MSc Integrated Petroleum Geoscience

Programme Handbook

2013-14 edition

Contents

University codes

The programmes and reference codes covered in this handbook are:

MSc Integrated Petroleum Geoscience: 57F610B1

PgDip Integrated Petroleum Geoscience: 61F610VX

PgCert Integrated Petroleum Geoscience: 62F610VZ

Preface

If you have just started studying on this programme, congratulations – you are now a student on one of the most prestigious petroleum geology courses in the world. If you are considering applying, then we hope that this handbook will answer many of your questions and persuade you to come and join us.

Aberdeen is an old city; it obtained its charter in 1179. It has had a university since 1495, an oil industry since 1970 and a masters degree in petroleum geoscience since 1972. Forty years on, that master's programme maintains its position at the forefront of training for the petroleum industry, with more than 1000 alumni in oil companies around the world.

This handbook sets out the aims and objectives of the MSc programme, Integrated Petroleum Geoscience (IPG), and of the courses which make it up. The handbook contains information that is relevant from year to year, and although its content may be amended, it is expected to change relatively slowly. It should be read in conjunction with the timetables which give detailed information on courses – when they are delivered, who the various tutors are, and when the assessment deadlines fall. One important point is that irrespective of the timetable, you should be in the University from at least 0900-1700 every day – being a student is a full-time job.

The handbook contains most of the information that you will need during the IPG programme. However, all of the information derives from University policies, which collectively form the Academic Quality Handbook. Key University policies are summarised on the MyAberdeen system (https://abdn.blackboard.com/webapps/cmsmain/webui/institution/Policies?action=frameset&subaction=view). It is important that make yourself familiar with the University's policies and procedures on the subjects covered.

Although we try to answer most of the questions that you may have in this handbook, we cannot cover everything. If you have questions please do not hesitate to ask any of the key staff: Postgraduate Coordinator, lecturers, course coordinators, or Programme Director.

Enjoy your time here in Aberdeen.

Professor David Jolley
Head of Discipline for Geology

1. MSc Integrated Petroleum Geoscience – FAQ

1.1 Why should I do this programme?

- Our MSc Integrated Petroleum Geoscience is one of the best in the world
- It has the highest employability results in the UK
- Two international field trips
- 95% of our students do placements in oil companies
- You will be taught by world experts with state of the art hardware and software
- You will be in the heart of Europe's oil industry in a city with the highest percentage of geoscientists per head of population anywhere in the world

1.2 What will it cost?

For international students in 2013-2014, the fees are £22,000. This covers all tuition and fieldwork travel and accommodation. Your living expenses will be around £7-10,000. These fees are in line with other top schools worldwide. The key point is that the programme only lasts one year, so total fees are about half what you would pay in a good US school. If you hold an EU passport and have residency in any EU country, the fees will be £8,400 in 2013-2014 (£8,800 for 2104-2015). For overseas students fees for the forthcoming 2014-2015 year will be £23,100.

1.3 What qualifications do I need to get in?

You must have a degree in Geology, Geophysics, or a joint degree with Geology as a major component (normally greater than 75%) at the level of a UK high Upper Second or better (USA GPA of 3.0 or better; Nigeria CGPA 4.0 or better). International students must prove proficiency in English (IELTS 7.0 or better). It is assumed that all students will have a basic knowledge of the aspects of geology most relevant to the petroleum industry.

1.4 What will I learn?

By the time you finish our MSc:

- You will be ready to start work the day you walk through your new employer's door.
- You will know how to work across discipline boundaries to solve industrial problems.
- You will be able to talk to specialists in the other engineering and scientific disciplines.
- You will have inter-personal and transferable skills in presentation, report-writing, team work, creative thinking, and problem solving.

1.5 How will I be taught?

The programme lasts 50 weeks, from late September. There are two semesters of teaching, three weeks of fieldwork, and 15-16 weeks working on an individual applied research project. The timetable is full – you will work from 0900-1700 every day.

The first semester concentrates on fundamentals: professional skills, petrophysics, geophysics (from acquisition and processing through basic interpretation to use of advanced attributes), and applied sedimentology. The highlight of this semester is a field trip to Sicily, focusing on carbonates, evaporites and turbidites. The second semester introduces new disciplines: petroleum geochemistry, hydrocarbon exploration, structural geology, and production geology (reservoir modelling and formation evaluation). There is a strong focus on teamwork and presentation skills, with challenging exercises set by Chevron and BP. The capstone of the whole programme is the two-week trip to the western US, which visits Utah, Arizona, and Nevada.

This trip is great preparation for your project, which is an integral part of the training and forms a large part of your assessment. The project entails working on a problem defined by industry using data supplied by industry. These projects are mostly done in a company office.

1.6 What skills will I gain?

By the time you graduate, you will have expertise in:

- Seismic interpretation
- Wireline log interpretation and petrophysical analysis
- Sedimentological analysis
- Working with core and other samples
- Interpreting geochemical and biostratigraphical data
- Evaluating exploration prospects and constructing basin analyses
- Calculating reserves and constructing geological reservoir models
- Reservoir quality and performance prediction evaluation
- Working with reservoir engineering fluid and rock data
- Taking account of completion engineering in making geological recommendations
- Understanding the technical and economic context of petroleum geoscience
- Working in teams, with a developing capability to take the lead when necessary
- Giving oral presentations
- Writing concise and effective reports
- Communicating with specialists from other disciplines, in particular those involved in drilling, reservoir engineering, petrophysics, geochemistry, and geophysics
- Auditing technically the geological work of others

1.7 Will I get a job?

We cannot promise, but in the last 15 years, 98% of our graduates have been employed in the oil industry or gone on to funded PhD research within six months of graduating (100% in 2011 and 2012) – the best record of any UK department. Just now, oil majors are short of qualified staff, and have increased recruitment of MSc graduates. There is no bias in recruitment for men and women in the industry.

