FACULTY OF ENGINEERING
MSc, PG Diploma and PG Certificate in

- Advanced Mechanical Engineering
- Advanced Mechanical Engineering with Aerospace
- Advanced Mechanical Engineering with Energy Systems
- Advanced Mechanical Engineering with Materials
- Advanced Mechanical Engineering with Power Plant Technologies
The contents of this booklet are as far as possible up to date and accurate at the date of publication. Changes and restrictions are made from time to time and the University reserves the right to add to, amend, or withdraw courses and facilities, to restrict student numbers and to make any other alterations as it may deem desirable and necessary. Changes are published by incorporation in the next edition of the University Calendar.

It is the responsibility of each individual student to become familiar with all University Regulations which apply to them, and in particular with any changes made to their Course Regulations in their later years of attendance, as published in the current University Calendar, which may be consulted in the University Library, Departmental Offices or the Student Business - Student Experience and Enhancement Services (SEES)
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Advanced Mechanical Engineering

Introduction
The University of Strathclyde has existed in various forms in Glasgow since 1796 and is recognised as one of the largest and most important institutions in the field of engineering education and research in the UK. Located in the centre of Glasgow - Scotland’s commercial and industrial capital - it caters for a population of around 15,000 undergraduate and 7,000 postgraduate students.

The Faculty of Engineering comprises 8 departments, covering all major engineering areas: Architecture, Biomedical Engineering, Chemical & Process Engineering, Civil & Environmental Engineering; Design, Manufacture & Engineering Management; Electronic & Electrical Engineering; Mechanical & Aerospace Engineering and Naval Architecture, Ocean & Marine Engineering. The Graduate School of Engineering has recently been formed to co-ordinate postgraduate training across the Faculty.

The MSc in Advanced Mechanical Engineering courses have been developed to provide high calibre mechanical engineering graduates with an in-depth technical understanding of advanced mechanical engineering topics, together with generic skills that will allow them to contribute effectively in developing company capabilities. The programmes are designed to make students more employable and also satisfy the Further Learning requirements necessary to obtain CEng status. Students joining the course will have the opportunity to select 9 technical/specialist level 5 classes, which will enable them to establish their curriculum with an aerospace, energy, power plant technology or materials theme.

Engineering involves the creative process of turning knowledge of science and technology into products, services, and infrastructure that benefit society. The energy sector is currently undergoing major changes, providing significant technological challenges and offering excellent career prospects for well-qualified engineers. The role of engineering is crucial in developing efficient technologies that can help protect the environment while contributing to competitiveness and economic growth.

The Advanced Mechanical Engineering course offers flexible postgraduate training opportunities, and leads to awards at Postgraduate Diploma and MSc levels. The course includes specialist and generic taught modules, and industry-relevant projects for those progressing to the MSc. Teaching methods include lectures, practical exercises and site visits. The MSc requires 180 credits and the PgDip 120 credits. The MSc industrial-based project or research thesis carries 60 credits.

This course is particularly suitable for Graduate Engineers in the following sectors:
- Chemical, Petrochemical & Process Engineering
- Design Engineering
- Energy & Power Generation
- Manufacturing
- Oil & Gas
- Power Plant
- Renewable Energies

Specialist Instructional Modules
Specialist instructional modules focus on different technical aspects allowing multidisciplinary tailored learning to suit individual needs. When choosing technical modules, individuals will discuss the options with the course co-ordinator.

Generic Instructional Modules
Students can select from a range of generic modules which are available to provide other skills which are considered necessary for professional engineers. Those on offer include Design Management, Project Management, Environmental Impact Sustainability, Information Management, Financial Engineering, Risk Management, and Knowledge Engineering and Management for Engineers.
Individual Project
On successful completion of 120 credits of taught modules, students choosing the MSc route undertake an industry-relevant project which entails the production of a dissertation. This individual project involves an in-depth study and production of a thesis – it may be focused on an idea suggested by industrial contacts, or allieto one of the many areas of research strengths within the Department.

Duration of Study
The minimum duration of this full-time MSc course is 12 months while the minimum duration for PG Diploma students is 9 months. Candidates may be awarded credits, and have their curriculum reduced accordingly, on the basis of passes obtained in a relevant programme of the University or another institution.

Admission
Applicants will normally possess a degree (or expect to achieve) 2.1 (second class upper division) undergraduate degree in a relevant mechanical engineering subject. Applicants with 2.2 (second class lower division) may be considered with relevant work experience, which is deemed by the University to be equivalent.

Fees
2014/15: Home/EU £3,900; Rest of UK £9,000; Overseas £15,900
Contact Information

| Department of Mechanical & Aerospace Engineering  |
| University of Strathclyde  |
| James Weir Building  |
| 75 Montrose Stree  |
| Glasgow G1 1XJ  |
| Scotland, UK  |

| Technical  |
| Dr T Scanlon  |
| Course Director  |
| T: +44 141 548 5013  |
| E: tom.scanlon@strath.ac.uk  |

| Administrative  |
| Ms Diane McArthur  |
| Postgraduate Administrator  |
| T: +44 141 548 2846  |
| E: d.mcarthur@strath.ac.uk  |

General course information is available on the website at:

http://www.strath.ac.uk/mae/studyhere/postgraduatestudies/ame/

Student Support Services

There are numerous support services within the University and these are detailed in the University Student Handbook which is issued to all new students and can be found at http://www.strath.ac.uk/media/ps/sees/informationandadviceteam/student_handbook.pdf.

The handbook also provides general information, which should assist you during your period of study. Information is also available on the Student Experience and Enhancement Services website at: http://www.strath.ac.uk/sees

We hope you do not encounter any problems during your study, however, please do not hesitate to contact Ms Diane McArthur, departmental Postgraduate Administrator for further administrative assistance.

IMPORTANT:

Please familiarize yourself with the University and course handbooks, particularly relating to University regulations.

THE ONUS IS ON THE STUDENT TO READ ALL UNIVERSITY COMMUNICATIONS. FAILURE TO DO SO COULD POSSIBLY HAVE AN IMPACT ON YOUR STUDIES, IF YOU HAVE NOT READ INFORMATION PARTICULARLY RELATED TO POLICIES AND PROCEDURES.
Semester Dates 2014/15

Semester 1: 26 September 2014 – 23 January 2015
Christmas Vacation: 22 December 2014 – 2 January 2015

Spring Vacation: 6 April 2015 – 17 April 2015

IMPORTANT: Further information on key dates is available at:
http://www.strath.ac.uk/studying/currentstudent/keydates/

Student Holidays:
Christmas Vacation: 22 December to 2 January 2015
Spring Vacation: 6 – 17 April 2015

The University is CLOSED on the following dates:
Monday 29 September 2014 (Local Autumn Holiday)
Wednesday 24 December 2014 – Friday 2 January 2015 (Christmas/New Year)
Friday, 3 April 2015 (Easter)
Monday 6 April 2015 (Easter)
Monday, 4 May 2015 (May Day Holiday)
Monday 25 May 2015 (Queen’s Birthday Holiday)
Friday 17 July 2015 (Local Glasgow Fair Holiday)
Monday 20 July 2015 (Local Glasgow Fair Holiday)
General University regulations are published on the University website at: 
http://www.strath.ac.uk/educationstrategy/gmpt/qualityenhancement/universityregulations/

Students should also be aware of the information available regarding "Policies and Procedures", which is available on the Student Experience and Enhancement Services website.

**Academic Dishonesty:**
The University regards academic dishonesty as a serious offence. Allegations of academic dishonesty will be fairly assessed and appropriate action will then be taken. An allegation that has been dismissed as a disciplinary offense may still incur an academic penalty for poor scholarship.

The University is aware that there are a variety of temptations for students to engage in academically doubtful or dishonest activities during formal examinations, or in relation to assignments, practical work, dissertations or thesis preparation. In setting assessed assignments of whatever form, all teaching staff actively consider how to minimise the opportunities for students to cheat. Promoting a general climate of academic integrity within the student body is important.

Please read the "Academic Dishonesty Guide" for Examples of Academic Dishonesty

**Absence and Voluntary Suspension**
If you are absent from the University for seven days or less you should record a self-certificate online via Pegasus, using the Personal circumstances link under the Services Tab.

For absences of 7 days or less. Students who have been absent for 7 days or less should record a self- certification online via PEGASUS using the Personal Circumstances link under the services tab.

For absences of more than 7 days. Where sickness results in absence of more than 7 days, you are required to submit a medical certificate (signed by a medical practitioner, who is not a meber of your family to Student Business-Engineering, McCance Building, Richmond Street, Level 1.

For absences from an examination: The self- certification does not apply, and if you are absent from an examination due to sickness, you must submit a formal medical certificate. All certificates that are submitted to Student Business are kept in your file, and details are recorded.

In considering results, the Board of Examiners is concerned to take into account medical or other circumstances which may have adversely affected a student's performance. It is very important that the University is made aware of such circumstances in writing and, where relevant, with the production of a medical certificate/documentation. Students should also advise the Course Director or Postgraduate Administrator of circumstances affecting their studies.

If you need to interrupt your studies, you should contact your Course Director. In certain circumstances, you may be recommended to apply for Voluntary Suspension. This is subject to approval by the Vice-Dean (Academic). If approved your registration will be amended to show a student in voluntary suspension.

Further full information on Absence and Voluntary Suspension, please visit: 
http://www.strath.ac.uk/sees/studentpolicies/policies/attendance/absenceandvoluntarysuspension/.
Examinations:
Students who fail to present themselves for an examination at the time and place published will be
deemed to have forfeited that opportunity to sit the examination; except that in cases of absence through
illness or other sufficient cause the Board of Examiners will take into consideration documentary evidence
in assessing a candidate's position.

Students must sit all terminal tests and examinations unless prevented by illness, in which case a medical
certificate must be produced.

Further guidance on Examinations is available: FAQ For Examinations

Academic Appeals:
Please refer to the Personal Circumstances and Appeals Procedure, before submitting an appeal to the
Faculty Office - Engineering:

The above Student Affairs Information is a brief guide to some of the important Policies and Procedures
information, which will assist you during your study at Strathclyde.

A FULL LIST OF THE UNIVERSITY’S “POLICIES AND PROCEDURES” IS AVAILABLE ON THE
STUDENT EXPERIENCE AND ENHANCEMENT (SEES) WEBSITE
At the University we are committed to providing a safe learning environment where dignity is respected and discrimination or harassment does not occur on the basis of age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex, sexual orientation and socio-economic background. No student should intentionally be made to feel threatened or excluded from class participation.

You are reminded of your responsibility for the duration of your studies by showing respect to fellow classmates and staff by remembering the following protocol:

- Attend all scheduled lectures/seminars and/or practical sessions such as labs, including any additional learning and teaching sessions.

- Arrive on time and remain in class until the end of the session. If you need to leave early for any reason, please notify the tutor at the beginning or prior to the class.

- Do not disrupt the class by habitually coming in late or coming and going from the classroom during the session. Students arriving late, without justified reasons, may be refused entry.

- Refrain from consistently interrupting another speaker and listen to the ideas of others with respect. Do not be rude or make personal attacks on individuals during group discussions.

- Inform and establish consent of the tutor if you wish to record the lecture. The recording must be used only for personal study.

- Do not bring food into the classroom, other than for medical reasons, e.g. diabetes. Beverages may be permissible at the tutor’s discretion if the room utilisation rules allow.

- Inform tutors of specific requirements for example the need to perform prayers for practising students of diverse faiths.

- Seek consent of students and staff before taking any photos in the classroom.

- At any course related external visit you are acting as ambassadors of the University and are reminded to act as such.

- Refrain from smoking on premises as this is prohibited in all University buildings.

- Follow emergency instructions and health and safety procedures.

- Should you have any concerns please bring them to the attention of your tutor and/or appropriate University staff.
OPERATING GUIDELINES (abbreviated)

PART A: GENERAL GUIDELINES

Progress Requirements and Assessment

1. PGT Boards of Examiners assess students’ performance in meeting the progress, transfer and award requirements for all postgraduate taught courses (PgCert, PgDip, MSc and MArch) and also the taught classes of research degrees (e.g. MRes, MPhil, PhD and EngD).

2. Students are required to meet the conditions set down in the general and course regulations. All regulations are published in the University Calendar. The general requirements are contained in Regulations 19.1, 20.1-20.4, and the requirements of individual Faculty courses appear in regulations 19.40 – 19.49. Copies of the relevant regulations are included in course handbooks that are issued to all students on admission to the University.

Boards of Examiners must also comply with the requirements outlined in section 6 of the University “Policy and Procedures on Assessment and Feedback” document.

3. Student progress is determined by the accumulation of credits. The pass mark at PGT level (level 5) is 50%.

4. Regulation 19.1.34 confirms that a candidate who satisfies a Board of Examiners in a class will be awarded the number of credits specified for that class.

5. The Faculty of Engineering operates a compensation scheme that can be applied only to a student’s first attempts. It is not used at later Boards unless first attempts are being considered or there are special circumstances. Further details are given in Part B below.

6. The Faculty of Engineering PGT Compensation Scheme applies to all PGT degrees in the Faculty, unless approval has been granted by the Board of Study and Senate for a course to be exempted. Departments that wish to exempt a course from the scheme must submit a request to the Faculty Office in writing, accompanied by appropriate supporting documentation.

7. Examination Boards should note that the University General Regulations for PGT courses state (19.1.37) that candidates for the degree of Master will normally be expected to perform to the satisfaction of the Board of Examiners in the taught components of the course, before being permitted to proceed to the project and/or dissertation. MSc students in the Faculty are therefore required to satisfy paragraphs 20-22 below.

8. PgCert and PgDip students (in contrast to MSc students) may resit once any number of classes, as per University general regulations.

Method of Operation of the Boards of Examiners:

13. The Board of Examiners will be chaired by the relevant Head of Department or their nominee.
14. The Board of Examiners will scrutinise the marks that have been set out in the Schedules of Assessment. Course co-ordinators should advise the Board of any amendments that require to be made to the Schedule. It is also their responsibility to recommend to the Board how the Compensation scheme should be applied in individual cases.

15. Generally, a mark of 50% or more in a class is regarded by the Board as a clear pass.

16. A candidate who satisfies a Board of Examiners in a class will be awarded the number of credits specified for that class.

17. Boards of Examiners will make one of the following decisions for all students:

- **AWARD**  
  A clear Award. The student has successfully completed all the taught and, if appropriate, the project/dissertation components of his/her degree, diploma or certificate course.

