Course Outline

MATS4001

Secondary Processing of Metals

Materials Science and Engineering

Science

T2, 2020

1. Staff

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor	Prof. Jianqiang Zhang	j.q.zhang@unsw.edu.au	Room 348, School of Materials Science and Engineering (Building E10), by appointment	Phone: 9385 5025
Lecturer	A/Prof. Sammy Chan	sli.chan@unsw.edu.au	Room 245, School of Materials Science and Engineering (Building E10), by appointment	Phone: 9385 4441

2. Course information

Units of credit: 6

Pre-requisite(s): None

Timetabling website: TBA

Teaching times and locations:

	Lecture	Lecture	Lecture
Day	Monday	Tuesday	Friday
Location	Online	Online	Online
Time	3-5pm	4-6pm	11am-1pm
Weeks	1,3-5,7-10	1-5,7-10	1-5,7-10

2.1 Course summary

Solidification, welding (emphasis on effect of welding on microstructure, HAZ's etc), fundamentals of metal working (including hot working, Zener-Hollomon parameter, dynamic recovery and recrystallization and cold working including slip line field theory, slab and upper bound analyses, formability, residual stresses), powder metallurgy and sintering, machining, recrystallization phenomena. Emphasis on the effect of processing conditions on microstructure and hence properties. Common classes of magnesium alloys, copper alloys and cast irons to be taught illustrating some of the principles involved

2.2 Course aims

To develop an understanding of the principles and practice of secondary processing of metals. Emphasis will be given to relevant physical metallurgy theories that underpin these processes. These methods will be illustrated with respect to commercial cast irons, magnesium and copper alloys.

2.3 Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

1. Make informed decisions in recommending selection of processing methods
2. Relate the microstructure of processed materials to processing conditions and behaviour in service
3. Solve problems relating to the solidification and the secondary processing of materials

2.4 Relationship between course and program learning outcomes and assessments

Course Learning Outcome (CLO)	LO Statement	Program Learning Outcome (PLO)	Related Tasks & Assessment
CLO 1	Make…	1.3, 1.4, 2.1 & 3.2	2, 3 & 4
CLO 2	Relate…	1.3, 1.4 & 3.2	2, 3 & 4
CLO 3	Solve…	1.4, 2.3 & 3.3	1 & 4

3. Strategies and approaches to learning

3.1 Learning and teaching activities

(Based on UNSW Learning Guidelines)

- *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.

Lectures: The core concepts will be taught in lectures, students will have access to the lectures notes before class for annotation during the lecture. Students will be engaged in the learning process through class discussions and problem-solving questions independently and working together with partners and groups.

3.2 Expectations of students

- Students must attend at least 80% of all classes with the expectation that students only miss classes due to illness or unforeseen circumstances
- Students must read through lecture notes and lab sheets prior to class
- During class, students are expected to engage actively in class discussions
- Students should work through lecture, tutorial and textbook questions
- Students should read through the relevant chapters of the prescribed textbook.
- Students should complete all assessment tasks and submit them on time.
- Students are expected to participate in online discussions through the Moodle page

4. Course schedule and structure

This course consists of 60 hours of class contact hours. You are expected to take an additional 90 hours of non-class contact hours to complete assessments, readings and exam preparation.

Week	Topics	Activity
1-2	Recrystallization phenomena	
3-4	Fundamentals of metal working (including hot working, Zener-Hollomon parameter, dynamic recovery and recrystallization and cold working including slip line field theory, slab and upper bound analyses, formability, residual stresses), Common classes of copper alloys	
5	Revision	Assignment 1
5,7	Review of solidification theory and practice. Common classes of magnesium alloys and cast irons	Mid-session exam
8-9	Welding, effect of welding on microstructure, HAZ's, etc.	
9-10	Metal forming processes: forging rolling and extrusion Revision	Assignment 2

