MATS6001

Fundamentals of Materials Processing

Course Outline
Session 1, 2016
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Course staff

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<thead>
<tr>
<th>Name</th>
<th>Room</th>
<th>Phone</th>
<th>Email</th>
<th>Consultation hours</th>
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<tbody>
<tr>
<td>Dr Kevin Laws</td>
<td>Room 301, School of Materials Science &amp; Engineering (Building E10)</td>
<td>9385 5234</td>
<td><a href="mailto:k.laws@unsw.edu.au">k.laws@unsw.edu.au</a></td>
<td>by appointment</td>
</tr>
<tr>
<td>Dr Rakesh Joshi</td>
<td>Room 448, School of Materials Science &amp; Engineering (Building E10)</td>
<td>9385 6726</td>
<td><a href="mailto:r.joshi@unsw.edu.au">r.joshi@unsw.edu.au</a></td>
<td>by appointment</td>
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Timetable

Lectures

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<tr>
<th>Day</th>
<th>Time</th>
<th>Location</th>
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<tr>
<td>Monday</td>
<td>13:00 – 15:00</td>
<td>Webster 256 (K-G14-256)</td>
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<tr>
<td>Wednesday</td>
<td>15:00 – 17:00</td>
<td>Law Building 302 (K-F8-302)</td>
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Course Objectives
This course covers selected topics in materials processing including elements of both extractive metallurgy and secondary processing methods. Students will understand the basic elements of operations of processing used in primary metal refinement and assorted secondary processing and shaping methods such as casting, rolling, welding and powder metallurgy.

Course Outline
This course will begin with an introduction to primary processing of materials. It will cover ironmaking, steelmaking, and production of Aluminium, Nickel, Magnesium and Titanium. The course will also cover semiconductor processing, single crystal growth of Si, GaAs, thin film processing (physical and chemical vapour deposition), processing of advanced nanostructures such as nanoparticles, nanowires, nanotubes, graphene. In addition this course will cover sustainable materials processing.

Course material will cover specific secondary metals processing such as casting processes including sand-box casting, investment casting, vacuum and die-casting, slab and twin-roll strip-casting; metal billet and sheet rolling; tube and bar extrusion; forging including drop, twist and non-twist forging; Powder consolidation techniques including hot isostatic pressing and spark plasma sintering; Soldering, Brazing and Welding, Subtractive manufacturing including multi-axis milling, machining, grinding and spark erosion; Additive manufacturing including typical 3D printing techniques including extrusion melting, selective laser melting/sintering, e-beam melting and droplet ejection;

Your Course at a Glance

| MATS6001 Fundamentals of Materials Processing 2016 - Timetable & Core Subjects |
|---------------------------------|---------------------------------|
| WEEK | Monday 13:00-15:00 | Wednesday 15:00-17:00 |
| DATE | Topic (Lecturer) | DATE | Topic (Lecturer) |
| 1 | 29th Feb. | Intro to Primary Processing (RJ) | 2nd March | ironmaking, steelmaking (RJ) |
| 2 | 7th March | Processing of AI, Ni (RJ) | 9th March | Processing Mg, Ti (RJ) |
| 3 | 14th March | Semiconductor processing (RJ) | 16th March | Single Crystal growth of Si and GaAs (RJ) |
| 4 | 21st March | Thin Films Technology (PVD)(RJ) | 23rd March | CVD for carbon materials (RJ) |
| Mid-Semester Break | | | |
| 5 | 4th April | MIDSESSION EXAMINATION (RJ) | 6th April | Intro to Secondary Processing (KJL) |
| 6 | 11th April | Casting Processes (KJL) | 13th April | Casting Processes (KJL) |
| 7 | 18th April | Metal Rolling & Extrusion (KJL) | 20th April | Forging Processes (KJL) |
| 8 | 25th April | ANZAC PUBLIC HOLIDAY DAY | 27th April | (KJL) Powder Consolidation |
| Topics for Presentation & Report Announced | | |
| 9 | 2nd May | Soldering & Brazing Processes (KJL) | 4th May | Welding Processes (KJL) |
| 10 | 9th May | Subtractive Manufacturing (KJL) | 11th May | Additive Manufacturing (KJL) |
| 11 | 16th May | Nanostructures (nanowires, nanotubes and graphene) (RJ) | 18th May | Sustainable materials processing (RJ) |
| 12 | 23rd May | Topic Reports Due Topic Presentations Staff Performance Review (RJ + KJL) | 25th May | Topic Presentations (RJ + KJL) |
| TBA | FINAL EXAMINATION (KJL) | |