- **P**  
  A clear Pass. The student has no re-sits and should proceed to the next year of study (normally only for students who are undertaking the course over more than one academic session).

- **MP**  
  May Proceed to Project/Dissertation. The student has normally satisfied all the taught components of his/her course and may proceed to the project/dissertation. (see 20, 21 and 22)

- **TM**  
  Terminate. The student will be instructed to withdraw from the course.

- **R**  
  Re-sit (May/June Board only). The student should take re-sit examinations in August, after which a decision will be made on possible award of MSc, PgDip or PgCert.

- **SL**  
  Unusual circumstances dictate that the student should receive a Special Letter, outlining his/her academic position as determined by the Examiners. In order to avoid unnecessary delay in students’ receiving results, it is preferable that this option only be recorded in exceptional circumstances.

- **TF**  
  Transfer. The student will be transferred to another degree, diploma or certificate course in the same group of courses. This may be qualified by the decision of, for example, TF and resit etc.

18. This Board will normally consider the transfer of candidates between PgCert, PgDip and MSc and progression to the MSc project/dissertation. This Board will also consider any outstanding candidates from the previous academic year.

19. The compulsory and optional classes required by candidates for either progression or award can be found in the relevant course regulations.

20. To proceed to the MSc project/dissertation a candidate will normally have accumulated all the credits on the taught component of the course at the first attempt.

21. With respect to students who have not passed all their credits at the first attempt the Board of Examiners will apply the Faculty PGT Compensation Scheme, if applicable, as outlined in Part B below. If this can be done and the student thereby gains sufficient credits, then the decision will be “Proceed to MSc Project/Dissertation”.

1st Examination Board (usually May/June)

18. This Board will normally consider the transfer of candidates between PgCert, PgDip and MSc and progression to the MSc project/dissertation. This Board will also consider any outstanding candidates from the previous academic year.

19. The compulsory and optional classes required by candidates for either progression or award can be found in the relevant course regulations.

20. To proceed to the MSc project/dissertation a candidate will normally have accumulated all the credits on the taught component of the course at the first attempt.

21. With respect to students who have not passed all their credits at the first attempt the Board of Examiners will apply the Faculty PGT Compensation Scheme, if applicable, as outlined in Part B below. If this can be done and the student thereby gains sufficient credits, then the decision will be “Proceed to MSc Project/Dissertation”.

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22. MSc students will normally only be allowed to resit a maximum of 20 credits, provided all other taught classes have been passed at the first attempt, with a minimum mark of 50% in each class, and no compensated passes have been awarded.

23. Students who are allowed to proceed to their project/dissertation, under the terms of paragraphs 22 and 36, must be warned that they cannot remain on the MSc course unless all outstanding taught classes are passed at the second attempt. Such students are required to sign a form verifying that they understand and accept the conditions required to remain on the MSc course.

24. MSc students who have failed to achieve the required number of credits on the taught component of the course, under the terms of paragraphs 20-22 will normally be transferred to the PgDip.

25. PgDip students who satisfy the terms of paragraphs 8 and 20-22 and have passed all taught components may be transferred to the appropriate MSc course and proceed to the project/dissertation.

26. Any student who has failed one or more classes will normally be entitled to one further attempt (19.1.19) to obtain enough credits for the award of a PgCert or a PgDip. A student is only entitled to one further attempt at classes for the award of an MSc under the conditions outlined in paragraph 22.

27. The Board may also consider awards for students who have satisfactorily completed the requirements of the course.

2nd Examination Board (usually September):

28. This is the main Examination Board for PGT Courses. Notwithstanding paragraph 27, this Board considers the award of MSc, PgDip and PgCert, and the transfer of students between MSc, PgDip and PgCert. Outstanding issues from the earlier Examination Board will also be considered.

29. Boards of Examiners may allow a thesis/dissertation to be re-submitted only if the original mark is at least 45%, in which case the re-submission must be made before the end of November (in the same calendar year).

Awards:

30. 
   a. Where a candidate has accumulated 120 credits of taught classes from the curriculum, together with 60 credits for the project/dissertation, he/she will be awarded an MSc.
   b. Where a candidate has accumulated 120 credits of taught classes from the curriculum, but has not obtained 60 credits for the project/dissertation, he/she will be awarded a PgDip.
   c. Where a candidate has not accumulated 120 credits of taught classes after 2 attempts, he/she may be considered for a PgCert. The PgCert can be awarded if the candidate has accumulated at least 60 credits of taught classes from the curriculum.
   d. A candidate who has accumulated less than 60 credits of taught material after two attempts will be deemed to have failed, and no award will be made.

Awards may be made "with Merit" or "with Distinction". Examination Boards should have regard to a student’s performance against criteria approved by Senate and consider the composite mark against the following general framework (19.1.49):

<table>
<thead>
<tr>
<th>Classification</th>
<th>Composite Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinction</td>
<td>70 - 100</td>
</tr>
<tr>
<td>Merit</td>
<td>60 - 69</td>
</tr>
<tr>
<td>Award</td>
<td>50 - 59</td>
</tr>
</tbody>
</table>
Notwithstanding University General Regulation 19.1.49, **PGT students are eligible for an award with merit/distinction only if they pass all classes at the first attempt.** (This includes any compensated class).

**PART B: THE FACULTY PGT COMPENSATION SCHEME**

35. The Faculty operates a compensation scheme that is designed to assist Boards of Examiners to take decisions about student progress to the MSc project/dissertation. The scheme can be applied only to the student's first attempts and, therefore, is normally used only at the May/June meetings of the Boards of Examiners. Marks of N + a mark (i.e. where there is an examination result but missing coursework) are not eligible for compensation.

36. Students who have accumulated at least 120 credits from the course curriculum and who have a credit-weighted average (CWA) of at least 55% are eligible for compensation. Any combination of classes, up to a maximum of 20 credits, may be compensated (where the class marks are in the range 40-49%).

Compensation can be applied to part-time students when they have completed classes totalling at least 60 credits. Students who have accumulated at least 60 credits and who have a CWA of at least 55% are eligible for compensation. A maximum of 10 credits of classes may be compensated (where the class marks are in the range 40-49%) or taken as a resit (where the class marks are below 40%).

33. Only in circumstances where compensation is not acceptable for professional accreditation will degrees be allowed to deviate from the scheme. In such cases, Departments must provide documentary evidence of the concerns expressed (e.g. a letter from the accrediting body stating that the Department may not apply compensation to specified accredited courses) together with any alternative proposals. Any such modification requires approval by the Board of Study and by Senate.
Instructional Modules
Most available modules are valued at 10 PG credits. Specialist technical modules and generic modules are spread across the two semesters.

Assessment methods will vary between the individual modules, and may comprise examination or written assignments, or a mixture of the two. Details of the assignments will be given during the modules, and will also be available within the University of Strathclyde’s Virtual Learning Environment “MyPlace” to which all registered students will have access.

Individual Project
Students taking the full MSc course undertake supervised, individual project work, with the award of MSc being made on the basis of an acceptable report/dissertation submission.

Assessment and Examinations
The pass mark for postgraduate assessment is 50% overall average. It is possible to get compensation for up to 2 modules in the 40-50% band, if the overall taught module average is at least 55%.

In the case of assignments, there will be a deduction of 5% per day for overdue assignment submissions.

Refer to the Course General Regulations for Resit Practice and Progress Procedure.
For further information please refer to Regulations 19.1.25 – 19.1.33
General Regulations for Postgraduate Study

19.1 General Regulations for Postgraduate Awards by Instruction

[The following General Regulations should be read in conjunction with the regulations governing specific courses]

Admission

19.1.1 Applicants shall normally:
(i) possess a degree (or in the case of direct entry to a Masters programme, a first or second class honours degree) from a United Kingdom University; or
(ii) possess other qualifications deemed, by the Course Director (or nominee) acting on behalf of Senate, to be equivalent to (i) above; or
(iii) be deemed, by the Course Director (or nominee) acting on behalf of Senate, to have achieved an academic standard equivalent to (i) above

19.1.2 In all cases, applicants whose first language is not English, shall be required to demonstrate an appropriate level of competence in the English language.

The University will operate a screening procedure for applicants in respect of criminal convictions.

Courses which involve students in contact with children under 18 or vulnerable adults will require students to be a member of the PVG (Protecting Vulnerable Groups) Scheme or, if already a member, to apply for an update.

19.1.3 Applicants who satisfy the provisions of Regulation 19.1.1 may, in addition, be required to have had a period of relevant experience acceptable to the Senate.

Credit Transfer and Recognition of Prior Learning (RPL)

19.1.4 The relevant Course Director (or nominee) may admit applicants and/or approve exemption from part of a course by credit transfer or RPL provided this is done in accordance with University procedures and against criteria defined on a course by course basis.

Credit granted for credit transfer or RPL may only be used once and, when used to gain exemption, will normally relate to achievements within 5 years of registration on a University of Strathclyde programme.

Exemption granted on the basis of credit transfer or RPL will be allowed primarily where students can demonstrate that the relevant specific learning outcomes have been achieved (i.e. primarily for specific rather than general credit). The extent of any allowed exemption shall be preferably no greater than 34% and normally not exceed 50% of the credits appropriate to the course. Exceptionally, by formal resolution, the Senate may approve up to 67% exemption in special circumstances.

Where any such exemption is granted, the Board of Study, acting on behalf of Senate, may approve an appropriate reduction in the minimum period of study.

Minimum Periods of Study

19.1.5 The minimum period of study shall normally be as follows:

For full-time study
Masters by full-time study 12 months
PG Diploma by full-time study 8 months
PG Certificate by full-time study 4 months

For part-time study, the minimum period of study shall be the learning equivalent of the full-time study period required taking account of the conditions under which the student will work. The overall duration of study will normally be greater than for full-time study.

Maximum Periods of Study

19.1.6 Unless specifically stated otherwise in the relevant course regulations, students shall be required to complete their course including the submission of any dissertation, design or report within a prescribed period from the date of the student's registration as follows:
For full-time study
Masters by full-time study 36 months
PG Diploma by full-time study 24 months
PG Certificate by full-time study 12 months

For part-time study
Masters by part-time study 60 months elapsed time
PG Diploma by part-time study 48 months elapsed time
PG Certificate by part-time study 24 months elapsed time

Exceptionally, the maximum period of study may be extended by Senate on the recommendation of the Board of Study.

Mode of Study
19.1.7 Courses may be offered on a full-time and/or part-time basis.
At the discretion of the relevant Board of Study on the recommendation of the relevant Course Director (or nominee), a student may transfer from full-time to part-time study and vice-versa where an appropriate course is available, at which time the relevant minimum and maximum periods of study will be reviewed.

Place of Study
19.1.8 Except where Senate has approved distance learning arrangements for off campus delivery, study shall normally be undertaken within the University or within an institution or agency approved by Senate for the purpose (see Regulation 20.6 and University Guidelines and Procedures for collaborative provision leading to awards or joint awards of the University).

Course Structure and Curriculum
19.1.9 Each candidate for an award must follow the curriculum as prescribed in the relevant course regulations. These may be amended from time to time by the Senate on the recommendation of the relevant Board of Study.
19.1.10 In accordance with the University Awards Framework, individual classes shall be assigned a level based on expected learning outcomes and a credit rating based on the volume of learning required.
19.1.11 The structure of taught courses shall normally accord with the following table:

<table>
<thead>
<tr>
<th>Award</th>
<th>Credit Requirements</th>
<th>Minimum Level Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postgraduate Certificate</td>
<td>60</td>
<td>50 credits at Level 5</td>
</tr>
<tr>
<td>Postgraduate Diploma</td>
<td>120</td>
<td>100 credits at Level 5</td>
</tr>
<tr>
<td>Masters Degree</td>
<td>180</td>
<td>150 credits at Level 5</td>
</tr>
</tbody>
</table>

Notes:
1. For a typical student one credit equates to approximately 10 hours of total student effort.
2. In certain circumstances, for example to meet professional accreditation requirements, the credit requirement may exceed the above framework.

19.1.12 The curriculum of every student must be approved in advance by the relevant Course Director or equivalent acting on behalf of the relevant Board of Study.

19.1.13 Where a pass in a particular class is a necessary condition for progress or for an award, this shall be clearly stated in the relevant course regulations.

19.1.14 The curriculum may include a design or other project or a dissertation.

19.1.15 Course delivery, materials, assessed work and oral examination shall be in English unless stated otherwise in individual course regulations and published in the Course Handbook.

19.1.16 Notwithstanding the provisions of Regulation 19.11.12, where unlisted optional classes may be chosen as part of the curriculum, the approval of the Head of Department (or nominee) responsible for offering each class is also required.
The University cannot guarantee that all optional classes will be available in any given academic year. The choice of classes may be subject to constraints of timetabling and may also be influenced by professional requirements as well as by a student’s entrance qualifications or pre-requisite classes passed.

In order to qualify for a University of Strathclyde award, a student who has been granted exemption from part of a University of Strathclyde course through credit transfer or RPL (in accord with Regulation 19.1.3) must gain from the University of Strathclyde course curriculum a minimum of one-third of the overall credit requirement for that award.

Dissertation

Where a dissertation is required, a student will normally be expected to have performed to the satisfaction of the Board of Examiners in the taught components of the course before being permitted to proceed to the dissertation. The dissertation shall be of a length and standard approved by the Board of Study and shall normally be submitted by a date approved by the Board of Study and published in the appropriate Course Handbook.

Any dissertation submitted under the provisions of Regulation 19.1.19 must be written in English. Exceptionally, having regard to the nature and content of the dissertation, the Board of Study concerned, acting on behalf of Senate, may permit submission in another language, in which case a translation of the abstract as a minimum into English must accompany the dissertation.

Attendance and Performance

Every applicant admitted to a course of study shall be required to attend regularly and to perform satisfactorily the work of each class in their curriculum.

A student has an obligation to inform the University Student Experience – Student Business at the first reasonable opportunity of any medical or other circumstances which might adversely affect their attendance, performance and/or ability to study.

A student who, in the opinion of the Head(s) of the Department(s) offering a class and the relevant Vice Dean Academic, does not satisfy the requirements as to attendance and to performance and having been informed in writing, shall not be entitled to take the examination in the subject of that class and shall be so informed.

Notwithstanding Regulation 19.1.23, a student may subsequently be permitted by the Course Director (or nominee) to take the examination in the subject of the class at the next available opportunity subject to satisfactory completion of appropriate course work.

