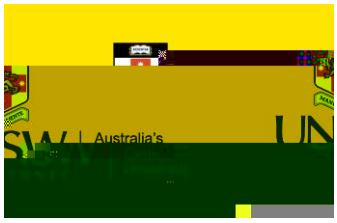

Course Outline

MATS4007

Engineered Surfaces to Resist Corrosion and Wear
Materials Science and Engineering

Science

T3, 2022

1. Staff

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor	Dr Judy Hart	j.hart@unsw.edu.au	Room 339	

Wear: Wear occurs in many engineering applications; this course will inform students of the economic reasons for developing wear-resistant materials and how other material properties affect the wear resistance. To understand the complex wear system, the fundamental models of wear will be taught through the wholistic tribological approach.

2.2 Course aims

To learn the behaviour of surfaces, electrochemical series, corrosion, methods for prevention of corrosion, stress corrosion cracking, wear and friction phenomena, surface hardening – nitriding, carburisation, hard coatings, oxidation, oxidation resistant coatings; Examples of materials selection for corrosion and wear resistance; Common corrosion-resistant alloys will be introduced to illustrate some of these principles involved.

2.3 Course learning outcomes (CLO)

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

1. Explain the mechanisms of wear and the environmental effect upon wear of different materials, and how to combat wear by correct selection of materials and/or lubrication.
2. Use the theories of different surface treatment processes and the properties of surfaces produced, so as to employ surface treatment processes professionally in engineering applications.
3. Identify the relationships between materials, microstructures and environments on corrosion behaviour of metals.
4. Select the right materials and apply different technologies for corrosion prevention.

2.4 Relationship between course and program learning outcomes and assessments

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.

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7. Readings and resources

Textbooks

I.M. Hutchings, Tribology, Edward Arnold, 1992.

B. Bhushan, Introduction to Tribology, 2nd Ed. (Wiley, 2013).

D.A. Jones, Principles and Prevention of Corrosion, 2nd Ed. Prentice Hall

Additional References

R.D. Arnell, P.B. Davies, J. Halling and T.L. Whomes, Tribology, (Macmillan, 1991).

G.W. Stachowiak and A.W. Batchelor, Engineering Tribology, 3rd Ed. (Elsevier, 2005).

D. F. Moore, Principles and Applications of Tribology, (Pergamon, 1975).

M.F. Ashby and D.R. Jones, Engineering Materials, (Pergamon, 1980), Ch. 25 and 26, p223-235.

Surface Cleaning, Finishing and Coating, Metals Handbook, 9th Ed., Vol. 5, (ASM, 1982)

R. Kossowsky, Surface Modification Engineering, (CRC Press Inc., 1989)

R.D. Sisson, Surface Modification and Coatings, (ASM, 1986)

T.S. Sudarshan and D.G. Bhat, Surface Modification Technologies I & II (The Metallurgical Society 1988 & 1989)

H. Silman, G. Isserlis and A.F. Averill, Protective and Decorative Coatings for Metals, Finishing Pub. 1978

M.G. Fontana Corrosion Engineering, McGrew Hill

H.H. Uhlig and R.W. Revie Corrosion and Corrosion Control, Wiley-Interscience

K.R. Trethewey and J Chamberlain Corrosion -- for students of Science and Engineering, Longman

J.M. West, E. Horwood Basic Corrosion and Oxidation, John Wiley & Sons

U.R. Evans, An Introduction to Metallic Corrosion, Edward Arnold

8. Administrative matters

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School Website: http://www.materials.unsw.edu.au/
Faculty Office: Robert Webster Building, Room 128
Faculty Website: http://www.science.unsw.edu.au/

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