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### Course at a Glance

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<th>Week</th>
<th>Dates</th>
<th>Topics</th>
<th>Assessment Tasks</th>
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<tr>
<td>1</td>
<td>29 February - 2 March</td>
<td>Introduction to Smart Materials and Smart Structures (DW)</td>
<td>Monday (11:00-13:00)</td>
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<tr>
<td>2</td>
<td>7 March - 9 March</td>
<td>Ferroelectric Ceramics and their Applications (DW)</td>
<td>Wednesday (09:00-11:00)</td>
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<td>3</td>
<td>14 March - 16 March</td>
<td>Piezoelectric Ceramics (DW)</td>
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<td>4</td>
<td>21 March - 23 March</td>
<td>Electro-optic Ceramics and Fibre-Optic Sensors (DW)</td>
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<td></td>
<td><strong>MID SESSION BREAK</strong></td>
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<tr>
<td>5</td>
<td>4 April - 6 April</td>
<td>Magnetic Ceramics (DW)</td>
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<tr>
<td>6</td>
<td>11 April - 13 April</td>
<td><strong>Presentation for Assessment Task 1 (DW)</strong></td>
<td>Introduction Microstructure and Property Correlations (PK)</td>
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<tr>
<td>7</td>
<td>18 April - 20 April</td>
<td><strong>MID-TERM EXAMINATION (DW)</strong></td>
<td>Mechanical Properties of Ceramics (PK)</td>
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<tr>
<td>8</td>
<td>27 April</td>
<td>Mechanical Properties of Ceramics (PK)</td>
<td></td>
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<tr>
<td>9</td>
<td>2 May - 4 May</td>
<td>Tribological Properties of Ceramics (PK)</td>
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<td>10</td>
<td>9 May - 11 May</td>
<td>Thermal Properties of Ceramics (PK)</td>
<td></td>
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<tr>
<td>11</td>
<td>16 May - 18 May</td>
<td>Thermomechanical Properties of Ceramics (PK)</td>
<td></td>
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<tr>
<td>12</td>
<td>23 May - 25 May</td>
<td>Chemical (corrosion) / Biological Properties of Ceramics (PK)</td>
<td></td>
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<td>13</td>
<td>30 May</td>
<td>Revision (PK)</td>
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<td></td>
<td></td>
<td><strong>FINAL EXAMINATION (PK)</strong></td>
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**Course Objectives**

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.

**Course staff**

| Dr Danyang Wang | Course Coordinator & Lecturer | Room 239, School of Materials Science and Engineering (Building E10) | Phone: 9385 7170  
dy.wang@unsw.edu.au | Consultation hours: by appointment |
|----------------|-------------------------------|---------------------------------------------------------------------|--------------------------------|-----------------------------------|
| Dr Pramod Koshy | Lecturer                      | Room 220, School of Materials Science and Engineering (Building E10) | Phone: 9385 6038  
koshy@unsw.edu.au            | Consultation hours: by appointment |

**Timetable**

**Lectures**

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Location</th>
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<tbody>
<tr>
<td>Monday</td>
<td>11:00 – 13:00</td>
<td>Mathews 311 (K-F23-311)</td>
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<tr>
<td>Wednesday</td>
<td>09:00 – 11:00</td>
<td>Law Building 163 (K-F8-163)</td>
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**Course Outline**

Oxide and non-oxide advanced ceramics, design parameters, structure/microstructure-processing-properties relations, thermal properties and materials, chemical (corrosion) properties and materials, mechanical properties and materials, thermomechanical properties and materials, tribological properties and materials, electromechanical properties and materials, magnetic properties and materials, electrical properties and materials, and optoelectronic properties and materials.
Assessment

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Weight</th>
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<tr>
<td><strong>Assessment Tasks 1</strong>&lt;br&gt;Students are required to conduct research into a mini-project about the smart materials/structures and their applications. The topics should be within the scope of electrical, electronic, optical and magnetic properties.&lt;br&gt;<strong>Requirements</strong>&lt;br&gt;A formal document, written to professional standard&lt;br&gt;A formal presentation&lt;br&gt;<strong>Due Dates</strong>&lt;br&gt;Week 6 (document) and Week 6 (presentation)</td>
<td>20%</td>
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<tr>
<td><strong>Assessment Tasks 2 (2 or 3 short assignments)</strong>&lt;br&gt;Students will be required to conduct research on a topic involving materials, properties, performance, of advanced ceramic products in terms of their mechanical / tribological / thermal / thermomechanical / corrosion / biological properties&lt;br&gt;Formal document written to professional standard (1-2 pp.) to be submitted within two weeks.</td>
<td>15%</td>
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<tr>
<td><strong>Laboratory Activity (To be confirmed)</strong>&lt;br&gt;Group activity on fabricating and testing ceramics and understanding the link between microstructures and properties</td>
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<tr>
<td><strong>Mid-Term Examination</strong>&lt;br&gt;<strong>Topics:</strong>&lt;br&gt;Electrical, electromechanical, magnetic and optoelectronic properties, and materials&lt;br&gt;<strong>Duration:</strong> 2 hours&lt;br&gt;<strong>Week 7</strong></td>
<td>30%</td>
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<tr>
<td><strong>Final Examination</strong>&lt;br&gt;<strong>Topics:</strong>&lt;br&gt;Mechanical, tribological, thermal, thermomechanical, chemical, and biological properties&lt;br&gt;<strong>Duration:</strong> 2 hours</td>
<td>35%</td>
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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

<table>
<thead>
<tr>
<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>The course follows in progression from MATS3002 <em>Fundamentals of Ceramic Processing</em>. The course assumes an understanding of ceramic processing parameters and then builds on these in terms of the properties of advanced ceramics, with an emphasis on the design variables relevant to the performance of products manufactured from these materials.</td>
</tr>
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| Graduate attributes that 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 |
| Expected learning outcomes | In doing this course, students will obtain:  
• An understanding of the oxides and non-oxides used to produce advanced ceramics  
• An appreciation of the structure/microstructure-processing-properties relations on design issues.  
• An understanding of the thermal, chemical, mechanical, thermomechanical, tribological, electromechanical, magnetic, electrical, and optoelectronic properties of advanced ceramics.  
• An appreciation of real-life performance scenarios for products made from these materials.  
Students also will learn:  
• To think critically in decision making and problem-solving  
• To communicate with correct terminology  
• To conduct library and online research  
• To work effectively to solve problems |
| Teaching strategies | • Core concepts, theories, and approaches will be covered in lectures.  
• These features will be synthesised in a practical context by discussing the impact of the structure, microstructure, processing, and properties on relevant design parameters.  
• More practical information will take the form of investigations of case studies of the use of advanced ceramics in a range of applications.  
• Teaching material, including course outline, relevant notes, case studies, and course announcements will be available on the Coaura Moodle website. |

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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 - Rules for the conduct of examinations

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