

## **CHEE 1331 (Required) Computing for Engineers**

CHEE 1331: Computing for Engineers (also CIVE 1331, INDE 1331) Cr. 3. (2-2). Prerequisite: MATH 1431. Credit may not be received for more than one of CHEE 1331, CIVE 1331 and INDE 1331. Introduction to the computing environment; matrix arithmetic; programming essentials; spreadsheets; symbolic algebra tools; solution of typical engineering problems using computer tools.

**Instructor:** Prof. Michael Nikolaou  
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Office hours: Open-door policy

*Students are encouraged to submit questions to the Instructor by email as soon as such questions arise.*

**Textbooks:** W. J. Palm III, Introduction to Matlab 7 for Engineers, McGraw-Hill, 2005. B. S. Gottfried, *Spreadsheet Tools for Engineers Using Excel 2007*, McGraw-Hill.  
D. M. Etter, *FORTTRAN 77 for Engineers*, Benjamin/Cummings, 1995<sup>1</sup>.

<sup>1</sup> Out of print. PDF file placed at <http://blackboard.egr.uh.edu>. A printout of the PDF file is available at the UH Copy Center.

**Additional material:** <http://blackboard.egr.uh.edu>

### **Prerequisites by Topic:**

- Algebra
- Calculus

### **Expected Student Outcomes:**

- Programming concepts:
  1. Demonstrate ability to write computer programs to solve simple numerical problems using software tools, such as:
    - Matlab (programming language and calculator)
    - Fortran (programming language)
    - Excel (electronic spreadsheet)
  2. Demonstrate ability to interface existing software tools with simple customized code
- Engineering problem solving concepts:
  - Demonstrate ability to read engineering problem statements, translate them to computing problems, solve them and report results

**Student Evaluation and Outcomes Assessment:**

Homework: 10% (assigned at <http://blackboard.egr.uh.edu>)

Exam 1<sup>a</sup>: 30%

Exam 2<sup>a</sup>: 30%

Final Exam<sup>a</sup>: 30%

**Topics:**

Part 1. Matlab

Part 2. FORTRAN

Part 3. Excel

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<sup>a</sup> ABET student outcome a

Lecture #	Topics	
Lecture 1	Introduction: Overview of Computing, Matlab, Fortran, Excel	Material for Exam 1 (Matlab)
Lecture 2	An Overview of Matlab (Palm, Chapter 1)	
Lecture 3	Numeric, Cell, and Structure Arrays (Palm, Chapter 2)	
Lecture 4	Functions and Files / Programming with MATLAB (Palm, Chapter 3)	
Lecture 5	Programming with MATLAB (Palm, Chapter 4)	
Lecture 6	Programming with MATLAB (Palm, Chapter 4)	
Lecture 7	Linear Algebraic Equations (Palm, Chapter 6)	
Lecture 8	Plotting and Regression (Palm, Chapter 5)	
Lecture 9	Probability and Statistics (Palm, Chapter 7)	
Lecture 10	Numerical Calculus and Differential Equations (Palm, Chapter 8)	
Lecture 11	Numerical Calculus and Differential Equations (Palm, Chapter 8)	
Lecture 12	Symbolic Processing with MATLAB (Palm, Chapter 10)	
Lecture 13	Solving Problems with FORTRAN 77 - Arithmetic Computations (Etter, Chapter 1 & 2)	Material for Exam 2 (FORTRAN)
Lecture 14	Control Structures (Etter, Chapter 3)	
Lecture 15	Engineering and Scientific Data Files (Etter, Chapter 4)	
Lecture 16	Array Processing (Etter, Chapter 5)	
Lecture 17	Function Subprograms (Etter, Chapter 6)	
Lecture 18	Subroutine Subprograms (Etter, Chapter 7)	
Lecture 19	Additional Data Types (Etter, Chapter 8)	
Lecture 20	Applications (Notes)	
Lecture 21	Analyzing Data Statistically (Gottfried, Chapter 6)	Material for Final Exam (Excel)
Lecture 22	Fitting Equations to Data (Gottfried, Chapter 7)	
Lecture 23	Solving Single or Simultaneous Equations (Gottfried, Chapter 11 & Chapter 12)	
Lecture 24	Optimization (Gottfried, Chapter 16)	
Lecture 25	Solving differential equations (Notes)	
Lecture 26	Applications (Notes)	

## Appendix

ABET Outcome, Criterion 3	Program-Specific Outcomes
(a) an ability to apply knowledge of mathematics, science and engineering.	<ul style="list-style-type: none"> <li>● Use chemistry and physics concepts to set up and solve chemical engineering problems</li> <li>● Use mathematical tools to solve chemical engineering problems</li> </ul>
(b) an ability to design and conduct experiments as well as to analyze and interpret data.	<ul style="list-style-type: none"> <li>● Select appropriate experimental equipment and techniques necessary to solve a given problem</li> <li>● Evaluate and interpret experimental results using statistical tools and chemical engineering concepts</li> </ul>
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health & safety, manufacturability, and sustainability.	<ul style="list-style-type: none"> <li>● Apply material and energy balance concepts to design a unit operation</li> <li>● Define objectives and perform the design of an integrated chemical process under realistic constraints</li> </ul>
(d) an ability to function on multi-disciplinary teams.	<ul style="list-style-type: none"> <li>● Define roles and responsibilities to align with capabilities of team members and fulfill project requirements</li> <li>● Develop and carry out a project plan through team work</li> </ul>
(e) an ability to identify, formulate and solve engineering problems.	<ul style="list-style-type: none"> <li>● Translate an engineering problem into a mathematical model or other suitable abstraction</li> <li>● Use mathematical model or other suitable abstraction to solve an engineering problem and interpret results</li> </ul>
(f) an understanding of professional and ethical responsibility.	<ul style="list-style-type: none"> <li>● Demonstrate knowledge of professional code of ethics.</li> <li>● Identify ethical issues and make decisions for a chemical engineering problem.</li> </ul>
(g) an ability to communicate effectively.	<ul style="list-style-type: none"> <li>● Make presentations that are factual and tailored to the audience</li> <li>● Can communicate in writing to non-technical and technical audiences</li> </ul>
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	<ul style="list-style-type: none"> <li>● Understand the impact of chemical engineering solutions in a global, economic, environmental, and societal context.</li> </ul>
(i) a recognition of the need for and an ability to engage in life-long learning.	<ul style="list-style-type: none"> <li>● Recognize the importance of advanced education and development opportunities</li> <li>● Identify, retrieve, and organize information necessary to solve open-ended problems</li> </ul>
(j) a knowledge of contemporary issues.	<ul style="list-style-type: none"> <li>● Know the interplay between current technical and societal issues</li> <li>● Know the recent history, current status, and future trends of chemical engineering</li> </ul>
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	<ul style="list-style-type: none"> <li>● Use modern software to solve chemical engineering problems</li> <li>● Understand how to operate equipment relevant to chemical engineering systems</li> </ul>