WHEELING JESUIT UNIVERSITY

Department of Engineering - Spring 2019

Course Title: **ENGINEERING ORIENTATION II**

Course No.:	**ENGR 112-01 (3 crs)**	Classroom:	**ASC-307**
Prerequisite:	**ENGR 111**	Class Time:	**M-W-F 11:00-11:50 AM**
Faculty:	**Fr. Luis A. Tampe, S.J., S.T.D.**	Office Hours:	**Wednesday 2:30 to 5:00 PM**
Office:	**Donahue 127E**		**(see Bb for more times)**
Phone:	**304-243-2269 / -2380 (Office)**	Email:	**ltampe@wju.edu**

[We] have all experienced the essence of structural engineering in our learning to balance first our bodies and later our [toy] blocks in ever more ambitious positions. . . . If we could remember those early efforts of ours . . . then we can begin to appreciate the task and the achievements of engineers, whether they be called builders in Babylon or scientists in Los Alamos. For all of their efforts are to one end: to make something stand that has not stood before, to reassemble Nature into something new, and above all to obviate failure in the effort.

<div align="center">Henry Petroski</div>

To make any future that we dreamt up real requires creative scientists, engineers, and technologists to make it happen. If people are not within our midst who dream about tomorrow—with the capacity to bring tomorrow into the present—then the country might as well just recede back into the cave because that's where we're headed.

<div align="center">Neil DeGrasse Tyson</div>

The heart of engineering isn't calculation; it's problem solving. School may teach the numbers first, but calculation is neither the front end of engineering nor its end goal. Calculation is one means among many to an end—to a solution that provides useful, objectively measurable improvement.

<div align="center">John Kuprenas and Matthew Frederick</div>

COURSE DESCRIPTION

The second of a two-course sequence designed to introduce students to the engineering profession. The course focuses on how to use computer software applications to solve introductory-level problems in some of engineering's specializations, such as chemical, civil, computer, electrical, and mechanical engineering. Students will further enhance their problem-solving and design skills by developing algorithms and converting them into MATLAB programs.

REQUIRED ITEMS

You must purchase a scientific calculator by the first week of class. The textbook is listed below:

Kosky, Philip, Robert Balmer, William Keat, and George Wise. *Exploring Engineering: An Introduction to Engineering and Design*. Waltham, MA: Academic Press, 2013. Third edition. **ISBN: 978-0-12-415891-7**

STUDENT LEARNING OBJECTIVES

Upon successful completion of ENGR 112, you will be able to:

1. List the essential characteristics of, and basic concepts used in, chemical, civil, computer, electrical, and mechanical engineering. (L)
2. Solve introductory-level problems in chemical, civil, computer, electrical, and mechanical engineering with and without Microsoft Excel. (M)
3. Use Microsoft Excel and MATLAB to solve introductory-level problems related to matrices, plotting, and root-finding of single-variable functions. (M)

EVALUATION METHODS

I will use the distribution described below to calculate your final course grade provided you do not violate the academic-integrity policy of Wheeling Jesuit University, engage in a pattern of disruptive classroom behavior, or accrue more than six absences during the semester. Without a prompt explanation and, where possible, documentation, your grade for a required assignment not completed on the scheduled date will be zero.

Grade Distribution	
35%	Exams 1 and 2
25%	Cumulative Final Exam
10%	Chapter Assignments
15%	Lab Assignments
15%	In-Class PowerPoint Presentation

After rounding off all decimals and under normal circumstances, I will use the scale outlined below to determine your final course grade.

Grading Scale			
94-100 A	83-86 B	73-76 C	60-65 D
90-93 A-	80-82 B-	70-72 C-	0-59 F
87-89 B+	77-79 C+	66-69 D+	

In addition to good class attendance and participation, passing this course requires you to complete successfully three exams, a PowerPoint presentation, and various lab and chapter assignments. I may also make optional extra-credit assignments available. Following each exam, I will notify you in writing of your standing (grade) in the course.

Two Exams and Cumulative Final Exam

The two exams and the cumulative final exam are closed book and closed notes, though you may bring a one-page summary of your class notes. Other than a scientific calculator, electronic devices (tablet, laptop, desktop computer, smart phone, etc.) are not permitted during exams. The questions in each exam will be similar to the chapter and lab assignments as well as to the problems discussed in class. Bathroom breaks are not allowed during exams.

Chapter Assignments

We will cover Chapters 6, 7, 8, 9, and 12 in the textbook. As we begin a particular chapter, I will assign a set of questions and exercises that will be due a few days later. Please carefully read and follow the assignment guidelines described on the next page.

Lab Assignments

I will periodically hand out a lab assignment following the lecture. Completing these labs will require using Microsoft Excel or MATLAB. You will have time to work on them in class until the end of the period. Lab assignments will ordinarily be due a few days later. Please carefully read and follow the assignment guidelines described on the next page.