1.8 Institutional Policies

Students are asked to make themselves familiar with the information on key institutional policies which been made available within MyAberdeen (https://abdn.blackboard.com/bbcswebdav/institution/Policies). These policies are relevant to all students and will be useful to you throughout your studies. They contain important information and address issues such as what to do if you are absent, how to raise an appeal or a complaint and how seriously the University takes your feedback.

These institutional policies should be read in conjunction with this programme and/or course handbook, in which School and College specific policies are detailed. Further information can be found on the University's Infohub webpage or by visiting the Infohub.

The information included in the institutional area for 2013/14 includes the following:

- Absence
- Academic Appeals & Complaints
- The Grade Spectrum (Undergraduate & Postgraduate)
- Codes of Practice on Student Discipline (Academic and Non-Academic)
- Common Assessment Scale
- Class Certificates
- Transcripts
- MyAberdeen
- TurnitinUK
- Feedback Framework
- Communication
- Aberdeen Graduate Attributes

2. Health and Safety

We take Health and Safety (H&S) issues very seriously. The overall policy is set by the University and implemented by the School of Geosciences. It is the Head of School's responsibility to ensure that all of our activities – field, classroom, and laboratory – are conducted in a safe way, in accordance with the School policy. It is YOUR responsibility to ensure that you are familiar with the policies and practices and abide by them.

2.1 Sources of information

All of the health and safety documentation can be found at:

http://www.abdn.ac.uk/geosciences/resources/safety.php

There are documents covering the following topics:

- The School *Health & Safety Guide*
- Fieldwork, including the handbook, risk assessment forms, and fieldwork safety forms
- The *Mountaineering Council of Scotland Emergency Procedures Advice*.
- The School Safety Bulletin *Safety Matters in Geosciences*, which contains news and appropriate reminders

2.2 Health & Safety in the classroom

You should be particularly familiar with the School Health and Safety Guide:

http://www.abdn.ac.uk/geosciences/resources/documents/safety/Health-Safety_Geosciences_2012.pdf

In it you will find the statement of our Health and Safety Policy; information on how our H&S is organised and lines of responsibility; guidance on health and safety training; fire safety procedures and drills; and useful telephone numbers. There is also a section on who does what in the Meston Building (the School is currently split across two buildings).

For day-to-day activity, you should read the sections on safety in class teaching spaces, computer workstations, lone working, housekeeping, and, most important of all, accident reporting.

2.3 Health & Safety in the field

Fieldwork safety is of particular importance. You will be given a health and safety briefing on each day of any field work, but in advance of all offsite work, you should be familiar with Section D of the *Guide*, which covers field safety.

While on fieldwork or on any offsite visit, we expect the highest standards of behaviour. Mostly, this is for safety reasons – people who are messing around do not pay proper attention to local hazards. However, as well as the safety aspect, you should remember that you are representatives of our university in general and the IPG programme in particular. The programme has had an outstanding international reputation for 40 years – as a student here you now have the responsibility of preserving and enhancing that reputation.

2.4 University insurance

While on University premises, you are covered by the University's insurance policies. Full details are available at:

http://www.abdn.ac.uk/staffnet/working-here/travel-insurance-application-367.php

You are strongly recommended to have your own insurance covering your personal belongings and any private activities.

Before undertaking field work, all students will be required to fill in the online travel insurance form available at: http://www.abdn.ac.uk/staffnet/working-here/insurance-373.php

3. Programme structure

3.1 Credits

The IPG programme is taught over two semesters, with a third (summer) semester devoted to your project. To obtain the degree of MSc, you need to have passed 180 credits, with 60 credits in each of the three parts of the course. There are exit points along the way. If you get 60 credits you are eligible for a Postgraduate Certificate (PgCert); 120 credits entitles you to a Postgraduate Diploma (PgDip). A credit is defined by the Scottish Qualifications Authority via the Scottish Credit & Qualifications Framework as follows:

> "One SCQF credit point represents a notional 10 hours of learning. This is made up of time for teaching, assessment, study and preparation. Credit points are gained on successful achievement of the learning outcomes in an award." (from *SQA's SCQF Credit Rating Service: a guide for submitting bodies*, September 2012)

The key point is that each 10 hours is by the student – it does not include coffee breaks, lunches or chatting! Universities have discretion on the balance of delivery of the notional 10 hours. This university recognises three main modes of teaching and learning: face-to-face teaching, self-directed learning, and private study.

Face-to-face teaching can be anything led by a tutor – lecturing, tutorials, or field teaching. Typically, there will be 2-4 hours per credit, although field teaching may be as high as 9 hours per credit. Self-directed learning is done by the student, using material given out by the tutor. It can be writing an essay, conducting a lab or field exercise, or a research investigation. Again, there will typically be 2-4 hours of SDL per credit. Private study is done by students, largely guided by their own interests. It can be extension reading for an assigned project, curiosity-driven research, or revision for an exam. Again, there will be 2-4 hours of private study per credit.

The bottom line is that 180 credits = 1,800 hours of work at a minimum. This is the same as a full-time job, and doing the MSc should be treated as such.

3.2 Courses

The IPG Programme is delivered in six courses, each with its own code and credit rating.

Semester	Code	Course name	Credits	Coordinator
1 & 2	GL5013	Professional skills incorporating international field trip	15	Adrian Hartley & David Macdonald
1	GL5011	Geophysics and petrophysics	30	David Iacopini
1	GL5012	Applied sedimentology	30	Adrian Hartley
2	GL5511	Production geology	15	Doug Boyd
2	GL5512	Regional exploration	30	Andrew Hurst
3	GL5907	Project	60	Hurst & Hartley

Each of these courses is described in detail later in the handbook.

3.3 Sequencing

The structure and sequencing of the programme is based on long experience of delivering our courses. Many students have done classes in sedimentology, stratigraphy, and structural geology before, but not all will have done geophysics and even fewer will have taken classes in petrophysics. These two techniques give extra insights into the architecture of the subsurface, so are taught ***before*** the material which may be more familiar. With this approach, the courses on subjects like sedimentology and stratigraphy can be taught in new ways. The structure of the programme is summarised in Table 1 (overleaf): note that this is an indicative structure; the real timetable is more complex and is subject to change through the year.

