Course Outline

MATS2007

Sustainable Materials Processing

Materials Science and Engineering

Science

T3, 2020

1. Staff

Position	Name	Email	Consultation times and locations	Contact Details
Lecturer **(Week 1-4)**	A/Prof Runyu Yang	r.yang@unsw.edu.au	Room 349, School of Materials Science and Engineering (Building E10) by appointment	Phone: 9385 6565
Lecturer **(Week 5-7)**	Dr Ben Pace	b.pace@unsw.edu.au	Room 347, School of Materials Science and Engineering (Building E10) by appointment	Phone: 9385 4837
Course Convenor **(Week 8 to 10)**	Dr Rakesh Joshi	r.joshi@unsw.edu.au	Room 448, School of Materials Science and Engineering (Building E10) by appointment	Phone: 9385 6726

2. Course information

Units of credit: 6

Pre-requisite(s): None

Timetabling website: TBA

Teaching times and locations: http://timetable.unsw.edu.au/2020/MATS2007.html#S3-7453

	Lecture	Lecture	Lecture
Day	Monday	Tuesday	Friday
Time	11:00-13:00	15:00-17:00	12:00-14:00
Weeks	1-3, 5, 7-10	1-5, 7-10	1-5, 7-10

2.1 Course summary

This is a capstone course, topics include: Sustainability of materials processing, energy utilisation and recovery, energy analysis of industrial processes, waste recycling and pollution minimization, life cycle assessment, carbon tax and product stewardship, environmental trends, sustainable materials, products and processing technologies.

2.2 Course aims

To develop an awareness and understanding of sustainability issues in materials and their processing in relation to design and application of materials and their effects on energy requirements and environment. By studying this course, students will develop analysis and problem-solving skills, particularly in energy recovery, saving and reduction, materials selection, and recycling of waste materials.

2.3 Course learning outcomes (CLO)

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

1. Solve problems in a systematic, analytical manner
2. Identify the distinguishing features of different types of energy, their conversion and appropriate measures in energy recovery and utilisation.
3. Assess the energy consumption and greenhouse gas emission for the life cycle period.
4. Identify the environmental issues and the opportunities to reduce or eliminate energy consumption, wastes and greenhouse gases in materials processing, design and application

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	Solve…	2.1, 2.2 & 2.3	2 & 4
CLO 2	Identify…	1.1, 1.2, 1.3 1.4, 1.5, 3.2 & 3.6	1 & 2
CLO 3	Assess…	1.1, 1.2, 1.3, 1.4 & 1.5	2, 3 & 4
CLO 4	Identify…	1.1, 3.3, 3.4 & 3.6	2, 3 & 4

3. Strategies and approaches to learning

3.1 Learning and teaching activities

(Based on UNSW Learning Guidelines)

- *Students are actively engaged 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.

Guest speakers: Guest speakers will provide first-hand insights on how materials science is used in industry and provide real-world context to the concepts taught in class. Students will also have the opportunity to develop professional skills.

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 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
- Students are expected to think critically and in decision making and problem-solving
- Students are expected to communicate with correct terminology
- Students are expected to conduct online research
- Students are expected to work effectively in a team to solve problems

4. Course schedule and structure

This course consists of 54 hours of class contact hours. You are expected to take an additional 96 hours of non-class contact hours to complete assessments, readings and exam preparation spread over the term.

Week	Topics	Activity
1	Sustainability of Materials Processing – Problems and possible solutions	
1-2	Materials life cycle assessment and case study	Tutorial 1
3	Materials selection strategies and case study	Tutorial 2
4	Use of LCA software package	**Quiz 1**
5	materials efficiency	
6	Break	
7	Environmental footprint – production, maintenance, and end-of-life disposal Green House Effect, carbon tax pollution minimization	**Group report 1**
8	Sustainable materials Waste to Value: Green Manufacturing, and processing technologies	
9	Green Manufacturing, and processing technologies/ Virtual Tour of SMaRT centre:	
10	Group interview/ presentation	**Group activity**

5. Assessment

5.1 Assessment tasks

Assessment task	Description	Weight	Due date
Group report:	Three students will form a group and will select a topic in one of the energy production industries (fossil fuel, nuclear, solar, biomass, etc.) or one of metal/materials production industries (ironmaking, steelmaking, cement, aluminium, copper, etc.). They will collaborate in working on the same topic and investigate possible problems in that particular area and find the ways/solutions to achieve the sustainability for this industry by considering the application of new materials, innovative technologies, and waste and environmental management etc.	**10%**	Week 7
Quiz 1:	Including 2x in-class tutorial questions, 1 computer lab and mid-term exam in week 4 for the topics covered in weeks 1-4.	**30%**	Week 4
Activity SMaRT Centre (Virtual Tour) + Team Based Interview	Team based interview: Students will be asked to identify an environmental issue and then organise a Q&A style presentation where details of the problems and their solutions will be identified. Students will be assessed on the identification of the problem, proposed solutions, presentation style and demonstrated team cohesiveness.	**20%**	Presentation Week 10 Report Week 10
Final exam:	**The exam will be of 2hrs in duration.** You will be assessed in understanding and ability to apply theory and technology learnt throughout the course to energy, materials, and environmental sustainability problems **Topics covered in weeks 5-9**	**40%**	**UNSW end-of-term 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

Assessment criteria and standards for each assessment tasks are available on the course Moodle page.

NOTE: Students who fail to achieve a score of at least 40% for the overall exam component (i.e., mid-session exam and final exam marks combined), but achieve a final mark >50% for the course, will 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.

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

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

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

- Michael F. Ashby, Materials and the Environment, Elsevier, 2nd Edition, 2012.
- Mark Diesendorf, Sustainability and sustainable development. Chapter 2, St Leonards, N.S.W.: Allen and Unwin 2000
- Jatin Nathwani and Artie W. Ng: Paths to sustainable energy. InTech, Crotia, 2010.
- Sustainable Development Handbook--2nd edition / by Stephen A. Roosa. CRC Press, 2010.
- Jan Harmsen, Joseph B. Powell, Sustainable Development in the Process Industries, John Wiley & Sons, Inc., Hoboken, New Jersey, 2010.
- Krishnan Sankaranarayanan, Hedzer J. van der Kooi, and Jakob de Swaan Arons, Efficiency and Sustainability in the Energy and Chemical Industries: Scientific Principles and Case Studies, Second Edition. CRC Press, New York, 2010

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