Examinations and Assessment

The Board of Examiners shall consist of not less than four persons including an External Examiner and academic staff responsible for the conduct of the course. It shall normally meet under the Convenership of the Course Director or Head of Department.

A student shall normally complete the assessments during the academic year in which the classes were undertaken unless permitted by the relevant Board of Study to postpone the assessment.

Classes shall be assessed by

(i) coursework assignments; or
(ii) written examinations; or
(iii) oral examinations; or
(iv) any combination of the above
unless specified otherwise in the relevant Course Handbook.

Except where a course includes an integrative/reflective class that will draw on work in other classes, each item of work may only be assessed in one class.
19.1.29 Candidates are required to pass written and oral examinations and to perform to the satisfaction of the Board of Examiners in the course work, and in the case of candidates for the degree of Master, in the dissertation or project.

19.1.30 A student who is deemed to have failed a taught class or who has been debarred in terms of Regulation 19.1.23 shall normally have one further opportunity to be re-assessed on a similar basis or by such other means as the Department(s) offering the class may decide. The nature of re-assessment shall be identified in module descriptors and/or Course Handbooks. The attempt shall normally be made at the next available diet of examinations.

Exceptionally, candidates for taught masters degrees who fail to satisfy the Board of Examiners may, in the light of their overall performance and subject to the approval of the Board of Examiners, be permitted to revise and re-submit their dissertation, normally within one year of the first submission.

19.1.31 Notwithstanding Regulation 19.1.30, Boards of Examiners may exceptionally permit alternative forms of re-assessment for a class where they consider it to be in a student’s interest.

The Board of Examiners may also require the student to re-attend the class.

19.1.32 The Board of Examiners may discount an attempt for a class where appropriate medical or other evidence has been provided subject to report to the relevant Board of Study.

19.1.33 At the discretion of the Board of Examiners or Course Director (or nominee), and, where appropriate, in conjunction with the External Examiner, a student may be required to attend and participate in an oral examination.

**Award of Credits**

19.1.34 The relevant Board of Examiners shall award the credits for the classes passed.

**Progress of Students**

19.1.35 Details of any required minimum level of performance to permit a student to progress from Certificate to Diploma and from Diploma to Masters are shown in individual course regulations hereafter.

19.1.36 To proceed to the next year of a course, a full-time student must normally accumulate the minimum number of credits in accordance with the following general framework:

<table>
<thead>
<tr>
<th>Progression</th>
<th>Minimum Number of Credits Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>First – Second Year</td>
<td>90</td>
</tr>
</tbody>
</table>

Individual courses may specify minimum credit numbers greater than those given above in which case these shall be given in the relevant course regulations.

Where a course is available on a part-time basis, progress requirements shall be specified in the relevant course regulations.

Where credits in particular classes are required for progress, these shall be specified in the relevant course regulations.

19.1.37 Candidates for the degree of Master will normally be expected to perform to the satisfaction of the Board of Examiners on the taught components of the course before being permitted to proceed to the project and/or dissertation. Notwithstanding Regulation 19.1.30, a candidate may be subject to a restriction in the number of classes that may be re-assessed.
19.1.38 Subject to prior approval of the Senate, Boards of Study may permit a Board of Examiners to apply compensation procedures according to prescribed criteria. In such cases, the criteria shall be detailed in the Course Handbooks.

19.1.39 The Board of Examiners, acting on behalf of Senate, shall ratify one of the following:

(i) award of the appropriate degree, diploma or certificate with distinction;
(ii) award of the appropriate degree, diploma or certificate with merit;
(iii) award of the appropriate degree, diploma or certificate;
(iv) progress to subsequent stages of the course;
(v) withholding of the award of the degree or other qualification pending further study or submission/resubmission of assignments;
(vi) transfer or termination of registration.

Transfer of Registration, Suspension and Withdrawal

19.1.40 Where a candidate has failed to satisfy the Board of Examiners, the Board of Study, acting on behalf of Senate and in accordance with the recommendation of the Board of Examiners, may

(i) require that registration be transferred to Postgraduate Diploma or Postgraduate Certificate course by instruction (as appropriate), subject to a related course being available; or
(ii) suspend a student from attendance at classes but require them to undertake assessments in accord with Regulations 19.1.30 – 19.1.32 until the required number of credits and necessary passes have been obtained to allow the student to proceed to the next stage/year of the course; or
(iii) recommend the award of such a Postgraduate Diploma or Postgraduate Certificate (as appropriate); or
(iv) terminate the student’s registration and require the student to withdraw.

19.1.41 On the recommendation of the relevant Course Director (or nominee), the relevant Vice Dean Academic may permit a student to undertake voluntary suspension for the whole or part of an academic year or transfer to part-time study subject to this mode of study being available.

19.1.42 A student may be required to withdraw from a course as a consequence of academic dishonesty or unprofessional conduct. Such a decision would be taken in consequence of a disciplinary hearing as provided for in Regulations 5.4 and 5.5.

19.1.43 On the recommendation of the relevant Course Director (or nominee), the Board of Study may approve transfer of a student’s registration between

(i) a Masters degree
(ii) a Postgraduate Diploma;
(iii) a Postgraduate Certificate.

as appropriate, subject to a related course being available.

The Board of Study shall determine what recognition towards the fulfillment of the requirements may be given to the period that the student has completed.

19.1.44 Where a candidate for the degree of Master or Postgraduate Diploma has satisfied the Board of Examiners but requests transfer to the Postgraduate Diploma or Postgraduate Certificate, the Board of Study, acting on behalf of Senate and in accordance with the recommendation of the Head of Department or Course Director or Board of Examiners, may

(i) permit registration to be transferred to Postgraduate Diploma or Postgraduate Certificate course by instruction (as appropriate), subject to a related course being available; or
(ii) recommend the award of such a Postgraduate Diploma or Postgraduate Certificate
Appeals against Transfer of Registration, Suspension, Termination, Withdrawal or Award Classification

19.1.45 A student who has been required to transfer registration or is suspended from attendance at classes or is required to withdraw under the provisions of Regulation 19.1.39 - 19.1.43 may appeal to the relevant Board of Study for reconsideration of the case.

19.1.46 A student may appeal to the relevant Board of Study for reconsideration of the classification of the award. Such an appeal must be submitted and the outcome of any such appeal must be decided upon before the student's award is confirmed.

19.1.47 The grounds for appeals under Regulations 19.1.45 and 19.1.46 may be any of the following:

(i) that there were procedural irregularities in the conduct of the examination or of the assessment (including alleged administrative error of such a nature as to cause reasonable doubt as to whether the examiners or the Board of Study would have reached the same conclusion if the alleged error had not been made); or

(ii) that there were medical, personal or other circumstances affecting the student's performance of which the examiners or the Board of Study were not aware when their decision was taken; or

(iii) that there was inadequate assessment, prejudice or bias on the part of one or more of the examiners or assessors.

Such an appeal shall be lodged in writing with the relevant Faculty Manager no later than a date specified by the Board of Study and notified in the letter informing the student of the transfer of registration or suspension or requirement to withdraw or the award classification. The appeal shall be supported by appropriate documentary evidence not previously available.

19.1.48 A student has the ultimate right of appeal to the Senate normally following an unsuccessful appeal to the relevant Board of Study. Such an appeal shall be lodged in writing supported by all appropriate documentary evidence and shall be lodged with the Deputy Secretary within a period of six weeks from the date of notification to the student of the outcome of the preceding appeal to the Board of Study and shall be supported by all the appropriate documentary evidence. The student will have a right of appearance, either alone or accompanied by one person, at the hearing of the appeal to the Senate.

Classification of Degrees

19.1.49 A student may be awarded a degree, a degree with merit or a degree with distinction. In reaching their decision, Boards of Examiners shall have regard to a student's performance against approved criteria and consider the composite mark against the following general framework:

<table>
<thead>
<tr>
<th>Classification</th>
<th>Composite Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinction</td>
<td>70 -100</td>
</tr>
<tr>
<td>Merit</td>
<td>60 – 69</td>
</tr>
<tr>
<td>Award</td>
<td>50 – 59</td>
</tr>
</tbody>
</table>

Award

19.1.50 A candidate who satisfies the conditions of the Ordinances governing the award of degrees, diplomas and certificates and of the general and course regulations will, on payment of the required fees, be entitled to receive the appropriate award. To qualify for the award, a candidate must have obtained passes in classes at all levels of the curriculum as specified in the course regulations. The candidate will receive a parchment setting forth the course of
study in which the award has been granted and, if appropriate, the classification in which the
candidate has been placed.

19.1.51 A candidate on a course that has multiple exit points (e.g. Postgraduate Certificate,
Postgraduate Diploma and degree of Master) may only retain one of the possible awards.

19.1.52 Notwithstanding the provision of 19.1.50 where such a course of study is undertaken on a
part-time basis over a period of more than three years, Senate may approve interim awards
that may be retained provided that such awards relate to separately named courses
governed by distinct course regulations.

19.2 to 19.11 (Numbers not used.)
Advanced Mechanical Engineering

MSc in Advanced Mechanical Engineering  
MSc in Advanced Mechanical Engineering with Aerospace  
MSc in Advanced Mechanical Engineering with Energy Systems  
MSc in Advanced Mechanical Engineering with Materials  
MSc in Advanced Mechanical Engineering with Power Plant Technologies  
Postgraduate Diploma in Advanced Mechanical Engineering  
Postgraduate Certificate in Advanced Mechanical Engineering

Course Regulations  
[These regulations are to be read in conjunction with Regulation 19.1]

Admission

19.47.21 Notwithstanding Regulation 19.1.1, applicants shall possess
(i) a degree (or in the case of direct entry to the degree of MSc, a first or second class Honours degree) from a United Kingdom university in Science or Engineering; or
(ii) a qualification deemed by the Course Director acting on behalf of Senate to be equivalent to (i) above.

In all cases, applicants whose first language is not English, shall be required to demonstrate an appropriate level of competence.

Duration of Study

19.47.22 Regulations 19.1.5 and 19.1.6 shall apply.

Mode of Study

19.47.23 The courses are available by full-time and part-time study.

Curriculum

19.47.24 All students shall undertake an approved curriculum as follows:

for the Postgraduate Certificate – no fewer than 60 credits
for the Postgraduate Diploma – no fewer than 120 credits including no fewer than 30 from the classes in List A and no fewer than 80 from the classes in List B
for the degree of MSc – no fewer than 180 credits including the Project and including no fewer than 30 from the classes in List A and no fewer than 80 from the classes in List B

Classes

<table>
<thead>
<tr>
<th>List A</th>
<th>Level</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF 927 Design Management</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>EF 930 Information Management</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>EF 931 Project Management</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>EF 932 Risk Management</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>EF 929 Financial Engineering</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>AB 975 Sustainability</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>EV 939 Environmental Impact Assessment</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>DM 930 Knowledge Engineering and Management for Engineers</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

List B
Level 5 classes offered by the Department of Mechanical and Aerospace Engineering, listed in Regulation 12.47.9.

Exceptionally, such other Level 5 classes as may be approved by the Course Director.
For the degree of MSc in Advanced Mechanical Engineering with Aerospace, the following classes are compulsory:
16598 Aerodynamic Performance 5 10
16599 Aerodynamic Propulsion Systems 5 10
ME 512 Spaceflight Mechanics 5 10

For the degree of MSc Advanced Mechanical Engineering with Energy Systems, the following classes are compulsory:
ME 927 Energy Resources and Policy 5 10
ME 929 Electrical Power Systems 5 10
ME 930 Energy Modelling and Monitoring 5 10

For the degree of MSc in Advanced Mechanical Engineering with Materials, the following classes are compulsory:
16565 Engineering Composites 5 10
ME 523 Polymer and Polymer Composites 5 10
ME 931 Industrial Metallurgy 5 10

For the degree of MSc in Advanced Mechanical Engineering with Power Plant Technologies, the following classes are compulsory:
ME 917 Advanced Boiler Technologies 1 5 10
ME 929 Electrical Power Systems 5 10
ME 923 Gas and Steam Turbines 5 10

Students for the degree of MSc only:
EF 900 Project 5 60

Examination, Progress and Final Assessment

19.47.25 Regulations 19.1.25 – 19.1.33 shall apply.

19.47.26 The final assessment will be based on performance in the examinations, coursework, the project where undertaken and, if required, in an oral examination.

Award

19.47.27 Degree of MSc: In order to qualify for the award of the degree of MSc in Advanced Mechanical Engineering, a candidate must have performed to the satisfaction of the Board of Examiners and must have accumulated no fewer than 180 credits, of which 60 must have been awarded in respect of the project. For the degrees of MSc in Advanced Mechanical Engineering with Aerospace, MSc in Advanced Mechanical Engineering with Energy Systems, Advanced Mechanical Engineering with Materials and Advanced Mechanical Engineering with Power Plant Technologies the candidate must have attained the credits in the appropriate compulsory classes.

19.47.28 Postgraduate Diploma: In order to qualify for the award of the Postgraduate Diploma in Advanced Mechanical Engineering, a candidate must have accumulated no fewer than 120 credits from the taught classes of the course.

19.47.29 Postgraduate Certificate: In order to qualify for the award of the Postgraduate Certificate in Advanced Mechanical Engineering, a candidate must have accumulated no fewer than 60 credits from the taught classes of the course.

Notes:

1 Throughout these regulations, part-time study includes part-time study and open learning.
2 Where the phrase “Course Director (or nominees)” is used in these regulations, the Head of Department shall nominate appropriate Officers (e.g. Selector or Course Director) or relevant Faculty Committee in each case in accordance with any Departmental or Faculty procedures.
3 In the Faculty of Humanities and Social Sciences, research students are based in the Graduate School and the Associate Dean (PGR) undertakes the role carried out by the Head of Department in the other three faculties.
4 All decisions taken by the Boards of Study, acting on behalf of Senate, should subsequently be
In interpreting these regulations, regard should be had to the University’s Policies and Procedures for Teaching and Learning and, where appropriate, Course Handbooks.

