

1. Course Codes G175, G177, G170-GSE	2. Course Title Petroleum Geoscience	3. School/Institute Petroleum Engineering	4. Type Specialised Institute Degree	5. Awards MSc PGDip PGCERT
6. Course Accredited by		7. QAA Subject Benchmarking Group(s) Earth Science / Engineering		
8. Date of Production/Revision May 2010				

10. Arrangement of Modules					11. Awards, Credits & Level
Mandatory and Optional Modules					
Semester 1		Starting From Semester 2		Starting From Semester 2/3	
Module Code & Title	Effort Hours	Module Code & Title	Effort Hours	Module Code & Title	Effort Hours
10 modules (including a project/ dissertation)	G11RC Reservoir Concepts	150	G11RB Reservoir Geophysics & Sedimentary Basins	150	180 SCQF credits for MSc; incl 180 credits at Level 11
	G11EM Reservoir Engineering to Exploration Methods	150	G11BA Petroleum basins 1	150	
	G11RV Reservoir Sedimentology	150	G11BB Petroleum basins 2	150	
	G11FE Formation Evaluation	150	*G11TM Timelapse, Multicomponent and Exploration Seismic	150	
8 taught modules (*with a choice between 2 modules)					120SCQF credits for PG Dip; inc 120 credits at Level 11
					60. SCQF credits for PG Cert; inc 60 credits at Level 11

12. Mode and Location of Study				13. Duration of Study (months)			
Home Campus ☒	Other Campus ☐	Full-time ☒	Part-time ☒				
(specify) ...							
Collaborative Partner ☒ Approved Learning Partner ☐							
14. Mode of Delivery							
Conventional ☒ Blended ☐ Independent ☐							
15. Level of Modules							
Level 11 ☒ Levels 7-10 (UG ☐ Mixed ☐							
Modules not at Level 11 (codes):							
16. Collaborative/Approved Learning Partner Course							
Edinburgh and Newcastle Universities							

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Course Notes

1. Nominal Pass Mark/Grade		2. Summary of Assessment Methods 50% coursework: 50% exam:		
- Masters: Min 50% per Module, 55% Overall, 180 credits - Diploma: Min 40% /Grade D per module, 120 credits overall - Certificate: Min 40% /Grade D per module, 60 credits overall				
3. Re-assessment Opportunities Remedial Work. At the discretion of exam board in case of a marginal fail (This would involve re-submission of a report or the completion of an appropriate assignment). Resit as per University Guidelines				
4. Award Criteria				
	Number of Module Passes Masters: Grade C Diploma and Cert: Grade D	Overall Mark/Grade	Basis of Overall Mark/Grade Grade: A: >=70% B: 60-69% C: 50 to 59% D: 40 to 49% E: 30 to 39%	Other Requirements Grade: F(less than 30%) = fail and no credits
Master (Distinction):	10	Overall Average Greater than 70%	65% or above in a maximum of two modules and greater than 70% in the remainder	
Master:	8	Min 55%	Minimum 6 taught Modules grade C or higher At the discretion of the examiners, maximum of 2 taught Modules at grade D and/or grade E. These are counted as discretionary passes and each is equivalent to a resit opportunity. Minimum grade C for the Team Project and grade C for the Individual Project	No taught Modules allowed below Grade F
Diploma (Distinction):	N/A			
Diploma:	120 credits	Min 40%, D	120 credits	
Certificate:	60 credits	Min 40%, D	60 credits	
5. Module Choice/Dissertation Masters: modules compulsory, Diploma and Certificate: choice of modules to reach required credit level Team Exploration Project: Field Exploration Assignment Individual Project: A piece of individual research work or study, which is carried out on campus or in a sponsoring company office or laboratory.				

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6. Additional Information				

Residential and ALP's: Diploma and Certificate are considered exit awards.

IDL: students may register on Diploma and transfer on completion of specified number of modules at Masters pass level (Grade C) to MSc

Residential and ALP's: Diploma and Certificate are considered exit awards.

IDL: students may register on Diploma and transfer on completion of specified number of modules at Masters pass level (Grade C) to MSc

The accompanying Course Description provides details of aims, outcomes, teaching & learning and assessment policies for the course. Details of individual modules are provided in the appropriate Module Descriptors.

