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**Official TCC Course Syllabus**

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| Discipline Prefix: EGR | Course Number: 120 | Course Title: Introduction to Engineering |
| Course Section: D03B |
| Credit Hours: 2 | Lecture Hours: 1 | Clinical Hours:  | Lab Hours: 2 |
| Contact Hours: 3 | Studio Hours:  | Semester: Spring 2020 |
| Meeting Days/Time/Location: Tuesdays & Thursdays, 1:30 – 2:45pm, Room H-151, Advanced Technology Center |

**Instructor Information**

Name: Paul E. Gordy, PE

Office Location: H-115, Advanced Technology Center

Office Hours: As posted on office door and on course Blackboard site

Contact Information: 757-822-7175

Course Website (optional): [www.faculty.tcc.edu/PGordy](http://www.faculty.tcc.edu/PGordy)

Blackboard site: <http://learn.vccs.edu>

Instructor email address (college or VCCS): PGordy@tcc.edu

# Course Information

### Course Description

Introduces the engineering profession, professional concepts, ethics, and responsibility. Reviews hand calculators, number systems, and unit conversions. Introduces the personal computer and operating systems. Includes engineering problem-solving techniques using computer software.

### Prerequisites and/or Co-requisites

Prerequisites: MTH 162, MTH 167, or placement into MTH 263

Co-requisites: None

### Required Course Texts and Supplementary Materials

Moaveni. Engineering Fundamentals – An Introduction to Engineering, 5th Edition. Cengage Learning, 2014. (ISBN: 978-1-305-08476-6)

### General Education Core Competencies Supported by this Course

After completion of this course, students will be able to:

* **Civic Engagement**
Civic Engagement is the ability to contribute to the civic life and well-being of local, national, and global communities as both a social responsibility and a life-long learning process. Degree graduates will demonstrate the knowledge and civic values necessary to become informed and contributing participants in a democratic society.
* **Quantitative Literacy**
Quantitative Literacy is the ability to perform accurate calculations, interpret quantitative information, apply and analyze relevant numerical data, and use results to support conclusions. Degree graduates will calculate, interpret, and use numerical and quantitative information in a variety of settings.
* **Written Communication**
A competent written communicator can use writing to communicate with others, resulting in understanding and being understood.

### Course Learning Outcomes

* Demonstrate a knowledge of the Engineering Profession including engineering disciplines,
accreditation and licensing.
* Use the NSPE Code of Ethics to discuss case studies in engineering ethics.
* Demonstrate a basic understanding of the engineering design process.
* Demonstrate proficiency in Excel for graphing and analyzing engineering data for engineering
problem solving.
* Demonstrate proficiency in MATLAB for performing calculations, graphing, and engineering problem solving.
* Describe basic concepts associated with working in teams.
* Gain familiarity with the architecture and programming of a microprocessor, such as the BASIC Stamp
or the Arduino Uno.
* Describe various types of peripheral devices to be controlled by microprocessor including servos
and sensors (such as infrared optical sensors, ultrasonic rangefinders, and temperature sensors.)
* Develop and implement algorithms for programming the Arduino-based based robot.
* Participate in team-based robotic experiments.
* Demonstrate the ability to evaluate information and scholarly literature
* Demonstrate effective search strategies with library databases

### Topics Covered in the Course

* Introduction to the Engineering profession, including accreditation and licensing.
* The engineering design process and teamwork
* Engineering problem solving
* Using Microsoft Excel for engineering problem solving and for graphing and analyzing data
* Using MATLAB for engineering problem solving
* Microprocessor hardware and software
* Microprocessor-based robot, such as the Arduino-BOT
* Controlling peripheral devices with a microprocessor, including, servos and sensors (such as infrared optical sensors, ultrasonic rangefinders, temperature and humidity sensors)
* Team project – communicating with a microprocessor
* Team project – controlling servos
* Team project – using sensors
* Team competition – navigating a robot on a track using various methods of navigation
* Team reports/presentations
* Information literacy: evaluation of information and scholarly literature
* Library databases: effective search strategies

