Department: Petroleum and Natural Gas Engineering

Course Specification of: Petroleum Reservoir Engineering 2

I. General information about the course

1	**Course Title**	Petroleum Reservoir Engineering 2 هندسة مكامن 2				
2	**Course Code and Number**	PNGE 342				
3	**Credit Hours**	**Credit Hours**				**Total**
		Theoretical	**Practical**	**Seminar/Tutorial**	**Training**	
		2		**1**		**3**
4	**Study Level and Semester**	Level Three – Second Semester				
5	**Pre-requisites (if any)**	PNGE 341				
6	**Co-requisites (if any)**	N.A.				
7	**Program (s) in which the course is offered**	Petroleum and Natural Gas Engineering				
8	**Language of teaching the course**	English				
9	**Study System**	Semester wise				
10	**Location of teaching the course**	Faculty of Petroleum and Natural Resources				
11	**Prepared by**	Dr. Khaled Saeed Ba-Jaalah				
12	**Date of Approval**					

II. Course Description:

The course provides students with the classifications and drive mechanisms of oil reservoirs and the basic methods for estimating the oil reserves. Topics include introduction of water influx. Water influx models. Saturated oil reservoirs. Predicting oil reservoir performance. Coning in vertical and horizontal wells. Decline-curve analysis. Through this course student well be do tutorials to estimate oil reserves and predicting future production using different methods and evaluating the coning problem in vertical and horizontal wells using three categories of correlation.

III. Course Intended Learning Outcomes (CILOs):

After completing the course, the student will be able to:

a1.	Classify reservoir-aquifer systems on the basis of degree of pressure maintenance, flow regimes, outer boundary conditions, and flow geometries.
b1.	Estimate the water and gas coning behavior by using the theoretical analysis of coning and many of the practical solutions.

Prepared by	Quality Assurance Unit	Dean of the Faculty	Dean of the Development & Quality Assurance Center
Assoc.Prof. Adel Al-Matary	Assoc.Prof. Adel Al-Matary	Assoc.Prof. Bassim AlKhirbash	Assoc.Prof. Huda Al-Emad

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

b2.	Perform water influx calculations by various models and incorporate in material balance equation analysis.
c1.	Calculate the initial oil in place and the oil recovery for volumetric and water-drive of saturated oil reservoirs.
c2.	Predict oil reservoir performance as a function of declining reservoir pressure and time-production phase.
c3.	Use decline curves to estimate oil reserves and performance prediction of oil reservoirs.

IV. Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes) :

Course Intended Learning Outcomes		Program Intended Learning Outcomes	
a1.	Classify reservoir-aquifer systems on the basis of degree of pressure maintenance, flow regimes, outer boundary conditions, and flow geometries.	**A1**	Demonstrate the concepts of basic science and mathematics related to field of petroleum engineering
b1.	Estimate the water and gas coning behavior by using the theoretical analysis of coning and many of the practical solutions.	**B1**	Use the principles of engineering in developing solutions to practical petroleum engineering and select appropriate computer software for modeling
b2.	Perform water influx calculations by various models and incorporate in material balance equation analysis.		
c1.	Calculate the initial oil in place and the oil recovery for volumetric and water-drive of saturated oil reservoirs.	**C1**	Carry out special engineering design in all petroleum engineering projects.
c2.	Predict oil reservoir performance as a function of declining reservoir pressure and time-production phase.		
c3.	Use decline curves to estimate oil reserves and performance prediction of oil reservoirs.	**C3**	Deal with the high level of uncertainty in definition and solution of petroleum reservoir problems.

V. Alignment of CILOs to Teaching and Assessment Strategies

First: Alignment of Knowledge and Understanding CILOs

Knowledge and Understanding CILOs	Teaching Strategies	Assessment Strategies

a1 -	Classify reservoir-aquifer systems on the basis of degree of pressure maintenance, flow regimes, outer boundary conditions, and flow geometries.	- Lecture - Discussion - Independent readings - Videos	- Quiz - Oral questions - Participation of students - Examinations

Second: Alignment of Intellectual Skills CILOs

Intellectual Skills CILOs		Teaching Strategies	Assessment Strategies
b1 -	Estimate the water and gas coning behavior by using the theoretical analysis of coning and many of the practical solutions.	- Lecture - Tutorial - Discussion - Problem solving	- Quiz - Home work - Examinations
b2 -	Perform water influx calculations by various models and incorporate in material balance equation analysis.		