Form 20

Heriot-Watt University - Module Descriptor Template (RAY)

Version 3.0 (2007/2008)

Module Title	Reservoir Engineering to Exploration Methods	School	Petroleum Engineering			On or Off-Campus	On& Off
Module Co-ordinator	S Geiger	SCQF Level	11	Module Code	G11EM	Semester	Credits
1. Pre-requisites	None						
2. Linked Modules (specify if synoptic)	None						
3. Excluded Modules	None						
4. Replacement Module	Code:	RAY replacement		5. Availability as an Elective	Yes ☐	No ☒	
6. Degrees for which this is a core module	Date Of Replacement: Sept 2008						
7. Aims	MSc/PgDipPg/Cert in Petroleum Geoscience						
The overall aim of this module is to:							
Understand the processes that control fluid movements from the basin to the reservoir scale and exploration methods appropriate at the basin scale							
8. Syllabus	- Describe the nature of the fluid flow and pressure distribution in a reservoir or basin - Use the analytical solutions to describe fluid flow in a reservoir or basin - Understand the fundamental and practical elements of exploration Be familiar with certain more specialised logging tools and their uses.						
9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)							
Subject Mastery	Understanding, Knowledge and Cognitive Skills	Scholarship, Enquiry and Research (Research-Informed Learning)					
On completion of the module, the student should be able to: - understand and appreciate the nature of the reservoir and fluids contained - calculate the reserves and show the variability in the calculations - calculate the steady-state permeability of a reservoir rock - understand and calculate the saturation profile in a layered reservoir - understand the nature of the diffusivity equation - perform drawdown and buildup analyses using analytical solutions - calculate and account for wellbore storage in well test analysis							

Module Title	Reservoir Engineering to Exploration Methods	School	Petroleum Engineering	On or Off-Campus	On& Off
Module Co-ordinator	S Geiger	SCQF Level	11	Module Code	G11EM
				Semester	1
				Credits	15

Personal Abilities	<i>Industrial, Commercial & Professional Practice Autonomy, Accountability & Working with Others Communication, Numeracy & ICT</i> In this course, students will be explicitly encouraged to: ♦ be aware of the importance of time management; ♦ develop their personal skills, including an awareness of both traditional and internet-based information sources; ♦ develop their skills in problem solving ♦ use IT as appropriate ♦ an ability to apply theoretical knowledge to practical problems. ♦ provide constructive feedback to teaching staff.				
10. Assessment Methods	11. Re-assessment Methods				
Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)
Exam	3 hours	100%		Resit if allowed	3 hours
12. Date and Version					
Date of Proposal	February 2008	Date of Approval by School Committee	April 2008	Date of Implementation	September 2008
				Version Number	1.00

Module Title	Formation Evaluation	School	Petroleum Engineering			On or Off-Campus	On& Off
Module Co-ordinator	Arfan Ali	SCQF Level	11	Module Code	G11FE	Semester	1
						Credits	15

1. Pre-requisites	None				
2. Linked Modules (specify if synoptic)	None				
3. Excluded Modules	None				
4. Replacement Module	Code:	RAY replacement	5. Availability as an Elective	Yes ☐	No ☒
6. Degrees for which this is a core module	Date Of Replacement:	Sept 2008	MSc/PgDipPg/Cert in Petroleum Engineering MSc/PgDipPg/Cert in Reservoir Evaluation and Management MSc/PgDipPg/Cert in Petroleum Geoscience		
7. Aims					

The overall aim of this module is to:

- Understand the concept of formation evaluation and well logging
- Understand the physical principles of the tools used in logging
- Characterise the formation based on interpretation of well logs

8. Syllabus

Introduction to formation evaluation: Definition of formation evaluation and logging techniques; Logging operation: tools and techniques; Principles of Logging Measurements; Principles of Depth Correlation; Interpretation process

Fundamentals of log interpretation: Correlation and Depth Matching; Interpretation of Lithology; Identification of Permeable and Non-Permeable Zones; Formation Zonation; Porosity Determination; Saturation Determination

Basic logging tools: Gamma Ray (GR) Tool; Spontaneous Potential (SP) Tool; Density Logging Tool; Resistivity Logging Tools; Induction and microresistivity logging tools.

Porosity tools and how to compute porosity: Acoustic Log (Wyllie time-average equation); Effects of hydrocarbon, shales, carbonates and uncompacted sands on the acoustic log; Density Log; Density of some common minerals, water, oil and gas; Minerals whose density cannot be read directly from the density log; Effect of temperature, pressure and salinity on the density of water; Effects of hydrocarbon, shales and pressure on the density log; Neutron Log; conditions of use and errors; Correlations used to derive porosity; Effects of hydrocarbons and shale on log

Lithology and porosity in complex formations: Porosity of a mixed lithology rock; Mixed lithology models; Deriving porosity from a

neutron-density crossplot, sonic-density crossplot, sonic-neutron crossplot, density-Pe crossplot; Technique and assumptions used for deriving minerals from an NGS crossplot; Effect of shaliness, secondary porosity and hydrocarbons on crossplots; Use of M-N plot to derive mineral content; Use of a MID plot to derive mineral content.