Students should also have regard to the Regulations contained in Part 1 of the University Calendar.
LIST A

Generic Modules

The following generic module descriptors are also provided in this section:

DM930  Knowledge Engineering and Management for Engineers
EF927  Design Management
EF930  Information Management
EF931  Project Management
EF932  Risk Management
EF929  Financial Engineering
EV939  Environmental Impact Assessment
AB975  Sustainability

LIST B

Specialist Modules:

The following module descriptors are described in this section:

16587  Pressurised Systems
ME501  Systems Engineering 1
ME502  Systems Engineering 2
ME505  Machine Dynamics
ME507  Machinery Diagnosis and Condition Monitoring
ME511  Mathematical Modelling in Engineering Science
ME514  Advanced Topics in Fluid Systems Engineering
ME516  Lightweight Structures
ME517  Spaceflight Systems
ME918  Advanced Boiler Technologies 2
ME927  Energy Resources and Policy

Aerospace (Compulsory for AME with Aerospace MSc, optional for others):

16598  Aerodynamic Performance
16599  Aerodynamic Propulsion Systems
ME512  Spaceflight Mechanics

Energy (Compulsory for AME with Energy Systems MSc, optional for others):

ME927  Energy Resources and Policy
ME929  Electrical Power Systems
ME930  Energy Modelling and Monitoring

Materials (Compulsory for AME with Materials MSc, optional for others):

16565  Engineering Composites
ME523  Polymer and Polymer Composites (not running in 2014-15)
ME931  Industrial Metallurgy

Power Plant Technologies (Compulsory for AME with Power Plant Technologies MSc, optional for others):

ME917  Advanced Boiler Technologies 1
ME925  Gas and Steam Turbines
ME920  Power Plant Systems

University timetables: www.strath.ac.uk/timetables will provide information on date/times/location of classes. Please check prior to attending the class for any changes.
(R) = Registrar in charge of class.

NB: Past exams papers (hard and electronic copies) can be found in the University Library. Module Description Forms for all Mechanical and Aerospace Engineering classes, which follow can be found on the Departmental web site at: http://www.strath.ac.uk/mae/currentstudents/

These contain comprehensive (and sometimes more up-to-date) information on all classes.

16565 Engineering Composites - 10 credits (ECTS 5)

2nd Semester: Prof J Thomason, (R), Prof M M Stack

General Aims: The promise claimed for new materials in engineering is most likely to be realised through the use of composites and ceramics. This class aims to give a basic understanding of modern composite materials and an appreciation of predictive modelling and design implications when composites are applied to engineering structures. The main composite manufacturing processes will be outlined.

Outline Syllabus: The module will teach the following: Classification and definition of composites; properties of fibres and matrices; micromechanics – elastic properties of lamina with unidirectional and random long fibre reinforcement; short fibre composites; macromechanics – constitutive relations for lamina and laminates; strength concepts and prediction; failure criteria; applications to load bearing structures; – tribology of composites; exposure to aggressive environments e.g. high temperatures.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
</tr>
<tr>
<td>1</td>
<td>May/June</td>
<td>2hrs</td>
</tr>
<tr>
<td>L/Outcomes</td>
<td>LO1, LO2, LO3, LO4</td>
<td>LO1-LO4</td>
</tr>
</tbody>
</table>

Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

16587 Pressurised Systems - 10 credits (ECTS 5)

1st Semester: Professor D H Nash (R)

General Aims: This module aims to introduce the subject of industrial Pressurised Systems and ensure competency in the use of Standards and Design Codes. Pressurised Systems are inherently dangerous since they contain stored energy which must be carefully controlled. The class aims to set down a methodology whereby a range of pressurised components (spheres, cylinders, cones, etc.) can be designed, manufactured, installed and operated to a high degree of safety.

Outline Syllabus: An introduction to the design philosophy and the manufacture of pressurised systems. The stress analysis of thin shells including cylinders, cones and spheres under pressure and temperature. Pressure vessel design: British and American Design Codes, design by rule, design by analysis. Stress categorisation - primary and secondary stresses, peak stress. Applications to the design of pressure vessel components, cylindrical and spherical pressure vessels, treatment of local loadings, openings, supports and heads. External pressure loading, buckling and stability. Local loads, supports and fatigue assessment. Simple piping systems design. Use of computer packages for pipework and pressure vessel design.
**Assessment Method(s) Including Percentage Breakdown and Duration of Exams**

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations*</th>
<th>Courseworks</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
<td>Weighting</td>
</tr>
<tr>
<td>1</td>
<td>Jan</td>
<td>2 hrs</td>
<td>70%</td>
</tr>
</tbody>
</table>

*Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

*NOTE: Exam will be Open Book exam and only course notes and copies of British Standard extracts as supplied on MyPlace will be permitted into the Examination Hall.

16598  Aerodynamic Performance - 10 credits (ECTS 5)

1st Semester:  Dr M T Stickland (R), Dr I J Taylor, Dr T Scanlon

**General Aims:** This module aims to introduce students to the principles of experimental aerodynamics and computational aerodynamics performance assessment together with an appreciation of vehicle aerodynamics. The course also provides an introduction to the importance of aeroelastic phenomena on aerodynamic design. Various aeroelastic phenomena will be introduced, with both static and dynamic problems investigated for a range of applications. The aim is to provide students with an understanding of the importance of understanding the aerodynamic flow field and its importance in the design process, and the interaction of the aerodynamic loading with the structure. A range of analysis techniques will be used to develop an understanding of the aerodynamic performance of aircraft and industrial aerodynamic problems.

**Outline Syllabus:** The module will teach the following:

- Experimental aerodynamics and their use in the verification of simulation data.
- Simulation using open source CFD codes
- Programming in NI labview.
- Vehicle Aerodynamics – drag, drag reduction, lift and downforce.
- Aeroelasticity fundamentals – static and dynamic aeroelastic phenomena; resonant and self-excited oscillations.
- Wing divergence and control reversal.
- Flutter - Classical coupled flutter; stall flutter.
- Bluff body aeroelasticity – Vortex induced vibration; galloping.

**Assessment Method(s) Including Percentage Breakdown and Duration of Exams**

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
<td>Weighting</td>
</tr>
<tr>
<td>LO1 and LO3</td>
<td>15 mins</td>
<td>10%</td>
<td>LO1, LO2, LO4 and LO5</td>
</tr>
</tbody>
</table>

*Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

16599  Aerodynamic Propulsion Systems - 10 credits (ECTS 5)

2nd Semester:  Dr I J Taylor (R)

**General Aims:** This module aims to provide an understanding of the principles of propulsion systems for aircraft and rockets. Throughout the course, the overall procedure and methodology for designing a propulsion device, starting from the aircraft concept and the associated engine requirements, through to the aero-thermal design of engine components is presented and discussed. Using a combination of lectures and project based activities, students will develop an understanding of the overall design process and the performance of aerospace propulsion systems.
Outline Syllabus:

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
</tr>
<tr>
<td>1</td>
<td>May</td>
<td>2 hours</td>
</tr>
<tr>
<td>L/Outcomes</td>
<td>All</td>
<td></td>
</tr>
</tbody>
</table>

L/Outcomes: All

ME501  Systems Engineering 1 - 10 credits (ECTS 5)

1st Semester: Dr C Maddock (R)

General Aims: This module aims to introduce concepts of modelling and control design for engineering systems. The approach is to present an engineering methodology that, while based on mathematical fundamentals, stresses physical systems modelling and practical control systems design with realistic system specifications. In particular, the aim is to study the performance, characteristics and advantages of feedback control systems, and to introduce control design techniques based on steady state and transient response specifications. Use of Simulink as a standard software tool will enhance the understanding and the ability to simulate and design.

Outline Syllabus: Introduction to engineering systems, system modelling, block diagram models, control systems design, simulation of systems using Matlab/Simulink, second order systems, transient response of control systems, feedback control systems characteristics.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
</tr>
<tr>
<td>1</td>
<td>January</td>
<td>2hrs</td>
</tr>
<tr>
<td>L/Outcomes</td>
<td>L01, L02</td>
<td></td>
</tr>
</tbody>
</table>

L/Outcomes: L01, L02

ME502  Systems Engineering 2 - 10 credits (ECTS 5)

2nd Semester: Dr C Maddock (R)

General Aims: This class will follow on directly from ME501 Systems Engineering 1. The aim is to use advanced modelling and control design techniques appropriate for complex engineering systems, understanding both the underlying theory, and the practical application of modelling dynamics systems and developing control laws through the use of Matlab/Simulink.

Outline Syllabus: Stability of engineering systems, frequency response design methods, design of state variable feedback systems, robust control and systems under uncertainty, estimator and observer design, system error signal and error analysis, performance of feedback control systems, steady-state response, time-domain specifications.
Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Coursework</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
</tr>
<tr>
<td>1</td>
<td>January</td>
<td>2 hours</td>
</tr>
</tbody>
</table>

L/Outcomes
- LO1, LO2, LO3, LO4

ME505 Machine Dynamics - 10 credits (ECTS 5)

1st Semester: Dr J Biggs (R)

**General Aims:** This module aims to cultivate an analytical approach to the dynamic problems which occur in conventional and modern machines from piston engine systems to autonomous system control with a view to developing good design and control practice and analytical skills. The course focuses on the dynamics and control of rotating components and machines both in 2-dimensions e.g. wind turbine dynamics and control and 3 dimensions e.g. spacecraft attitude dynamics and control. The course involves using complex numbers, linear algebra and ordinary differential equations to solve practical engineering problems.

**Outline Syllabus:**
- Introduction to machine dynamics: Mathematical preliminaries of rotating mechanisms; Out of balance and balancing of rotor-dynamic machines; Out of balance and balancing of reciprocating machines; Passive and active control of low-dimensional systems (rotations in the plane); Passive and active control of High-dimensional machines (spatially rotating machines) such as autonomous underwater vehicles and spacecraft.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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</thead>
<tbody>
<tr>
<td>Number</td>
<td>Month(s)</td>
<td>Duration</td>
</tr>
<tr>
<td>1</td>
<td>January</td>
<td>2 hours</td>
</tr>
</tbody>
</table>

L/Outcomes
- LO1, LO2, LO3, LO4

ME507 Machinery Diagnosis and Condition Monitoring – 10 credits (ECTS 5)

1st and 2nd Semester: Dr I Trendafilova (R), Dr G West, Dr V Caterson

**General Aims:** Condition monitoring and fault detection in structures and machinery plays an important part in the maintenance and protection of equipment, and has come to the fore since the recent advances in computer-based systems. The aim of the class is therefore to provide an understanding of Condition Monitoring (CM) and its relevance to industry. This is achieved by studying different CM and integrity assessment techniques, the instrumentation and use, and how they are applied. Particular attention is paid to vibration-based health monitoring and signal (time series) analysis.

**Outline Syllabus:**
- The basic idea of health monitoring and CM of structures and machines. Some basic techniques. Study of periodic and random signals, probability distribution, statistical properties, auto and cross correlation and power spectral density functions of commonly found systems, spectral analysis. Fourier transform: the basic idea of Fourier transform, interpretation and application to real signals. Response of linear systems to stationary random signals: FRFs, resonant frequencies, modes of vibration. Introduction to vibration-based monitoring. Machinery CM by vibration analysis: use and selection of measurements, analysis procedures and instruments. Typical applications to rotating machinery. Some other health monitoring techniques: acoustic emission, oil debris and temperature analysis applications.
Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Laboratory</th>
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<tr>
<td>1</td>
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</table>

L/Outcomes

1. LO1-LO8

Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required.

ME511 Mathematical Modelling in Engineering Science - 10 credits (ECTS 5)

2nd Semester: Dr J Biggs (R)

General Aims: This module is designed to provide insights into generic problems in Engineering Science through the use of ordinary differential equations. Mathematical modelling will be presented as an important tool for Engineers to understand complex phenomena and to predict the behaviour of complex systems. The development of key topics in differential equation theory will be cast in the context of real problems in Engineering Science. An example is the use of bifurcation methods to understand buckling. Since the main goal of the class is to explore the relationship between mathematics and real phenomena, simple differential equations are used for illustration to avoid excessive mathematical complexity. This course requires a strong mathematical ability and understanding.


Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
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<td>Month(s)</td>
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</table>

L/Outcomes

1. LO1, LO2, LO3, LO4

Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required.

ME512 Spaceflight Mechanics - 10 credits (ECTS 5)

1st Semester: Dr M Vasile (R)

General Aims: This class is designed to provide a comprehensive overview of spaceflight mechanics, including both orbit and attitude dynamics. The two-body problem will be solved from first principles to allow the solution of the two-body position-time problem. This analysis will then be used to investigate various modes of orbit transfer. Attitude stabilisation will be investigated for both spin- and 3-axis stabilised spacecraft. Finally, the various elements of the class will be brought together to illustrate the mission analysis and design process.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<td>Month(s)</td>
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<td>2 hrs</td>
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</table>

Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required.

ME514  Advanced Topics in Fluid Systems Engineering - 10 credits (ECTS 5)

2nd Semester: Dr Y Zhang (R), Dr W Nicholls, Dr M Oliviera, Dr T Scanlon, Dr I J Taylor

General Aims: Complex and interesting fluid flow and heat transfer problems are central to many advanced fluid engineering systems often at the cutting-edge of modern engineering. These include human biological flows, multiphase flows, micro and nano scale flows. In all of these our physical understanding is limited, which limits our engineering design ability. This class will give students the opportunity to identify and explore a number of advanced topics in heat transfer and fluid flow. We will investigate the limitations of current engineering knowledge and the new approaches that engineers are seeking to develop. Where appropriate, computational fluid dynamics techniques will be used to explore some advanced modelling approaches and to carry out simulations of complex fluid systems. The range of flow systems the students will encounter may include (in addition to those mentioned above): refrigeration and power systems, high speed flows important for modern air- and spacecraft design, nanotech desalination and water purification, and flows encountered in urban environments and structures.

Outline Syllabus: Up to four topics selected from the following will be explored: Multiphase flows, Phase change heat transfer (boiling, condensation, melting, solidification), Micro and nano flows, Very-high-speed aerodynamics, Wind effects on structures, Turbulence, Microdroplet technology, Computational fluid dynamics

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
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Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required.

ME516 Lightweight Structures - 10 credits (ECTS 5)

2nd Semester: Dr M Wheel (R), Dr T Comlekci

General Aims: This module aims to provide practical experience in designing lightweight structures to ensure that they have sufficient strength and stiffness to prevent failure, particularly by buckling, when in service. This experience will be obtained by undertaking an aerospace themed or similar design, construct and test activity.

Outline Syllabus: The module will teach the following: Students, working in groups, will construct a standard specification BMFA (British Model Flying Assn.) Arrow class indoor aeromodel or similar lightweight structure. Its operational and structural performance will then be assessed. The design of the model will then be progressively modified to enhance performance and the expected enhancement measured through further testing. Through this exercise students will gain the knowledge and experience summarized in the learning outcomes.
Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
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<th>Examinations</th>
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L/Outcomes

Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required.

