Course Outline

MATS2003

Materials Characterisation

Materials Science and Engineering

Science

T2, 2020

1. Staff

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor / Lecturer Lecturer	Dr Owen Standard	o.standard@unsw.edu.au	Room 243A, School of Materials Science and Engineering (Building E10) by appointment	Phone: 9385 4437

2. Understand the principles of operation of major instruments used for characterisation of materials, practical skills in examining and quantifying material structures
3. Understand the importance of structure to mechanical, physical, and other properties of materials
4. Prepare appropriate test samples from host components using routine metallographic techniques.
5. Select and apply crystallography, X-ray diffraction, optical microscopy, electron microscopy, and selected spectroscopic techniques to characterise the composition and structure of materials.

2.4 Relationship between course and program learning outcomes and assessments

Course Learning Outcome (CLO)	Program Learning Outcome (PLO)	Related Tasks & Assessment
CLO 1	1.3, 1.4, 2.2, 3.2 & 3.4	1, 2, 3 & 4
CLO 2	1.3, 1.4 & 2.2	1, 2 & 4
CLO 3	1.3 & 3.4	1, 3 & 4
CLO 4	1.3	1, 2 & 4
CLO 5	1.3, 3.4 & 3.5	1, 2 & 4

3. Strategies and approaches to learning

3.1 Learning and teaching activities

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 in the characterisation of materials and the analysis of materials behaviour. This is facilitated by interactive online tutorials, calculation- based assignments, and laboratory reports.

Effective learning is supported by a climate of inquiry where students feel appropriately challenged.
Understanding of the underlying theory and principles of metallography, crystallography, diffraction, microscopy, and spectroscopy are challenging – students will apply this to real-world materials and situations by performing calculations, solving problems, and completing practical laboratories.

Learning is more effective when students' prior experience and knowledge are recognised and built on.
This course is built on prior courses in materials science, computing, mathematics, chemistry, and physics.

Students become more engaged in the learning process if they can see the relevance of their studies to professional and disciplinary contexts

4. Course schedule and structure

The recommended pace of self-learning in the course is indicated in the table below. Nominally there are 3 x 2 hrs recorded lectures per week. The online laboratories are nominally 2 hrs each (for 4 labs). The formal mid-term and final exams are nominally 2 hours each. You are expected to take an additional 60 hours (2 hrs per week) of non-class contact hours to study and readings, complete assessment tasks, study and readings, and exam preparation spread over the term.

Week	Topics	Activity
1	Course introduction Specimen >>BDC 110.28 .6 (r)28 .6 1m	

5. Assessment

5.1 Assessment tasks

Assessment task	Description	Weight	Due date
Tutorial/ Assignments:	Crystallography Assignment: Students will determine basic crystallographic relationships and perform crystal structure calculations.	8%	Week 4
	X-ray Diffraction Assignment: The principle of operation of a powder X-ray diffractometer will be demonstrated to students by means of a video. Students will determine crystallographic structure factors and diffraction intensities of a selected material from first principles and will use them to compare with me.8s68.8 2.88 re f* 0.75 f* BT 0-1.9 (l)-0.6 ( )0.6		

Assessment tasks submitted after the deadline will receive a penalty of 20% of the max. grade for every day late, or part thereof. Assessment tasks submitted 5 or more days after the deadline will

7. Readings and resources

- C. Barrett and T.B. Massalski, Structure of Metals, 3rd Revised Edition. Pergamon Press, Oxford, 1980.
- B.D. Cullity and S.R. Stock, Elements of X-ray Diffraction, 3rd Revised Edition. Prentice-Hall Inc., 2001.
- R. Jenkins & R.L. Snyder, Introduction to X-ray Powder Diffractometry. John Wiley & Sons Inc., 1996
- N.F. Kennon, Patterns in Crystals. John Wiley, Chichester, 1980.
- M.H.Loretto, Electron Beam Analysis of Materials, Second Edition. Chapman and Hall, New York, 1994.
- Metals Handbook, Ninth Edition, Volume 9 Metallography and Microstructures. American Society for Metals, USA, 1985.
- J.C. Russ, The Image Processing Handbook, Third Edition. CRC Press, Boca Raton, Florida, 1999.
- G.F. Vander Voort, Metallography Principles and Practice. McGraw Hill, New York, 1984.
- Y. Waseda, E. Matsubara, and K. Shinoda, X-Ray Diffraction Crystallography: Introduction, Examples and Solved Problems. Springer, Berlin, 2011.

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