



## خطة مقرر: تقييم المكامن

### Course Plan (Syllabus): Formation Evaluation

معلومات عن أستاذ المقرر Information about Faculty Member Responsible for the Course					
الاسم Name	Assoc.Prof. Adel Al-Matary		الساعات المكتبية (أسبوعياً) Office Hours		
المكان ورقم الهاتف Location & Telephone No.	770770769		السبت SAT	الأحد SUN	الاثنين MON
البريد الإلكتروني E-mail	a.almatary@su.edu.ye		الثلاثاء TUE	الأربعاء WED	الخميس THU

معلومات عامة عن المقرر General information about the course						
1.	اسم المقرر Course Title	تقييم المكامن Formation Evaluation				
2.	رمز المقرر ورقمه Course Code and Number	PNGE 344				
3.	الساعات المعتمدة للمقرر Credit Hours	الساعات المعتمدة Credit Hours			الإجمالي Total	
		محاضرات Lecture	عملي Practical	سمنار/تمارين Seminar/Tutorial		تدريب Training
		2	1	-	-	3
4.	المستوى والفصل الدراسي Study Level and Semester	3 <sup>rd</sup> level, 2 <sup>nd</sup> semester				
5.	المتطلبات السابقة للمقرر Pre-requisites	PNGE 343				
6.	المتطلبات المصاحبة (إن وجدت) Co-requisite	-				
7.	البرنامج الذي يدرس له المقرر Program (s) in which the course is offered	Bachelor of Petroleum and Natural Gas Engineering				
8.	لغة تدريس المقرر Language of teaching the course	English/ Arabic				
9.	مكان تدريس المقرر Location of teaching the course	Faculty of Petroleum and Natural Resources				

وصف المقرر Course Description	
The purpose of this course is to provide the student with a working knowledge of the current methodologies used in geological description/analysis, formation evaluation (the	



analysis/interpretation of well log data). Teach student the current methodologies used in Interpretation and analysis of well logging data. Petrophysics and formation evaluation by wireline logging as well as core analysis comprise a workflow central to exploration and production in the petroleum industry. This is a core skill set for all petroleum engineers.

### Course Intended Learning Outcomes (CILOs) مخرجات تعلم المقرر

After completing the course, the student will be able to:		بعد الانتهاء من دراسة المقرر سوف يكون الطالب قادرا على أن:
a1.	Demonstrate the current methodologies used in Interpretation and analysis of well logging data.	- a1
a2.	identify the lithology, depositional environment of subsurface strata.	- a2
b1.	determine formation lithology through logs like S.P, G.R etc. and also depositional environment with the help of Gamma rays spectroscopy and Dip-meter tools.	-b1
b2.	determine physical properties of the subsurface, strata like resistivity, porosity, thickness etc. through tools like Laterolog, induction, density, neutron, etc.	- b2
c1.	calculate the porosity, permeability, thickness of different interesting layers in a well.	- c1
c2.	Calculate finally, the hydrocarbon saturation in different reservoir rocks at the well site itself.	- c2
c3.	estimate hydrocarbons reserve in a particular block.	- d1
d1.	Make a successful report clearly on the formation evaluation and well log analysis	- d2

### Course Content محتوى المقرر

Theoretical Aspect خطة تنفيذ الموضوعات النظرية				
الرقم Order	الوحدات (الموضوعات الرئيسية) Units	الموضوعات التفصيلية Sub Topics	الأسبوع Week Due	الساعات الفعلية Con. H

Prepared by  
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Quality Assurance Unit  
Assoc.Prof. Adel Al-Matary

Dean of the Faculty  
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Dean of the Development  
& Quality Assurance Center  
Assoc.Prof. Huda Al-Emad