Aberdeen University Week Number (Monday of Week 1 = roughly 10 July)	11	*GL5013:* **Induction and skills training**	
	12	*GL5011:* **Petrophysics**	*GL5011:* **Geophysics**
	13		
	14	*GL5011:* **Geophysics**	
	15		
	16		
	17	*GL5012:* **Sedimentology**	
	18	*GL5012:* **Sicily field trip**	
	19	*GL5012:* **Sedimentology**	*GL5011:* **Geophysics**
	20		
	21		
	22		
	23	Exams	
	24	**Christmas Vacation**	
	25		
	26		
	27	*GL5512:* **Exploration**	
	28		
	29	*GL5512:* **Exploration: Structural Geology**	
	30		
	31		
	32		
	33		
	34		
	35	*GL5511:* **Production geology**	
	36		
	37		
	38		
	39	Exams	
	40	*GL5013:* **Utah Field Trip**	
	41		
	42	Break	
	43	*GL5907:* **Individual project based in a company**	
	44		
	45		
	46		
	47		
	48		
	49		
	50		
	51		
	52		
	1		
	2		
	3		
	4		
	5		
	6		
	7	***Marking period leading to presentation day***	
	8		
	9	*Preparation for arrival of new class*	
	10		

Table 1: *Indicative IPG timetable*

4. Textbooks

By its very nature this MSc programme is aligned to the leading edge of science and technology, so much of the written material comes to you in the form of handouts and research papers. However, there are two books that you will need, and a number of basic textbooks that you may find useful. These are listed below. All of these books are in the University library, but having your own copy may save you some time.

4.1 Geophysics

There are two compulsory books:

> Bacon, M., Simm, R. & Redshaw, T. 2003. *3-D Seismic Interpretation*. Cambridge, CUP, 222 pp.

> Ashcroft, W.A. 2011. *A petroleum geologist's guide to seismic reflection.* Chichester, Wiley-Blackwell, 157 pp.

The following book is recommended

> Sheriff, R.E. & Geldart L.P. 1995. *Exploration Seismology* (2nd Edition). Cambridge, CUP, 628 pp.

4.2 Petrophysics

In this course, you will be provided with a manual, so there are no compulsory texts, but the following general guide is recommended:

> Rider, M. & Kennedy, M. 2011. *The geological interpretation of well logs* (3rd Edition). Sutherland, Rider-French Consulting Ltd, 440 pp.

4.3 Sedimentology

There are no compulsory texts, but the following are recommended:

> Posamentier, H.W. & Walker, R.G. 2006. *Facies Models Revisited*. SEPM Special Publication 84. SEPM, Tulsa, Oaklahoma, 532 pp.

> Reading, H.G. (Ed.) 1996. *Sedimentary environments: processes, facies and stratigraphy* (3rd edition). Oxford, Blackwell, 557 pp.

> Tucker, M.E. & Wright, V.P. 1990. *Carbonate sedimentology*. Oxford, Blackwell, 482 pp.

4.4 Exploration

There are no compulsory texts, but the following book is recommended both for this course and the entire programme

> Allen, P.A. & Allen, J.R. 2013. *Basin analysis: principles and applications.* Oxford, Blackwell, 3rd Edition

Chapter 11 of this book is compulsory for the exploration course.

5. Assessment

5.1 Style and mode of assessment

All of your work will be assessed: there are two main styles of assessment. ***Formative assessment*** means that you get verbal or written feedback either individually or as a group, and may get an indicative mark. Note that no mark given in a formative assessment counts towards your final grade. ***Summative assessment*** does count towards your final grade and you will get verbal or written feedback.

There are three main ways that assessment will be carried out:

1. Tutor assessment, where the assessment is done by a member of staff or a guest lecturer. All of the summative work will be assessed in this way. Most work that counts towards final grades is double blind marked – in other words two members of staff review the work independently. In case of dispute, a third marker will be used.
2. Self assessment, where you grade your own work based on a model answer given by the tutor. Obviously, this is never used for summative assessments.
3. Peer assessment, where your class mates assess your work and give the feedback. This is commonly used for assessing presentations, and is always formative.

5.2 The Common Assessment Scale (CAS)

The University has a firm policy to ensure marking is on an absolute and objective scale, and is consistent between markers. Assessment is based on objective criteria for each of five quality bands. Using these criteria (see Table 2, overleaf), the assessor first decides within which band a piece of work falls, and then whether the work falls squarely in the band, or if it is borderline to the adjacent band (either stronger or weaker). The assessment is recorded using the 20-point Common Assessment Scheme (CAS code). In contrast with schemes based on a percentage scale, where 100% is rarely attained, it is important to note that a maximum mark at the top of the α-band (CAS code 20) is entirely achievable. It does not mean “a perfect answer”, but instead means “the best that could be expected under the conditions prevailing, or in the time available”. In some instances a fully numeric marking scheme may be unavoidable, for example in practical work. In those cases the mark will be converted to the CAS for recording purposes, but the conversion may not be a simple scaling from the maximum marks achievable to the 20-point CAS scale.

5.3 In-course assessment and group work

About half of the programme will be assessed by looking at practical work, projects and reports while the course is under way. This process is known as in-course or continuous assessment (CA). The exact balance between in-course assessment and examinations varies from course to course, but over the whole programme we are aiming for at least 50% of your mark coming from in-course assessments; this is shown in Table 3.

As you can see from the table there is also a lot of group work, which forms just under one third of the assessment for the taught part of the programme. This is deliberate, and part of the employability training that is a core part of this programme. In your working lives you will not get to choose your co-workers, and team-working is a key skill, highly prized by employers. Teams are never self-selected, but are chosen by staff in a random way that reflects the race and gender balance of the class as a whole.

5.4 Examinations

Examinations are held in December and March/April on the preceding term’s curriculum. Previous years’ examination papers will be made available, but be aware that format of examinations can change. If the format changes radically, a mock examination paper of the same style will be made available to students.

Since this is an advanced programme (rather than a conversion programme), there are no resit examinations.