### Description of Assignments/Assessments

* Blackboard Quizzes – online quizzes for various sections of the course.
* Homework Assignments – Individual assignments based on textbook and lecture topics.
* Team Assignments – Team assignments based on team robotics projects. It is critical that all team members be present for all team exercises. No credit will be given to team members that are absent during a team exercise.
* Media Assignments – Individual media worksheet assignments based on videos viewed in class or online.
* In-Class Exercises – Individual and/or group assignments to be completed during class. No credit will be received if a student is absent during an in-class exercise.
* Test #1 – Written test based on Homework Assignments, Media Assignments, related textbook sections, and related class notes.
* Test #2 – Computer-based exam on Excel.
* Test #3 – Computer-based exam on MATLAB

### Grade Policy

Course grades will be computed based on the following percentages (the exact number of assignments may be adjusted)

 Test #1 (MATLAB, HW #4-6) 12%

 Test #2 (Homework #1-3,7, Media #1-3) 12%

 Test #3 (Excel, HW #8-9) 12%

 Blackboard Quizzes (5) 15%

 Homework Assignments (11) 25%

 Media Assignments (3) 3%

 In-Class Exercises (3-5) 6%

 Team Assignments (5) 15%

Grades will be based on the following scale:

 A: 90 – 100

 B: 80 – 89

 C: 70 – 79

 D: 60 - 69

 F: 0 – 59

Final grades are made available to each student within the Student Information System (SIS) now web delivered via MyTCC or SIS.

Based on the progression of the course, the grade distribution for each assignment may change. However, if changes are made, I will notify students in a timely manner and in writing.

### Canvas and Course Communication

Students should check Canvas and their VCCS student email accounts regularly at least every 72 hours. The best way to reach the instructor is by email. The instructor will respond within 72 hours, although generally much sooner.

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# Course Schedule

The following course schedule may change due to the progression of the course. The course schedule may change at the discretion of the instructor; however, students will be notified in writing when any changes/additions are made to the schedule.