Saturation determination Use of Archie equation; formation resistivity factor; potential errors in Archie equation; saturation from a crossplot of resistivity logs and porosity logs; Saturation determination from Rwa, logarithmic overlays, from Ro overlay and F

overlay, from Resistivity Ratio Methods; Describe the Impact of Shale on the determination of saturation.

Shaley sand interpretation: Effect of shale on saturation determination; Laminated sand-shale models, the Dispersed Shale Model and the total shale model.

Module Title	Formation Evaluation	School	Petroleum Engineering	On or Off-Campus	On& Off
Module Co-ordinator	Arfan Ali	SCQF Level	11	Module Code	G11FE
				Semester	1
					Credits
					15

9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)

Subject Mastery	<i>Understanding, Knowledge and Cognitive Skills</i>	<i>Scholarship, Enquiry and Research (Research-Informed Learning)</i>
	On completion of the module, the student should be able to: • Understand the properties of rocks and fluids that produce characteristic signals • Read and interpret a well log • Analyse the data and correct for environmental factors. • Interpret the log to discern porosity, water saturation, lithology, hydrocarbon content • Synthesise the interpretations of several logs and produce a consistent interpretation of the reservoir • Account for the effect of shale in the reservoir	
Personal Abilities	<i>Industrial, Commercial & Professional Practice Autonomy, Accountability & Working with Others Communication, Numeracy & ICT</i> In this course, students will be explicitly encouraged to: ♦ be aware of the importance of time management; ♦ develop their personal skills, including an awareness of both traditional and internet-based information sources; ♦ develop their skills in problem solving ♦ use appropriate IT tools to present and interpret log information ♦ an ability to apply theoretical knowledge to practical problems. ♦ provide constructive feedback to teaching staff.	

10. Assessment Methods				11. Re-assessment Methods		
Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)	
Examination	2 x 2hrs	100%		Examination	3	
12. Date and Version						
Date of Proposal	February 2008	Date of Approval by School Committee	April 2008	Date of Implementation	September 2008	Version Number
						1.00

Form 20

Heriot-Watt University - Module Descriptor Template (RAY)

Version 3.0 (2007/2008)

Module Title	Sedimentology and Structure	School	Petroleum Engineering			On or Off-Campus	On& Off
Module Co-ordinator	A Gardiner/H Lewis	SCQF Level	Module Code	G11RV	Semester	Credits	15
		11			1		

1. Pre-requisites	None		
2. Linked Modules (specify if synoptic)	None		
3. Excluded Modules	None		
4. Replacement Module	Code:	5. Availability as an Elective	Yes ☐ No ☒
6. Degrees for which this is a core module	Date Of Replacement:	Sept 2008	
7. Aims	MSc/PgDipPg/Cert in Petroleum Geoscience		

The overall aim of this module is to:

- Understand the development of sediment processes in clastic and carbonate reservoirs and how these affect reservoir properties
- Understand the structural elements of reservoirs. Determine development of reservoir structure in terms of deformation.
- Geophysical techniques available to assess structure of a field.
- Understanding deformation and its impact on fluid flow

Module Title	Sedimentology and Structure	School	Petroleum Engineering			On or Off-Campus	On& Off		
Module Co-ordinator	A Gardiner/H Lewis	SCQF Level	11	Module Code	G11RV	Semester	1	Credits	15

8. Syllabus

- Develop an understanding of sediment processes and reservoir properties
- Develop a fundamental understanding of environmental and facies analysis
- Can identify genetic units and interpret environment.
- Can understand basic petrographic data
- Understanding of clastic diagenesis and impact on reservoir characteristics.
- Provide illustration of challenges facing reservoir modellers
- Provide introduction to field sedimentology/ outcrop analysis
- Understanding of the basic carbonate environments
- Understanding of carbonate diagenesis
- Understanding of the problems particular to carbonate reservoirs
- Architecture and reservoir modelling of clastic and carbonate sequences
- Rock mechanics principle, 2D and 3D stress and strain, mohr circle
- Vocabulary of structural geology, and why the terms are significant
- Introduction to Geophysics (basic principles) for assessing reservoir structure
- Relate structural features to the basic rock mechanics concepts
- Relate fractures and their fluid flow consequences
- Relate faults and their fluid flow consequences
- Appreciate contribution of seismic to structural geology

9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)

