



Course Outline

MATS4002

Design with Advanced Ceramics

Materials Science and Engineering

Science

T1, 2022

1. Staff

| Position | Name | Email | Consultation times and locations | Contact Details |
|----------|--------------|--|----------------------------------|-----------------|
| Course | A/Prof | dy.wang@unsw.edu.au | Room 239 | |
| Convenor | Danyang Wang | | | |

2.2 Course aims

The objective of the course is to familiarise students with the full range of materials, properties, applications, and design requirements necessary for the utilisation of high-performance ceramics in modern technological functions. The main design parameters that will be understood are defined by the thermal, chemical, mechanical, thermomechanical, tribological, electromechanical, magnetic, electrical, and optoelectronic properties of advanced ceramics. This will assist in building improved understanding of real-life performance scenarios for products made using these materials

2.3 Course learning outcomes (CLO)

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

1. Demonstrate an understanding the properties and characteristics of ceramics for high-performance applications.
2. Assess the range of typical properties of these materials with the aim of utilising them in high-demand designs requiring specific mechanical, thermal, electrical, and other properties.
3. Demonstrate an understanding of how to manipulate ceramic microstructures through processing in order to obtain optimal properties for different applications.

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 | Demonstrate... | 1.3, 1.4, 2.2, 3.2 & 3.4 | 2 & 3 |
| CLO 2 | Assess... | 1.3, 1.4, 2.2, 3.2, 3.4 & 3.6 | 1, 2, 3 & 4 |
| CLO 3 | Demonstrate... | 1.3, 1.4 & 3.4 | 1, 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 read, write, discuss, and are engaged in solving problems on the thermal and mechanical properties of materials, and in analysis and evaluation of materials' and devices' performance using electron/photon-

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 ceramic processing.

- Students become more engaged in the learning process if they can see the relevance of their

4. Course schedule and structure

This course consists of 52 hours of class contact hours. You are expected to take an additional 98 hours of non-class contact hours to complete assessments, readings and exam preparation.

| Week | Topics | Activity |
|-------------|---|-------------------------|
| 1 | Introduction Introduction to electroceramics Ferroelectric ceramic and their applications | |
| 2 | Ferroelectric ceramic and their applications Piezoelectric ceramics | |
| 3 | Piezoelectric ceramics Fibre-Optic Sensors Magnetic ceramics | Formative in-class quiz |

5. Assessment

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: [_____](#). Medical certificates or other appropriate documents must be included. Students should also advise the lecturer of the situation.
- In the absence of a request for special consideration, the maximal allowable extension for a late completion of assessment tasks is 7 days (includes non-working days) from the due date for that task. The penalty for late submission is a deduction of 10%/day of the total mark for each day, or part thereof after the due date.
- 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://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.
- 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 -8 ()11.9ssa(t)-1.1 ceentsea Of.2 (ud)-1/(ud)-1/(@078>Tj/TT0 1 Tf0.458 0 Td()Tj-0.002 Tc

responsibility and courage. 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

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>
-