**ATLANTIC CAPE COMMUNITY COLLEGE**

**COURSE TITLE**

AERG 101-Introduction to Engineering

**COURSE DESCRIPTION**

Provides a broad introduction to the engineering profession for those with little or no prior exposure to the subject while providing a foundation for additional study in engineering. Students are introduced to the engineering profession and, different disciplines of engineering. The interdependency of these disciplines will also be explored through the completion of projects that require input from several disciplines of engineering.

*Co-requisite:* MATH155

*Credits:* 3

**TEXTBOOK**

Moaveni, S. (2011). Engineering Fundamentals: An Introduction to Engineering, 4th Edition Cengage Learning Boston, MA

ISBN-13: 978-1-4390-6208-1

**INTENDED LEARNING OUTCOMES**

Upon completion of this course students will be able to:

• Think critically to solve engineering problems

• Identify applications of engineering

• Work effectively in small groups

• Describe the engineering design process

• Write an engineering report

• Apply ethical reasoning

• Identify fundamental engineering principles

**LEARNING GOALS/OBJECTIVES**

1. **Students will be introduced to the engineering profession including exposure to different branches of the engineering disciplines, while exploring the necessary requirements students need to understand to become a good engineer.**
   1. Identify examples of engineering achievements in our world
   2. Describe common traits of good engineers
   3. Identify different engineering disciplines
   4. Explain applications of different engineering disciplines
   5. Describe the importance of accreditation
2. **Student will examine the engineering design process while identifying key aspects of the process and exploring the importance of teamwork, while examining the importance of engineering standards and codes.**
   1. Describe the engineering design process
   2. Explain the importance of sustainability in design
   3. Identify factors impacting the economics of engineering design
   4. Explain the importance of material selection
   5. Explain the importance of teamwork
   6. Identify common traits of good teamwork
   7. Create a task chart
   8. Explain the difference between patents, trademarks, and copyright
   9. Describe the importance of engineering standards and codes
3. **Students will study the importance of engineering communication, while examining problem solving skills and report writing.**
   1. Present engineering work
   2. Identify the steps involved in the solution of engineering problems
   3. Write a progress report
   4. Write an executive summary
   5. Write a short memo
   6. Analyze a detailed technical report
   7. Make an oral presentation
4. **Students will investigate engineering ethics.**
   1. Describe the importance of engineering ethics
   2. Identify the Code of Ethics of the National Society of Professional Engineers
   3. Analyze the Engineer’s Creed

**FUNDAMETAL CONCEPTS OF ENGINEERING**

1. **Students will be introduced to engineering fundamentals and concepts every engineer should know.**
   1. Identify and describe engineering problems
   2. Identify fundamental dimensions
   3. Define systems of units
   4. Identify systems of units
   5. Convert systems of units
   6. Define dimensional homogeneity
   7. Describe the difference between numerical and symbolic solutions
   8. Define significant digits
   9. Describe engineering components and systems
   10. Identify physical laws and observations in engineering
2. **Students will explore length and length related parameters.**
   1. Examine length as a fundamental unit of dimension
   2. Explain the measurement of length as a unit of analysis
   3. Explain nominal sizes versus actual sizes
   4. Define radian measures of angles
   5. Define strain
   6. Calculate area of surfaces
   7. Calculate volume of three dimensional objects
   8. Define second moments of areas
3. **Students will examine the affects of time and examine time related parameters such as time a dimension and is measurement.**
   1. Explain the importance of time as related to engineering
   2. Measure time as unit of analysis
   3. Define period and frequencies of periodic functions
   4. Identify engineering parameters involving length and time
   5. Define angular motion of gravitating objects
4. **Students will examine mass and mass-related parameters of physical quantities**
   1. Describe why mass is a fundamental dimension
   2. Measure mass an object
   3. Define density of an object
   4. Define specific volume of an object
   5. Define specific gravity of an object
   6. Define mass flow rate of substances
   7. Describe mass moment of inertia
   8. Define momentum of a particle
   9. Define conservation of mass and matter
5. **Students will study force and force related parameters**
   1. Define force and the unit of measurement
   2. Explain the application of Newton’s Laws in mechanics
   3. Define and compute moment of inertia
   4. Define and compute Work
   5. Explain the difference between pressure and stress
   6. Define modulus of elasticity
   7. Define modulus of rigidity
   8. Define bulk modulus of compressibility
   9. Describe linear impulse
6. **Students will gain an understanding of temperature and temperature-related parameters**
   1. Explain why temperature is a fundamental dimension
   2. Measure temperature
   3. Explain the difference between temperature difference and heat transfer
   4. Define thermal comfort
   5. Define metabolic rate
   6. Identify temperature related properties
   7. Identify heating values of fuels
   8. Explain degree-days and energy estimation
7. **Students will learn about electric current and related parameters.**
   1. Explain why electric current is a fundamental parameter
   2. Define voltage
   3. Explain the difference between direct current and alternating current
   4. Define electrical circuit
   5. Identify electrical components
8. **Students will learn about energy and power.**
   1. Define mechanical energy
   2. Define thermal energy
   3. Explain the first law of thermodynamics
   4. Define efficiency
   5. Describe the relationship between watts and horsepower
   6. Define efficiency
   7. Define energy sources
   8. Define generation
   9. Define consumption