Subject Mastery	Understanding, Knowledge and Cognitive Skills	Scholarship, Enquiry and Research (Research-Informed Learning)
	On completion of the module, the student should be able to: • Understand sediment processes and texture and their impact on reservoir characteristics • Key Sedimentary Facies and their diagnostic characteristics from various data sources (cores, wireline logs etc) • Sedimentary environments from wireline logs • Understand deformation and resulting structures • Deformation and the resultant fractures and faults and their impact on flow	

Module Title	Reservoir Concepts	School	Petroleum Engineering		On or Off-Campus	On& Off
Module Co-ordinator	P Corbett	SCQF Level	Module Code	G11RC	Semester	Credits
		11			1	15

1. Pre-requisites	None					
2. Linked Modules (specify if synoptic)	None					
3. Excluded Modules	None					
4. Replacement Module	Code:	RAY replacement	5. Availability as an Elective	Yes ☐	No ☒	
6. Degrees for which this is a core module	Date Of Replacement: Sept 2008					
7. Aims	MSc/PgDip/PgCert in Reservoir Evaluation and Management MSc/PgDip/PgCert in Petroleum Geoscience					

The overall aim of this module is to allow the student to:

- Understand geological control on reservoir properties and performance.
- Understand the concept of flow units and the basic processes involved in their development.
- Be able to correlate, map and calculate hydrocarbons in place

8. Syllabus

- Understand the basic concept of an oil (or gas) field
- Develop a basic understanding of major producing basin (eg North Sea)
- Gain a database of case study reservoir problems (from N. Sea and beyond)
- Understand the various architectural relationships in reservoirs
- Understand the basic operational geological concepts
- Describe and represent the geometric characteristics of reservoirs. Explain development of reservoir shape in terms of deformation processes.
- Relate structural features to the operation of petroleum systems. Practical use of structural geology in exploration and development.
- Develop basic core description skills (also illustrate range of reservoirs)
- Know how to recognise reservoir flow units
- Know how to define the flow unit geometry in the subsurface
- Know how to draw maps of flow units
- Know how to define properties of flow units
- Know how to determine volumetric hydrocarbons in place

9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)

Subject Mastery Understanding, Knowledge and Cognitive Skills Scholarship, Enquiry and Research (Research-Informed Learning)

Module Title	Reservoir Concepts	School	Petroleum Engineering	On or Off-Campus	On& Off	
Module Co-ordinator	P Corbett	SCQF Level	11	Module Code	G11RC	
				Semester	1	
					Credits	15
	On completion of the module, the student should: - Understand the geological factors which affect the quantities of hydrocarbon resources trapped in a reservoir (both hydrocarbons in place and recoverable) - Be able to assess key reservoir parameters - Know how hydrocarbon resources are estimated in a reservoir, including uncertainty in estimating key reservoir parameters necessary to compute hydrocarbon resources. - Understand the factors which affect hydrocarbon recovery - Understand uncertainty and the use of geostatistics to address uncertainty					
Personal Abilities	<i>Industrial, Commercial & Professional Practice Autonomy, Accountability & Working with Others Communication, Numeracy & ICT</i> In this course, students will be explicitly encouraged to: - be aware of the importance of time management; - develop their personal skills, including an awareness of both traditional and internet-based information sources; - develop their skills in problem solving - use appropriate IT tools - develop an ability to apply theoretical knowledge to practical problems. - provide constructive feedback to teaching staff.					
10. Assessment Methods			11. Re-assessment Methods			
Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)	
Exam	3 hours	80%		Resit if allowed	3 hours	
Coursework		20%				
12. Date and Version						
Date of Proposal	February 2008	Date of Approval by School Committee	April 2008	Date of Implementation	September 2008	
				Version Number	1.00	

Module Title	Timelapse Multicomponent & Exploration Seismic	School	Petroleum Engineering			On or Off-Campus	On& Off		
Module Co-ordinator	C MacBeth	SCQF Level	11	Module Code	G11TM	Semester	2	Credits	15
1. Pre-requisites	None								
2. Linked Modules (specify if synoptic)	None								
3. Excluded Modules	None								
4. Replacement Module	Code:	RAY replacement				Yes ☐	No ☒		
6. Degrees for which this is a core module	Date Of Replacement: Sept 2008								
7. Aims	MSc/PgDipPg/Cert in Petroleum Geoscience								
The overall aim of this module is to:									
- Understand the use of timelapse seismic - Understand the origin and use of seismic anisotropy									
8. Syllabus									
- Motivation for timelapse seismic - Rock physics and fluid substitution - Biot and Gassman's equations - Acquisition and process considerations - Repeatability and cross equalisation - Seismic history match - Feasibility studies - Response of seismic to insitu stress - Seismic anisotropy for fracture detection - Design of multicomponent surveys									
9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)									
Subject Mastery	Understanding, Knowledge and Cognitive Skills Scholarship, Enquiry and Research (Research-Informed Learning)								
On completion of the module, the student should be able to: - Understand seismic surveys data analysis - Understand fracture detection									

