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Course Structure

**Core Courses:**
BS 0850 Managerial Economics Online  
MSE 301 Integrated Materials Engineering Portfolio  
MSE 302 Materials Characterisation

**Option Courses:**
MSE 307 Engineering Alloys  
MSE 308 Ceramics and Glasses  
MSE 309 Polymers & Composites  
MSE 310 Electronic Structure and Opto-Electronic Behaviour  
MSE 312 Nanomaterials 1  
MSE 315 Biomaterials  
MSE 316 Imperial Horizons/Management  
MSE 317 Modelling  
MSE 318 Surfaces & Interfaces

**BEng Materials Science and Engineering:**
5 Options

**BEng Materials with Management:**
3 Options  
BS 0820 Managing Innovation  
BS 0806 Entrepreneurship

**MEng Materials Science and Engineering:**
5 Options

**MEng Aerospace Materials:**
2 Options  
MSE 307 Engineering Alloys  
MSE 309 Polymers and Composites  
A101 Introduction to Aerodynamics  
A110 Introduction to Structural Analysis

**MEng Materials and Nuclear Engineering:**
3 Options  
ME3-HNUCN Introduction to Nuclear Engineering  
ChE 430 Nuclear Chemical Engineering

**MEng Biomaterials and Tissue Engineering:**
3 Options  
MSE 315 Biomaterials (core)  
MSE 418 Advanced Tissue Engineering (core)
MSE 301 Integrated Materials Engineering Portfolio

Aims and objectives
The integrated materials engineering portfolio aims to ensure that engineering students graduating from Imperial College have the necessary skills to successfully contribute to innovation and engineering, are aware of these skills and are able to present these in a manner which will further their professional development.

Learning outcomes
Through carrying out the tasks in the integrated engineering portfolio the students should be able to:
1. Plan research and design work needed to achieve a goal
2. Find and critically assess technological information
3. Use the information to design a process or product
4. Demonstrate an original/creative approach to solving engineering problems
5. Analyze the economic merits of a technological project
6. Recognize the innovative aspects of a project and potential intellectual property rights
7. Plan for quality assurance
8. Be confident to delegate work to colleagues
9. Present a case in a concise and convincingly argued short written document
10. Present a case in a concise and convincingly argued short presentation
11. Write good quality contributions to technical reports on work carried out over an extended period
12. Contribute to the organization of collaborative reports
13. Recognize how course activities have developed their skills, where improvements are needed and how to record such activities to achieve professional status

Approach
The integrated materials engineering portfolio adds to engineering skills already developed in first and second year of the course (MSE 106 Materials Engineering & MSE 206 Materials Engineering) through a range of activities:
- Literature review
- Technical design study
- Business plan development through e-learning and seminars
- Lectures on quality assurance
- Lectures on intellectual property rights
- Personal development planning with the personal tutor

For the literature review component, students are required to present a short argument (maximum 2000 words), supported through high quality references, which assesses the state of the art in a technological field and identifies the opportunities for innovative work.
In order for students to achieve this, they will receive training and guidance from an academic supervisor, who will meet with students on at least 3 occasions:

- to brief the students on the topic to be investigated and to raise student awareness of tools available to search the literature.
- a feedback meeting to discuss the findings of the student based on a draft plan of the document
- a feedback meeting to discuss the findings of the student based on a draft review

These will be assigned on a first come first served basis after a list of titles is posted in the autumn term.

**Timing:** Week 1 of Autumn term until week 1 of Spring term

**Individual work**

**Supported by academic supervisor**

**Deadline:** **Tuesday 10th January 2017**

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**Design study**

Dr Luc Vandeperre and Ben Chan

The design study aims to develop your engineering skills further by asking you and your colleagues to come together to actually design and fabricate a scaled version of a working material processing plant. In order to make this an achievable task, obviously you will be divided in groups, who each take only one part of the plant. To ensure that we get an idea in how far your design solution is a good one, the year will first be split in a number of competing companies, each designing the entire plant, and only then in subgroups responsible for parts of the design. This will help us in judging how far some groups had a tougher design than others and hence equilibrate the marks. Running the design study in 4 parallel groups also introduces a small competitive element for those who like that.