Third: Alignment of Professional and Practical Skills CILOs

Professional and Practical Skills CILOs		Teaching Strategies	Assessment Strategies
c1-	Calculate the initial oil in place and the oil recovery for volumetric and water-drive of saturated oil reservoirs.	- Lecture - Tutorial - Discussion - Problem solving	- Quiz - Home work - Examinations
c2-	Predict oil reservoir performance as a function of declining reservoir pressure and time-production phase.		
c3-	Use decline curves to estimate oil reserves and performance prediction of oil reservoirs.		

Fourth: Alignment of Transferable (General) Skills CILOs

Transferable (General) Skills CILOs	Teaching Strategies	Assessment Strategies

VI. Course Content:

A. Theoretical Aspect:

Order	Topic List / Units	Sub Topics List	Number of Weeks	Contact Hours	(CILOs)
1	**Introduction of Water Influx**	- Introduction - Reservoir-aquifer systems are	1	2	a1

		commonly classified on the basis of: ✓ Degree of pressure maintenance ✓ Flow regimes ✓ Outer boundary conditions ✓ Flow geometries			
2	**Water Influx Models**	- Pot aquifer - Schilthuis' steady-state - Hurst's modified steady-state	1	2	a1, b1
		- The Van Everdingen-Hurst unsteady-state ▪ Edge-water drive ▪ Bottom-water drive	1	2	
		- Fetkovich's method ▪ Radial aquifer ▪ Linear aquifer	1	2	
3	**Predicting Oil Reservoir Performance**	- Instantaneous Gas-Oil Ratio - Oil saturation adjustment for: ▪ water influx ▪ gas-cap expansion ▪ combination drive ▪ shrinking gas cap	1	2	b1, b2, C2
		- Estimate cumulative oil production between the initial and bubble-point pressures	1	2	
		- Predict the performance of solution-gas-drive reservoirs, including: ▪ Tracy's method ▪ Muskat's method - Tarner's method	1	2	
4	**Mid-term Exam**		1	2	a1,b1,b2,c2
5	**Coning in vertical wells**	- Introduction of gas and water coning - Vertical well critical rate correlations.	1	2	a1,b1,b2
		- Breakthrough time in vertical Wells. - Well performance calculations after Breakthrough.	1	2	

6	**Coning in horizontal wells**	- Horizontal well critical rate correlations. - Horizontal well breakthrough time.	1	2	a1,b1,b2
7	**Saturated oil reservoirs**	- Material-balance plots. - Volatile-Oil Reservoirs	1	2	c1,c2
8	**Decline-Curve Analysis**	- Parameter Estimation for Exponential decline. - Parameter Estimation for Harmonic decline.	1	2	c1,c2,c3
		- Parameter Estimation for Hyperbolic decline.	1	2	
Number of Weeks /and Contact Hours Per Semester			**14**	28	

B. Practical Aspect (if any)

Order	Practical / Exercises/ Tutorials topics	Number of Weeks	Contact Hours	Course ILOs
1	Calculate water influx by: - Pot aquifer - Schilthuis' steady-state - Hurst's modified steady-state - The Van Everdingen-Hurst unsteady-state ▪ Edge-water drive ▪ Bottom-water drive - Fetkovich's method ▪ Radial aquifer ▪ Linear aquifer	**2**	**4**	b1,b2
2	Estimate cumulative oil production between the initial and bubble-point pressures.	**1**	**2**	b1,b2
3	Predict the performance of solution-gas-drive reservoirs by: -Tracy's method -Muskat's method -Tarner's method	**2**	**4**	b1,b2,c2
4	- Calculate critical oil flow rate in vertical Wells. - Calculate Breakthrough time in vertical Wells. - Well performance calculations after Breakthrough.	**2**	**4**	b1,b2