Module Title	Timelapse Multicomponent & Exploration Seismic	School	Petroleum Engineering			On or Off-Campus	On& Off
Module Co-ordinator	C MacBeth	SCQF Level	11	Module Code	G11TM	Semester	2
						Credits	15

Personal Abilities	<i>Industrial, Commercial & Professional Practice Autonomy, Accountability & Working with Others Communication, Numeracy & ICT</i> In this course, students will be explicitly encouraged to: ♦ be aware of the importance of time management; ♦ develop their personal skills, including an awareness of both traditional and internet-based information sources; ♦ develop their skills in problem solving ♦ use IT as appropriate ♦ an ability to apply theoretical knowledge to practical problems. ♦ provide constructive feedback to teaching staff.				
10. Assessment Methods	11. Re-assessment Methods				
Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)
Exam	3 hours	100%		Resit if allowed	3 hours
12. Date and Version					
Date of Proposal	February 2008	Date of Approval by School Committee	April 2008	Date of Implementation	September 2008
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Heriot-Watt University - Module Descriptor Template (RAY)

Version 3.0 (2007/2008)

Module Title	Reservoir Geophysics & Sedimentary Basins	School	Petroleum Engineering	On or Off-Campus	On & Off	
Module Co-ordinator	C MacBeth/Gary Couples/Dorrik Stow	SCQF Level	11	Module Code	G11RB	
				Semester	2	
					Credits	15

1. Pre-requisites	None	5. Availability as an Elective	Yes ☐ No ☒
2. Linked Modules (specify if synoptic)	None		
3. Excluded Modules	None		
4. Replacement Module	Code: RAY replacement		
	Date Of Replacement: Sept 2008		
6. Degrees for which this is a core module	MSc/PgDipPg/Cert in Petroleum Geoscience		
7. Aims			
The overall aim of this module is to: • Reservoir Geophysics (basic principles) • Influence of rocks and reservoir fluids on seismic properties • Seismic Attributes & Seismic Inversion • Imaging and Resolution (tuning effects) • Correlation between Reservoir Characteristics & Attributes • Acquisition & Processing (fundamentals, migration) • 4D Seismic • Develop basic understanding of gravity and magnetic surveys			
8. Syllabus			
• Understand the influence of reservoir fluids on seismic properties • Understand the significance of seismic attributes • Develop an understanding of current seismic acquisition techniques • Understand the principles of seismic processing • To be able to undertake a quantitative seismic interpretation • Understand and assess the benefits of 4D seismic			
9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)			
Subject Mastery	Understanding, Knowledge and Cognitive Skills	Scholarship, Enquiry and Research (Research-Informed Learning)	

Module Title	Reservoir Geophysics & Sedimentary Basins	School	Petroleum Engineering	On or Off-Campus	On& Off
Module Co-ordinator	C MacBeth/Gary Couples/Dorrik Stow	SCQF Level	11	Module Code	G11RB
				Semester	2
				Credits	15

	On completion of the module, the student should be able to: • The role of reservoir geophysics in geomodelling through imaging (structure, faults etc) and lithofacies/ property interpolation between wells • The role of 4D seismic in reservoir management				
Personal Abilities	<i>Industrial, Commercial & Professional Practice</i> <i>Autonomy, Accountability & Working with Others</i> <i>Communication, Numeracy & ICT</i> In this course, students will be explicitly encouraged to: ♦ be aware of the importance of time management; ♦ develop their personal skills, including an awareness of both traditional and internet-based information sources; ♦ develop their skills in problem solving ♦ use IT as appropriate ♦ an ability to apply theoretical knowledge to practical problems. ♦ provide constructive feedback to teaching staff.				