5. Assessment

5.1 Assessment tasks

Assessment task	Description	Weight	Due date
Assignment 1:	The assignment covers the topics taught in Weeks 1-5, namely recrystallisation and fundamental metal working theories, such as Zener-Hollamon parameter, dynamic restoration processes, slip line field theory etc)	10%	Week 5
Mid-session quiz:	The mid-term exam includes questions pertaining to the material learnt in Weeks 1-5	40%	Week 7
Assignment 2:	This assignment covers the topics taught in Weeks 5,7-10, namely casting, welding and common metal working processes (forging, rolling and extrusion)	10%	Week 10
Final exam:	The exam will be 2hrs in duration and held in the final exam period. It will cover the second part of the course weeks 6 – 10	40%	Final exam period

Further information

UNSW grading system: https://student.unsw.edu.au/grades

UNSW assessment policy: https://student.unsw.edu.au/assessment

5.2 Assessment criteria and standards

- The assessment criteria and standards will
- Students who fail to achieve a score of at least 40% for either the mid-session exam and/or final exam but achieve a final mark >50% for the course, may still be awarded a UF (Unsatisfactory Fail) for the course.
- Please refer to the UNSW guide to grades: https://student.unsw.edu.au/grades

5.3 Submission of assessment tasks

- UNSW operates under a Fit to Sit/ Submit rule for all assessments. If a student wishes to submit an application for special consideration for an exam or assessment, the application must be submitted prior to the start of the exam or before an assessment is submitted. If a student sits the exam/ submits an assignment, they are declaring themselves well enough to do so. Information on this process can be found here: https://student.unsw.edu.au/special-consideration. Medical certificates or other appropriate documents must be included. Students should also advise the lecturer of the situation.
- Unless otherwise specified in the task criteria, all assignments must be uploaded via Moodle prior to the due date for submission.
- Assignments/lab reports submitted after the due date for submission 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: https://student.unsw.edu.au/disability. Early notification is essential to enable any necessary adjustments to be made.
- Rules governing conduct during exams are given at: https://student.unsw.edu.au/exam-rules

5.4. Feedback on assessment

Assignments: Feedback will be given two weeks after submission of the assignment and take the form of the mark for the assignment, overall comments on how the class performed, any common areas that were not answered correctly. Additionally, personal feedback and how each student performed may be given.

Midsession exams: Students will receive their marked exams indicating what questions were answered correctly and incorrectly. Overall comments and worked solutions may be provided to the class.

Final exam: Students will receive their final mark.

6. Academic integrity, referencing and plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits**:** honesty, trust, fairness, respect, responsibility and courage.[1] At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and **plagiarism** can be located at:

- The *Current Students* site https://student.unsw.edu.au/plagiarism**,** and
- The *ELISE* training site http://subjectguides.library.unsw.edu.au/elise/presenting

The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct.

7. Readings and resources

- D.Hull and D.J.Bacon, Introduction to Dislocations, 3rd Ed., 1988
- R.W.K.Honeycombe, The Plastic Deformation of Metals, 1968
- G.E.Dieter, Mechanical Metallurgy, 3rd Ed., 1988
- R.E.Reed-Hill and R. Abbaschian, Physical Metallurgy Principles, 1992

[1] International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

- R.E. Smallman and R. Bishop, Metals and Materials, 1996
- R.E. Smallman, Modern Physical Metallurgy, 1985.
- F.J. Humphreys and M. Hatherly, Recrystallization and Related Annealing Phenomena, Pergamon Press, Oxford, 1996

8. Administrative matters

School Office: Room 137, Building E10 School of Materials Science and Engineering
School Website: http://www.materials.unsw.edu.au/
Faculty Office: Robert Webster Building, Room 128
Faculty Website: http://www.science.unsw.edu.au/

9. Additional support for students

- The Current Students Gateway: https://student.unsw.edu.au/
- Academic Skills and Support: https://student.unsw.edu.au/academic-skills
- Student Wellbeing, Health and Safety: https://student.unsw.edu.au/wellbeing
- Disability Support Services: https://student.unsw.edu.au/disability-services
- UNSW IT Service Centre: https://www.it.unsw.edu.au/students/index.html
- Assessment Implementation Procedure: https://www.gs.unsw.edu.au/policy/documents/assessmentimplementationprocedure.pdf
- Special Consideration: https://student.unsw.edu.au/special-consideration