Band	CAS	Descriptors
A	**20** **19** **18**	Outstanding ability and critical thought. Evidence of extensive reading. Superior understanding. The best performance that can be expected from a student at this level.
B	**17** **16** **15**	Able to argue logically and organise answers well. Shows a thorough grasp of concepts. Good use of examples to illustrate points and justify arguments. Evidence of reading and wide appreciation of subject.
C	**14** **13** **12**	Repetition of lecture notes without evidence of further appreciation of subject. Lacking illustrative examples and originality. Basic level of understanding.
D	**11** **10** **9**	Limited ability to argue logically and organise answers. Failure to develop or illustrate points. The minimum level of performance required for a student to be awarded a pass.
Marginal fail	**6-8**	Weak presentation. Tendency to irrelevance. Some attempt at an answer but seriously lacking in content and or ability to organise thoughts.
Clear fail	**5-1**	Contains major errors or misconceptions. Seriously incomplete.
	0	Token or no submission

Table 2: *The Common Assessment Scale. Note that:*

1. *The CAS is not a linear scale and in converting raw marks to a CAS mark there is no requirement that there should be the same interval of raw marks for each of the 21 CAS marks.*
2. *A mark of 9 represents the minimum level of performance normally needed for a student to be awarded a Pass, and 20 indicates the best performance which could be expected from a student at the relevant level.*
3. *It is for examiners to determine what constitutes a Pass: 9 is not equivalent to 45%. Similarly, other points on the Scale indicate levels of performance and do not correspond directly to percentages or other marking systems.* ***CAS marks 1-20 should not, therefore, be considered equivalent to 20 x 5%.***
4. *It is incorrect to average CAS marks and round-up or round-down the average mark.*
5. *Additional CAS points should not be created by the use of decimals i.e. each CAS mark should be an integer.*

5.5 The role of the External Examiners

The primary roles of External Examiners are to ensure that the standards set for the University's awards and a programme's constituent courses are appropriate when compared to relevant national benchmarks, the National Qualifications Frameworks, the relevant Programme Specification and, where appropriate, the requirements of relevant Professional and Statutory Bodies. In particular, they have responsibility for assessing whether the standards of student performance in a programme and its constituent courses are appropriate and comparable with those of similar programmes in other UK universities.

They also assess whether the processes for assessment, examination and the determination of awards are sound, have been conducted fairly and are in line with our University's policies and regulations.

We currently have two external examiners for this programme, one from academia, and one with relevant experience in the oil industry. External examiners approve all examination papers, and have the right to see all written and project work should they so desire. They can also conduct oral examinations on any or all students at the end of the programme

Table 3: *Assessment balance for the various courses on the IPG programme. The terms "Formative" and "Summative" are explained in the text. The end columns show the nominal credit values of the continuous assessment (CA) and examination elements of each course. Some of the CA work is in groups; the nominal credits given for group assessments are shown in brackets.*

Course code	**Course name**	**Credits**		**Formative assessments with feedback**		**Summative assessments (% of total mark)**					**Nominal credits**	
											CA	**Exam**
GL5011	**Geophysics & petrophysics**	30	*Balance*									
	Petrophysics		*10*	Class exercises		Image log exercise (10%)		Open book exam (40%)	Exam (50%)		5	5
	Geophysics		*20*	Class exercises		Numerical assessment (30%)			Exam (70%)		6	14
GL5012	**Applied sedimentology**	30		Sicily notebook	Sicily group poster	Brent Exercise (30%)		Shuaiba Group (20%)	Core logging (10%)	Exam (40%)	18 (*6*)	12
GL5511	**Production Geology**	15		Case history summaries (individual)	Ythan development plan (Group)	Bruce exercise (10%)		Chevron exercise (10%)		Exam (80%)	3 (*3*)	12
GL5512	**Regional Exploration**	30		Hannon Westwood - individual exercise	First structural practical	Organic geochemistry report (10%)	Exploration group exercise (20%)	Second Group structure exercise (20%)	IBA exercise (20%)	Exam (30%)	20 (*18*)	10
GL5013	**Professional skills & international field trip**	15		Public speaking	Video practice	Professional diary (20%)	Utah group presentation (80%)			No exam	15 (*12*)	0
		Total: 120 taught credits									**67 (*22*)**	**53**

Percentage summaries: CA makes up 56% Exams make up 44% – of the taught programme assessment (120 credits)
CA makes up 37% Exams make up 30% – of the total programme assessment (180 credits)
Note that group work is 32% of the assessment for the taught course and 21% of the assessment for the total programme.

5.6 Awarding of the degree of MSc

This section is from the **Academic Quality Handbook,** *Appendix 7.7: Procedures for determining progression and award in modularised postgraduate taught programmes of study (Grade Spectrum)*. For a full version, see: http://www.abdn.ac.uk/registry/quality/appendix7x7.pdf The *Grade Spectrum* is used to determine progression and award in all modularised postgraduate taught programmes of study. The most important points are shown below.

Progression or award	**Relevant criteria**
No progression permitted	Normally marks below **9** in elements constituting one quarter of the assessment for the Postgraduate Certificate (PgCert)
Progression from PgCert to postgraduate diploma	Normally marks at **9 or better** in all elements from the Postgraduate Certificate stage
Progression from the taught programme to MSc	Normally marks at **9 or better** in all taught programme elements
Award of PgCert or PgDip	Normally marks at **9 or better** in all elements
Award of PgDip with Commendation	Marks at **15 or better** in elements constituting half of the assessment; **and n**ormally marks at **12 or better** in all elements
Award of PgDip with Distinction	Marks at **18 or better** in elements constituting half of the total assessment; **and** marks at **15 or better** in elements constituting three quarters of the total assessment; **and** normally marks at **12 or better** in all elements
Award of master's degree	Once the requirements for progression to the Master's stage have been satisfied, normally marks at **9 or better** in all elements, inclusive of the Master's project; note that you MUST pass the project to be awarded an MSc
Award of master's degree with commendation	Marks at **15 or better** in elements constituting half of the total assessment, inclusive of the project **(which must also be graded at 15 or better); and** normally marks at **12 or better** in all elements
Award of master's degree with distinction	Marks at **18 or better** in elements constituting half of the total assessment, inclusive of the project **(which must also be graded at 18 or better); and m**arks at **15 or better** in elements constituting three quarters of the total assessment; **and** normally marks at **12 or better** in all elements.