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| **Date** | **Topic(s)** | **Reading Assignment** | **Homework Assignment(s) – Due in one week (unless otherwise noted)** |
| T, Jan 14 | TCC Engineering curriculum, TCC Student Handbook for Engineering, engineering disciplines, engineering vs engineering technology | Chapter 1-2 &Lecture Notes | HW #1 - (graduation plan) |
| R, Jan 16 | Engineering accreditation (ABET), Professional Engineering registration. | Chapter 1-2 & Lecture Notes | HW #2 - (ABET, licensing, engineering profession)Media #1 ("*Get Licensed, Get Ahead*") |
| T, Jan 21 | Engineering Ethics - NSPE Code of EthicsVideo (shown in class): “*Incident at Morales*" | Chapter 5 & Lecture Notes | Media #2 – (“*Incident at Morales*") |
| R, Jan 23 | Ethics case studiesClass Exercise (team): Discuss engineering case studies and decide as a group which NSPE Code sections apply and how to respond. The team presents their decision. |  | HW #3 - (Ethics Case Studies) |
| T, Jan 28 | MATLAB Lecture #1 (basic features, .m files, using built-in functions).  | Chapter 15 & Lecture Notes | HW #4 - (MATLAB A) |
| R, Jan 30 | Continue/review MATLAB Lecture #1. Class exercise (individual). |  | Bb Quiz #1 - (Ethics: Ch 5 and related material) |
| T, Feb 4 | MATLAB Lecture #2 (tables of calculations, graphing). Class exercise (individual). | Chapter 15 & Lecture Notes | HW #5 - (MATLAB B) |
| R, Feb 6 | Continue/review MATLAB Lecture #2. Class Exercise (individual). | Chapter 15 & Lecture Notes | Media #3 – ("*To Engineer is Human*") |
| T, Feb 11 | MATLAB Lecture #3 (Decision structures). Applications. Class Exercise (individual). | Lecture notes & handouts | HW #6 – (MATLAB C) |
| R, Feb 13 | Significant Digits and Systems of Units (bring calculator to class) | Chapter 6 & Lecture Notes | Bb Quiz #2 - (MATLAB & and related material) |
| T, Feb 18 | Systems of Units (bring calculator to class).Class Exercise (individual). | Chapter 6 & Lecture Notes | HW #7 - (Sig. Digits and Systems of Units) – Due in 3 classes |
| R, Feb 20 | Systems of Units (bring calculator to class)Class Exercise (individual). | Chapter 6 & Lecture Notes |  |
| T, Feb 25 | **Test #1:** Practical test on MATLAB using classroom computers |  |  |
| R, Feb 27 | Engineering Problem-Solving using Excel (basics): Overview of spreadsheet features, formulas, functions, absolute and relative cell addresses, tables, formatting. | Chapter 14 & Lecture Notes | Bb Quiz #3 - (Systems of Units: Ch 6 and related material)HW #8 - (Excel A) |
| T, Mar 3 | Engineering Problem-Solving using Excel (basics): Continued topics from previous class, possible in-class time for homework, class exerciseClass Exercise (individual). | Chapter 14 & Lecture Notes |  |
| R, Mar 5 | Engineering Problem-Solving using Excel (graphing):x-y (scatter) graphs; linear, exponential, power, and polynomial regression; correlation coefficient; log scales.Class Exercise (individual). | Chapter 14, Section 4.7 & Lecture Notes | HW #9 - (Excel B) |
| **Mar 9-14** | **Spring Break – No TCC classes** |  |  |
| T, Mar 17 | **Test #2**: Written test on the Engineering Profession, Ethics, Significant Digits, and Systems of Units (based on HW #2,3,7; Media #1-3; Ch 1,2,5,6 & related notes). |  |  |
| R, Mar 19 | Engineering Problem-Solving using Excel (graphing):Continued topics from previous class, possible in-class time for homework, class exerciseClass Exercise (individual). | Chapter 14Section 4.7 & Lecture Notes |  |
| T, Mar 24 | Engineering Problem-Solving using ExcelGraphing curves with multiple x and or y values,Histograms, lookup tables and functions, statistical functions. Class Exercise (individual). | Chapter 14Section 4.7 & Lecture Notes | HW #10 - (Excel C) |
| R, Mar 26 | Excel Lecture C continued |  |  |
| T, Mar 31 | **Test #3:** Practical test on Excel using classroom computers |  |  |
| R, Apr 2 | Introduction to the Arduino-BOT – Why study robots? Robot applications, overview of hardware & software (compiler), overview of sensors and applications, C++ programming using the Arduino environment, emphasis on the importance of teamwork on labs. Divide class into teams for the remainder of the semester. | Lecture notes & handouts | Bb Quiz #4 - (Excel: Ch 14 and related material) |
| T, Apr 7 | Introduction to the Arduino-BOT – Team assignment to write several small programs for the Arduino-BOT to control LEDs and to gain familiarity with the software and hardware. | Lecture notes & handouts | Team Assignment #1 - (Communicating with the ARDUINO-BOT) |
| R, Apr 9 | Servos and the Arduino-BOT – servos (unmodified and modified), applications of servos, Arduino commands to control servos, calibrating servos. Analyzing and graphing the performance of servos on Arduino-based robots and using the results of the analysis to predict robot speed, direction and distance travelled.  | Lecture notes & handouts | Team Assignment #2 - (Calibrating servos) |
| T, Apr 14 | Navigating the Arduino-BOT using Dead Reckoning – controlling the ARDUINO-BOT, calculating distances using wheel revolutions (dead reckoning), turning, navigating a course, predicting robot speed and distance | Lecture notes & handouts | Team Assignment #3 - (navigating a track using dead reckoning) |
| R, Apr 16 | Navigating the Arduino-BOT using Dead Reckoning(continued) | Lecture notes & handouts | Bb Quiz #5 - (Arduino-BOT and related material) |
| T, Apr 21 | Navigating the Arduino-BOT using Line Following – The Arduino-BOTs are programmed to use infrared sensors to follow a line on a track. Selection structures in C++ | Lecture notes & handouts | Team Assignment #4 - (navigating a track using infrared sensors) |
| R, Apr 23 | Information Literacy - Evaluation of information and scholarly literature. Guidelines for evaluating information. Applying information literacy to projects. | Lecture notes & handouts | HW #11 – Information Literacy |
| T, Apr 28 | Engineering Design – the Design Process, teamwork, scheduling, research, self- and team-evaluation, developing a conceptual design for the ASEE Model Design Competition and giving a team presentation. | Chapter 3, Lecture notes & handouts | Team Assessment Team #6 - (ASEE Robotics Competition – brainstorming and presentation) |
| R, Apr 30 | Navigating the Arduino-BOT using Tactile Sensors (whiskers) – controlling the ARDUINO-BOT using tactile sensors (whiskers), navigating a course, using functions in C++ (if time allows) or team presentations (see below) | Lecture notes & handouts | Team Assignment #5 - (navigating a track using whiskers) – if time allows |
| T, May 5 | Team Presentations – Team PowerPoint Presentation based on Team Assignment #6 (joint team 10-minute presentations before the class by each team).  |  | Provide the instructor with a printout of the presentation before making the presentation. Peer- and self-evaluation forms due by the end of class. |

