Course Outcomes	CSC 2533

CSC 2533: Introduction to Engineering Computation

Credit Hours: 3 hours

Frequency: Fall and Spring semesters

Prerequisites:

MATH 1550

Prerequisites by Topics:

Calculus (derivatives with respect to a single variable, partial derivatives, single integrals (one integration variable), double integrals (two integration variables))

Catalog Course Description:

Also offered as ME 2533. Problem solving techniques and structured programming tools for engineering synthesis and analysis; application of symbolic solvers and technical computing toolkits.

Course Outcomes

1. Be familiar with the MATLAB programming language,
2. Be familiar with finite precision computation,
3. Be familiar with solutions of nonlinear equations in a single variable,
4. Be familiar with solutions of nonlinear equations in two or three variables,
5. Be familiar with solutions of systems of linear equations,
6. Be familiar with numerical integration for one integration variable,
7. Be familiar with numerical integration for two integration variables,
8. Be familiar with solutions of ordinary differential equations,
9. Be familiar with solutions of systems of ordinary differential equations,
10. Be familiar with plotting graphs.

Texts and Other Course Materials

MATLAB Programming for Engineers – Stephen J. Chapman 0-534-42417-1 Latest edition, Thomson

Major Topics

- Fundamentals of MATLAB programming,

- Convergence of numerical methods,
- Iterative solver method for single root finding,
- Newton's Method for single root finding,
- Newton's Method for multiple root finding,
- Gauss-Jordan Method for solving systems of linear equations,
- Simpson's Rule for numerical integration of single integrals (one integration variable),
- Simpson's Rule for numerical integration of double integrals (two integration variables),
- Runge-Kutta Method for solving first order differential equations,
- Runge-Kutta Method for solving second order differential equations,
- Runge-Kutta Method for solving systems of first order differential equations,
- Runge-Kutta Method for solving systems of second order differential equations,
- Fundamentals of plotting graphs,
- Plotting multiple curves on the same graph.

Assignments/Projects/Laboratory Projects/Homework

- 12 three-hour labs
- Each lab has two programming assignments based on the major topics listed above

Curriculum Category Content (estimated in semester hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms	12	0	Data Structures	3	0
Software Design	10	0	Prog. Languages	12	0
Computer Arch.	1	0			

Relationship to Criterion 3 Outcomes

A	B	C	D	E	F	G	H	I	J	K
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Math Fundamentals:
Solving an equation for a variable, derivatives, partial derivatives, matrix multiplication, inverse of a matrix, linear algebra techniques, iteration of numerical methods, root finding, numerical integration, numerical solutions of differential equations – 8 hours

Data Structures:
Variables, one-dimensional arrays, two-dimensional arrays – 3 hours

Algorithms and Software:
Problem analysis and algorithm development – 12 hours
Programming logic, software design – 10 hours

Computer Organization and Architecture:
Components of computer, data storage (bits, bytes), limit on size of integer – 1 hour

Concepts of Programming Languages:
Variables, arrays, read statements, print statements, plot statements, arithmetic operators and functions, arithmetic expressions, relational and logical operators, logical expressions, if statements, while loops, for loops, user-defined functions – 12 hours

Social and Ethical Issues:

Oral Communication (presentations):
None

Written Communication:
Students are required to include comments in their programs

Course Coordinator: Dr. Nathan Brener
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