Table 4: *Threshold standards defined for progression and award decisions using the Grade Spectrum. The Examiners have discretion to depart from this norm, taking special circumstances into account (e.g. illness). Where discretion is exercised, clear reasons will be identified and record kept.*

It is very important to note that CAS marks for courses that constitute part of a Postgraduate Taught Programme are provisional - they can be raised or lowered at the Final Examiners' meeting later in the academic year (with one exception). The exception is that CAS 8 (Not Achieved) may be changed at the Final Examiners' meeting to CAS 9 or above (Achieved), but CAS 9 can NOT be changed to CAS 8 or lower. A candidate who is registered for, but fails to satisfy the requirements of a Master's Degree, or of a Postgraduate Diploma, or who elects not to proceed to further study, may, if otherwise qualified, be awarded a Postgraduate Diploma or Postgraduate Certificate. If students appeal against the Programme award which is recommended by the Examiners the Senate Policy on Academic Appeals in force at that time will apply.

Section B: Details of individual courses

GL5013: Professional Skills incorporating international field trip

Course Co-ordinators: Professor David Macdonald and Professor Adrian Hartley

Credits: 15

Course aims:

1. To teach presentation and communication skills
2. To teach standards of professional behaviour and the skills necessary to take a place in the diverse workforce of a demanding international industry.
3. To allow students to work in different teams in pursuit of common goals
4. To teach student how to design and execute a research project relevant to the hydrocarbon industry

Main learning outcomes:

By the end of this course students will be aware of issues relation to team work, particularly communication, diversity, and organisation. They will be able to communicate technical interpretation effectively by oral, written and electronic methods. They will be able to design and carry out a research project relevant to the hydrocarbon industry

Content:

Presentation skills: oral, written and electronic (lectures and practicals) [10 hours]

Current issues (attendance at external lectures) [15 hours SDL]

Field trip: exercises in sedimentology, stratigraphy, structural geology, tectonics, exploration geology, production geology, and economics [14x8 hrs = 112 hours]

Private study in preparation for trip [13 hours]

Teaching style:

Teaching in on a workshop basis for the skills courses and in small groups in the field (staff-student ratio 1:8 or better)

Assessment:

Assessment of many of the skills elements is formative with instant feedback. Much of the field assessment is also formative with the instant feedback, including peer assessment.

There are two summative elements:

1. A professional logbook details attendance at external professional events. Students are encouraged to reflect on the content of these presentations. (20%)
2. Team presentations on an aspect of the petroleum geology of a region studied on the international field trip. (80%)

Effort:

Notional student effort required to complete the course	**150 hours**
Of which:	
Timetabled teaching sessions	**137 hours**
Time an average student would be expected to devote to private study	**13 hours**

GL5011: Geophysics and Petrophysics

Course coordinator: Dr David Iacopini

Credits: 30 (balance: geophysics 20 credits, petrophysics 10 credits)

Course aims:

1. To provide sufficient theoretical knowledge and practical training for the student to be capable of working independently on a wide range of hydrocarbon exploration and development evaluation tasks in industry.
2. To make the student aware of the physical and chemical properties of rocks as an aid to describing subsurface geology.
3. To introduce the major techniques for downhole logging, covering the principles by which each works, the information obtained, and the reliability of that information.
4. To introduce various practices that tie geology to seismic data and gain 2D/3D seismic computer interpretation experience.
5. To address recent trends in seismic acquisition and processing (4D, AVO, 4C, OBC), and seabed electromagnetic (EM) surveying.
6. To introduce the concept of seismic imaging

Main learning outcomes:

By the end of the course, the student should:

1. Understand the theory of seismic signal description
2. Appreciate the main processes involved in a typical seismic data-processing suite
3. Understand the basic concepts of seismic stratigraphy
4. Be able to construct synthetic seismograms and explain the principles on which they are based
5. Be able to explain, and illustrate with examples, the concepts of seismic modelling
6. Be able to define, and illustrate with examples, the different types of seismic attributes
7. Be able to recognize the presence of hydrocarbons in rocks from seismic surveys
8. Be familiar with the more important of the recent trends in seismic acquisition and interpretation
9. Be able to describe, and illustrate with examples, how seismic surveys are used in the mapping and prediction of reservoir quality
10. Have well developed skills in computer-based interpretation of 3D seismic data sets
11. Understand the fundamental rock properties that affect fluid storage and movement in the subsurface, and know how these are assessed to compute hydrocarbon
12. Understand the procedures for downhole logging by wireline and by measurement-while-drilling
13. Be able to describe the fundamental physical principles of operation, resolution and uncertainties, and summarise potential applications of standard logging tools.
14. Be able to determine lithology by integrated analysis of a standard suite of logs.
15. Be able to identify hydrocarbon bearing zones, distinguish gas from oil, and calculate in-situ reserves by integrated analysis of a standard log suite

Content:

Geophysics: The seismic reflection method, principles of seismic acquisition, processing, basic interpretation, pitfalls, attributes and their interpretation.

Petrophysics: all standard wireling log tools, log suites, lithologic determination from cross-plots, computerised log analysis, DST, RFT and pressure testing

Lectures (geophysics)	39 hours
Lectures (petrophysics)	30 hours
Image log workshop	18 hours
Visit to acquisitions company	5 hours
Tutorials	33 hours

Teaching style:

Teaching is by a mixture of lectures, labs and tutorials organised into three hour blocks.

Assessment:

Most class exercises are formative with instant feedback. There are three summative in-course assessments and an examination. The summative CA elements are:

1. Image log exercise (10% of the petrophysics element of the course)
2. Open book petrophysics test (40% of the petrophysics element of the course)
3. Numerical assessment, run as a class test (30% of the geophysics element of the course)

There are two examination papers: a 2 hour petrophysics paper and a 3 hour geophysics paper.

