logging	**CLO: 1**	
2	06-10 MAR	Well Logging Classification & Borehole Environment	**CLO: 1**	
3	13-17 MAR	Caliper Log	**Quiz-1**	
		Temperature Logging	**Assignment step-1** **CLO: 1 & 2**	
Nawroz Holiday			
4	27-31 MAR	Natural Gamma Ray Log	**Assignment step -2** **CLO: 2 & 3**	
		Spectral Gamma Ray Logs		
5	03-07 APR	Sonic Log		
		Test 1		
6	10-14 APR	Density Log	**Quiz-2**	
		Photo Electrical Factor Log	**CLO: 2 & 4 & 5**	
7	17-21 APR	Neutron Log and Lithology Determination from Logs	**Assignment step -3**	
24-29 APR		**(Mid-Term Examination)**		
8	01-05 MAY	SP Log	**CLO: 4, CLO: 5**	
		Assignment Test		
9	08-12 MAY	Resistivity Logs (Induction Log)	**CLO: 6, 7 & 8**	**Quiz-3**
		Resistivity Logs (Lateral Log)		**Assignment step -4**
10	15-19 MAY	Micro Resistivity Logs		
		Dip-meter log	**Quiz-4**	
11	22-26 MAY	Image Logs and Quick Look Methods	**Assignment step -5**	
		Reservoir Geology	**CLO: 9** **Quiz-5**	
12	29 MAY-02 JUN	Static and Dynamic properties of reservoirs		
		Reservoir Characterization		
13	05-09 JUN	**Test 2**		
		Core Test Analysis		
14	12-16 JUN	Net Pay Cut-Offs and N/G reservoir and pay ratio calculation	**CLO: 10**	
		Reserve Estimation		
15	19-23 JUN	**Review Week**		
(Final Examination)			