The learning outcomes of the design study are that by the end of the design study you should be able to:

1. Plan research and design work needed to achieve a goal
2. Find and critically assess technological information
3. Use the information to design a process or product
4. Make and read technical drawings for simple objects
5. Automate simple tasks using programmable controllers
6. Demonstrate an original/creative approach to solving engineering problems
7. Be confident to delegate work to colleagues and to agree and manage shared tasks
8. Present a case in a concise and convincingly argued short written document
9. Present a case in a concise and convincingly argued short presentation
10. Write good quality contributions to technical reports on work carried out over an extended period
11. Contribute to the organization of collaborative reports

The design study runs essentially over Autumn and Spring term but you will make a final presentation in which you defend your design in Summer term to a board with external engineers. During this period, there will be three phases to your project: concept phase, prototype phase, and final design phase with specific goals for every period. A number of reports and presentations are required to document progress as well as a record of manufacturing trials and technical drawings.

The design study is supported by introductory lectures on technical drawing, automation and control and fabrication, and demonstrations of 3D printing and CNC machining. You will have to report progress on a weekly basis and can seek advice to overcome specific issues by booking a slot during the office hours of Dr Luc Vandeperre, Ben Chan and the automation expert, Dr Gwilherm Kerherve.

A detailed description of the requirements for the design study can be found in the design study handbook.
Overview of design study deadlines and marks associated with each component:

<table>
<thead>
<tr>
<th>What</th>
<th>Group deadline</th>
<th>Company deadline</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial GANTT chart</td>
<td>10/10/2016</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Concept design report</td>
<td>21/11/2016</td>
<td>28/11/2016</td>
<td>20%</td>
</tr>
<tr>
<td>Presentation and defence of concept</td>
<td>12/12/2016</td>
<td>NA</td>
<td>5%</td>
</tr>
<tr>
<td>Integrated proto-type test day</td>
<td>08/02/2016</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Proto-type and lessons learned report</td>
<td>15/02/2016</td>
<td>22/02/2016</td>
<td>20%</td>
</tr>
<tr>
<td>Parts List + Signed off Drawings</td>
<td>NA</td>
<td>22/03/2016</td>
<td>10%</td>
</tr>
<tr>
<td>Fabrication record</td>
<td>NA</td>
<td>22/03/2016</td>
<td>5%</td>
</tr>
<tr>
<td>Final design report</td>
<td>15/03/2016</td>
<td>22/03/2016</td>
<td>25%</td>
</tr>
<tr>
<td>Integrated design test day</td>
<td>08+09/06/2016</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Defence of final design</td>
<td>08+09/06/2016</td>
<td>NA</td>
<td>5%</td>
</tr>
<tr>
<td>Peer marking of contribution</td>
<td>09/06/2016</td>
<td>NA</td>
<td>10%</td>
</tr>
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</table>

The final requirement is that each student should **prepare a portfolio of their individual work** in a manner consistent with how work would be recorded and presented for achievement of professional qualification using the CEng model as a reference. To this end, they should include a reflective commentary of about one page summarising how these activities have developed their engineering skills and analysing where further skill development would be beneficial. The portfolio should contain at a minimum:

1. The reflective summary and updated curriculum vitae
2. An updated personal development plan
3. The literature review
4. The individual design section from the technical design study
5. Examples showing the individual contributions to the team efforts

Where students have carried out activities outside the required curriculum to develop their engineering skills, they are advised to include these for future reference.

**Timing:** Autumn, Spring and Summer term

**Individual**

**Supported by Personal tutor**

**Deadline:** Friday 23rd June 2017
Assessment of Integrated Engineering Portfolio:

<table>
<thead>
<tr>
<th>Assessment component</th>
<th>Marks</th>
<th>Individual / Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature review</td>
<td>50</td>
<td>Individual</td>
</tr>
<tr>
<td>Integrated design study report</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Managerial Economics</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Comprehensive Exam</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Individual portfolio (1 per student)</td>
<td>Pass / Fail</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>300</td>
<td>Individual</td>
</tr>
</tbody>
</table>

The pass mark for this component of the course is 40% on the entire module. Students can only pass the module if all components have been submitted.

Core: MSE 302 Materials Characterisation

Prof Stephen Skinner, Dr Sarah Fearn, Dr Victoria Bemmer and Mr Richard Sweeney

This course consists of both lectures and laboratories. You will learn basic principles of materials characterisation including scanning and transmission electron microscopy and X-ray diffraction along with surface, and thermal analysis. The course will be assessed by four laboratory reports (10% each), a class work exercise in X-ray diffraction (10%) and an examination (50%).