Effort

Notional student effort required to complete the course **300 hours**

Of which:

Timetabled teaching sessions **125 hours**

Time an average student would be expected to devote to private study **175 hours**

GL5012: Applied sedimentology

Course coordinator: Professor Adrian Hartley

Credits: 30

Course aims:

The course aims develop practical geological skills applicable to the hydrocarbons industry, embracing the subdisciplines of clastic and carbonate sedimentology, stratigraphy, and diagenesis; it will show how sedimentological and stratigraphic knowledge is crucial in both exploration and development activities, and is fundamental in making predictive models. It will impart a practical knowledge of depositional environments which form hydrocarbon reservoirs, linking these together using the techniques of sequence stratigraphy as applied to siliciclastic and carbonate settings. The origin and effects of reservoir fluids and subsequent diagenesis will also be covered. Students will be exposed to stratigraphic techniques which are used in the interpretation of age and depositional environment in exploration and development programmes. The course incorporates a field trip which gives students a chance to integrate all of the elements in the taught part of the course. Currently this field trip is to Sicily.

Main learning outcomes:

By the end of the course students should:

- Be able to deduce depositional environments using subsurface data, allied to understanding from surface outcrops, superficial and shallow sub-surface analogues
- Understand the inherent variability in reservoir quality and geometry due to depositional and diagenetic processes
- Understand the role of diagenesis in altering reservoir properties during burial
- Use palaeobiology to deduce palaeoenvironments
- Understand the nature of stratigraphy: chrono-, bio-, litho- and seismic-stratigraphy data sources, requirements and limitations
- Correlate elements of a petroleum system using sequence stratigraphy
- Use regional datasets to establish the tectonic framework of sedimentary basins
- Use seismic methods to interpret stratigraphic architecture

Content:

- Sedimentary environments and facies
- Processes of sediment transport and deposition
- Stratigraphic architecture in relation to external controls
- Applied sequence stratigraphy
- Principles of diagenesis and impact on reservoir properties
- Core logging

Teaching:

This course will be taught by mixed delivery in 3 hour blocks which will mostly be a mix of lectures and practical exercises. There is also a field element.

Assessment:

The course will be assessed by continuous assessment and examination. There will be a wide variety of formative assessments with instant feedback and three structured summative assessments with written feedback.

The summative assessment will be:

1. Brent palaeo-delta interpretation	30%
2. Shuaiba group exercise	20%
3. Core logging exercise	10%
A single examination of three hours for the balance	40%

Effort

Notional student effort required to complete the course **300 hours**

Of which:

Timetabled teaching sessions **107 hours**

Time an average student would be expected to devote to private study **193 hours**

GL5511: Production Geology

Course coordinator: Dr Doug Boyd

Credits: 15

Course aims:

This course aims to deliver key skills and understanding in production geology, in the hydrocarbon industry;

- An appreciation of the role of the geologist during the development and production stages of a hydrocarbon field.
- Knowledge of the types of geological heterogeneity that might impact hydrocarbon production.
- The approaches employed in building qualitative and quantitative geological models of the subsurface, and the difficulties associated with doing this reliably.
- The basis from which to convey the expectations of the reservoir engineer, and procedures that will lead to improved reservoir performance evaluation.
- From this basis the course aims to provide an understanding of the behaviour of the fluids in reservoirs (including the interaction of fluid and rock properties) before and during production and to illustrate how the dynamic behaviour of a reservoir cannot always be predicted from static measurements.

It is important to view these activities in an economic context; accordingly, the course will inform the student of important economic and logistical constraints which operate alongside geological details.

Main learning outcomes

By the end of this course the student should:

- Understand the full life cycle of oil and gas fields, and the role of the geoscientist at each stage.
- Understand what is involved in developing a full reservoir description for a field.
- Understand the impact on fluid flow of sedimentological heterogeneity at all scales.
- Understand the impact on fluid flow of structural heterogeneity below the scale of seismic resolution.
- Know the underlying principles employed in constructing and visualising numerical reservoir models.
- Be familiar with the main statistical methods for describing rocks and modelling reservoirs.
- Understand the behaviour of reservoir fluids and drive mechanisms; fluid saturation, porosity, permeability, and wettability.

Content:

The course will cover:

- Reservoir geometry and heterogeneity from depositional and structural causes
- The role of the geologist in development planning and driving production, and the interface with reservoir engineering.
- The concept of model cells and the role of upscaling
- Building a reservoir model

Teaching style:

This course will be delivered in short course format with additional tutorials, exercises, offsite visits, and field work. Teaching will involve senior staff from the consultancy industry, BP, and Chevron. The balance of delivery is:

Lectures and labs	30 hours
Field Trip	8 hours
Offsite exercises (BP & Chevron)	32 hours
Tutorials	3 hours

Assessment:

There will be two major formative assessments with instant feedback: 1. case histories of individual fields, and 2. a group exercise on a field development plan. The summative assessments are:

1. Bruce field development exercise (BP) 10%
2. Alba well planning exercise (Chevron) 10%

A 3 hour written examination 80%

Effort

Notional student effort required to complete the course	**150 hours**
Of which:	
Timetabled teaching sessions	**73 hours**
Time an average student would be expected to devote to private study	**77 hours**

GL5512: Regional exploration

Course coordinator: Professor Andrew Hurst

Credits: 30

Course aims:

This course aims to demonstrate the stages in a hydrocarbon exploration project from initial basin screening, through the identification of leads and prospects, to an economic assessment. The course includes components of structural geology, tectonics, organic geochemistry, and basin modelling. It is important to view these activities in an economic context; accordingly, the course aims to explain the role of the geologist in the business of exploration and appraisal of hydrocarbons. This aims to inform the student of important economic and logistical constraints which operate alongside geological details. To do this the course illustrates the steps involved with bidding for acreage, and in planning field appraisal, providing an understanding of the concepts of geological risk assessment, and uncertainty management.