10. Assessment Methods				11. Re-assessment Methods			
Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)		
Exam	3 hours	90%		Resit if allowed	3 hours		
Coursework		10%					
12. Date and Version							
Date of Proposal	February 2008	Date of Approval by School Committee	April 2008	Date of Implementation	September 2008	Version Number	1.00

Module Title	Petroleum Basins 2	School	Petroleum Engineering			On or Off-Campus	On & Off
Module Co-ordinator	H Lewis	SCQF Level	11	Module Code	G11BB	Semester	2
						Credits	15

1. Pre-requisites	None	5. Availability as an Elective	Yes ☐	No ☒
2. Linked Modules (specify if synoptic)	None			
3. Excluded Modules	None			
4. Replacement Module	Code:	Date Of Replacement:	RAY replacement Sept 2008	
6. Degrees for which this is a core module	MSc/PgDipPg/Cert in Petroleum Geoscience			
7. Aims				
The overall aim of this module is to:				
Understand the thermal and hydrocarbon characteristics of a petroleum basin				
8. Syllabus				
- Understand the thermal and pressure evolution of petroleum basin systems - Be able to interpret a simple basin model - Know the geochemistry and types of hydrocarbons and their modes of formation - Know the time / temperature conditions for hydrocarbon generation and maturation - Understand what drives and controls hydrocarbon migration and entrapment				
9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)				

Subject Mastery	Understanding, Knowledge and Cognitive Skills	Scholarship, Enquiry and Research (Research-Informed Learning)
On completion of the module, the student should be able to: - Understand the sequence of formation of a basin and the rocks and rock sequences contained within it - Be able to integrate geological, geophysical and geochemical data - Determine the value of a prospect		

Module Title	Petroleum Basins 2	School	Petroleum Engineering			On or Off-Campus	On& Off
Module Co-ordinator	H Lewis	SCAQF Level	11	Module Code	G11BB	Semester	2
						Credits	15

Personal Abilities	<i>Industrial, Commercial & Professional Practice Autonomy, Accountability & Working with Others Communication, Numeracy & ICT</i> In this course, students will be explicitly encouraged to: ♦ be aware of the importance of time management; ♦ develop their personal skills, including an awareness of both traditional and internet-based information sources; ♦ develop their skills in problem solving ♦ use IT as appropriate ♦ an ability to apply theoretical knowledge to practical problems. ♦ provide constructive feedback to teaching staff.					
10. Assessment Methods			11. Re-assessment Methods			
Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)	
Exam	3 hours	100%		Resit if allowed	3 hours	
12. Date and Version						
Date of Proposal	February 2008	Date of Approval by School Committee	April 2008	Date of Implementation	September 2008	
				Version Number	1.00	

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Heriot-Watt University - Module Descriptor Template (RAY)

Version 3.0 (2007/2008)

Module Title	Petroleum Basins 1	School	Petroleum Engineering		On or Off-Campus	On & Off
Module Co-ordinator	H Lewis	SCQF Level	11	Module Code	G11BA	Credits
				Semester	2	15

1. Pre-requisites	None			5. Availability as an Elective	Yes ☐	No ☒
2. Linked Modules (specify if synoptic)	None					
3. Excluded Modules	None					
4. Replacement Module	Code:	RAY replacement				
	Date Of Replacement:	Sept 2008				
6. Degrees for which this is a core module	MSc/PgDipPg/Cert in Petroleum Geoscience					
7. Aims						
The overall aim of this module is to:						
Understand the physical characteristics of a petroleum basin						
8. Syllabus						
- Understand the concepts of seismic and sequence stratigraphy and apply them to realistic datasets - Know the basic characteristics of carbonate systems and their evolution - Know the sedimentological principals, characteristics and inter-relationships of basin-scale clastic systems						
9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)						
Subject Mastery	<i>Understanding, Knowledge and Cognitive Skills</i> <i>Scholarship, Enquiry and Research (Research-Informed Learning)</i>					
	On completion of the module, the student should be able to: - Understand the sequence of formation of a basin and the rocks and rock sequences contained within it - Be able to integrate geological and geophysical data to determine the rock sequences within the basin					

Module Title	Petroleum Basins 1	School	Petroleum Engineering	On or Off-Campus	On& Off
Module Co-ordinator	H Lewis	SCQF Level	11	Module Code	G11BA
				Semester	2
				Credits	15

Personal Abilities	<i>Industrial, Commercial & Professional Practice Autonomy, Accountability & Working with Others Communication, Numeracy & ICT</i> In this course, students will be explicitly encouraged to: ♦ be aware of the importance of time management; ♦ develop their personal skills, including an awareness of both traditional and internet-based information sources; ♦ develop their skills in problem solving ♦ use IT as appropriate ♦ an ability to apply theoretical knowledge to practical problems. ♦ provide constructive feedback to teaching staff.				
10. Assessment Methods			11. Re-assessment Methods		
Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)
Exam	3 hours	80%		Resit if allowed	3 hours
Coursework		20%			
12. Date and Version					
Date of Proposal	February 2008	Date of Approval by School Committee	April 2008	Date of Implementation	September 2008
				Version Number	1.00

