

# ENGI-160: PROGRAMMING WITH MATLAB FOR ENGINEERS AND SCIENTISTS

---

## Effective Term

Fall 2026

## CC Approval

12/05/2025

## AS Approval

12/11/2025

## BOT Approval

12/18/2025

## COCI Approval

02/16/2026

## SECTION A - Course Data Elements

### CB04 Credit Status

Credit - Degree Applicable

### Discipline

Minimum Qualifications	And/Or
Engineering (Master's Degree)	

### Subject Code

ENGI - Engineering

### Course Number

160

### Department

Engineering

### Division

Science and Engineering (SE)

### Full Course Title

Programming With MATLAB for Engineers and Scientists

### Short Title

Prog w/MATLAB for Eng & Sci

### CB03 TOP Code

0701.00 - \*Information Technology, General

### CIP Code

11.0201

### CB08 Basic Skills Status

NBS - Not Basic Skills

### CB09 SAM Code

C - Clearly Occupational

### Rationale

Update due to CCN changes.

## SECTION B - Course Description

### Catalog Course Description

This course teaches computer programming using the MATLAB's syntax, control, and data structures. It includes object oriented programming techniques, introduces numerical techniques for scientific and engineering applications, and emphasizes optimal programming practices. Various aspects of the software life-cycle, including design, documentation, implementation, debugging, testing, and maintenance are introduced. Case studies and software projects are significant parts of the course.

## SECTION C - Conditions on Enrollment

### Open Entry/Open Exit

No

### Repeatability

Not Repeatable

### Grading Options

Letter Grade Only

### Allow Audit

Yes

## Requisites

### Prerequisite(s)

Completion of MATH-C2210 with a minimum grade of C.

## Requisite Justification

### Requisite Description

Course Not in a Sequence

### Subject

MATH

### Course #

C2210

### Level of Scrutiny

Required by 4-Year Institution

### Explanation

Single Variable Calculus I Early Transcendentals listed as a required prerequisite on C-ID descriptor for Programming and Problem-Solving in MATLAB (ENGI-220)

---

## SECTION D - Course Standards

### Is this course variable unit?

No

### Units

3

### Lecture Hours

36

### Lab Hours

54

### Outside of Class Hours

72

**Total Contact Hours**

90

**Total Student Hours**

162

**Distance Education Approval****Is this course offered through Distance Education?**

Yes

**Online Delivery Methods**

DE Modalities	Permanent or Emergency Only?
Entirely Online	Permanent
Hybrid	Permanent
Online with Proctored Exams	Permanent

**SECTION E - Course Content****Student Learning Outcomes**

Upon satisfactory completion of the course, students will be able to:	
1.	Apply numeric techniques and computer simulations to solve scientific- and engineering-related problems.
2.	Demonstrate understanding and use of fundamental data structures.
3.	Create and control simple plot and user-interface graphics objects in MATLAB.
4.	Design and document computer programs and analyses to communicate results, to facilitate evaluation and debugging, and to anticipate and resolve user errors.

**Course Objectives**

Upon satisfactory completion of the course, students will be able to:	
1.	Introduce the MATLAB software environment.
2.	Apply a variety of common numeric techniques to solve and visualize scientific- and engineering-related computational problems.
3.	Introduce common approaches, structures, and conventions for creating and evaluating computer programs, primarily in a procedural paradigm, but with a brief introduction to object-oriented concepts and terminology.
4.	Reinforce a structured, top-down approach to formulate and solve problems with MATLAB.

**Course Content**

1. Engineering Problem Solving Methodology
  - a. Problem definition and specifications
  - b. Input and output information and variables
  - c. Working a special case by hand
  - d. Design and implementation of computer algorithm
  - e. Test of algorithm
2. Technical Computing Environment
  - a. MATLAB interactive workplace
  - b. MATLAB documentation, help, and resources
  - c. Common mathematical functions
  - d. Designing, editing, and executing scripts
3. Array Mathematics
  - a. Arrays: scalars, vectors, and matrices
  - b. Scalar and array operations
  - c. Visualization: 2D plotting
4. Mathematical Functions
  - a. Complex numbers
  - b. Polynomial functions and operations
  - c. Random numbers
  - d. Functions of two variables