Options

At the end of your second year, all students will have selected their option courses (of 24 lectures each), which may include an Imperial Horizons or Business School course. It is worth noting that language courses may be taken without credit if you prefer to do this. Details of the options are given below:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Tutors</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE 307</td>
<td>Engineering Alloys</td>
<td>DD/TP/VV</td>
</tr>
<tr>
<td>MSE 308</td>
<td>Ceramics and Glasses</td>
<td>FG/NK/CM</td>
</tr>
<tr>
<td>MSE 309</td>
<td>Polymers &amp; Composites</td>
<td>LV/ES/MS</td>
</tr>
<tr>
<td>MSE 310</td>
<td>Electronic Structure &amp; Opto-Electronic Behaviour</td>
<td>MO/DJR</td>
</tr>
<tr>
<td>MSE 312</td>
<td>Nanomaterials 1</td>
<td>DJR/PP/MPR</td>
</tr>
<tr>
<td>MSE 315</td>
<td>Biomaterials</td>
<td>JRI/ES/MMS</td>
</tr>
<tr>
<td>MSE 317</td>
<td>Modelling</td>
<td>APH</td>
</tr>
<tr>
<td>MSE 318</td>
<td>Surface &amp; Interfaces</td>
<td>SH/DP</td>
</tr>
<tr>
<td>ME3-HNUC</td>
<td>Introduction to Nuclear Engineering</td>
<td>Mech Eng: Dr S Walker</td>
</tr>
<tr>
<td>MSE 316</td>
<td>Imperial Horizons/Management</td>
<td>Various</td>
</tr>
</tbody>
</table>

Full descriptions of all modules are available on Blackboard and via the Departmental Student System (DSS—this is where you can select your module options in Year 3 and Year 4).
Assessment Third Year (70% BEng/30% MEng)

<table>
<thead>
<tr>
<th>Course</th>
<th>Lecture Hours</th>
<th>Exam Mark</th>
<th>CW Mark</th>
<th>Pass Mark</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE 301 Integrated Materials Engineering Portfolio</td>
<td>8</td>
<td>100</td>
<td>200</td>
<td>40%</td>
<td>22</td>
</tr>
<tr>
<td>MSE 302 Materials Characterisation (Exam 50, 5 labs 50)</td>
<td>30</td>
<td>50</td>
<td>50</td>
<td>40%</td>
<td>6</td>
</tr>
<tr>
<td>5 x Optional Courses (5 x Exams 100 each)</td>
<td>24 Per Course</td>
<td>100 Per Course</td>
<td>40%</td>
<td>6 Per option</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>650</td>
<td>250</td>
<td>50%</td>
<td>60</td>
<td></td>
</tr>
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</table>

**BEng Research Projects**

Students registered for the BEng will be allowed (at the discretion of the DUGS) to do a 250 mark research option (MSE 320 Research project with Materials Engineering). The project follows exactly the timetable for the Year 4 project, as described in the Year 4 handbook. This course comprises a research project, a QA/IPR coursework and a business plan based on the research project. Students taking this option will not carry out a Design Study or the standalone Literature Review, and only take 4 option courses.

The system for deciding which BEng students can do an individual research project are as follows: In the summer term, interested students will be interviewed by the DUGS. If the DUGS agrees they have a good case for why they should be permitted to conduct a project, the student will need to achieve a minimum of 70% overall in the second year to be considered. On achieving this they will be permitted to select a project from the list provided over the summer and will be allocated a project when these are completed for the MEng students.
Comprehensive Examination

The Comprehensive Examination is designed to test your overall knowledge of Materials, both in breadth and in depth. It is a three-hour examination that has two sections, labelled A and B.

Section A: Everything taught in Year 1 and 2, in four parts (these are short questions)
Section B: Is in two parts and all questions are compulsory

These questions are designed to test the core concepts that we would expect a competent materials scientist or engineer to have a firm understanding of. They are similar in style to the short questions you will have seen in your examinations from years 1 and 2.

Mathematics (101, 201) permeates through many of the questions, but there is no dedicated mathematics question or section. Crystallography, Materials Selection, Process Principles and Materials Characterization are also examinable.

“Cramming” is not advised for the Comprehensive Examination! It is much better to start reviewing the core material from the course from an early stage in the year. To help you to do this, short questions will be posted on Blackboard every few weeks from the end of term 1, followed by the solutions a few weeks later.
MEng Students - Instructions for Placement Reports

The nature of work carried out on work placements varies considerably and placement project reports are expected to reflect this. There are, therefore, no rigid requirements for the contents of the report. However, the report is expected to be about 2000 words in length, must not exceed 2500 words in length, and should normally have the following structure:

1. **Title page, including:**
   - Title that clearly identifies what the report is about
   - Name of the student
   - Name of the Company/Institution
   - Name of Supervisor

2. **Signed declaration that the report is your own original work and is xxxx words in length**

3. **Abstract or Executive Summary:**
   - One or two short paragraphs which summarise the purpose, method and main findings of the work in a clear, concise and complete way. It should include all subjects about which new information is given and include the major conclusions that have been reached.