Main learning outcomes

By the end of the course, the student should:

- Understand the role of exploration in the hydrocarbon industry, and the role of geoscience in exploration.
- Be competent in interpretation of molecular, bulk chemical and thermal maturity data, and familiar with computer-based modelling.
- Understand the role of diagenesis in altering reservoir properties during burial.
- Understand the play concept, and be familiar historical development of play concepts.
- Have an appreciation of global oilfield statistics.
- Understand basin analysis, structural and stratigraphic basin evolution, and the relationships between lithospheric processes and sedimentary sequences
- Understand the use of cross sections and maps
- Be familiar with the concepts of risk and uncertainty and how they are assessed.

Content:

The content covers the uses of structural geology in hydrocarbon exploration and basin analysis. This theme is extended to examine financial and global issues associated with petroleum prospect evaluation.

The course may involve an internal competition in petroleum exploration to decide the team that will represent Aberdeen in the Imperial Barrel Award of the American Association of Petroleum Geologists. Since entry to this competition relies on timetables set by the AAPG, this may not be possible in all years.

Teaching style:

Teaching is by a variety of lectures, practical exercises and group work. The balance of delivery is:

Exploration economics short course	30 hours
Lectures and laboratory classes	90 hours
Tutorials	12 hours

Assessment:

There will be formative assessment with instant feedback through the course. The summative assessments will be:

1. Structural geology practical exercise (group: 20%)
2. Organic geochemistry report (10%)
3. Exploration group exercise (20%)
4. IBA group exercise (20%)

There will be a single examination of three hours, which contributes 30% of the assessment.

Effort

Notional student effort required to complete the course **300 hours**

Of which:

Timetabled teaching sessions **132 hours**

Time an average student would be expected to devote to private study **168 hours**

GL5907 MSc Integrated Petroleum Geoscience: Final project

Course coordinators: Professor Andrew Hurst & Professor Adrian Hartley

Credits: 60

Course aims

In the final project you are expected to undertake and complete a study of a problem applicable to the petroleum industry. The project is an extended, independent, self-directed, piece of practical work integrating and reinforcing the material taught on the course, and giving a detailed insight into the demands of, and ways of working in the hydrocarbon industry. The project forms the major part of the IPG's employability strategy.

Commonly, the projects are constructed around a current problem a company is facing, but for which they are short of manpower. These projects usually involve original research nature, and have not been worked on before. It is common, but not essential, that you work on their projects in the offices of the company which offered the topic and which is providing data.

Expected outcomes

By the end of the final project, you should understand and be able to use skills developed during the taught course part of the MSc to:

- Collate information provided by the industrial sponsor and use this to design a work programme that addresses the scientific, technical and economic problems posed.
- Describe and interpret a dataset provided by the industrial sponsor within a 3 month period.
- Write a report of no more than 7,500 words in a style appropriate for industry, but without sacrificing academic rigour and excellence.
- Give a ten-minute presentation on an aspect of the project in front of an experienced audience from academia and industry.

Assumed knowledge

The Final Project is the culmination of the previous taught courses of the Integrated Petroleum Geoscience MSc. The project will require integration of different elements and assumes a general knowledge of all aspects of petroleum geology.

Oral presentation of results

You must give a ten-minute presentation on an aspect of their project, adhering carefully to any confidentiality restrictions that may have been imposed (see next section). The combined audience of industry and academic personnel jointly decide the best presentation, which is awarded the ***Steven York Memorial Prize*** (donated by Badley Ashton). You are also urged to give an extended presentation of your work direct to the company which provided the data.

Confidentiality of MSc projects

Quite deliberately, we do *not* refer to these as MSc theses or dissertations – they are, in the University regulations, called ***Final Reports***. Unlike a thesis, final reports are not public documents.

Two copies are held in the University, neither of which is ever on public access. One is assessed by University staff assigned as markers, who are automatically bound to confidentiality under their terms of employment. The other copy is assessed, by an External Examiner. The External Examiners are bound, under the terms of the University of Aberdeen Academic Quality Handbook (accepted when being appointed), to keep all material confidential.

Assessment

The final project forms one third of the assessment for the MSc degree. Importantly, to obtain a commendation or a distinction, it is necessary to get a CAS mark in the relevant band (15-17 for commendation, 18-20 for distinction). The project is assessed purely on report, so this is a very important piece of work. The marking system has three parts:

1. Each report is subject to double blind marking (i.e. two markers working entirely independently of each other). If the marks are different, the report is given to a third marker.
2. All reports are moderated by the Programme Director to ensure that marking standards are even across all reports.
3. Independently of University of Aberdeen staff, each report is read and marked by an external examiner.

As well as the formal marking process, two other factors may be used to influence the final mark. First, a good performance in the final presentation may be used as a guide to your overall knowledge and understanding. Secondly, advice from an External Examiner may help to decide a mark.

The attached table shows the criteria that are used in marking reports and the balance between these factors.

Submission of report

You must submit:

1. One PDF of the whole report as a single PDF file. This must be submitted by the deadline. From the 2012-2013 Academic Year, these will be uploaded to the MyAberdeen system. In the current year, they should be submitted on a memory stick (which will be returned to you). If you are working overseas, you must make arrangements with the Postgraduate Secretary to place your PDF on a FTP site if it is too large to email. This is your responsibility.
2. Two paper copies of the complete report should be submitted soft bound. Again. These should be submitted by the deadline, unless you have made arrangements with the Programme Director in advance, for instance if you are working overseas.

You are **strongly** advised to leave sufficient time for electronic assembly, printing and collation of your report, leaving at least two clear days to deal with any emergencies. Experience suggests that these final stages take at least a week. If there are problems, you must inform the Programme Director immediately and in advance of the submission deadline.

Please note that late submissions will lose three CAS marks per day or part of a day

Layout of report

Your report should follow the following guidelines:

1. The maximum word limit is 7,500 words, not counting figure and table captions, references or appendices. Appendices are not a way of avoiding the word limit, so do NOT put material in appendices that should be in the main report. It will not be read (or marked) as part of the report.
2. Use 12 Point **Times New Roman** or similar for the text. Do not use a sans serif font like **Arial**, as these fonts are difficult to read in large blocks of text. Note that clear sans serif fonts such as Arial or Tahoma are better than serif fonts for text on diagrams and for PowerPoint slides.
3. All pages to have 2.5 cm margins all the way round.

