

D E P A R T M E N T O F
Materials Science & Engineering



College of Engineering

University of Wisconsin-Madison

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MS&E 271 - Materials Science and Engineering Problem Solving I

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Catalog Description

271 Materials Science and Engineering Problem Solving I. I or II; 2 cr. Introduction to the application of commercial software tools (spreadsheets and equation solvers) to solving materials science and engineering problems, including heat and mass balances, steady state heat transfer and diffusion, nucleation, and solidification.

Course Prerequisite(s)

- Chem 103
- Math 222

Prerequisite knowledge and/or skills

- Calculus, freshman chemistry, and concurrent registration in physics

Textbook(s) and/or other required material

- H. Scott Fogler and Steven E. LeBlanc, Strategies for Creative Problem Solving, Prentice Hall, NJ 1995
- Reading assignments from the literature
- Notes, laboratory exercise packets, and other course materials prepared by F.J. Bradley

Course objectives

- Develop computer fluency in using common computer tools for problem solving, data analysis and information processing and presentation.
- Learn how to apply generic problem solving heuristics to elementary sophomore-level engineering problems.
- Gain a better understanding of self and others.
- Be able to contribute effectively in a team environment.

Topics covered

- Elements of problem solving, including strategies and heuristics, attitude, creativity, teamwork.
- Basic and select advanced features of productivity and equation solving computer tools: Word, Excel, Access, PowerPoint, EES, MathCAD.
- Internet basics: Web, ftp, email, searching, HTML.
- Introduction to the design and construction of websites.
- Mind mapping.
- Learning styles (e.g. Myers-Briggs and Kolb Learning Style Inventory).

- Brain function, memory, and learning.
- Theories of intelligence.
- Perry's Model of Intellectual Development.
- Motivation.

Class/laboratory schedule

- two 3 hour computer class/laboratories per week

Contribution of course to meeting the professional component

This course contributes primarily to the students' knowledge of engineering topics, and does provide design experience.

- Economic
- Ethical
- Societal

Relationship of course to undergraduate degree program objectives

This course primarily serves students in the department. The information below describes how the course contributes to the undergraduate program objectives.

- Ability to apply knowledge of mathematics and physics to the solving basic materials science and engineering problems (Van der Waal's equation of state for real gases, 1D steady state temperature profile in a slab with heat generation, analytical solution for distance solidified versus time for the case of the water-cooled mold) [ABET:3a]
- An ability to analyze and interpret experimental data (frequency distribution of microstructure image analysis data, statistical analysis of experimental data, Access database application for the analysis and interpretation of chemistry process control data) [ABET:3b]
- An ability to design a system to meet desired needs (team project involving the design and construction of website) [ABET:3c]
- An ability to function on teams [ABET:3d]
- An ability to identify, formulate, and solve engineering problems [ABET:3e]
- An understanding of professional and ethical responsibility (reading/mind mapping/discussion assignment) [ABET:3f]
- An ability to communicate effectively orally and in writing (reading/mind mapping/discussion assignments and team presentation and write up of Web project) [ABET:3g]
- A recognition of the need for, and an ability to engage in life-long learning (reading/mind mapping/discussion assignments) [ABET:3i]
- An ability to use the techniques, skills and modern engineering and computing tools necessary for engineering practice (experience in using Excel, Word, Access, PowerPoint, MathCAD, and EES in a variety of contexts to solve engineering problems and process data and information) [ABET:3k]

Assessment of student progress toward course objectives

- Two exams to assess students' ability to use the various computer tools to solve elementary engineering problems, analyze data, and process information. (60%)
- A team grade based on design, presentation and written report of website project. (25%)
- Construction of mind maps and participation in discussion of reading assignments. (15%)

Person(s) who prepared this description

- [Fred J. Bradley](#)

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