هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications
(Postgraduate Degree)

Course Title:	**INTERPRETATION OF WELL LOGGING**
Course Code:	**Geo 573**
Program:	**M.Sc. in Geology**
Department:	**Department of Geology & Geophysics**
College:	**College of Science**
Institution:	**King Saud University**

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A. Course Identification

1. Credit hours: **3 (2 + 0 + 1)**
2. Course type ☒ Required ☐ Elective
3. Level/year at which this course is offered: M.Sc. Geology, First Level
4. Pre-requisites for this course (if any)**: None**
5. Co-requisites for this course (if any)**: None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Seminars	
4	Others (specify)	
Total		60

B. Course Objectives and Learning Outcomes

1. Course Description

Through the recording of petrophysical properties using a variety of sensors. The course will demonstrate the Logging tools developed over the years which measure the natural gamma ray, electrical, acoustic, stimulated radioactive responses, electromagnetic, nuclear magnetic resonance, pressure and other properties of the rocks and their contained fluids. The course will provide in-depth knowledge on the borehole environment, physical principles of various logs, logging techniques, and log interpretation using advanced methods

2. Course Main Objective

(.) Principles of Well Logging: Borehole Environment, Log Data Acquisition
(.) Fundamentals on Quantitative Log Interpretation
(.) Spontaneous Potential Log, Density Logs, Neutron Logs, Resistivity Logs, Microresistivity Logs, Focused Logs, and their Interpretations
(.) Advanced Techniques in Log Interpretation: Porosity determination, Permeability, Shaly-sand analysis
(.) Interpretation Case Studies for Promising Horizons for Production.

3. Course Learning Outcomes

	Course Learning Outcomes (CLOs)	Aligned PLOs*
1	**Knowledge and Understanding**	
1.1	**To develop a good understanding on the Borehole Environment where logging is done,**	1.1
1.2	**To learn about the Logging Techniques, their underlying Physical Principles, Logging tools, & Logs produced**	1.1
1.3	**To know the Log Interpretation Techniques as applied to various logs for determination of Porosity, Permeability, Flushed Zone Resistivity, Formation Water Resistivity, determining Lithology, Matrix Identification Lithology**	1.2
1...		
2	**Skills :**	
2.1	**Apply interpretation techniques for determining Porosity, Permeability, Lithology estimation & Petrophysical parameters**	2.2
2.2		
2.3		
3	**Values:**	
3.1	**Effective team work to discuss and interpret well logging data with good time management**	3.1
3.2	**Good presentation skills.**	3.2
3.3		

* Program Learning Outcomes

C. Course Content

No	List of Topics	Contact Hours
1	**Principles of Well Logging: Borehole Environment, Log Data Acquisition, Invasion & Resistivity Profiles**	**4**
2	**Fundamentals of Quantitative Log Interpretation: Porosity, Saturation, Permeability, Archie's equation, Temperature & Pressure, Invasion Process, Resistivity**	**4**
3	**Spontaneous Potential Log, Origin of SPs, Shale Baseline, Formation Water Resistivity determination, Shale Volume calculation**	**4**
4	**Porosity Logs: Density Log, Neutron Log and their Interpretations, estimation of Formation Lithology using Neutron-Density combination**	**4**
5	**Resistivity Logs: Physical principles for Resistivity & Induction Logging, Conventional Logs, Focused Electrode Logs – LL3, LL7 & LL8, Dual Laterologs, SFL, MSFL, Induction Logs, Flushed Zone Resistivity**	**6**
6	**Log Interpretation: Archie's Water Saturation, Permeability from Logs, Shaly-sand analysis**	**4**
7	**Interpretation Case Studies for promising horizons for production: Sandstone & Limestone Formations**	**4**
	Total	

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**To develop a good understanding on the Borehole Environment where logging is done,**	**Classroom Lectures, Interactive classroom discussions**	**Mid-Term & Final examinations**
1.2	**To learn about the Logging Techniques, their underlying Physical Principles, Logging tools, & Logs produced**		
1.3	**To know the Log Interpretation Techniques as applied to various logs for determination of Porosity, Permeability, Flushed Zone Resistivity, Formation Water Resistivity, determining Lithology, Matrix Identification Lithology**		
2.0	**Skills**		
2.1	**Apply interpretation techniques for determining Porosity, Permeability, Lithology estimation & Petrophysical parameters**	**- Classroom Lectures,** **- Research work assignment**	**- Mid-Term & Final practical examinations** **- Report on Research work assignment**
2.2			
…			
3.0	**Values**		
3.1	**Effective team work to discuss and interpret well logging data with good time management**	**Research work assignment**	**- Timely-submission of the research work assignment**
3.2	**Good presentation skills.**	**- presentations**	**Design and deliver a presentation.**
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2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework 1	3	1%
2	Homework 2	5	1%
3	First Mid-term exam	6	10%

#	Assessment task*	Week Due	Percentage of Total Assessment Score
4	Homework 3	8	1%
5	Homework 4	10	1%
6	Second Mid-term exam	12	10%
7	Presentation and Oral exam	14	6%
8	Research work	14	10%
9	Practical exam	15	20%
10	Final exam	16	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

The Academic Faculty is available in his office for 4 hrs/week for consultation and academic advice to students. The Office Hours timings are pre-notified at the beginning of the Semester.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	**(.) "Basic Well Log Analysis", by G. Asquith & D. Krygowski, 2004. American Association of Petroleum Geologists Methods in Exploration Series, No. 16, Second Edition.** **(.) "Theory, Measurement and Interpretation of Well Logs", by Z. Bassiouni, 1994. Society of Petroleum Engineers, Texas.**
Essential Reference Materials	**(.) SCHLUMBERGER, 1998. Log Interpretation Charts, SMP-7006, Texas.** **(.) WESTERN ATLAS INTERNATIONAL Inc., 1995. Log Interpretation Charts, Texas, Western Atlas.** **(.) HALIBURTON Energy Services, 1994. Log Interpretation Charts (third printing), Texas, Haliburton Company**
Electronic Materials	**(.) Search websites for: Society of Professional Well Log Analysts—both Transactions & Journal Publications on Well Log Interpretations** **(.) Schlumberger published materials on websites.**
Other Learning Materials	**(.) "Fundamentals of Well-Log Interpretation", by O. Serra, 1984. Elsevier, New York.**

	(.) Hilchie, D.W., 1982. Advanced Well Log Interpretation. D.W. Hilchie Inc., Colorado.

2. Educational and research Facilities and Equipment Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Lecture room with at least 15 seats** • **laboratory with at least 15 places .**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **One PC connected to Data show in the lecture room.** • **laboratory with at least 15 places equipped with PCs**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	**(.) Software for computational-practice on Log Interpretation by students,** **(.) Typical Logs and their interpretations -- demonstrating oil-field case studies**

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and assessment	**Students**	**Indirect** **- Student course evaluation at the conclusion of the course**
Extent of achievement of course learning outcomes	**Faculty**	**Direct** **Calculating of the successes percentage for each student in each learning outcome of the course from the exams results**
Quality of learning resources	**Students**	**Indirect** **- Student course evaluation at the conclusion of the course**

Evaluation Areas/Issues (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	