(RJ) = Dr Rakesh Joshi; (KJL) = Dr Kevin J Laws
Assessment

MATS6001 Fundamentals of Materials Processing 2016 – Assessment Tasks

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<tr>
<th>Assessment Task</th>
<th>Assessment Due/Held</th>
<th>Grade Allocation</th>
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<tr>
<td>Topic Report</td>
<td>Week 12 25th of May</td>
<td>10%</td>
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<td>Students will select a topic based a range of allocated primary or secondary materials processing methods and techniques outlined in this course. A 2 page (minimum 1200 words) report including table of contents, figures, figure captions and appropriate references based on this topic shall be submitted.</td>
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| Topic Presentation              | Week 12 23rd & 25th of May   | 10%              |
| Students will prepare and present a 10 minute oral presentation including digital projector slides (MS Powerpoint or similar) based on their allocated Topic Report subject matter. |

| Midsession Examination          | Week 5 4th of April 13:00-15:00 | 40%              |
| The examination will be 2 hours in duration and held during class time. Students will be assessed on primary processing course material (Weeks 1-4). You will be assessed in understanding and ability to apply theory and technology learnt throughout the course in a Q & A context. |

| Final Examination               | TBA                           | 40%              |
| The examination will be 2 hours in duration and held during the examination period. Students will be assessed on secondary processing course material (Weeks 5-11). You will be assessed in understanding and ability to apply theory and technology learnt throughout the course in a Q & A context. |

References


Learning and teaching philosophy underpinning the course

Based on UNSW Learning Guidelines

The course is designed for students to actively engage in the learning process and analyse and synthesise the content in a real world environment.

- **Students are engaged actively in the learning process.**
  It is expected that, in addition to attending classes, students will read, write, discuss, and engage in analysing the course content.

- **Effective learning is supported by a climate of inquiry, where students feel appropriately challenged.**
  Students are expected to be challenged by the course content and to challenge their own preconceptions, knowledge, and understanding by questioning information, concepts, and approaches during class and study.

- **Learning is more effective when students’ prior experience and knowledge are recognised and built on.**
  Coursework, tutorials, assignments, laboratories, examinations, and other forms of learning and assessment are intended to provide students with the opportunity to cross-reference these activities in a meaningful way with their own experience and knowledge.

- **Students become more engaged in the learning process if they can see the relevance of their studies to professional and disciplinary contexts.**
  The course content is designed to incorporate both theoretical and practical concepts, where the latter is intended to be applicable to real-world situations and contexts.
## Course Information

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<th>Units of credit</th>
<th>6</th>
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<tr>
<td>How the course relates to other course offerings and overall program(s) in the discipline</td>
<td>This is a Master's level course and a background in materials science, process metallurgy or physical metallurgy would be advantageous.</td>
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| Graduate attributes which will be gained through the course | • Ability to communicate effectively  
• Capacity for creativity and innovation  
• Ability to manage information and documentation  
• Understanding of professional and ethical responsibilities, and commitment to them  
• Ability to function effectively as an individual  
• Ability to work effectively in multidisciplinary and multicultural teams  
• Capacity for lifelong learning and professional development  
• Professional attitudes |
| Expected learning outcomes | In doing this course, you will learn to:  
• Identify the distinguishing features of different types of primary and secondary processing techniques and their commercial applications.  
• Solve problems and identify appropriate processing techniques suitable for specific real-world applications in a systematic, analytical manner.  
You will also learn to:  
• Communicate with correct terminology  
• Conduct online research |
| Teaching strategies | • Core concepts, theories and approaches will be covered in lectures.  
• These concepts will be synthesised in a practical context in topic assignments and presentations.  
• Class discussion will be extensively used to encourage students involvement in teaching and learning  
• Teaching material, including course outline, notes, assignments, case studies and course announcements are available on the Course Moodle website.  

*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 a 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
† Adapted with kind permission from the University of Melbourne.
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.