4. **Contents page:** listing of chapters, sections, subsections

5. **Introduction:**
   - A brief introduction to the structure, position and mission of the Company/Institution
   - A description of the background and history of the problem you have worked on in order to explain the relevance of your work (why did you do this project?). A complete and coherent introduction to the aims and objectives of the work and the concepts behind it.

6. **Description of the work performed, including:**
   - A description of the techniques used (methods)
   - A chapter describing the results obtained (results)
   - A critical analysis (discussion)

7. **Summary of findings and achievements (conclusions)**

8. **Any recommendations that have come out of the work**

9. **Acknowledgements**

10. **A bibliography giving full details of references referred to in the report**

11. **Appendices**

Please check with your supervisor before presenting any aspects of your project in reports, oral presentation or on web pages. If necessary, reports should be clearly marked CONFIDENTIAL, in which case they will only be read by those involved in marking.

A copy of the report should be given to your placement supervisor. A copy should also be uploaded to Blackboard by 4pm on Friday 6th October 2017 (at the beginning of your fourth year).

The report is first and second marked within the department. Comments from your placement supervisor are taken into account. On Monday 9th October 2017 you will be required to give a 10 minute presentation on your placement as part of the assessment. A timetable will be circulated in the first week of term.

**Breakdown of Assessment**

100 marks are allocated for the Work Placement, with 50% for the written report and 50% for the oral presentation.
### Option Choices and Project Allocation for the Fourth Year

At the beginning of the Summer term you will be given information on the choice of options for study in your fourth year. You will be asked to confirm your selections as soon as possible so we can plan the timetable accordingly. However, if you do change your mind, providing the course selected is not over-subscribed, you will be permitted to change your selection. Information regarding the options available from Imperial Horizons and Management subjects will also be provided during the Summer term with the necessary instructions for registration.

Final year projects will be allocated to students on the MEng courses during the summer. The procedure for the allocation of projects is as follows: at the start of the Summer a list of available projects will be published and you will be given two weeks to consider these and to discuss them with potential supervisors, after which you will submit your choices. Every effort will be made to assign the students with one of their choices whilst maintaining a balance of projects across academic staff. Where competition for a project exists the project will be assigned to the student with the best academic performance. Any changes to projects and/or titles must be approved and confirmed by the DUGs and the Student Office.
Broden your education. Enhance your potential.

http://www.imperial.ac.uk/horizons

Looking to get the most out of your degree?

The Imperial Horizons programme offers a wide range of courses for all Imperial College undergraduates. It is designed to broaden your education, inspire your creativity and enhance your professional impact. Over 80 different short course options are available from four fields of study throughout your undergraduate degree.

Please see the Imperial Horizons website for further information: http://www.imperial.ac.uk/horizons/course-options/third-and-fourth-year-undergraduates/

Third/Fourth Years (Thursdays: 4-6pm)

<table>
<thead>
<tr>
<th>Course</th>
<th>Total number of weeks</th>
<th>Autumn Term</th>
<th>Spring Term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Weeks</td>
<td>Start</td>
</tr>
<tr>
<td>Languages</td>
<td>20</td>
<td>10</td>
<td>13 Oct 2016</td>
</tr>
</tbody>
</table>

“This class has been truly fantastic; not only has it been stimulating and highly engaging but it has also generated more perspective and enthusiasm for my core engineering than I would previously have imagined possible”
Departmental Staff List

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**Academic Staff continued**

<table>
<thead>
<tr>
<th>Name</th>
<th>Initial</th>
<th>Office</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Luc Vandeperre</td>
<td>LV</td>
<td>LM04C</td>
<td><a href="mailto:l.vandeperre@imperial.ac.uk">l.vandeperre@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Prof Aron Walsh</td>
<td>AW</td>
<td></td>
<td><a href="mailto:a.walsh@imperial.ac.uk">a.walsh@imperial.ac.uk</a></td>
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<td>FX</td>
<td>B334</td>
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</tr>
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</table>

**Student Office Staff:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Office</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mrs Fiona Thomson</td>
<td>G03a</td>
<td><a href="mailto:fiona.thomson@imperial.ac.uk">fiona.thomson@imperial.ac.uk</a></td>
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<td>Miss Raj Gill</td>
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<tr>
<td>Miss Beth Britton</td>
<td>G03a</td>
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