Rector of Sana'a University  
Prof. Dr. Al Qaseem Mohammed Abas



1	<b>Formation Properties</b>	Rock Formations Petrophysical Properties	Week 1	2
2	<b>Open hole logging</b>	application of caliper tool. Calculation of salinity of formation water	Week 2	2
3	<b>SP Logging</b>	Origin of SP, uses of SP log - Shaliness -Factors influence SP log.	Week 3	2
4	<b>Gamma ray log</b>	Uses of gamma ray log - Determination of Shaliness of formation-API counts Natural Spectral Gamma ray log	Week 4	2
5	<b>Density log:</b>	- Environmental corrections -Porosity determination -Tool calibration, Litho density log.	Week 5	2
6	<b>Neutron log:</b>	Principle and application of neutron tool. Porosity determination.	Week6	2
7	<b>Sonic log:</b>	application of sonic log -Bore hole compensation -Determination of primary and secondary porosity, determination of mechanical properties of rock, elastic constants, fractures etc.	Week 7	2
8	<b>Mid Term Exam</b>		Week 8	2
9	<b>Resistivity log:</b>	Focused resistivity log - Advantages of focused resistivity tools over conventional resistivity tools. Determination of true resistivity (Rt) of the formation	Week 9	2
10	<b>Induction log:</b>	Criteria for selection of induction and lateral logging tool, Determination of true resistivity (Rt) of the formation -Resistivity index <b>Archie's equation</b>	Week 10	2
11	<b>Cased hole logging:</b>	• Completion and Cement Bond Logs • Formation Testers • Production Logs and Well Performance	Week 11	2
12	<b>Direct Methods:</b>	• Mud logging •Routine Core Analysis • Special Core Analysis • Mechanical Properties • Digital Core Analysis	Week 12	2
13	<b>Interpretation:</b>	Quick look interpretation - Cross plots. Neutron- Density, Sonic- Density, Sonic- Neutron cross plots -Hingle plot-Mid plot Correlation - Hydrocarbon reserve estimate.	Week 13	2



14	<b>Borehole Imaging and Dipmeter Logs</b>	Dip meter log-Formation tester -Nuclear magnetic resonance log & Scanner logs (Sonic scanner, MR scanner Rt scanner). Calculating the dip of the formations, collection of fluid samples from wells for confirmation of log interpretation	Week 14	2
15	<b>Synthesis</b>	Logs and Formation Evaluation: Putting it All Together Formation Evaluation and Petrophysics of Shale and Tight Reservoirs • Well Log Interpretation: Case Study	Week 15	2
16	<b>Final Exam</b>	▪	Week 16	2
عدد الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester			<b>16</b>	<b>32</b>

Practical / Training/ Tutorials/ Exercises Aspects خطة تنفيذ موضوعات الجانب العملي			
الرقم Order	موضوعات العملي/ المهام / التمارين Practical/ Tutorials/ Exercises Aspects	الأسبوع Week Due	الساعات الفعلية Cont. H
1	calculation of $V_{shale}$ , determine gamma ray response for common rocks	Week 1	2
2	calculation of $V_{shale}$ , calculation of formation water resistivity $R_w$ from SP log	Week 2-3	4
3	calculate sonic porosity	Week 4	2
4	calculate density porosity	Week 5	2
5	calculate neutron porosity	Week 6	2
6	Mid Term	Week 7	2
7	Calculation of $R_t$ – tornado chart	Week 8-9	4
8	Techniques to calculate water saturation	Week 10-11	4
9	Comprehensive interpretation in well logging	Week 12-13	4
10	Case studies	Week 14	2
11	Final practical Exam	Week 15	2
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		<b>15</b>	<b>30</b>

Teaching Strategies استراتيجيات التعليم والتعلم
<ul style="list-style-type: none"> <li>▪ Interactive Lectures</li> <li>▪ Discussion</li> <li>▪ Demonstration</li> <li>▪ Brain storm</li> <li>▪ Problem solving</li> <li>▪ Tutorials &amp; practical classes,</li> </ul>

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- Case study,
- Computer based teaching