- e. Visualization: 3D plotting
- f. User-written functions
- 5. Selection Programming Structure
  - a. Relational and logical operators
  - b. If statements
  - c. Else & elseif clauses
  - d. Relational and logical functions
- 6. Repetition Programming Structure
  - a. For loops
  - b. While loops
  - c. Switch-case construction
- 7. Text Programming
  - a. Character strings
  - b. String conversions
  - c. String functions
  - d. Display formatting
- 8. Linear Algebra and Matrices
  - a. Matrix operations
  - b. Matrix functions
  - c. Special matrices
- 9. Solutions to Systems of Linear Equations
  - a. Graphical interpretation
  - b. Solution by matrix division and matrix inverse
- 10. Interpolation and Curve Fitting
  - a. One-dimensional interpolation
  - b. Two-dimensional interpolation
  - c. Curve fitting
- 11. Data Analysis
  - a. Maximum and minimum
  - b. Sums and products
  - c. Mean and median
  - d. Sorting
  - e. Variance and standard deviation
  - f. Histograms
- 12. Numerical Analysis
  - a. Minimization
  - b. Zero finding
  - c. Integration
  - d. Differentiation
- 13. Symbolic Mathematics
  - a. Symbolic objects, variables and expressions
  - b. Operations of symbolic expressions
  - c. Differentiation and integration
- 14. Object Oriented Programming
  - a. MATLAB's graphical user interface objects
  - b. Object generation and parameter modification

## Methods of Instruction

### Methods of Instruction

Types	Examples of learning activities
Discussion	Work with team members to analyze problems and data to determine optimal use of MATLAB to solve problems. Design of algorithms.
Experiments	Apply numeric techniques and computer simulations to solve scientific and engineering problems.
Lab	Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.
Lecture	Lecture topics are listed in the course content section.

Group Work Design of algorithms. Applications for MATLAB. Final Comprehensive Group Project (Examples: Pattern Recognition, Image Analysis/Identification, Floor Mapping).

### Online Adaptation

Types	Examples of learning activities
Activity	Apply numeric techniques and computer simulations to solve scientific and engineering problems.
Directed Study	Apply a top-down, modular, and systematic approach to design, write, test, and debug sequential MATLAB programs to achieve computational objectives.
Discussion	Work with team members to analyze problems and data to determine optimal use of MATLAB to solve problems. Design of algorithms.
Group Work	Design of algorithms. Applications for MATLAB. Final Comprehensive Group Project (Examples: Pattern Recognition, Image Analysis/Identification, Floor Mapping).
Lecture	Lecture topics are listed in the course content section.

### Instructor-Initiated Online Contact Types

Announcements/Bulletin Boards  
 Chat Rooms  
 Discussion Boards  
 E-mail Communication  
 Video or Teleconferencing

### Student-Initiated Online Contact Types

Chat Rooms  
 Discussions  
 Group Work

### Course design is accessible

Yes

## Methods of Evaluation

### Methods of Evaluation

Types	Examples of classroom assessments
Exams/Tests	Multiple Choice, Completion, Short Answer, and Programming. Final Exam – Multiple Choice, Completion, Short Answer, and Programming
Projects	Final Comprehensive Group Project (Examples: Pattern Recognition, Image Analysis/Identification, Floor Mapping). Analysis of scientific- and engineering-related problems. Programming to achieve computational objectives. Apply numeric techniques and computer simulations to solve scientific and engineering problems.
Simulation	Apply numeric techniques and computer simulations to solve scientific and engineering problems.
Lab Activities	Analysis of scientific- and engineering-related problems. Programming to achieve computational objectives. Apply numeric techniques and computer simulations to solve scientific and engineering problems.

## Assignments

### Reading Assignments

Assigned readings and elective readings as needed for to further understanding of topics covered in lecture and lab.

Examples:

Read specific section of the textbook, read an assigned article, use the internet to research a specific function of a MATLAB directive/command.

### Writing Assignments

Development of algorithms for problem solving. Documentation and description of MATLAB programs/scripts.

### Outside-of-Class Assignments

Use MATLAB to analyze and visualize data, apply numerical techniques and computer simulations to solve scientific and engineering problems.

## SECTION F - Textbooks and Instructional Materials

### Material Type

Textbook

### Author

Daniel T. Valentine and Brian H. Hahn

### Title

Essential MATLAB for Engineers and Scientists

### Edition/Version

8th

### Publisher

Academic Press

### Year

2022

### ISBN #

9780323995481

---

### Material Type

Textbook

### Author

William Palm

### Title

MATLAB for Engineering Applications

### Edition/Version

5th

### Publisher

McGraw Hill

### Year

2023

### ISBN #

9781264908097

---

## SECTION G - Diversity, Equity and Inclusivity

How does your course and/or course outline of record reflect strategies for accommodating and engaging diverse student populations, advancing equitable outcomes, and fostering inclusion for all students?

TBD

### Course Codes (Admin Only)

#### CB00 State ID

CCC000593468

**CB10 Cooperative Work Experience Status**

N - Is Not Part of a Cooperative Work Experience Education Program

**CB11 Course Classification Status**

Y - Credit Course

**CB13 Special Class Status**

N - The Course is Not an Approved Special Class

**CB23 Funding Agency Category**

Y - Not Applicable (Funding Not Used)

**CB24 Program Course Status**

Program Applicable

**Allow Pass/No Pass**

No

**Only Pass/No Pass**

No