**COMPUTATIONAL ENGINEERING TOOLS**

1. **Students will employ computational engineering tools, while using available software to solve engineering problems.**
   1. Use spreadsheets to solve problems
   2. Write formulas
   3. Utilize functions
   4. Utilize logical functions
   5. Plot using a spreadsheet
   6. Compute matrix
   7. Fit a curve using a spreadsheet
2. **Students will be introduced to MATLAB/MATHEMATICA**
   1. Use MATLAB/MATHEMATICA functions
   2. Plot using MATLAB/MATHEMATICA
   3. Import objects into MATLAB/MATHEMATICA
   4. Compute matrix using MATLAB/MATHEMATICA
   5. Fit curves using MATLAB/MATHEMATICA
   6. Create symbolic mathematics using MATLAB/MATHEMATICA

**ENGINEERING GRAPHICAL COMMUNICATION, MATERIAL SELECTION AND DESIGN**

1. **Students will examine the use of engineering graphical communication for conveying information to other engineers, machinists, technicians, and managers.**
   1. Explain the importance of engineering drawings
   2. Identify orthographic view
   3. Identify isometric view
   4. Identify sectional view
   5. Identify the difference between civil, electrical, and electronic drawings
   6. Define solid modeling
   7. Identify common engineering symbols
2. **Students will learn why material selection is an important design decision.**
   1. Describe electrical properties of material
   2. Mechanical properties of materials
   3. Thermo physical properties of materials
   4. Identify common solid engineering materials
   5. Identify common fluid materials

**MATHEMATICS STATISTIC, AND ENGINEERING ECONOMICS**

1. **Students will learn about the use of mathematics, statistics in engineering, and why they are import.**
   1. Identify and apply mathematical symbols
   2. Identify, examine and develop simple linear models of order one and order two
   3. Identify and examine nonlinear models
   4. Identify and examine and develop exponential and logarithmic models
   5. Define and develop simple matrix algebra problems
   6. Define notion of mathematical calculus and its relevance to engineering
   7. Utilize differential equations in solving real life problems
   8. Define the basic ideas of simple probability density functions
   9. Identify the basic ideas of descriptive and inferential statistics
   10. Explain frequency distribution of continuous variables
   11. Define mean or expected values of continuous and discrete variables
   12. Define median of ungrouped and grouped data
   13. Define standard deviation of random variables
   14. Explain the properties of the normal distribution
2. **Students will examine the importance of economics functions in engineering**
   1. Interpret a cash flow diagram
   2. Explain the difference between simple and compound interest
   3. Explain how to calculate the future worth of a present amount
   4. Define annuity
   5. Define series payment
   6. Utilize a spreadsheet to calculate financial functions

**COURSE EVALUATION**

Examinations (3) 300 points

Homework (12) 360 points

Group Project (1) 200 points

Presentation (1) 140 points

A= 900-1000

B=800-899

C=700-799

D=600-699

F=599-

**LEARNING ACTIVITIES**

***Examinations***

The examinations will be based on the required reading and lecture notes.

***Homework***

The homework assignments will come from the end of chapter assignments in the book.

***Group Project***

The group project focuses on space or aviation-related systems design. More information will be given during class.

***Presentation***

Students are required to solve an engineering problem and make a presentation to the class explaining how you derived the solution.