ME517  Spaceflight Systems - 10 credits (ECTS 5)

2nd Semester:  Dr M Macdonald (R), + Guest Lecturers

General Aims: This class is designed to provide a comprehensive overview of spaceflight systems. An overview of the complete spacecraft lifecycle from proposal, through delivery and operations is covered, along with the function and purpose of the spacecraft sub-system level components. In addition to the technical detail of spaceflight systems, the importance of ancillary skill-sets is introduced such as project management. Finally, the various elements of the class will be brought together through the production of competitive proposals for a typical spaceflight system development program

Outline Syllabus: The module will teach the following - spacecraft (sub-)systems; spacecraft design and trade-offs; spacecraft operations; spacecraft systems lifecycle; Proposal writing, production and presentation

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tr>
<td>L01 and L02</td>
<td>LO1 and LO2</td>
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ME917  Advanced Boiler Technologies 1 - 10 credits (ECTS 5)

1st Semester:  Dr W Dempster (R), Dr A Galloway + Guest Lecturers

General Aims: This module aims to provide core knowledge of the modern conventional power plant boiler and to develop a critical awareness of the operation, design and integration of the key components that comprise a boiler system.

Outline Syllabus: The module will teach the following: boiler types and configurations; Draft System hydraulics; Two phase heat transfer and hydraulics: two phase flow regimes, two phase pressure drop, critical heat flux; Furnace heat transfer using simple thermal design models; Superheater and reheater heat transfer; Fuels and combustion calculations; Erosion and corrosion issues in boilers; Environmental control technologies for NOx, SOx, particulates and CO2 mitigation

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
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ME918  Advanced Boiler Technologies 2 - 10 credits (ECTS 5)

2nd Semester:  Professor D Nash (R), Professor D MacKenzie + Guest Lecturers

General Aims: Pressurised systems are inherently dangerous since they contain stored energy which must be carefully controlled. The class aims to set down a methodology whereby a range of pressurised components (spheres, cylinders, cones, etc.) can be designed, manufactured, installed and operated to a
high degree of safety.

An overview of the main elements of power plant will be given. Attention will be given to the design of the boiler and associated equipment. In addition the design of piping systems will be addressed. Each of the key elements of the power plant will be reviewed in the light of current standards, PD5500 and EN13445 for Vessels, EN12952 for boiler and EN13480 for piping.

In addition, some reference will be made to the Pressure Equipment Directive PED EN/97/23

**Outline Syllabus:** The module will teach the following: Introduction and Overview of Advanced Boilers; Introduction to Pressure Equipment; The Basics of Stress Analysis; The PED, PSSR and CDR (Pressure Equipment Directive, Pressure Systems Safety; Regulations and Construction Design and management Regulations); Shell Theory (Background and Edge Bending); Plastic Design Concepts; Materials for Pressure; Nozzles and Openings; Design-by-Analysis for Pressure Systems; EN12952 Pressure Calculations; Overview of ASME1; Local Loads; Creep-Fatigue (with case studies); Bolted Joints; Piping Systems; Fatigue Design

**ME920 Materials for Power Plant - 10 credits (ECTS 5)**

1st Semester: Dr A McLaren (R), Dr A Galloway + Guest Lecturers

**General Aims:** This module aims to give students a thorough introduction to the materials science and metallurgy that underpins the design of power plant. This will build on basic concepts to give an appreciation for the theory of alloy design and strengthening mechanisms, including an understanding of the importance of fracture and creep.

**Outline Syllabus** The module will teach the following: the structure of metals and alloys, building on atomic bonding and crystallography, including an appreciation of crystal defects; definitions of material properties used in engineering; the importance of the motion of dislocation defects as the major mechanism of plastic deformation, and an understanding of their effect on the strength of the material; the important strengthening mechanisms available in metals and allows, namely: Solid solution strengthening, work hardening, particle strengthening and grain size control; The use of equilibrium phase diagrams to predict the structure of alloys; the importance of diffusion and phase transformations and the concept of non-equilibrium conditions; the factors that limit the design of power plant components from a materials point of view

**Assessment Method(s) Including Percentage Breakdown and Duration of Exams**

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<td>1</td>
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**ME923 Gas and Steam Turbines - 10 credits (ECTS 5)**

2nd Semester: Dr I Taylor (R)

**General Aims:** This module aims to give students an advanced knowledge of applications of both steam and gas turbines within the power generation industry. The module includes details of power-plants that have been developed specifically to integrate gas turbines such as (gas turbine exhaust gas) heat recovery steam generators (HRSGs) used in combined cycle gas turbine (CCGT) plants. Also, aspects of gas and steam turbine design and operation are discussed. Key inputs will come from industry to ensure the course material is in line with current professional practice.

**Outline Syllabus:** The module will teach the following: Gas turbine design, including aero derivatives and industrial designs for power generation; GT thermodynamics, including the Brayton cycle; Simple (open) cycle and combined cycle configurations; Efficiency of CCGT plant, feedwater heating in the CCGT cycle; HRSGs, including supplementary firing and once-through HRSGs; Fuel options, and dual pressure cycles; Characteristics of CC steam turbines; Condition monitoring and maintenance regimes; Theory of gas and steam turbines; Design of turbomachinery
Assessment Method(s) Including Percentage Breakdown and Duration of Exams

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<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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L/Outcomes

| LO1 & LO2 |

Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required

ME927 Energy Resources and Policy - 10 credits (ECTS 5)

1st Semester: Professor J Clarke (R), Dr N Kelly

General Aims: Against the background of international commitments on atmospheric emissions, diminishing fossil fuel resources, renewable energy systems deployment and the liberalisation of energy markets, this module examines sustainable options for energy production, supply and consumption. The aim is to give students an understanding of current trends in the energy market, and to enable a critical evaluation of emerging ideas, technologies and policies especially in relation to new and renewable energy supply systems.

Outline Syllabus: The module will teach the following: Historical trends in energy production: fossil fuels; renewable energy; nuclear power; Atmospheric pollution: global and local; UK and international commitments; Thermal power generating plant: efficiency; emissions; combined cycle plant; CHP; Nuclear plant: history of technology; environmental impacts; policy issues; Renewable energy sources: nature and extent of resources; exploitation methods; environmental impacts; costs; Energy efficiency measures: demand-side management; storage and conversion techniques; The transport sector: fuel use and emissions; environmental impacts; options for change; Policy issues: support mechanisms for renewables; CO₂ stabilisation strategies; role of nuclear power; demand reduction.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tr>
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<tr>
<td>1</td>
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<td>2 hours</td>
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</table>

L/Outcomes

| All |

Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required.

ME929 Electrical Power Systems - 10 credits (ECTS 5)

1st Semester: Dr N Kelly (R)

General Aims: This module aims to provide students with an understanding of the operation of modern electrical power systems featuring renewable and low carbon generation, along with the techniques to undertake a basic technical analysis of key electrical devices and systems.

Outline Syllabus: The module will teach the following: The fundamentals of electrical power: direct current (DC) and voltage, alternating current (AC) and voltage. For AC systems: converting time varying, fixed frequency quantities to phasor form; the basics of circuit analysis: basic circuit elements (resistor, inductor and capacitor) and their effect on current and voltage in DC and AC systems; Power in DC and AC systems: looking at the concepts of real, reactive, apparent power and impedance; an overview of the demand for electricity, looking at the aggregate characteristics of electricity demand and giving a specific example of demand for electricity in a dwelling; an overview of electricity generation and distribution within the UK, along with a detailed review of the growth of renewable electricity generation;
Microgeneration, storage and power conversion; the basics of electromagnetism, specifically focusing on how it underpins the operation of electrical equipment; an overview of electrical devices including the transformer, synchronous generator and induction machines (used as both motors and generators). For each, an equivalent circuit will be developed and used to illustrate the operational characteristics of these devices in power systems; an introduction to protection in electrical power systems.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
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L/Outcomes

| L01 LO2      | L01         |

Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required.

ME 930 Energy Modelling and Monitoring - 10 credits (ECTS 5)

1st Semester: Dr P Strachan (R)

General Aims This module aims to impart an understanding of the theoretical and operational principles underlying simulation modelling of energy supply and demand systems and their environmental impact. The emphasis is on practical computer lab-based modelling exercises

Outline Syllabus The module will teach the following: Heat and mass transfer processes occurring within energy supply and demand systems; Simulation principles: problem representation, treatment of time and space, numerical methods, validation, use in practice; Simulation practice: problem description, modelling methodology, results interpretation, case studies; Built environment: energy demand, passive and active energy systems, options for intervention, performance assessment methods; Renewable energy system modelling, focusing on supply-demand matching; Strategic level analysis for energy efficient buildings and renewable energy integration; the role of storage with dynamically varying demand and intermittent supply; Information systems: energy management, monitoring and targeting, classification techniques, trend analysis, smart metering.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
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<th>Courseworks</th>
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<td>100%</td>
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L/Outcomes

| L01 and L02 |

Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required.
EF927  Design Management

Module Registrar: Prof A Duffy
alex.duffy@strath.ac.uk

Taught To (Course): Postgraduate Courses

Other Lecturers Involved: R Maclachlan, W Ion

Credit Weighting: 10
Semester: 1

Assumed Prerequisites: None

Compulsory/Optional/Elective class:

Academic Level: 5

Educational Aim
To provide a structured introduction to the Design Management process, issues and tools.

Learning Outcomes
On completion of the module the student is expected to be able to

LO1 Appreciate and understand the role of design within an organisation and the organisational structures required for effective design.

LO2 Appreciate the role of design models, approaches and methods

LO3 Know a variety of aspects and the complexities of design development

LO4 Appreciate the role of innovation in design and know how to measure design performance

Syllabus
The module will teach the following:

- Background and design for competitiveness and sustainability.
- Integrated Product Development, and different approaches and aspects to design development including concurrent engineering, team engineering, product management, design management, distributed design, and decision support.
- The design activity, methods and process models including role of the market, specification, conceptual and detail design
- Basic team and management structures (organisation)
- Key issues related to design complexities (e.g. relating to the people, processes, resources, product, key considerations, knowledge and information, decision making) and the key aspects of design co-ordination
- Design performance and innovation

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tr>
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<td>100</td>
<td>LO1, 2, 3 and 4</td>
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<td>Recommended Reading</td>
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</table>
Module Registrar: Dr David Grierson
d.grierson@strath.ac.uk
Taught To (Course): Sustainable Engineering Programme

Other Lecturers Involved: na
Credit Weighting: 10
Semester: 1

Assumed Prerequisites: na
Compulsory class
Academic Level: 5

Educational Aim

This module aims to provide students with an understanding of the concepts of sustainability and sustainable development. The social, environmental, and economic impact of development strategies will be identified and the mitigation of negative impacts discussed.

Learning Outcomes

On completion of the module the student is expected to be able to

LO1: understand the concept of social, environmental and economic sustainability
LO2: discuss population, urban, and economic growth strategies and their impacts

(UK SPEC suggests no more than 4 learning outcomes per module. Statements must be broad and be syllabus free and link in with the intended learning outcomes on the programme specifications.)

Syllabus

The module will cover the following:

- Shifting world views with respect to technology and ecology
- Green politics
- Green theoretical perspectives
- Climate change
- Sustainable development
- Limits to growth (people, economies & cities)

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tr>
<td>LO1 and LO2</td>
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Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework project
**Recommended Reading**

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<tr>
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<th>Title</th>
<th>Publisher, Location, Year</th>
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<tbody>
<tr>
<td>Bookchin, M.</td>
<td>Remaking Society</td>
<td>Black Rose Books, Montreal and New York, 1989</td>
</tr>
<tr>
<td>Fox, W.</td>
<td>Towards a Transpersonal Ecology; Developing New Foundations for Environmentalism</td>
<td>Green Books Ltd, Devon, 1995</td>
</tr>
<tr>
<td>Kuhn, T.</td>
<td>The Structure of Scientific Revolutions</td>
<td>Houghton Miflin, New York, 1962</td>
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<tr>
<td>MacKay, D.J.C.</td>
<td>Sustainable Energy: without the hot air</td>
<td>UIT Cambridge, 2009</td>
</tr>
<tr>
<td>O'Riordan, T.</td>
<td>Environmentalism, 2nd edition</td>
<td>Pion, London, 1981</td>
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EF929/CL504 Financial Engineering

**Module Registrar:** Dr Girma Zawdie  
g.zawdie@strath.ac.uk  

<table>
<thead>
<tr>
<th>Other Lecturers Involved</th>
<th>Credit Weighting: 10</th>
<th>Semester: 2</th>
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<td>Academic Level: PG</td>
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</table>

**General Aims**

The module aims to introduce elements of financial engineering that are applied to reduce risk of business insolvency and enhance the financial robustness of business enterprises. To this end, the module covers the essentials of Financial Engineering both as an academic discipline and as a strategy of financial and business risk management in the light of contemporary circumstances. Recent trends in corporate business behaviour in major industrialized countries have heightened concern with issues of corporate governance, corporate ethics, financial strategies and the role of the financial engineer. Central to this concern is the aim of managing risk to ensure the solvency and sustainability of business ventures. In exploring the way forward, business enterprises often consider organisational and management options that would enable them to enhance their position of competitiveness and solvency under uncertain and risky market conditions. Why do businesses go bust? What is the best strategy for survival and growth? What are the options for financing investment projects both in the private and public sectors of an economy? How would the financial engineer propose to combine loan capital and equity capital to raise funds for an investment initiative; and how would he/she advise his/her company/organization to build its investment portfolio to ensure financial security in volatile market conditions? These are some of the major issues the financial engineering module takes on board.

**Specific Learning Outcomes**

Upon successful completion of this module, the student will be able to:

- Identify and analyse issues arising from the financial accounts and reports of companies
- Evaluate investment decisions in the light of financial market circumstances
- Identify and evaluate sources and methods of raising finance
- Analyse the principles underlying operation of financial/capital markets
- Identify and evaluate financial strategies and instruments for corporate risk management
- Identify the various risks involved in the construction business and evaluate the implications for financial strategies
- Evaluate the financial viability of risk transfer options available to PFI and PPP projects in terms of cost-benefit analysis.