### Tasks and Assignments الأنشطة والتكليفات

م No	التكليف/ الواجب Assignments	نوع التكليف (فردى/ تعاوني)	الدرجة المستحقة Mark	أسبوع التنفيذ Week Due
1	n/a			
Total Score إجمالي الدرجة			15/150 10/ 100	

### Learning Assessment تقويم التعلم

م No	أساليب التقويم Assessment Method	موعد (أسبوع) التقويم Week Due	الدرجة Mark	الوزن النسبي % Proportion of Final Assessment
1	Report	Quarter	5	3.4%
2	Participation	Weekly	10	6.6%
3	Quizzes	End of a topic	10	6.6%
4	Mid-Term (theoretical)	Week 8	15	10%
5	Mid-Term (practical)	Week 6	15	10%
6	Final Exam (practical)	Week 12	25	16.7%
7	Final Exam (theoretical)	Week 16	70	46.7%
Total المجموع			150	100 %

### Learning Resources مصادر التعلم

توثق المراجع حسب نظام APA (اسم المؤلف، سنة النشر، اسم الكتاب، دار النشر، بلد النشر).

#### Required Textbook(s) المراجع الرئيسية (لا تزيد عن مرجعين)

1. Toby Darling (2005) Well Logging and Formation Evaluation, (Gulf Professional/Elsevier,
2. George B. Asquith and Daniel Krygowski (2004) Basic Well Log Analysis. AAPG,

#### Essential References المراجع المساندة

1. Formation Evaluation, Edward J. Lynch, Harper & Row, 1962.
2. Well Logging & Reservoir Evaluation, Oberto Serra, Editions Technip, 2007.
3. Bateman, R. M., 2012, **Openhole Log Analysis and Formation Evaluation**, Society of Petroleum Engineers, Richardson, TX.
4. James Smolen (1996) Cased Hole and Production Log Evaluation, PennWell.
5. Schlumberger. 2009. Log Interpretation Charts. 2009 edition.

#### Electronic Materials and Web Sites etc. المصادر الإلكترونية ومواقع الإنترنت

[www.spe.com](http://www.spe.com)  
[www.schlumberger.com](http://www.schlumberger.com)  
[www.aapg.com](http://www.aapg.com)



Course Policies:	
<b>1</b>	<b>Class Attendance:</b> <ul style="list-style-type: none"> <li>- Students are expected to attend classes regularly and promptly.</li> <li>- The attendance should not be less than 80%.</li> <li>- If the student has been absent, he is responsible for finding out any missed material by consulting other students or going to the professor's office hours.</li> </ul>
<b>2</b>	<b>Tardy:</b> <ul style="list-style-type: none"> <li>- Attendance and arriving on time for the class are necessary. If the student is late, he will be prevented from class.</li> </ul>
<b>3</b>	<b>Exam Attendance/Punctuality:</b> <ul style="list-style-type: none"> <li>- According to the rules the student gets absent in the exam of the course.</li> </ul>
<b>4</b>	<b>Assignments &amp; Projects:</b> <ul style="list-style-type: none"> <li>- Papers survey or projects should be submitted by the time detriment by the professor.</li> </ul>
<b>5</b>	<b>Cheating:</b> <ul style="list-style-type: none"> <li>- According to the rules, cheating is a serious offense and will always result in an imposition of a penalty. The penalties that can be started from the range of canceling the result of the course to canceling the student's admission.</li> </ul>
<b>6</b>	<b>Plagiarism:</b> <ul style="list-style-type: none"> <li>- Plagiarism is a serious offense and will always result in an imposition of a penalty. The penalties that can be started by making a zero mark for the work.</li> </ul>
<b>7</b>	<b>Other policies:</b> <ul style="list-style-type: none"> <li>- The student should by a commitment by the rules inside class and university. Therefore, he is expected to show respect for his classmate, instructors &amp; others.</li> </ul>