5	- Calculate critical oil flow rate in horizontal Wells. - Calculate Breakthrough time in horizontal Wells.	**2**	**4**	b1,b2
6	Calculate the initial oil in place and the oil recovery for saturated oil reservoirs by: - Material balance method - Material balance plots	**2**	**4**	c1,c2
7	Estimate oil reserves and predicting future production by: -Exponential decline -Harmonic decline -Hyperbolic decline	**2**	**4**	c1,c2,c3
8	Practical Exam	**1**	**2**	b1,b2,c1,c2,c3
Number of Weeks /and Contact Hours Per Semester		**14**	**28**	

VII. Teaching Strategies:

1. Discussion
2. Independent readings
3. Lecture
4. Problem solving
5. Tutorial
6. Videos

VIII. Tasks and Assignments :

No	Assignments/ Tasks	Type of Assignment	Mark	Week Due	CILOs (symbols)
1	**Exercises & Home works**	personal	15	By-weekly basis	b1,b2,c1,c2 ,c3
	Total Score إجمالي الدرجة		**15**		

IX. Learning Assessment :

No.	Assessment Tasks	Week due	Mark	Proportion of Final Assessment	CILOs (symbols)
1	**Exercises & Home works**	By-weekly basis	15	10 %	b1,b2,c1,c2,c3
2	**Quiz (1)**	W6	5	3.3 %	a1,b1,b2,c2

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Quality Assurance Unit
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3	**Midterm Exam**	W8	25	16.7 %	a1,b1,b2,c2
4	**Quiz (2)**	W12	5	3.3 %	a1,b1,b2,c2
5	**Final Exam (practical)**	**W 15**	30	20 %	b1,b2,c1,c2,c3
6	**Final Exam (theoretical)**	**W16**	70	46.7 %	a1,b1,b2,c1,c2,c3
Total			**150**	**100.00%**	

X. Learning Resources :

1- Required Textbook(s) :

1. Ahmed, T., 2010, Reservoir Engineering Handbook, 4th Edition, ELSEVIER Inc.
2. Towler, B. F., 2002, Fundamental Principles of Reservoir Engineering, SPE, vol 8.

2- Essential References :

1. Craft, B. C., and Hawkins M., 1991, Applied Petroleum Reservoir Engineering, Prentice Hall, New Jersey.
2. Dake, L. D., 1978, Fundamentals of Reservoir Engineering, Elsevier.

3- Electronic Materials and Web Sites *etc.* :

1. Sites of society petroleum engineers. https://www.spe.org/en/
2. Journal of Petroleum Science and Engineering.

https://www.journals.elsevier.com/journal-of-petroleum-science-and-engineering

XI. Course Policies :

1	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject, otherwise he/she will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic. If the absent is more than 25% of a course total contact hours, student will be required to retake the entire course again.
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he/she will be considered as absent.
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4	**Assignments & Projects:** In general one assignment is given to the students after each chapter, the student has to

	submit all the assignments for checking on time, mostly one week after given the assignment.
5	**Cheating**: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
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Department: Petroleum and Natural Gas Engineering

Academic Year: 2019 – 2020

Course Plan (Syllabus): Petroleum Reservoir Engineering 2

I. Information about Faculty Member Responsible for the Course :

Name	**Dr. Khaled Saeed Ba-Jaalah**	**Office Hours**					
Location &Telephone No.	**Hadhramout Univ. 701915823**	**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail	**kbajaalah@hotmail.com**						

II. General information about the course:

1	**Course Title**	Petroleum Reservoir Engineering 2 هندسة مكامن 2				
2	**Course Code and Number**	PNGE 342				
3	**Credit Hours**	**Credit Hours**				**Total**
		Theoretical	**Practical**	**Seminar/Tutorial**	**Training**	
		2		**1**		***3***
4	**Study Level and Semester**	Level Three – Second Semester				
5	**Pre-requisites (if any)**	PNGE 341				
6	**Co-requisites (if any)**	N.A.				
7	**Program (s) in which the course is offered**	Petroleum and Natural Gas Engineering				
8	**Language of teaching the course**	English				
9	**Location of teaching the course**	Faculty of Petroleum and Natural Resources				

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The course provides students with the classifications and drive mechanisms of oil reservoirs and the basic methods for estimating the oil reserves. Topics include introduction of water influx. Water influx models. Saturated oil reservoirs. Predicting oil reservoir performance. Coning in vertical and horizontal wells. Decline-curve analysis. Through this course student well be do tutorials to estimate oil reserves and predicting future production using different methods and evaluating the coning problem in vertical and horizontal wells using three categories of correlation.