Form 20

Heriot-Watt University - Module Descriptor Template (RAY)

Version 3.0 (2007/2008)

Module Title	Diagenesis, Geomodelling and Geomechanics		School	Petroleum Engineering		On or Off-Campus	On & Off
Module Co-ordinator	G Couples		SCQF Level	11	Module Code	G11DG	Semester
						2	Credits
							15

1. Pre-requisites	None			5. Availability as an Elective	Yes ☐	No ☒
2. Linked Modules (specify if synoptic)	None					
3. Excluded Modules	None					
4. Replacement Module	Code:	RAY replacement				
6. Degrees for which this is a core module	Date Of Replacement:	Sept 2008				
	MSc/PgDipPg/Cert in Petroleum Geoscience					
7. Aims						
The overall aim of this module is to: - Understand the lab measurements of rock properties under stress - Geomechanical approach to understanding flow in deformed rocks - Understand the concept and basis of geomodelling (includes geostatistics and equiprobable realizations) - Understand the workflow in constructing a geomodel - Know the drivers for diagenesis and the petrophysical consequences, particularly for clastic rocks						
8. Syllabus						
- Understand how measurements are obtained in the laboratory (Yield & post yield behaviour of rocks) - Rock Physics (Sonics properties of Rocks and Fluids) - Understand the hydraulic fracturing process and the nature of well stability - Understand the importance of rock compressibility as a drive mechanism - Understand the significance of higher-order material descriptions (rheologies) - Poroplastic behaviour phenomenon in basin compaction - Seals formation and failure in overpressured basins - Stress sensitive reservoir. - The role of geomodelling and its link to dynamic simulation. - The fundamental geostatistics applied in geomodelling						
9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)						
Subject Mastery	<i>Understanding, Knowledge and Cognitive Skills</i>	<i>Scholarship, Enquiry and Research (Research-Informed Learning)</i>				

Module Title	Diagenesis, Geomodelling and Geomechanics	School	Petroleum Engineering	On or Off-Campus	On& Off
Module Co-ordinator	G Couples	SCQF Level	11	Module Code	G11DG
		Semester	2	Credits	15

	On completion of the module, the student should be able to: • Understand the principles of rock physics and geomechanical application. • Understanding Sealing from a geomechanical perspective • The role of reservoir geophysics in geomodelling through imaging (structure, faults etc) and lithofacies/ property interpolation between wells • The role of 4D seismic in reservoir management				
Personal Abilities	<i>Industrial, Commercial & Professional Practice</i> <i>Autonomy, Accountability & Working with Others</i> <i>Communication, Numeracy & ICT</i> In this course, students will be explicitly encouraged to: ♦ be aware of the importance of time management; ♦ develop their personal skills, including an awareness of both traditional and internet-based information sources; ♦ develop their skills in problem solving ♦ use IT as appropriate ♦ an ability to apply theoretical knowledge to practical problems. ♦ provide constructive feedback to teaching staff.				

10. Assessment Methods				11. Re-assessment Methods		
Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)	
Exam	3 hours	80%		Resit if allowed	3 hours	
Coursework		20%				
12. Date and Version						
Date of Proposal	February 2008	Date of Approval by School Committee	April 2008	Date of Implementation	September 2008	Version Number 1.00

Form 20

Heriot-Watt University - Module Descriptor Template (RAY)

Version 3.0 (2007/2008)

Module Title	Field Exploration Project	School	Petroleum Engineering		On or Off-Campus	On& Off
Module Co-ordinator	Hi Lewis and staff	SCQF Level	Module Code	G11TP	Semester	Credits
		11			3	15

1. Pre-requisites	None	5. Availability as an Elective	Yes ☐ No ☒
2. Linked Modules (specify if synoptic)	None		
3. Excluded Modules	None		
4. Replacement Module	Code: RAY replacement		
6. Degrees for which this is a core module	Date Of Replacement: Sept 2008 MSc/PgDip in Petroleum Geoscience		
7. Aims			
The overall aim of this module is to: • Work both as individual but mainly as an integrated team • Present results of evaluation as a coherent written report • Present results orally to examiners			
8. Syllabus			
• Determination of scope of project • Draw up a work programme to a tight deadline • Deliver a study to a deadline • Produce a report on the formation of a basin			
9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)			
Subject Mastery	Understanding, Knowledge and Cognitive Skills Scholarship, Enquiry and Research (Research-Informed Learning) On completion of the module, the student should be able to: • The workflow and organisational skill of integrated studies. • Integrated analysis • Team work • Communication of results in writing and orally • Basin Development		