4. Pages must be numbered. This includes pages with figures.
5. Figures must be numbered sequentially, following any logical system. For instance, you could number from Figure 1 to Figure "n", or number within chapters: Figure 1.1-Figure 1.4, then 2.1-2.5 etc.
6. Please do not use low-resolution screen captures as figures. Ask yourself the question "Can I read this". If the answer is no, then the marker will not be able to read it either, and you will be marked down. Credit will be given for the creation of original figures.
7. Sources of all figures must be clearly acknowledged. Note that if you write "Figure 1: Location map (***from*** BP Internal Report 76/3)" you are implying that the diagram has been copied without modification. If you write "Figure 1: Location map (***after*** BP Internal Report 76/3)" you are implying that you have used the original figure as a base and made some modification to it. If a source is not given, we will assume that you have drawn it yourself.
8. For referencing in the text, follow the Harvard (parenthetical) system, using the (author date) style. For one author just use the surname and date (Smith 2010); for two authors, use both surnames (Smith & Jones 2010); for multiple authors use only the first surname (Smith *et al.* 2010). *Et al.* stands for *et alia*, meaning "and others".
9. References should be presented in alphabetical order of first author surname using the following styles:
10. ***Journal articles:***
    Macdonald, D.I.M., Gomez-Perez, I., Franzese, J., Spalletti, L.A., Lawver, L.A., Gahagan, L., Dalziel, I., Thomas, C.G.C., Trewin, N.H., Hole, M.J. & Paton, D.A. 2003. Mesozoic break-up of SW Gondwana: implications for regional hydrocarbon potential of the southern South Atlantic. *Marine & Petroleum Geology* **20**, 287-308.
    Papers in books and special publications:
    Macdonald, D.I.M., Archer, B., Murray, S., Smith, K. & Bates, A. 2007. Modelling and comparing the Caledonian and Permo-Triassic erosion surfaces across Highland Scotland: implications for landscape inheritance. *In*: Nichols, G., Williams, E. & Paola, C. (*Eds*), *Sedimentary processes, environments and basins: a tribute to Peter Friend*. *Special Publications of the IAS* **38**, 283-299.
    Books: Macdonald, D.I.M. (ed.) 1991. *Sedimentation, tectonics and eustasy: sea-level changes at* active *margins. Special Publication of the International Association of Sedimentologists* **12**, Oxford, Blackwell Scientific Publications, 518pp.
11. Appendices should be used for important material which may be bulky or is not absolutely necessary for the main text. For example, data tables, specifications of analytical instruments, or microfaunal lists from wells should be in appendices if relevant to the report.

Writing guidelines

Since all projects are different, it is important not to be too prescriptive about the way that the report is laid out. However, there are certain elements of the structure that should be common across all project types.

1. ***Abstract:*** This is a précis of your report, outlining objectives, methods, results and the significance of the results. This section should not be longer than one page, and should be able to be read independently of the main report. It should not contain references or point to figures in the main text. It is usually best to write it last.
2. ***Introduction:*** Most importantly, you have to outline the problem, so give context with a regional setting section and/or a literature review (as appropriate). State the purpose of your project early on; if the marker has not discovered the scientific and commercial drivers of your work by the end of Page 2, the results are unlikely to be happy.
3. ***Data and methodology:*** What data were available to you and what methods did you use to process and interpret those data? Reference any analytical techniques you used, the software used in interpretation, and outline your workflow.

4. ***Interpretation and results:*** Give a summary of your results, remembering that (a) a picture is worth 1,000 words, and (b) you can have as many pictures as you want. So, present maps, representative parts of seismic sections, and correlation panels that illustrate the points you wish to make in the text. A common mistake is to put in a diagram, then duplicate the caption in the text, then try to describe the diagram in detail – this is the main cause of people over-running the word limit. Let the diagrams speak, and only put in the highlights of the figure in the text: e.g. "Figure 11 shows that the source rocks entered the oil window in the Tithonian".
5. ***Discussion:*** How do your results compare with (a) what other people have found in the same area, (b) what other people have found in different areas, and (c) what are the implications of this for the problem you were set? Do not bring in new material in the discussion section. Remember to draw a clear distinction between fact (what you know: "the rock is a sandstone") and conclusion (what you and others think: "the rock is a fluvial sandstone")
6. ***Conclusions:*** A clear statement of what you found. This can be bullet points or numbered paragraphs.
7. ***Acknowledgements:*** Who helped you? Keep it short and sincere. These can be on an introductory page (as in most past IPG reports), or before the references (as in most scientific journals).
8. ***References:*** see the guidelines above.

Please note that this is a general suggestion. The actual layout and the balance of content will vary from project to project.

Writing style

The main rule is to try to keep it simple. Short sentences are better than long ones. The active voice is preferable to the passive. First person is acceptable in moderation. So:

"I logged 102.5 m of core" rather than "One hundred and two and a half metres of core were logged"

For an example of a beautifully written, beautifully structured piece of scientific writing, see Dan McKenzie's classic paper on the origin of sedimentary basins:

McKenzie, D. 1978. Some remarks on the development of sedimentary basins. *Earth & Planetary Science Letters* **40**, 25-32.

Here is a paragraph from page 30 of that paper:

In the Great Basin of the western U.S.A. recent mapping has demonstrated the existence of a number of large shallow-angle normal faults [22]. Seismic reflection observations (Snelson, person communication) show that similar faults exist at depth in other parts of the basin. It therefore appears probable that the extension in the Great Basin is considerably greater than commonly estimated from surface mapping.

One fact or thought per sentence, one idea per paragraph.

For more information on how to write scientific prose, see:

http://www.scitext.com/writing.php which is a free site sponsored by the University of Cambridge. See in particular the section "Tips for writing"