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After completing the course, the student will be able to:

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b1.	Estimate the water and gas coning behavior by using the theoretical analysis of coning and many of the practical solutions.
b2.	Perform water influx calculations by various models and incorporate in material balance equation analysis.
c1.	Calculate the initial oil in place and the oil recovery for volumetric and water-drive of saturated oil reservoirs.
c2.	Predict oil reservoir performance as a function of declining reservoir pressure and time-production phase.
c3.	Use decline curves to estimate oil reserves and performance prediction of oil reservoirs.

V. Course Content:

A. Theoretical Aspect:

Order	Topic List / Units	Sub Topics List	Number of Weeks	Contact Hours
1	**Introduction of Water Influx**	- Introduction - Reservoir-aquifer systems are commonly classified on the basis of: ✓ Degree of pressure maintenance ✓ Flow regimes ✓ Outer boundary conditions ✓ Flow geometries	1	2
2	**Water Influx Models**	- Pot aquifer - Schilthuis' steady-state - Hurst's modified steady-state	1	2
		- The Van Everdingen-Hurst unsteady-state ▪ Edge-water drive ▪ Bottom-water drive	1	2
		- Fetkovich's method ▪ Radial aquifer ▪ Linear aquifer	1	2

3	**Predicting Oil Reservoir Performance**	- Instantaneous Gas-Oil Ratio - Oil saturation adjustment for: ▪ water influx ▪ gas-cap expansion ▪ combination drive ▪ shrinking gas cap	1	2
		- Estimate cumulative oil production between the initial and bubble-point pressures	1	2
		- Predict the performance of solution-gas-drive reservoirs, including: ▪ Tracy's method ▪ Muskat's method - Tarner's method	1	2
4	**Mid-term Exam**		1	2
5	**Coning in vertical wells**	- Introduction of gas and water coning - Vertical well critical rate correlations.	1	2
		- Breakthrough time in vertical Wells. - Well performance calculations after Breakthrough.	1	2
6	**Coning in horizontal wells**	- Horizontal well critical rate correlations. - Horizontal well breakthrough time.	1	2
7	**Saturated oil reservoirs**	- Material-balance plots. - Volatile-Oil Reservoirs	1	2
8	**Decline-Curve Analysis**	- Parameter Estimation for Exponential decline. - Parameter Estimation for Harmonic decline.	1	2
		- Parameter Estimation for Hyperbolic decline.	1	2
Number of Weeks /and Contact Hours Per Semester			**14**	28

B. Practical Aspect (if any)

Prepared by	Quality Assurance Unit	Dean of the Faculty	Dean of the Development & Quality Assurance Center
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Order	Practical / Exercises/ Tutorials topics	Number of Weeks	Contact Hours
1	Calculate water influx by: - Pot aquifer - Schilthuis' steady-state - Hurst's modified steady-state - The Van Everdingen-Hurst unsteady-state ▪ Edge-water drive ▪ Bottom-water drive - Fetkovich's method ▪ Radial aquifer ▪ Linear aquifer	2	4
2	Estimate cumulative oil production between the initial and bubble-point pressures.	1	2
3	Predict the performance of solution-gas-drive reservoirs by: -Tracy's method -Muskat's method -Tarner's method	2	4
4	- Calculate critical oil flow rate in vertical Wells. - Calculate Breakthrough time in vertical Wells. - Well performance calculations after Breakthrough.	2	4
5	- Calculate critical oil flow rate in horizontal Wells. - Calculate Breakthrough time in horizontal Wells.	2	4
6	Calculate the initial oil in place and the oil recovery for saturated oil reservoirs by: - Material balance method - Material balance plots	2	4
7	Estimate oil reserves and predicting future production by: -Exponential decline -Harmonic decline -Hyperbolic decline	2	4
8	Practical Exam	1	2
Number of Weeks /and Contact Hours Per Semester		**14**	**28**