# Course Policies

**Attendance Policy**: All students are expected to be present and on time at all scheduled class and laboratory meetings. Instructors are not required to admit a student who arrives late to the classroom. A student who adds a class or registers after the first day of classes is counted absent from all class meetings missed.

If a student is absent more than 15 percent of scheduled instructional time, attendance may be defined as unsatisfactory. This calculation includes absences occurring during the add/drop period. See also the Withdrawal Policy in this syllabus for more information. Per the college’s attendance policy, faculty has the right to develop a more stringent policy as well. Students who do not attend or participate in class by the deadline to drop for tuition refund may be deleted from the course.

**Late Work/Make-up Exam Policy**:

* Homework, Media Assignments, and Team Assignments will be accepted late up to two weeks late with a 10-point penalty. After two weeks a 20-point late penalty will apply. However, no late assignments will be accepted after the last class meeting.
* Students will receive a grade of 0 on Class Exercises if they are absent.
* Students will not receive any credit for Team Assignments if they are absent when the team assignment was performed.
* No make-up tests are allowed. Missing a test will result in a grade of 0 for the test unless the student gets approval before the tests or notifies the instructor within 24 hours of the test in case of emergency.

Classroom Behavior

TCC is committed to maintaining a social and physical environment conducive to carrying out its education mission. Therefore, all members of the TCC community are expected to demonstrate standards for civility.

Be moderate in speaking. Loud, obscene, argumentative, or threatening speech is disruptive to teaching and learning and is offensive to others. It has no place in an academic setting

Resolve any disagreements in a positive, non-combative manner. Request the assistance of college authorities if needed.

Show respect for the comfort of others in an educational setting by observing acceptable standards for personal cleanliness and dress.

Electronic Devices

Cell phones, pagers, and other communication devices are prohibited from use in classrooms, laboratories, and libraries, unless authorized by the appropriate faculty or staff. Although soundless communication devices such as cell phones and pagers are permissible in classrooms, college offices, and/or meeting rooms, they must not be answered during class.

Inclement Weather/Emergent Hazardous Conditions

Tidewater Community College uses TCC Alerts to immediately contact and inform faculty, staff and students of a major crisis or emergency. TCC Alerts delivers important emergency alerts, notifications, and updates via email, text message or pager.