Module Title	Field Exploration Project	School	Petroleum Engineering			On or Off-Campus	On& Off
Module Co-ordinator	H Lewis and staff	SCQF Level	11	Module Code	G11TP	Semester	3
						Credits	15

Personal Abilities	Industrial, Commercial & Professional Practice Autonomy, Accountability & Working with Others Communication, Numeracy & ICT					
	In this course, students will be explicitly encouraged to: ♦ be aware of the importance of time management; ♦ integrate skills of different Petroleum Engineering/ Geoscience disciplines ♦ appreciate the need for communication in team working situations ♦ develop and present a cohesive written and oral report on the findings generated by the team members ♦ be aware of the standard required of technical reports in the industry ♦ be aware of the nature of negotiation between parties (such as use of competitors' facilities)					
10. Assessment Methods				11. Re-assessment Methods		
Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)	
Report (written and oral presentation if required)		100%		Resubmission if allowed		
12. Date and Version						
Date of Proposal	February 2008	Date of Approval by School Committee	April 2008	Date of Implementation	September 2008	Version Number 1.00

Module Title	Individual Project	School	Petroleum Engineering		On or Off-Campus	On& Off
Module Co-ordinator	J Somerville and IPE staff	SCQF Level	11	Module Code	G11IP	Semester
					3	Credits
						30

1. Pre-requisites	None	5. Availability as an Elective	Yes ☐	No ☒
2. Linked Modules (specify if synoptic)	None			
3. Excluded Modules	None			
4. Replacement Module	Code:	Date Of Replacement:	RAY replacement	Sept 2008
6. Degrees for which this is a core module	MSc/PgDip in Petroleum Engineering MSc/PgDip in Reservoir Evaluation and Management MSc/PgDip in Petroleum Geoscience MSc/PgDip in Petroleum Engineering with Project Management			
7. Aims	The overall aim of this module is to: - develop a greater understanding of a specific petroleum engineering problem - determine the limits of applicability of the proposed solution - relate the project findings in a succinct, technical manner			
8. Syllabus	Introduction to problem and definition of objectives: Definition of problem; statement of context (technical and economic); resources required; development of work plan to achieve aims and objectives; completion of safety and ethical considerations; schedule of work Literature review: Development of framework within which to set work; Description of relevant resources to be accessed; critical review of relevant literature; development of argument to support project work Analysis/experiment/simulation to be conducted to meet objectives: Generation of work plan to cover relevant work; assessment of resources required for each section; familiarisation with operational requirements of resource; conduct work plan; reporting of findings to supervisors/ peers for review Analysis of results, conclusions, recommendations and presentation of work: Compilation of findings from research work conducted; critical review of techniques, errors, variations in results; comparison with published work of others; conclusions drawn from work and recommendations; preparation and submission of thesis and associated audio/visual presentations as required			
9. Learning Outcomes (HWU Core Skills: Employability and Professional Career Readiness)				
Subject Mastery	Understanding, Knowledge and Cognitive Skills Scholarship, Enquiry and Research (Research-Informed Learning)			

Module Title	Individual Project	School	Petroleum Engineering	On or Off-Campus	On& Off
Module Co-ordinator	J Somerville and IPE staff	SCQF Level	11	Module Code	G11IP
				Semester	3
				Credits	30

- On completion of the module, the student should be able to:
- Critically appraise a problem and devise an appropriate strategy to investigate it
 - use technical resources appropriate to the problem
 - perform relevant calculations/design work/experimentation to test proposed solution
 - report findings technically in form of written structured report and oral technical presentation
 - write a technical paper

Personal Abilities

Industrial, Commercial & Professional Practice Autonomy, Accountability & Working with Others Communication, Numeracy & ICT

In this course, students will be explicitly encouraged to:

- ◆ be aware of the importance of time management;
- ◆ develop their personal skills, including an awareness of both traditional and internet-based information sources;
- ◆ develop their skills in problem solving
- ◆ use appropriate IT tools and experimental equipment
- ◆ an ability to apply theoretical knowledge to practical problems.
- ◆ develop presentation skills

10. Assessment Methods**11. Re-assessment Methods**

Method	Duration of Exam (if applicable)	Weighting (%)	Synoptic modules?	Method	Duration of Exam (if applicable)
Thesis (written and oral presentation if required)		100%		Resubmission if allowed	

12. Date and Version

Date of Proposal	May2010	Date of Approval by School Committee	May2010	Date of Implementation	September 2010	Version Number	2.00
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