VI. Teaching Strategies:

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3. Lecture

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4. Problem solving
5. Tutorial
6. Videos

VII. Tasks and Assignments :

No	Assignments/ Tasks	Type of Assignment	Mark	Week Due
1	**Exercises & Home works**	personal	5	By-weekly basis
	Total Score إجمالي الدرجة		**5**	

VIII. Learning Assessment :

No.	Assessment Tasks	Week due	Mark	Proportion of Final Assessment
1	**Exercises & Home works**	By-weekly basis	15	10 %
2	**Quiz (1)**	W6	5	3.3 %
3	**Midterm Exam**	W8	25	16.7 %
4	**Quiz (2)**	W12	5	3.3 %
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Total			**150**	**%100**

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قسم/ برنامج Department: هندسة النفط والغاز الطبيعي Petroleum and Natural Gas Engineering

مواصفات مقرر: تقييم المكامن

Course Specification of: Formation Evaluation

General information about the course المعلومات العامة عن المقرر						
.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	Credit Hours الساعات المعتمدة				الإجمالي Total
		محاضرات Lecture	عملي Practical	سمنار/تمارين Seminar/Tutorial	تدريب Training	
		2	1	-	-	3
.4	المستوى والفصل الدراسي Study Level and Semester	3rd level, 2nd semester				
.5	المتطلبات السابقة المقرر (إن وجدت) Pre-requisites (if any)	PNGE 343				
.6	المتطلبات المصاحبة (إن وجدت) Co-requisites (if any)	-				
.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	نظام الدراسة Study System	Semesters				
.10	مكان تدريس المقرر Location of teaching the course	Faculty of Petroleum and Natural Resources				
.11	اسم معد(و) مواصفات المقرر Prepared by	Assoc.Prof. Adel Al-Matary				
.12	تاريخ اعتماد مجلس الجامعة Date of Approval	2020				

Course Description وصف المقرر

وصف المقرر بالإنجليزية	وصف المقرر بالعربية
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	

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Quality Assurance Unit
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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.		- c3
d1	Make a successful report clearly on the formation evaluation and well log analysis		- d1

مواءمة مخرجات تعلم المقرر مع مخرجات التعلم للبرنامج: Alignment of CILOs (Course Intended Learning Outcomes) to PILOs (Program Intended Learning Outcomes)			
مخرجات التعلم المقصودة من المقرر (Course Intended Learning Outcomes)		مخرجات التعلم المقصودة من البرنامج (Program Intended Learning Outcomes) (تكتب جميع مخرجات البرنامج كما هي رمزا ونصا)	
a1	Demonstrate the current methodologies used in Interpretation and analysis of well logging data.	A1	
a2	identify the lithology, depositional environment of subsurface strata.	A3	
b1	determine formation lithology through logs like S.P, G.R etc. and also depositional environment	B2	

	with the help of Gamma rays spectroscopy and Dip-meter tools.		
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.	**C2**	
c2	Calculate finally, the hydrocarbon saturation in different reservoir rocks at the well site itself.	**C2**	
c3	estimate hydrocarbons reserve in a particular block.	**C3**	
d1	Make a successful report clearly on the formation evaluation and well log analysis	**D3**	

مواءمة مخرجات التعلم باستراتيجيات التعليم والتعلم والتقويم
Alignment of CILOs to Teaching and Assessment Strategies

أولا: مواءمة مخرجات تعلم المقرر (المعارف والفهم) باستراتيجية التعليم والتعلم والتقويم:
First: Alignment of Knowledge and Understanding CILOs

مخرجات المقرر/ المعرفة والفهم **Knowledge and Understanding CILOs**		استراتيجية التعليم والتعلم **Teaching Strategies**	استراتيجية التقويم **Assessment Strategies**
a1 -	Demonstrate the current methodologies used in Interpretation and analysis of well logging data.	-Interactive Lectures - Discussion - Demonstration	Examinations, Oral presentation Achievement tests
a2 -	identify the lithology, depositional environment of subsurface strata.		