When an incident or emergency occurs, authorized senders will be instantly notified via TCC Alerts. TCC Alerts is a personal connection to real-time updates, instructions on where to go, what to do, or what not to do, who to contact, and other important information. New users may register via the link on the College’s [Closings & Emergencies](https://www.tcc.edu/closings-emergencies) webpage (<https://www.tcc.edu/closings-emergencies>).

All students are encouraged to sign up for TCC Alerts as soon as possible. If you have already subscribed, please verify your contact information is up-to-date in TCC Alerts.

Disposition of Classes for Emergency Shutdown of the College

In the event of an emergency shutdown of the college, the president and the executive staff may elect to conclude the term in session if eighty-five percent or more of that term has been completed. If the term in session is concluded, faculty shall compute final grades of students based on coursework completed at that point.

nbsp;Academic Policies & Procedures

Students are responsible for being aware of the policies, procedures, and student responsibilities contained within the current edition of the TCC Catalog and Student Handbook.

Withdrawal Policy

Students who wish to withdraw without academic penalty should contact a counselor to determine the appropriate procedure. Withdrawals through completion of 60 percent of a session will result in a W grade. After 60 percent of a session is completed, a withdrawal will result in a grade of F in a credit course or a grade of U in a developmental course, except under mitigating circumstances that must be documented by the instructor and approved by the academic dean. Dynamic session classes have unique refund and withdrawal dates. Contact a campus Enrollment Services Office for more information, or visit the Academic Calendar website (URL provided in Important Websites section).

A student who drops after the last day to withdraw does not receive a 'W'. He/she receives an 'F', in which case there is both an academic and financial penalty. A student who withdraws by the deadline faces a financial penalty, but not an academic penalty.

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| 01/29/2020 | Deadline to drop for tuition refund |
| 03/27/2020 | Deadline to withdraw without academic penalty and to receive a grade of W for the course |

Academic Integrity

TCC will expect students to demonstrate personal and academic integrity, to be open to new ideas, and to share in a community where individuals from diverse backgrounds and cultures help one another grow intellectually, socially, and personally.

TCC expects students to achieve, not just to get by. And while many caring and talented faculty and staff are here to help, students must take responsibility for their own learning. Students should strive for a high level of academic performance and to be responsible, contributing citizens within the college and in outside communities. Above all, TCC wants students to develop a love of learning that will last a lifetime, along with a life-long interest in maintaining emotional and physical wellness.

Student Outcomes Assessment Requirement

Work products submitted by students to fulfill course requirements may be used by the college to evaluate its academic programs and general education requirements.

Plagiarism and Academic Misconduct

Academic misconduct includes, but is not limited to, the following actions: cheating on an examination or quiz—either giving or receiving information; copying information from another person for graded assignments; using unauthorized materials during tests; collaboration during examinations; buying, selling or stealing examinations; arranging a substitute for oneself during examinations; substituting for another person, or arranging such a substitution; plagiarism—the intentional or accidental presentation of another’s words or ideas; collusion with another person or persons in submitting work for credit in class or lab, unless such collaboration is approved in advance by the instructor.

Faculty members who have reliable evidence of academic misconduct will (1) investigate the matter, and (2) review the facts of the matter and the proposed penalty with the appropriate academic dean. They may then take one or more of the following actions:

Require the work to be accomplished again

Give no credit for the test, paper, or exercise

Assign a grade of F, U, or W for the course

Refer the matter to the campus Dean for Student Services or designee for possible disciplinary sanction through the college’s disciplinary procedure

If the faculty member chooses to refer the matter to the campus Dean for Student Services or designee for disposition, the Plenary Disciplinary Procedure shall be followed, and the student’s dismissal from the college is a possibility.

