CONESTOGA

COURSE OUTLINE

Course Numerical Methods (2012-2013)

Code / Version MATH3160 (100)

Total Hours 45

Credits 3

PreRequisite(s) MATH1125 (100) Math II (Electronics)
or MATH2000 (100) Applied Math II

CoRequisite(s)

Course Description

This course focuses on providing the mathematical knowledge required to apply numerical methods for solving engineering and software application problems.

Course Outcomes

Successful completion of this course will enable the student to:

1. Implement matrix manipulation to perform 2-dimensional (2D) and 3-dimensional (3D) transformations such as scaling graphical data, basic trigonometric transforms such rotation of objects in 2D and 3D space, and movement of objects through 2D and 3D space.
2. Describe the role of trigonometry in graphical manipulation, and polar to rectangular conversions, complex numbers, use of sinusoids to represent frequencies in audio data.
3. Solve systems of equations.
4. Demonstrate linear interpolation.
5. Demonstrate trajectory calculations, relations and functions that define natural movement of objects.
6. Demonstrate basic numerical methods, such as fixed fractional bit math and fast expansions for floating point arithmetic, to support fast integer-only mathematics for audio and video data processing.
7. Demonstrate numerical methods in basic calculus including integration and differentiation techniques.

Unit Outcomes

Successful completion of the following units will enable the student to:

1.0 Introduction to Numerical Methods

- 1.1 Explain the need for high speed mathematics in a graphical or gaming environment.
- 1.2 Describe how to represent fractional information without using fractions, by scaling and reducing real numbers to eliminate fractions (fixed fractional bit arithmetic).
- 1.3 Describe simple mathematical expansions for common mathematical operations such as exponentials, logarithms, and trigonometric functions.
- 1.4 Explain when approximations are preferred over more precise real number mathematics.

2.0 Solving Systems of Equations and Linear Interpolation

- 2.1 Demonstrate how to solve a system of equations.
- 2.2 Demonstrate simple interpolation between two or more known points of data in 2D or 3D space.
- 2.3 Describe advanced interpolation concepts, such as approximating curvilinear paths with multiple linear segments in 2D or 3D space.

3.0 Basic Trajectory Calculations

- 3.1 Review standard relations and functions with emphasis on concepts such as parabolas, hyperbolas, ellipses, etc.
- 3.2 Describe how objects such as balls, missiles, etc., can be modeled mathematically through the use of relations and functions such as a parabola.
- 3.3 Describe how concepts such as gravity or friction affect ideal paths of objects.

Course Numerical Methods (2012-2013)

Code / Version MATH3160 (100)

3.4 Describe the concept of orbits and how various relations and functions such as ellipses or hyperbolas can be used to represent the path of objects around planets, stars, etc.

3.5 Demonstrate trajectory calculations in a graphical environment.

4.0 Introduction to Derivatives

4.1 Review concepts such as slope of lines, secants, tangents.

4.2 Describe the relationship between distance, velocity, acceleration, and other rate calculations.

4.3 Describe the concepts behind sequences and limits.

4.4 Describe and apply the concept of a derivative.

4.5 Describe how derivatives define the instantaneous rate of change.

4.6 Calculate the derivatives of polynomials, products and quotients of functions.

4.7 Describe how derivatives apply to curvilinear motion.

5.0 Introduction to Integration

5.1 Describe the concept of an anti-derivative.

5.2 Describe role of integration when calculating area under a curve.

5.3 Describe numerical integration.

5.4 Describe the trapezoidal rule and Simpson's rule.

5.5 Apply integration in situations such as area under curves, volume of solids, etc. using numerical methods.

Required Student Resources

Optional Student Resources

Gilat, Amos and Vish Subrarmaniam. Numerical Methods for Engineers and Scientists (2nd). Wiley.

Evaluation

The minimum passing grade for this course is 55 (D).

In order to successfully complete this course, the student is required to meet the following evaluation criteria:

Weekly Homework Assignments	50.00
Mid-term Exam	25.00
Final Exam	25.00
	100.00 %

Other

Conestoga College is committed to providing academic accommodations for students with documented disabilities. Please contact the Disability Services Office.

Prepared By Norbert Mika

School Information Technology

Date 2012-08-20

CONESTOGA

COURSE OUTLINE

Course Numerical Methods (2012-2013)

Code / Version MATH3160 (100)