ثانيا: مواءمة مخرجات تعلم المقرر (المهارات الذهنية) باستراتيجية التدريس والتقويم:
Second: Alignment of Intellectual Skills CILOs

مخرجات المقرر/ المهارات الذهنية **Intellectual Skills CILOs**		استراتيجية التعليم والتعلم **Teaching Strategies**	استراتيجية التقويم **Assessment Strategies**
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.	Discussion Demonstration Brain storm Problem solving	Essay test, Laboratory

b2 -	determine physical properties of the subsurface, strata like resistivity, porosity, thickness etc. through tools like laterolog, induction, density, neutron, etc.		Performance

ثالثا: مواءمة مخرجات تعلم المقرر (المهارات المهنية والعملية) باستراتيجية التدريس والتقويم:

Third: Alignment of Professional and Practical Skills CILOs

مخرجات المقرر/ المهارات المهنية والعملية Professional and Practical Skills CILOs		استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقويم Assessment Strategies
c1-	calculate the porosity, permeability, thickness of different interesting layers in a well.	Tutorials & practical classes, Case study, Computer based teaching	Achievement tests Chart Drawing practical exams
c2-	Calculate finally, the hydrocarbon saturation in different reservoir rocks at the well site itself.		
c3-	estimate hydrocarbons reserve in a particular block.		

رابعا: مواءمة مخرجات تعلم المقرر (المهارات العامة) باستراتيجية التدريس والتقويم:

Fourth: Alignment of Transferable (General) Skills CILOs

مخرجات المقرر Transferable (General) Skills CILOs		استراتيجية التعليم والتعلم Teaching Strategies	استراتيجية التقويم Assessment Strategies
d1-	Make a successful report clearly on the formation evaluation and well log analysis	Small group working Seminars Case Study Method	Achievement tests Presentation

Course Content محتوى المقرر

Theoretical Aspect موضوعات الجانب النظري

الرقم Order	الموضوعات الرئيسة/ الوحدات Topic List / Units	الموضوعات الفرعية Sub Topics List	عدد الأسابيع Number of Weeks	الساعات الفعلية Contact Hours	رموز مخرجات التعلم للمقرر (CILOs)
1	**Formation Properties**	Rock Formations Petrophysical Properties	1	2	a2,b2
2	**Open hole logging**	application of caliper tool. Calculation of salinity of formation water	1	2	a1,b1,b2
3	**SP Logging**	Origin of SP, uses of SP log - Shaliness -Factors influence SP log.	1	2	a1,b1,b2
4	**Gamma ray log**	Uses of gamma ray log - Determination of Shaliness of formation-	1	2	a1,b1,b2

		API counts Natural Spectral Gamma ray log			
5	**Density log:**	- Environmental corrections -Porosity determination -Tool calibration, Litho density log.	1	2	a1,b1,b2
6	**Neutron log:**	Principle and application of neutron tool. Porosity determination.	1	2	a1,b1,b2
6	**Sonic log:**	application of sonic log -Bore hole compensation -Determination of primary and secondary porosity, determination of mechanical properties of rock, elastic constants, fractures etc.	1	2	a1,b1,b2
8	**Resistivity log:**	Focused resistivity log - Advantages of focused resistivity tools over conventional resistivity tools. Determination of true resistivity (Rt) of the formation	1	2	a1,b1,b2
9	**Induction log:**	Criteria for selection of induction and lateral logging tool, Determination of true resistivity (Rt) of the formation -Resistivity index **Archie's equation**	1	2	a1,b1,b2
10	**Cased hole logging:**	• Completion and Cement Bond Logs • Formation Testers • Production Logs and Well Performance	1	2	a1,b1,b2,d1
11	**Direct Methods:**	• Mud logging •Routine Core Analysis • Special Core Analysis • Mechanical Properties • Digital Core Analysis	1	2	a1,b1,b2,d1
12	**Interpretation:**	Quick look interpretation - Cross plots. Neutron- Density, Sonic-Density, Sonic- Neutron cross plots -Hingle plot-Mid plot Correlation - Hydrocarbon reserve estimate.	1	2	a1,b1,b2, c1,c2,c3,d1
13	**Borehole Imaging and Dipmeter Logs**	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	1	2	a1, d1
14	**Synthesis**	Logs and Formation Evaluation: Putting it All Together Formation Evaluation and Petrophysics of Shale and Tight Reservoirs	1	2	All CILO