Educational Accessibility

Students who have documented, diagnosed disabilities, and who need special accommodations for tests, etc., are advised to see the Educational Accessibility Disabilities Services staff in Student Services so that the instructor may be notified of what accommodations are appropriate in each case. Requests for accommodations should be made to the designated campus Educational Accessibility counselor at least 45 days before classes begin. Documentation must be provided to support the need for accommodations.

Students who have been hospitalized (for medical or psychiatric reasons) unexpectedly during the semester shall contact the Office of Educational Accessibility Counselor for support and connection to college resources. If the student is incapacitated, a designee may make contact on their behalf.

For assistance with disabilities, contact the campus Educational Accessibility Counselor/Provider or the Coordinator of Educational Accessibility Services: call 822-7752, visit Student Services/Development, or visit the Educational Accessibility webpage (URL provided in Important Websites section).

Emergency Procedures

In the event of a bomb threat, tornado, or fire, students and staff may be directed to evacuate the building or move to an internal assembly area within the building. Evacuation routes are posted in each classroom. The map indicates the route to the nearest exit. Students should review the map to make sure that the exit routes for the building are clearly understood. The information regarding locations of the Emergency Assembly Areas and Internal Assembly Areas for all classrooms or spaces used on the various campuses is available on the Crisis and Emergency Management Plan (CEMP) webpage (<https://web.tcc.edu/emergency/cemp.htm>). If you require assistance during an evacuation, let your instructor know at the end of the first class.

nbsp;Student Success Resources

The following resources are available to TCC students. Visit the *Student Handbook* webpage for more information about student services and locations.

Library

 A library is located at each TCC campus and at the Visual Arts Center. These libraries are intended for research and study, and they contain materials in print and digital format to support the courses, curricula, and mission of the college. The research materials include books, newspapers, magazines, journals, DVDs, streaming media and an extensive collection of indexes, abstracts and full-text databases. Faculty members may place materials on reserve in the libraries for their students. Visit the Library webpage for more information: http://libguides.tcc.edu/LibraryPage

Academic Support Services

Each campus provides various kinds of academic assistance. One-on-one tutoring, math and computer labs, and other forms of individual and group assistance may be available. Students can also find free help for writing, from short questions about commas and comma splices to a comprehensive review of research papers in progress, in the Writing Centers.

Online Learning Help Desk

Visit the following website for Canvas support: <https://www.tcc.edu/student-services/canvas-support>

Canvas offers 24/7 support for students via phone (877-875-8359) and live chat.  Live chat support can be accessed from the Help menu once you log into Canvas.
TCC provides Canvas support Monday to Friday, 8:30 a.m. to 5 p.m., by phone (757-822-1470), email (canvas@tcc.edu), and [online request form](https://forms.tcc.edu/canvas-help-request-form/).

Important Websites

• College Website: <https://www.tcc.edu>

• Closings and Emergencies:<https://www.tcc.edu/closings-emergencies>

• Student E-mail: <https://tcc.my.vccs.edu>

• Educational Accessibility: <https://www.tcc.edu/student-services/personal-support/students-disabilities>

• Student Handbook: [https://w](https://www.tcc.edu/studenthandbook)[ww.tcc.edu/stu](https://www.tcc.edu/studenthandbook)[denthandbook](https://www.tcc.edu/studenthandbook)

• TCC Catalog: [https://www.tcc.edu/academics/catalog/](http://www.tcc.edu/academics/catalog/)

• Class Schedule: <https://m.sis.vccs.edu/index.php/app/catalog/classSearch?institution=TC295>(or log-in to SIS for current course offerings)

• Academic Calendar: [https://www.tcc.edu/academics/calendars/](http://www.tcc.edu/academics/calendars/)

• For current financial aid information and assistance, visit <https://www.tcc.edu/paying-for-college/federal-financial-aid/> or <https://studentaid.ed.gov/>

• Library: <https://libguides.tcc.edu/LibraryPage>.