**Syllabus**

Introduction to the credit

- Elements of Financial Accounting
- Financial Reports: Balance sheets, income statements, Financial Ratios
- Financial assets and asset valuation
Sources of project finance
Capital structure and gearing
Financial engineering of capital projects
Influence of the stock market on Engineering firms
Cases in business failures
The PFI Debate
Investment decisions, financial instruments and portfolio risk management
Restructuring strategies - acquisitions and mergers

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

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<thead>
<tr>
<th>Examination</th>
<th>Duration</th>
<th>Weighting %</th>
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Recommended Reading


DM930 Knowledge Engineering and Management for Engineers

Module Registrar: Professor A Duffy
Taught To (Course): DMEM UG and PG Courses

Other Lecturers Involved: 
Credit Weighting: 10
Semester: 2
Assumed Prerequisites: None
Compulsory/Optional/ Elective Class: Academic Level: Five

Module Format and Delivery (hours):

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<td>12</td>
<td>35</td>
<td>17</td>
<td>100</td>
</tr>
</tbody>
</table>

This module aims to give students an understanding of the types of knowledge, techniques and systems used in building knowledge based systems and to discuss the application of these techniques.

Learning Outcomes

On completion of the module the student is expected to be able to

LO1 Demonstrate knowledge and understanding of Knowledge Management
LO2 Demonstrate knowledge and understanding of Knowledge Models and Methods
LO3 Demonstrate knowledge and understanding of Knowledge Engineering and Development Processes

Syllabus

The module will teach the following in the context of examples related to Knowledge Engineering;

- Introduction to knowledge
- Expert Systems and Knowledge Based Systems development process
- Knowledge elicitation and acquisition.
- Knowledge representations
- Reasoning, chaining and searching.
- Uncertainty techniques.

Assessment of Learning Outcomes

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning

LO1 Demonstrate knowledge and understanding of Knowledge Management
C10 Appreciate and understand the role of knowledge management for suitable problem solving
C11 Understand the structures, logic and formalisms required for effective knowledge management

LO2 Demonstrate knowledge and understanding of Knowledge Models and Methods
CO1 Appreciate the different types of knowledge, reasoning and uncertainty approaches
CO2 Appreciate the role of knowledge models, methods and tools for suitable problems

LO3 Demonstrate knowledge and understanding of Knowledge Engineering and Development Processes
CO1 Understand the knowledge engineering and development process of knowledge based systems
CO2 Demonstrate logical understanding, clarity and insight in knowledge engineering

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

12 Principles of Assessment and Feedback
12 principles relating to the assessment and feedback developed by the University will be incorporated in the feedback and assessment of the module, in particular:

- Interactive learning in class to ensure student comprehension of key concepts.
- A detailed list of the criteria and weightings used in the assessment process will be included in assignment handouts.
- Provision of timetabled “feedforward” sessions to allow students to gain feedback against the assessment criteria on their prepared coursework solutions prior to the submission of their solutions.
- Feedback against assessment criteria will be provided to the students once the grading process has been completed.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

**Assessment Method(s) Including Percentage Breakdown and Duration of Exams**

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Duration</td>
<td>Max Marks</td>
</tr>
<tr>
<td>LO1, 2 and 3</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>

**Coursework / Submissions deadlines:**

Monday of Week 12 at 12 noon.

**Resit Assessment Procedures:**

Students need to gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be if appropriate re-examined during the August diet. This re-examination will consist of a formal examination or presentation/demonstrations assessment.

**Recommended Reading**


(on Learning & Teaching webpages: [www.strath.ac.uk/learnteach/teaching/staff/assessfeedback/12principles/](http://www.strath.ac.uk/learnteach/teaching/staff/assessfeedback/12principles/))
EF930  Information Management

Module Registrar: Dr Iain Boyle  Taught To (Course): PG, UG
Other Lecturers Involved: Dr Andrew Lynn,  Credit Weighting: 10
Assumed Prerequisites: None  Semester: 1
Compulsory/Optional/ Elective class:  Academic Level: 5

Module Format and Delivery (hours):

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Tutorial</th>
<th>Laboratory</th>
<th>Project</th>
<th>Private Study</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>72</td>
<td>100</td>
</tr>
</tbody>
</table>

Educational Aim

This module aims to give students an understanding of the different approaches, techniques and tools used in building information based systems. In particular the module will:

- Introduce students to the software engineering process, identifying information requirements and visual modelling.
- Provide them with a basic understanding of information storage, retrieval, and systems.
- Provide an appreciation and basic skills in the process of developing information systems.
- Familiarise students with information technology, and how to model and use information.

Learning Outcomes

On completion of the module the student is expected to be able to

LO1  Identify information requirements and model information in a readily recognised way.
LO2  Design and model platform independent information flows using a variety of representations.
LO3  Develop and implement an appropriate information system to meet identified information requirements.
LO4  Report the development of an information system.
LO5  Discuss key aspects of information management.

Syllabus

Introduction; information systems; information input and retrieval; information modelling process and techniques, databases as an information resource; information normalisation; information system development process; visual modelling; information requirements; information structure and organisation; information retrieval; web-based information systems; integration of information systems.

Assessment of Learning Outcomes

Criteria

Identify information requirements and model information in a readily recognised way.

CO1  Appreciate and understand the role of information management for suitable information requirements.
CO2  Understand the structures, logic and formalisms required for effective information visualization.
LO1  Design and model platform independent information flows using a variety of representations.
CO3  Demonstrate an appreciation of modelling and optimising information irrespective of a computational system.
LO2  Develop and implement an appropriate information system to meet the identified information requirements.
CO4  Demonstrate knowledge of the information system design and development process.
CO5  Development of an appropriate information system.
LO3  Report the development of an information system.
    CO6  Demonstration of the quality of reporting the above.

LO4  Discuss key aspects of information management.
    CO7  Demonstrate knowledge of key features of information management.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

12 Principles of Assessment and Feedback
(on Learning & Teaching web pages:
www.strath.ac.uk/learnteach/teaching/staff/assessfeedback/12principles/ )

12 principles relating to the assessment and feedback developed by the University will be incorporated in the feedback and assessment of the module, primarily though the following key implementations:

- Interactive learning in class to ensure student comprehension of key concepts.
- A detailed list of the criteria and weightings used in the assessment process will be included in assignment handouts.
- Provision of timetabled “feed forward” (coursework clinic) sessions to allow students to gain feedback against the assessment criteria on their prepared coursework solutions prior to the submission of their solutions.
- Feedback against assessment criteria will be provided to the students once the grading process has been completed.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Duration</td>
<td>Max Marks</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>100</td>
<td>LO1, LO2, LO3, LO4, LO5</td>
</tr>
</tbody>
</table>

Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

Coursework / Submissions deadlines:

Resit Assessment Procedures:
Students need to gain a summative mark of 50% to pass the module.

Students are expected to participate in inter-active class question and answering, impromptu class presentations, and open but focussed dialogue. Failing adequate participation and demonstration of subject knowledge may result in formal examination or presentation/demonstration assessment.

Recommended Reading


EF931/935 Project Management

Module Registrar: B Dickson
Brian.dickson@strath.ac.uk

Taught To (Course): MSc Power Plant Engineering

Other Lecturers Involved: Credit Weighting: 10

Assumed Prerequisites: Semester: 1

Academic Level: 5

Educational Aim

This module aims to provide students with skills relating to the use of engineering practices in Project Management with particular respect to the effective and efficient use of resources.

Learning Outcomes

On completion of the module the student is expected to be able to

LO1
Demonstrate practical skills so that they are able to outline the scope of managing projects and the importance of completing projects on time, to an agreed quality and cost without excess use of resources.

LO2
Gain intellectual skills so that they are able to demonstrate understanding of project network methods and demonstrate familiarity with industry standard project planning software.

LO3
Develop an understanding of the inter-dependency between project estimating and project control and cost management.

LO4
Understand the basis of contract law, the different types of contract and when they are used.

(UKSpec suggests no more than 4 learning outcomes per module. Statements must be broad and be syllabus free and link in with the intended learning outcomes on the programme specifications.)

Syllabus

A statement on the range of learning

Introduction to Project management techniques and project control.
Basic aspects of project teams; project scope of work; network related management techniques; project features; project constraints and resources; quality assurance and document control.
Project networks: definition of events; activities and nodes; precedence networks and "activity on node" method; analysis of critical path.
Procedural and Graphical presentation techniques that are used as industry standard planning packages.
Introduction to Contract Law: formation of contract; validity; terms of the contract; breach of contract; agency; company contracts.
Project Budgetary control including cash flow, financial borrowing and investment.
### Assessment Method(s) Including Percentage Breakdown and Duration of Exams

<table>
<thead>
<tr>
<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Duration</td>
<td>Weighting</td>
</tr>
<tr>
<td>LO1</td>
<td>1</td>
<td></td>
<td>50%</td>
</tr>
</tbody>
</table>

*Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.*

### Recommended Reading

- Course notes and provided references
- Industrial based case studies
EF932 RISK MANAGEMENT

<table>
<thead>
<tr>
<th>Risk Management (EF932)</th>
<th>Credit Value</th>
<th>Level</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

Timetable

| Semester 2, Weeks 1-12, Friday 1-3, Class – LT401, Lab – Col309A |

General Aim

Under Health and Safety legislation, and under the wider European Post-Seveso Directives, it is mandatory for many industries to carry out risk assessments with the aim of showing that risk is “As Low As Reasonably Practicable”. This module aims to introduce the fundamental techniques of risk analysis and risk-informed decision making. Students will have the opportunity to learn the general principles of methods and their place in risk management, as well as the chance to develop skills in applying these methods to variety of engineering examples.

Syllabus

<table>
<thead>
<tr>
<th>Week</th>
<th>Location</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Class</td>
<td>Managing risks of technological systems and fault and event tree modelling</td>
</tr>
<tr>
<td>2</td>
<td>Lab</td>
<td>Using commercial software (e.g. Reliability Workbench) to support system risk analysis</td>
</tr>
<tr>
<td>3</td>
<td>Class</td>
<td>Processes for identifying, assessing and managing common cause failures</td>
</tr>
<tr>
<td>4</td>
<td>Class</td>
<td>Role of the human in technological risk</td>
</tr>
<tr>
<td>5</td>
<td>Class</td>
<td>Guest lecture from industry collaborator</td>
</tr>
<tr>
<td>6</td>
<td>Class</td>
<td>Class test and guest lecture from industry collaborator</td>
</tr>
<tr>
<td>7</td>
<td>Class</td>
<td>Cost-benefit analysis to support ALARP assessments</td>
</tr>
<tr>
<td>8</td>
<td>Class</td>
<td>Risk informed decision-making using Bayesian belief nets and uncertainty analysis</td>
</tr>
<tr>
<td>9</td>
<td>Lab</td>
<td>BBN Cases using Genie</td>
</tr>
<tr>
<td>10</td>
<td>Holiday</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Class</td>
<td>Managing structured expert judgement to inform risk assessment</td>
</tr>
<tr>
<td>12</td>
<td>Class</td>
<td>Guest Lecture – Professor John Quigley (University of Strathclyde)</td>
</tr>
</tbody>
</table>

Learning Outcomes

• To understand the general process of risk management and its applications in industry
• To build risk models, appreciating the modelling issues involved in their application
• To understand key theoretical concepts and their application in the development of an ALARP case
• To use commercial software to conduct detailed risk analysis of technological systems

Assessment Method(s)

Class tests to assess understanding of key concepts and methods (50%) scheduled in weeks 6 and 12
Group assignment to develop full risk analysis of a technological system (50%)

Coursework, case studies

Major case studies (fully developed cases developed in collaboration with lead risk analysts in the partner organisations) include:

- NASA Space Shuttle Risk Assessment;
- RSSB UK Railway Network Risk Informed Investment Decisions
- Octel Chemical Plant Risk Modelling and Management

Invited speakers from industry (e.g. risk analysts or managers in relevant industries) and academics (e.g. international visitors to University).

Recommended Reading

E-learning material customised for the module, originally developed with funding from EPSRC
D. Vose "Risk Analysis"

Lecturers

<table>
<thead>
<tr>
<th>Lecturers</th>
<th>Ext No.</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Matthew Revie</td>
<td>4578</td>
<td><a href="mailto:Matthew.j.revie@strath.ac.uk">Matthew.j.revie@strath.ac.uk</a></td>
</tr>
<tr>
<td>Professor Tim Bedford</td>
<td>2394</td>
<td><a href="mailto:Tim.bedford@strath.ac.uk">Tim.bedford@strath.ac.uk</a></td>
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</table>


**EV939 Environmental Impact Assessment**

<table>
<thead>
<tr>
<th>Module Registrar:</th>
<th>Dr E João <a href="mailto:elsa.joao@strath.ac.uk">elsa.joao@strath.ac.uk</a></th>
<th>Taught To (Course):</th>
<th>PG, UG</th>
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</thead>
<tbody>
<tr>
<td>Other Lecturers Involved:</td>
<td>some contributions from external practitioners</td>
<td>Credit Weighting:</td>
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</tr>
<tr>
<td>Semester:</td>
<td>2</td>
<td></td>
<td></td>
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<td>Compulsory/optional/elective class:</td>
<td></td>
<td>Academic Level:</td>
<td>5</td>
</tr>
<tr>
<td>Compulsory to:</td>
<td>MSc in Environmental Engineering</td>
<td></td>
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<tr>
<td>Optional to:</td>
<td>MEng Civil Eng 5th Year; MSc Environmental Science; MSc Sustainability and Environmental Studies; MSc Global Water Sustainability; MRes Geo-Environmental Engineering; MRes IPPC; MRes Climate Change Adaption; MSc Sustainable Engineering</td>
<td></td>
<td></td>
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</tbody>
</table>

**Prerequisites:** None

**Module Format and Delivery (hours):**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Tutorial</th>
<th>Assignments</th>
<th>Field Visit</th>
<th>Private Study</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>36</td>
<td>2</td>
<td>40</td>
<td>100</td>
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</tr>
</tbody>
</table>

**General Aims**

Environmental impact assessment (EIA) relates to the process of identifying, evaluating and mitigating the biophysical, social, economic, cultural and other relevant effects of development proposals prior to major decision being taken and commitments made. This module aims to provide students with an introduction to some of the methods used to predict environmental impacts, and to see how these may be used to integrate environmental factors into decisions. The module emphasises the use of EIA as a design tool and focuses on issues related to the quality of the EIA process overall and of the Environmental Impact Statements in particular. The module draws principally on the UK planning context of environmental impact assessment (also called Environmental Assessment) but also takes account of EIA experience in other countries and international organisations, together with developing internal experience of Strategic Environmental Assessment (SEA) Sustainable Engineering

**Specific Learning Outcomes**

**Knowledge and Understanding**

On completion of the module students should:

- be conversant with the regulatory requirements for statutory EIA;
- be familiar with some of the methodologies commonly used in preparing EIA, including public participation;
- understand the relationship between EIA and development decisions;
- understand the ways in which EIA can contribute to sustainable development and its limitations in this regard; and
- be familiar with issues regarding the links between EIA and SEA.

