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Course Objective
This course is designed to introduce the basic steps from ore to actual parts in ferrous and non-ferrous metals and to provide a good understanding on new development in each step.

Course staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Contact Information</th>
<th>Consultation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Farshid Pahlevani</td>
<td>Course Coordinator &amp; Lecturer</td>
<td>Room 445, School of Materials Science and Engineering (Building E10) Phone: 9385 4433  <a href="mailto:f.pahlevani@unsw.edu.au">f.pahlevani@unsw.edu.au</a></td>
<td>By appointment</td>
</tr>
<tr>
<td>Dr Sophie Primig</td>
<td>Lecturer</td>
<td>Room 346, School of Materials Science and Engineering (Building E10) Phone: 9385 5284  <a href="mailto:s.primig@unsw.edu.au">s.primig@unsw.edu.au</a></td>
<td>By appointment</td>
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</table>
## Your Course at a Glance

<table>
<thead>
<tr>
<th>What you will learn</th>
<th>Weeks</th>
<th>Assessment Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to making iron from iron ore</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Introduction to Steel making</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Major developments which change the shape of steel making industry</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Ferrous casting and its recent development</td>
<td>4–5</td>
<td></td>
</tr>
<tr>
<td>Heat treatment for as-cast parts</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Presentation and discussion on assignment 1</td>
<td>6</td>
<td>Assignment 1</td>
</tr>
<tr>
<td>Processing of low-alloyed steels</td>
<td>7–8</td>
<td></td>
</tr>
<tr>
<td>Processing of high alloyed steels, powder metallurgy</td>
<td>8–9</td>
<td></td>
</tr>
<tr>
<td>Introduction to non-ferrous alloys (Al, Ni)</td>
<td>9–10</td>
<td></td>
</tr>
<tr>
<td>Introduction to non-ferrous alloys (Cu, Ti)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Recycling</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Presentation and discussion of assignment 2</td>
<td>12</td>
<td>Assignment 2</td>
</tr>
</tbody>
</table>

## Timetable

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture/tutorial</td>
<td>Wednesday</td>
<td>11:00 – 13:00</td>
</tr>
<tr>
<td>Lecture/tutorial</td>
<td>Friday</td>
<td>12:00 – 14:00</td>
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</tbody>
</table>
Course Content

- Iron from ore to metal: Basic principle of produce metallic iron from iron ore and general overview of existing processes. Recent advancement in this area.
- Introduction to steel making: what is steel making and basic understanding of this process
- Major development in steelmaking: what are the recent developments which change the face of steelmaking industry? In which areas there is the potential for improvement.
- Steel casting and heat treatment of as-cast parts: after producing the steel what will happen to that. Advanced techniques in steel casting and what is the most common heat treatment after producing as-cast steel.
- Processing of low-alloyed steels (e.g. HSLA steels), thermo-mechanical processing, microstructural design towards structural applications, microstructure-property relationships of steels.
- Processing of high-alloyed steels (e.g. tool steels), re-melting techniques, introduction to powder-metallurgy, processing of powder-metallurgical steels
- Process metallurgy of selected non-ferrous alloys (aluminium alloy, nickel-based alloys, titanium alloys, aluminium alloys)

Assessment

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1: An assignment will be given on innovative solution to solve the existing dis-advantage in processing iron ore or steel making process. Comparison between existing process and proposed idea is necessary</td>
<td>20%</td>
</tr>
<tr>
<td>Assignment 2: An assignment will be given on the processing or recycling of selected metal product covering technical as well as environmental and economic aspects.</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam: The exam will be 2hr in duration and held in the final exam period</td>
<td>60%</td>
</tr>
</tbody>
</table>

References

- Ahindra Ghosh and Amit Chatterjee, Iron making and Steel making, PHI learning private, 2008.
- John Campbell, Complete casting handbook, Elsevier
- Metal casting Handbook ASM international.
Learning and teaching philosophy underpinning the course

• Students are actively engaged in the learning process.
  It is expected that, in addition to attending classes, students read, write, discuss, and are engaged in solving problems on the electronic properties of materials, and in analysis and evaluation of materials’ electron-related properties in the context of modern theories of physics.

• Effective learning is supported by a climate of inquiry where students feel appropriately challenged.
  Problems involving electron theory are challenging; students will be given assignments that will motivate deep analysis of various physical phenomena in materials science and engineering.

• Learning is more effective when students’ prior experience and knowledge are recognised and built on.
  This course is built on prior courses in mathematics, physics and chemistry.

• Students become more engaged in the learning process if they can see the relevance of their studies to professional and disciplinary contexts.
  Students will be asked to analyse the role of electron theory in understanding various physical phenomena in materials science and how properties such as electrical conduction and magnetism influence the science and engineering of existing and new devices and components.

Course Information

<table>
<thead>
<tr>
<th>Units of credit</th>
<th>6</th>
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| How the course relates to other course offerings and overall program(s) in the discipline | • The course covers various topics involving iron and steel making, steel processing and non-ferrous metallurgy.  
• The course offers an opportunity for students to apply the knowledge learned from other courses such as, heat transfer, basic metallurgy and materials science, phase transformation, etc. It emphasizes solving problems at a larger scale, more related to engineering application. |
| Graduate attributes which will be gained through the course | • Knowledge of fundamental principles governing processing of metals for problem solving in engineering  
• Information literacy and writing communication |
| Expected learning outcomes | • To understand the principles and concepts ferrous and non-ferrous metallurgy  
• To understand the underlying fundamentals in processing of metal parts |
| Teaching strategies | • Lectures covering fundamentals and major concepts, with their applications demonstrated via selected examples |
• Students are expected to attend classes and prepare for discussion
• Assignments to enhance students’ understanding and generate opportunities for students to practise
• Significant report writing to develop students’ literature review and writing skill

1 Based on the professional attributes given in Engineers Australia National Generic Competency Standards - Stage 1 Competency Standard for Professional Engineers and UNSW Graduate Attributes.

Academic honesty and plagiarism

What is Plagiarism?
Plagiarism is the presentation of the thoughts or work of another as one’s own.* Examples include:

• direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person’s assignment without appropriate acknowledgement;
• paraphrasing another person’s work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
• piecing together sections of the work of others into a new whole;
• presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
• claiming credit for a proportion of work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

• correct referencing practices;
• paraphrasing, summarising, essay writing, and time management;
• appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle
Continual course improvement

• Students will be asked to provide evaluative feedback through the UNSW’s Course and Teaching Evaluation and Improvement (CATEI) process at the end of the course.

• Students are encouraged to address any problems regarding teaching of this course at the annual staff-student meeting.

• Student comments on teaching during the session are welcome and will be appreciated.

At times students may be asked to answer a short questionnaire for feedback on the course.

Administrative Matters

• Students should attend at least 80% of all classes.

• Students unable to submit assignments on time or attend the mid-session quizzes or final exams on health grounds should make a request for special consideration. Information on this process can be found here (https://my.unsw.edu.au/student/atoz/SpecialConsideration.html). Medical certificates or other appropriate documents must be included. Students should also advise the lecturer of the situation.

• Assignments/lab reports submitted after the deadline will receive a 10% of maximum grade penalty for every day late, or part thereof.

• Students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course coordinator prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (www.studentequity.unsw.edu.au). Early notification is essential to enable any necessary adjustments to be made.

Rules for Exams

Rules governing conduct during exams are given at: https://my.unsw.edu.au/student/academiclife/assessment/examinations/examinationrules.html - Rulesfortheconductofexaminations

Note that the use of mobile phones or music players in an exam room will constitute Academic Misconduct.