		• Well Log Interpretation: Case Study			
عدد الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester			14	28	

Practical Aspect (if any) الموضوعات العملية (إن وجدت)

الرقم Order	التجارب العملية/ التمارين / تدريبات Practical / Exercises/ Tutorials topics	عدد الأسابيع Number of Weeks	الساعات الفعلية Contact Hours	رموز مخرجات التعلم Course ILOs
1	calculation of *Vshale*, determine gamma ray response for common rocks	1	2	b1, b2, c1, c2, c3, d1
2	calculation of *Vshale*, calculation of formation water resistivity Rw from SP log	2	4	b1, b2, c1, c2, c3, d1
3	calculate sonic porosity	1	2	b1, b2, c1, c2, c3, d1
4	calculate density porosity	1	2	b1, b2, c1, c2, c3, d1
5	calculate neutron porosity	1	2	b1, b2, c1, c2, c3, d1
6	Calculation of Rt – tornedo chart	2	4	b1, b2, c1, c2, c3, d1
7	Techniques to calculate water saturation	2	4	b1, b2, c1, c2, c3, d1
8	Comprehensive interpretation in well logging	2	4	b1, b2, c1, c2, c3, d1
9	Case studies	1	2	All CILO
اجمالي الأسابيع والساعات الفعلية Number of Weeks /and Contact Hours Per Semester		13	26	

Teaching Strategies استراتيجيات التعليم والتعلم

- Interactive Lectures
- Discussion
- Demonstration
- Brain storm
- Problem solving
- Tutorials & practical classes,
- Case study,
- Computer based teaching

Prepared by	Quality Assurance Unit	Dean of the Faculty	Dean of the Development & Quality Assurance Center
Assoc.Prof. Adel Al-Matary	Assoc.Prof. Adel Al-Matary	Assoc.Prof. Bassim AlKhirbash	Assoc.Prof. Huda Al-Emad

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

Tasks and Assignments الأنشطة والتكليفات

م No	التكليف/ الواجب Assignments/ Tasks	نوع التكليف (فردي/ تعاوني)	الدرجة المستحقة Mark	أسبوع التنفيذ Week Due	خرجات التعلم CILOs (symbols)
1	n/a				
	إجمالي الدرجة Total Score				

Learning Assessment تقييم التعلم

الرقم No.	أنشطة التقييم Assessment Tasks	أسوع التقييم Week due	الدرجة Mark	نسبة الدرجة إلى الدرجة النهائية Proportion of Final Assessment	مخرجات التعلم CILOs (symbols)
1	Report	Quarter	5	3.4%	d3
2	Participation	Weekly	10	6.6%	all
3	Quizzes	End of a	10	6.6%	all
4	Mid-Term (theoretical)	Week 8	15	10%	b21,b2.2.c1.c2.c3
5	Mid-Term (practical)	Week 6	15	10%	b21,b2.2.c1.c2.c3
6	Final Exam (practical)	Week 12	25	16.7%	all
7	Final Exam (theoretical)	Week 16	70	46.7%	all
الإجمالي Total			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 الرئيسة (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
www.schlumberger.com
www.aapg.com

Course Policies:

Prepared by	Quality Assurance Unit	Dean of the Faculty	Dean of the Development & Quality Assurance Center
Assoc.Prof. Adel Al-Matary	Assoc.Prof. Adel Al-Matary	Assoc.Prof. Bassim AlKhirbash	Assoc.Prof. Huda Al-Emad

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

1	Class Attendance: - Students are expected to attend classes regularly and promptly. - The attendance should not be less than 80%. - 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.
2	Tardy: - Attendance and arriving on time for the class are necessary. If the student is late, he will be prevented from class.
3	Exam Attendance/Punctuality: - According to the rules the student gets absent in the exam of the course.
4	Assignments & Projects: - Papers survey or projects should be submitted by the time detriment by the professor.
5	Cheating: - 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.
6	Plagiarism: - 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.
7	Other policies: - The student should by a commitment by the rules inside class and university. Therefore, he is expected to show respect for his classmate, instructors &others.