**Disciplinary/Professional skills**

- learn how to evaluate the quality of an Environmental Impact Statements using the criteria used in the UK by the Institute of Environmental Management and Assessment (IEMA).
Sound knowledge and skills portfolio on EIA that can be offered and utilised in environmental and engineering consultancies, local government and environmental regulators.

**Transferable skills**
- Research skills and report writing
- Communicate effectively (written, verbal and graphic)
- Time management and ability to work independently
- Team-working & building

**Syllabus**

The course will be taught using a combination of lectures, group discussions, seminars, case studies and presentations by practitioners.

The module requires the completion of the following parts (although some of the guest speakers may change every year):

- **Week 1** - Intro to the course. Introduction to Environmental Impact Assessment (EIA). The quality of Environmental Impact Statements (EIS). Discussion on the Institute of Environmental Management and Assessment’s criteria for evaluating EIS. (Dr Elsa João).
- **Week 2** - Carrying out an EIA – key methods. Key implementation problems of the EIA process. Discussion on the principles of EIA best practice. (Dr Elsa João).
- **Week 3** - The EIA of the M74 road extension in Glasgow (Anna McLauchlan, Research Student, David Livingstone Centre for Sustainability, Civil Engineering).
- **Week 4** - EIA in the developing world (Isobel Stanley, Technical Director, Edge Consultants)
- **Week 5** - Nature conservation, legal designations and wildlife law (including the Habitats Directive) and their links to EIA. (Dr Paul Walton, Species and Habitats Policy Officer, RSPB Scotland).
- **Week 6** - SNH Students’ Seminar: Planning, Landscape & the Natural Heritage [For MSc students only.]
- **Week 7** - Lecture and workshop on the key principles of Strategic Environmental Assessment (SEA) and how it relates to EIA. (Dr Elsa João)
- **Week 8** - EIA of the Black Law Windfarm. (Dr Simon Zisman, RPS Group Plc)
- **Week 9** - What is the value of EIA? (Dr Ross Marshall, Environment Agency).
- **Week 10** - Consultation and public participation in EIA. Uncertainty and subjectivity issues. Data issues for EIA. The importance of scale issues. The case for scale guidelines. (Dr Elsa João).
- **Week 11** - Talk about the field visit to be carried out.
- **Week 12** - Field Visit [exact case study changes every year as it requires the visit of site that is either about to be developed or one that is still being built]

**Assessment Method(s) Including Percentage Breakdown and Duration of Exams**

**Criteria for assessment**
The course will be assessed by have two assignments only (i.e. there is no exam):

**Assignment 1** (contributes to 30% of the final mark) – **GROUP WORK**
Working in groups of two, write a report, not exceeding 2000 words in length, evaluating the quality of a given environmental impact statement using the criteria used by the IEMA.

**Assignment 2** (contributes to 70% of the final mark) – **INDIVIDUAL WORK**
The following essay, not exceeding 3000 words in length:

Evaluate the extent to which biased evaluations, narrow boundaries, data gaps and/or simplifying assumptions are affecting the legitimacy of the EIA process, and propose reforms to existing policy that would help overcome such problems. [Please note that it is crucial that you illustrate your answer with case studies drawn from guest speakers’ presentations, the literature, environmental impact statements (EIS) studied and/or field visit.]
Please note the following advice in relation to the assignment 2:

a) Essays should combine academic and applied discussion and analysis. In relation to academic content, the essay should draw on the wider literature and should include supporting references. In relation to applied content, the essay should draw upon experience derived from real examples and case studies to illuminate issues of wider relevance.

b) It is crucial that you select key issues that you deem to be significant and present them clearly and persuasively. Your introduction should explain and justify your choice.

c) Your mark for this assignment will reflect:
   1. The extent to which your essay directly addresses the essay topic.
   2. Your selection of the key issues that you deem to be significant.
   3. The structure, logic and clarity of your argument.
   4. Evidence of a critical approach to the topic (rather than a descriptive approach).
   5. How well referenced the essay is.
   6. Use of case study material.
   7. The depth of understanding of the subject area – this will be done partly by reference to choice of issues, but more importantly by the way in which those issues are addressed and the connections drawn in the argument.

d) Note that the assessment of point 7 above is only possible for essays that are clear, well argued and well structured, i.e. even if you have a highly developed understanding of the EIA process, a poorly argued essay will obscure this from the marker.

e) Please impose an explicit structure by having sub-headings that are closely linked to the overall argument of your essay (N.B. 1st section is the “introduction” and the final is the “conclusions”).

f) The essay should be well referenced and include references not only from books but also from papers published in international refereed journals. Therefore, one of your main sources of information must be the database GEOBASE: [www.lib.strath.ac.uk/artsweb/GEOGDB.htm](http://www.lib.strath.ac.uk/artsweb/GEOGDB.htm)

<table>
<thead>
<tr>
<th>Examination</th>
<th>Duration</th>
<th>Weighting %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coursework</td>
<td>No. of Assignments</td>
<td>Weighting %</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>30% (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70% (2)</td>
</tr>
</tbody>
</table>

(1) Groupwork
(2) Individual essay

Resit Examinations: Essay with a new topic.

Core Reading (further reading will be provided in class)


EF900: Individual Project/Dissertation

In this part of the course, students undertake supervised, individual project work, with the award of MSc being made on the basis of an acceptable report/dissertation submission, and submitting an electronic format as a pdf file as directed by their Project Supervisor. This component is valued at 60 PG credits.

In order to graduate at the ceremony in November 2015, the final version of your dissertation must be submitted to your supervisor NO LATER THAN FRIDAY 4 September 2015. It is important to note that this is a STRICT DEADLINE for those who wish to graduate in November. If corrections are required to the dissertation or if submission is after this date, graduation cannot take place until the following year (usually July). Bear in mind, however, that it is necessary to register to graduate prior to completion of the dissertation.

Form for this purpose are available to download: http://www.strath.ac.uk/media/ps/registry/graduation/GraduationEnrolmentForm.pdf
Appendix 1
Departmental Safety Regulations

Emergency telephone numbers (internal) - Extension 2222 or 3333
Emergency telephone number (external) 9/999 Fire/Police/Ambulance

1. Safety Organisation
Health and safety within the Department is organised in accordance with the University Safety Code (Section 6.6 of the University Calendar) which should be studied by all members of staff. All members of staff will be issued with a copy of these Regulations and are required to sign a declaration stating that the Regulations have been read and understood. Supervisory staff should ensure that the attention of students is drawn to the provisions of the Safety Code and Departmental Safety Regulations.

The Head of the Department has ultimate responsibility for all health and safety matters.

Health and safety management is undertaken by the Departmental Safety Convener.

An Area Safety Committee has been formed to monitor health and safety issues within specific areas. The identities of current post-holders and their areas of responsibility can be obtained from Central Services or from the Departmental Safety Convener.

General information on any health and safety matter should be directed to the Departmental Safety Convener in the first instance.

The University’s Safety Services Unit can be contacted on Ext 2726.

2. Departmental Safety Committee
A Departmental Safety Committee has been appointed consisting of at least three persons representative of the main groups of staff working in each area and include, where appropriate, at least one student. The Departmental Safety Convener convenes the meetings of the Departmental Safety Committee and acts on its behalf as necessary.

3. Fire
In the event of a General Fire Alarm the procedure is set out in the Fire Regulations posted at every floor of the James Weir Building and any other building you may occupy. Read these carefully and check from time to time for any changes which may be made.

- Fire drills will be held at least once per semester.
- Know the meaning of the audible fire alarms.
- Know every escape route in the building.
- Exit by a different route at each drill.
- Note locations of fire extinguishers - all are clearly marked.

In the event of a fire being discovered:-

- Leave the room, close the door and raise the alarm by activating the nearest "break-glass" fire alarm call point and informing the security wardens (Ext 2222 or 3333).
- If it is safe to do so, use an appropriate fire extinguisher to attack the fire. Do not use water where electrical equipment or flammable liquids are involved.
- In the case of laboratory fires, if it is safe to do so, switch off all electrical and fuel supplies to the equipment involved or, if necessary, to the entire laboratory.
- Do not store combustible materials on or near electric heaters.
- Do not accumulate waste material.
4. Accident or Illness
Emergency Telephone Numbers - Extension 2222 or 3333

- If possible give immediate assistance to the patient. General First-Aid Guidance notes are contained in all First-Aid boxes. A First Aid box may be found in all of the Departmental Laboratories.
- Get help of colleagues.
- Telephone 2222 or 3333 giving own name and department, exact location (building, floor, room number) and nature of incident.
- Say if a doctor is required.
- Do not move the patient from reported position (unless obviously necessary to avoid further injury) until the arrival of the ambulance services.
- The patient should be accompanied to the hospital by a colleague.

5. Reporting of Accidents and Dangerous Occurrences
All accidents and dangerous occurrences, however apparently trivial, should be reported to the member of staff in charge or to the technician in charge of the laboratory. The Departmental Safety Convener should also be informed.

An official Accident or Occurrence Report Form S.1 should be completed for all accidents and dangerous occurrences and sent to the University Safety Officer via the Departmental Safety Convener. Should an incident result in hospital attendance, the Safety Office should be informed by phone as soon as possible.

6. COSHH
Under the Control of Substances Hazardous to Health Regulations 1988 (COSHH), it is incumbent upon anyone involved in the use of hazardous materials to ensure that a safe working practice is agreed upon. No work is permitted until a RISK ASSESSMENT FORM (S20/S21) has been completed. Copies of each assessment must be lodged with the Safety Convener.

All staff and relevant students should be acquainted with the Regulations.

Copies of the approved Guidance handbook on COSHH may be obtained from the Safety Convener or the University Safety Office.

Failure to comply with the Regulations may result in that area of activity being shut down BY LAW.

7. Hazardous Operations
Work should not proceed unless a Risk Assessment has been issued and signed.

Suitable protective clothing must be worn for all potentially dangerous operations (e.g. grinding/welding) supplies of which are available from the technician in charge of the laboratory.

All areas in which special hazards exist (e.g. lasers) are clearly marked and entry to these regions is restricted to those personnel having permission to work in them. Refer to the Protection of Eyes Regulations 1974.

All hazardous materials and glassware should only be transported or carried in properly designed safety containers. Winchesters should be carried only in proper holders, not in the hand. Passenger lifts should not be used unless special precautions are taken.

8. Permits to Work
All persons, other than trained workshop staff, who wish to use machine tools, hand held tools or welding
equipment, etc must have a Permit to Work signed by the Head of Department or his appointed Deputy and an appropriate Academic Supervisor. Permits will only be granted to persons who can show evidence of satisfactory training and relevant experience. Permit holders must liaise with the Laboratory Superintendent before using any equipment. Permit application forms can be obtained from the Departmental Safety Convener.

9. General Laboratory/Workshop Procedure

- Protective clothing and safety glasses must be worn at all times.
- Coat racks or lockers are provided and should be used for outdoor clothing (coats, scarves, etc.).
- Food and drink is not permitted in laboratories or workshops.
- Always use machine guards where provided.
- Clean tools and machines after use and deposit all scrap material in the bins provided.
- Keep litter bins covered.
- Observe and obey No Smoking signs.
- Observe and obey all warning signs.
- Horseplay is forbidden.
- When operating equipment in the laboratories, at least two people should be present. One of these should be a technician or a member of the academic staff. Where working alone is essential, the completion of a Risk Assessment must be performed and endorsed by the Laboratory Superintendent or Academic Supervisor prior to the commencement of such work.
- Avoid loose clothing, long hair and badly fitting footwear.
- Keep all chemicals in suitable storage (see under COSHH).
- Switch off all gas cylinders, water, gas and other taps when not in use.
- Keep labs and workshops tidy.
- Keep floors clean and free of oil and grease deposits.
- Do not obstruct passages, doorways or other thoroughfares.
- Keep clear of overhead lifting-gear.
- Lifting tackle should only be used by trained personnel under the overall supervision of the technician in charge and in accordance with appropriate regulations. Replace all guard rails which may have been removed to facilitate the movement of equipment.
- Do not overload electrical power points.
- Trip hazards, such as trailing cables must not run across working areas.

9.1 Office Areas

- Office areas should be kept clean and tidy and free of trailing electrical cables.
- Cables should be inspected regularly and replaced if the insulation shows signs of wear.
- Materials should not be stored on top of filing cabinets or cupboards particularly near eye level.
• Filing cabinets should be filled from the bottom to ensure stability and drawers kept closed.

• Solvents should only be used in well ventilated areas and kept clear of heat sources.

10. Access to Buildings outwith Normal Hours
See Access to University Premises (Appendix 2).

11. Supervision of Postgraduate and Project Students
Supervisors should establish a mode of working with their students such that the supervisor is aware of and agrees to, each element of work, that safe working practices are agreed and where appropriate set down on paper and that regular, active, supervision is established.

12. Visitors to Laboratories
Visitors to the laboratories who are not accompanied by a member of staff should report to the relevant Laboratory Superintendent.

Maintenance staff should report to the relevant Laboratory Superintendent before commencing work in any laboratory area.

Children under the age of 14 are not normally permitted to enter laboratories or workshops. (See Appendix 2 of this Handbook).

13. Electricity at Work Regulations 1989
All offices, storerooms, workshops and laboratories, of whatever kind, within the Department must comply with these Regulations.

It should be noted that the University’s Estates Management Department is responsible for all electrical services in the University, e.g. isolators, sockets and other such fixed equipment and no one may break into the electrical system for any reason without the authorisation of the University Electrical Engineer. Persons involved in the use of, and/or responsible for the use of electrical equipment, must read the Regulations and the University’s own handbook entitled “Local Rules for Electrical Safety” (November 1991), a copy of which may be obtained from the Departmental Safety Convener. Work on ‘live’ equipment is prohibited unless in the most exceptional circumstances; before any such work is undertaken permission in writing must be granted by the Departmental Safety Convener.

14. General Electrical Safety
Open-bar electric fires and non-automatic kettles are not allowed in the University.

Multi-way distribution boards with 13 amp shuttered outlets may be used from a socket provided the total load does not exceed 13 amps and they are designed to BS1363. Adaptors are not permitted.

Plugs must be fitted by, and new equipment inspected by, a competent person, before being taken into service, normally by arrangement with the relevant Laboratory Superintendent. A record of the equipment must be kept (see 15 below). The Departmental Safety Convener may approve members of staff bringing in their own personal electrical equipment (except those banned items shown above), however, such items must also be included in the Departmental inventory of electrical equipment and appropriately inspected and tested (see 15 below).

All staff have individual responsibility to report obviously faulty equipment, e.g. broken plug tops, damaged cables, etc. to their supervisor or directly to the relevant Laboratory Superintendent. Equipment thought to be defective should not be used and must be reported immediately to the relevant Laboratory Superintendent. Such equipment should be removed from service until compliance with Section 15 is established. Users of equipment should regularly inspect for damage to casings, cables and plugs etc. and for loose screws.

Where specific hazards exist in laboratory/workshop areas they will be clearly marked at the direction of the relevant Laboratory Superintendent.

All persons wishing to use new or existing equipment in laboratory areas must liaise with the relevant Laboratory Superintendent before commencing work.
15. Inspection and Testing of Electrical Apparatus
All electrical apparatus is required to be inspected and tested at certain intervals. Portable electrical equipment should not be used unless it possesses an approved PAT label.

All fixed installations are the responsibility of the University Electrical Engineer.

All other equipment which can be plugged into a socket, including extension cables, etc. (and can also include battery operated equipment) is the responsibility of the Head of Department.

The Regulations require records to be kept of the maintenance, inspection and testing of all equipment in some detail for the duration of its working life. These records will be maintained centrally by the Departmental Safety Convener. Advice should be sought from the relevant Laboratory Superintendent prior to the introduction of any new electrical equipment.

16. Control of Noise at Work Regulations 2005
Loud noise at work can damage hearing therefore, measures have to be put in place to prevent or reduce risks from exposure to noise at work. It can also be a safety hazard at work, interfering with communication and making warnings harder to hear.

The Regulations require the employer to assess the risks to your employees from noise at work; take action to reduce the noise exposure that produces those risks; provide your employees with hearing protection if you cannot reduce the noise exposure enough by using other methods; make sure the legal limits on noise exposure are not exceeded; provide your employees with information, instruction and training; carry out health surveillance where there is a risk to health.

The Noise at Work Regulations 1989 have been revised and the new 2005 updated legislation comes into force on 6th April 2006 (with the exception of the music and entertainment sectors where the Regulations come into force on 6th April 2008).

1. The new Regulations require employers to take specific action at certain action values (previously called action levels). These relate to:

   ① the levels of noise employees are exposed to averaged over a working day or week (e.g. use of weekly exposure would be appropriate in situations where noise exposures varied markedly from day to day e.g. gardening staff using power tools on two days of the week); and,

   ② the maximum noise (peak sound pressure – noises due to impacts e.g. hammering, pneumatic impact tools) to which employees are exposed in a working day.

Noise levels are measured in decibels (dB) and the following new values are:

a. **Lower exposure action values:**
   - daily or weekly exposure of **80dB** (previously 85dB);
   - peak sound pressure of **135dB**.

b. **Upper exposure action values:**
   - daily or weekly exposure of **85dB**;
   - peak sound pressure of **137dB**.

**Exposure limit values:** (these are levels of noise exposure which must not be exceeded)
- daily or weekly exposure of **87dB**, peak sound pressure of **140dB**. These exposure limit values take account of any reduction in exposure provided by hearing protection ie personal protective equipment.

2. There is a new specific requirement to provide **health surveillance** where there is a risk to health.

Hearing protection must now be made available where there is exposure above the new lower exposure action value (80dB).
Hearing protection must be worn and a programme of control measures (see below) implemented where there is exposure above the new upper exposure action value (85dB). Noise assessments will require to be reviewed to take into account the changes in the action levels. (See below).
Health surveillance must be provided for all individuals, staff or students where there is a risk to health from exposure to noise e.g. employees who are likely to be regularly exposed above the upper exposure action values, or are at risk for any reason, e.g. they already suffer from hearing loss or are particularly sensitive to damage. More information on health surveillance is available from the University’s Occupational Health Service. If you have any concerns regarding occupational noise induced hearing loss or tinnitus (ringing or buzzing in the ears) please contact the Occupational Health Service on extension (JA) 4824 or email occupationalhealth@strath.ac.uk.

The implementation of these Regulations can be quite complex and advice should be obtained from the Safety Officer by anyone affected by them.

17. **Buildings and Equipment**
   Building structural faults should be brought to the attention of the University’s Estates Management Department.

The safety and installation of electrical equipment and the clearance of electrical faults up to the normal 13 Amp socket outlets are the responsibility of the University’s Electrical Engineer who is based in Estates Management.

18. **Radiation Hazards**
   Radiation Hazards are the responsibility of the Area Radiation Protection Supervisors. The identities and locations of current post-holders can be obtained from your Departmental Safety Convener.

19. **Compressed Gas Safety**
   Only persons within the Department who have been specifically trained may transport, attach or detach gas cylinders from equipment. These persons will follow the University Guidance on Compressed Gas Safety (15th December 2009).
Appendix 2
Access to University Premises - John Anderson Campus

6.7.1 The University Court has approved the following regulations to control access to premises belonging to or in the occupation of the University in order to balance the need for access on the one hand and considerations of general and personal safety (of users), security (of property), and economy (in light, fuel and security staff) on the other.

6.7.2 The normal hours of access to departmental accommodation are as follows:
Monday-Friday

<table>
<thead>
<tr>
<th>Venue</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andersonian Library</td>
<td>(as stated in Regulation 3.5 of the University Calendar)</td>
</tr>
<tr>
<td>Computer Centre</td>
<td>0800-2200</td>
</tr>
<tr>
<td>Sports Centre</td>
<td>(as stated in the Regulations of the Centre for Sport and Physical Activity)</td>
</tr>
<tr>
<td>All other departments</td>
<td>0800-1800</td>
</tr>
</tbody>
</table>

6.7.3 Some University buildings may be open beyond 1800 hours. Nevertheless, the normal hours of access for departmental accommodation is 0800-1800 hours. Every other time is considered outwith normal working hours.

6.7.4 Saturdays, Sundays and public holidays are considered to be outwith normal hours of access.

6.7.5 Academic, senior administrative and academic related staff are granted automatic rights of access outwith normal hours of access (please see the above) to communal accommodation and departmental accommodation within the area with which they are identified.

6.7.6 Estates Management personnel are granted automatic rights of access outwith normal hours of access (please see above) to communal accommodation and departmental accommodation, normally by prior arrangement with the Head of Department or other departmental staff responsible for the departmental accommodation. However, obviously, in an emergency, for example, flood, Estates Management staff may have to enter departmental accommodation without prior notification. It is, therefore, imperative that any hazardous operations or particularly hazardous material which by necessity is left on open benches be appropriately labelled.

6.7.7 Computer Centre staff are granted automatic rights of access outwith normal hours of access to all areas where that department has computer and communications equipment.

6.7.8 University Safety Services personnel are granted automatic right of access to all University accommodation at all times.

6.7.9 Research fellows, research assistants, individual postgraduate students and members of the technical, secretarial, clerical and manual staff may be granted rights of access to communal accommodation and departmental accommodation outwith normal hours of access. Buildings may be open until 2200 hours but permission (for those who require it) to enter departmental accommodation is required from the Head of Department or their deputy. Individual undergraduate students may also be granted such rights of access through the same procedure. The levels of access available are as follows:

1) Unlimited Access
(i) An unlimited authorised access card (RED) must be issued by the department and signed by the Head of Department or their deputy and the person being granted access.
(ii) The department and those areas specified within it which have been authorised for entry must be stated on the card.
(iii) The card may be valid for up to one year from issue. However, the expiry date must be shown on the card.
(iv) The card is only valid if used in conjunction with an unexpired student/staff identity card or other photographic identification.
(v) The card is issued on the understanding that the cardholder has read and understood that part of the appropriate Departmental Safety Regulations pertaining to out of hours working.
(vi) Unlimited access should only be granted when considered essential by the Head of Department.
(vii) Requests for red cards for lab access must be accompanied by a risk assessment (S20 form) and signed by the project supervisor.
ANY BREACH OF REGULATIONS WILL RESULT IN IMMEDIATE CANCELLATION OF OUT OF HOURS ACCESS AND DISCIPLINARY PROCEEDINGS.

Computer Centre Access
6.7.10 RED card access needs a countersignature by Computer Centre staff as well as Head of Department signature.

Temporary Rights of Access
6.7.11 The Head of a Department or, in their absence, a deputy previously authorised by the Head of Department may, exceptionally, grant temporary rights of access to departmental accommodation, including laboratories and workshops, outwith normal hours of access for a maximum period of one year at a time to a named visitor of not less than 16 years of age in respect of an individual person deemed by the Head of Department on their own responsibility to be suitable.

6.7.12 Some departmental equipment may only, by statute, be used by persons over 18 years of age. The Head of Department must ensure the visitor granted access is fully aware of all appropriate University/Departmental Safety Regulations and Procedures including evacuation.

6.7.13 The name of the visitor granted access and a note of the duration of the access granted must be lodged with Security Control.

6.7.14 Members of staff and students who would normally need RED CARD access are exempt from this requirement when attending social functions authorised by the Head of Department, in departmental rest areas, for example, common rooms, tea rooms, etc. This exemption is only valid until 2200 hours. If it is expected that the function will continue after this time, special permission must be granted by the Chief Operating Officer. Please see Regulation 6.7.15.

6.7.15 The Chief Operating Officer may, exceptionally, grant temporary rights of access to persons other than those granted rights of access under previous Regulations for the purpose of attending specific meetings, examinations or other functions on University premises. When temporary rights of access are so granted Security Control must be notified.

6.7.16 Departmental Safety Regulations must make adequate provision for the health and safety of all persons using departmental premises outwith normal hours of access as defined in the Regulations above.

6.7.17 All persons granted rights of access who use premises outwith normal hours must inform Security Control of their intention to enter, remain in or leave the premises in order that the security staff may arrange for them to be granted access to or exit from the building concerned. They must also record their presence on the premises either by telephoning Security Control or by signing the log book at Security Control (or, in the case of the Royal College, the James Weir or Thomas Graham Building, the log book held at the James Weir Building, Montrose Street entrance) before they enter the premises. All University staff must carry a University staff identity card or other photographic identification. Students must carry a current student identification card plus the appropriate departmental authorisation (for example, BLUE or RED card). Persons using premises outwith normal hours of access may be refused entry or requested to leave by a member of the Security or University Safety Services staff if they cannot show proof of identity.

6.7.18 Security staff must check periodically the safety of individuals recorded as being on the premises outwith normal hours of access.

6.7.19 Persons using premises outwith normal hours of access must have access to a telephone in order to contact Security Control in the event of an emergency.

6.7.20 Operations outwith normal working hours which have been assessed and identified as having a particular risk associated with them must have appropriate control measures in place to handle the foreseeable consequences of the work.

6.7.21 Abuse of the system may result in confiscation of the access card and identity card by Security or Safety Services personnel.

Children - Special Access
6.7.22 Children (persons under the age of 16) are permitted to enter the office accommodation and sports and recreational facilities of the University during the normal hours of access. Access to University premises is only permitted if accompanied by a parent or other responsible adult. Outwith normal working hours, children may be allowed access to office accommodation only; they must be accompanied by the parent or legal guardian who must directly supervise the child.

6.7.23 Children are not permitted to enter laboratories or workshops or other accommodation whose sole means of access is by way of a laboratory or workshop unless for the purpose of attending a supervised course, demonstration or exhibition in which case all sources of potential hazard will have been removed or rendered safe by other means.
**Pet Animals**

6.7.24 Pet animals of any nature may only be brought on to University premises under extraordinary circumstances. A Head of Department, on advice from a Departmental Safety Convener, may exceptionally authorise access to department premises in which case the animal must be kept under the direct supervision of the owner or other responsible person. A guide dog accompanying a blind person will normally be permitted unrestricted access to University premises but the nature of equipment in certain areas may make it necessary to deny access to such guide dogs.
**Appendix 3**

**Key to Buildings**

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Building Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>John Arbuthnott Building Robertson Wing</td>
</tr>
<tr>
<td>AR</td>
<td>Architecture Building</td>
</tr>
<tr>
<td>AT</td>
<td>Alexander Turnbull Building</td>
</tr>
<tr>
<td>BH</td>
<td>Barony Hall</td>
</tr>
<tr>
<td>CL</td>
<td>Collins Building</td>
</tr>
<tr>
<td>CU</td>
<td>Curran Building</td>
</tr>
<tr>
<td>CV</td>
<td>Colville Building</td>
</tr>
<tr>
<td>EM</td>
<td>181 St James Road</td>
</tr>
<tr>
<td>GH</td>
<td>Graham Hills Building</td>
</tr>
<tr>
<td>HD</td>
<td>Henry Dyer Building</td>
</tr>
<tr>
<td>HW</td>
<td>John Arbuthnott Building Hamnett Wing</td>
</tr>
<tr>
<td>JA</td>
<td>John Anderson Building</td>
</tr>
<tr>
<td>JW</td>
<td>James Weir Building</td>
</tr>
<tr>
<td>LD</td>
<td>Lord Todd</td>
</tr>
<tr>
<td>LH</td>
<td>Lord Hope Building</td>
</tr>
<tr>
<td>LT</td>
<td>Livingstone Tower</td>
</tr>
<tr>
<td>MC</td>
<td>McCance Building</td>
</tr>
<tr>
<td>RC</td>
<td>Royal College Building</td>
</tr>
<tr>
<td>RT</td>
<td>Ramshorn Theatre</td>
</tr>
<tr>
<td>SB</td>
<td>Strathclyde Business School</td>
</tr>
<tr>
<td>SP</td>
<td>St Pauls Chaplaincy Centre</td>
</tr>
<tr>
<td>ST</td>
<td>Stenhouse Building</td>
</tr>
<tr>
<td>SU</td>
<td>Students’ Union</td>
</tr>
<tr>
<td>TG</td>
<td>Thomas Graham Building</td>
</tr>
<tr>
<td>UC</td>
<td>University Centre</td>
</tr>
<tr>
<td>WC</td>
<td>Wolfson Building</td>
</tr>
<tr>
<td>WD</td>
<td>Sir William Duncan Building</td>
</tr>
</tbody>
</table>