In-Class PowerPoint Presentation

By Friday March 22, you should have chosen a topic that will be the focus of your in-class presentation. The topic must be relevant to the course, center on a specific engineering project, and meet my approval. For example, your in-class presentation can focus on the challenges faced by the engineers who designed a particular structure, process, software, device, type of vehicle, etc. You could also focus on the causes of a well-documented design failure or on one of the Grand Challenges for Engineering identified by the National Academy of Engineering (see the fourteen-point list at www.engineeringchallenges.org). Your topic cannot be an engineering discipline itself. At the end of the semester, you will give an in-class ten-minute oral presentation using PowerPoint slides. As in ENGR-111, rising High School seniors are your intended audience. In order to complete this assignment successfully, you should use what you learned about PowerPoint in ENGR-111 last fall.

Class Participation

I encourage and fully expect your on-time attendance and informed, focused participation in each class. To that end, please bring the textbook to class, sit in the same seat for the duration of the semester to expedite my record keeping, and avoid disruptive behavior, meaning any conduct that diminishes the learning environment of our classroom by distracting me or others—examples include talking, texting, surfing the web or merely giving the impression of doing so, using a messaging app, frequent tardiness, and recurring bathroom breaks.

Optional Extra-credit Assignments

As an opportunity to write an optional two-page reaction paper, I may suggest watching a particular broadcast, participating in an event, or attending a presentation on campus. Please note that, in the absence of a major documentable emergency, I typically do not accept late papers. Submitting an extra-credit paper on time requires handing in a hard copy during the regularly scheduled class period in which it is due. Please write your papers on the template included in the course's Blackboard page and use Times New Roman 12-point font as well as standard margins. Your paper's line spacing should be no greater than two and no smaller than one and a half. Submitting a handwritten hard copy or a paper containing overly faint, illegible typeface is unacceptable. Unacknowledged sources that are quoted directly or merely paraphrased are entirely inappropriate and will be considered plagiarism. I will add any extra-credit points you earn during the semester to your final-exam grade.

ASSIGNMENT GUIDELINES

I will strictly enforce these guidelines when grading your chapter and lab assignments. Please let me know if you have questions or concerns about these guidelines.

1. Hand in each assignment on time. I normally do not accept late assignments.
2. For handwritten assignments, use engineering paper or unruled white 8½ × 11 paper.
3. Please staple your work or use a paper clip as directed to keep the pages in order.
4. Use the N-K-H-S or the G-F-S method to show every major step of your work.
5. Draw and label all free body diagrams and other more general diagrams.
6. Before plugging in any numbers, indicate clearly the formulas you are using.
7. Explanations and reasons should be written legibly and in complete sentences.
8. The final answer with its correct units should be clearly indicated.
9. Present the problems in order and write your name on the front side of each page.
10. When using Microsoft Excel, print the gridlines and headings.
11. If you print a graph, include descriptive chart and axis titles with appropriate units.
12. I will not grade sloppy or illegible work.

ATTENDANCE POLICY

Regardless of your current year of study at the university (e.g., freshman, sophomore, etc.), more than six absences or a pattern of disruptive behavior—such as frequent tardiness—will become a major factor in determining your final grade and can result in an FA (failure due to excessive absences). Please see me following the end of class if you arrive after I have taken attendance to ensure that I have not recorded your tardiness as an absence. Please note that Wheeling Jesuit University does not distinguish between excused and unexcused absences, meaning every absence, regardless of your reasons for missing class, adds to your total number of absences.

Leaving Class Early
If you know ahead of time that you will leave class early, please let me know before I begin to lecture. In a university setting, letting your professors know that you need to leave class early is considered proper form and common courtesy.

Being Absent for an Exam or on a Due Date
If you are absent on the day of an exam or when an assignment is due in class, you should provide me by the very next class with an explanation and, if possible, appropriate documentation regarding your absence. Failure to take these steps can result in a zero for the missed exam or assignment. If you are absent on the day of the final exam and do not provide me with an explanation and, if possible, appropriate documentation within twelve hours of the final's listed start time, your grade for the final exam could be zero. Please speak with me well in advance if you know ahead of time that, for a serious reason, you will be absent on the day of an exam or of the final exam. Failure to contact me in advance could result in a zero for that exam or the final. You are responsible for making up missed exams and the final exam as soon as possible.

Student Athletes
If you are a student athlete, please provide me with your travel and game schedule ahead of time. For obvious reasons, this requirement becomes essential if your game schedule conflicts with any of our course's exams or due dates. Please note that student athletes in particular need to be vigilant about missing class since Wheeling Jesuit University does not distinguish between excused and unexcused absences.

DROPING OR WITHDRAWING FROM THE COURSE

The last day of the Add/Drop period for this semester is Friday January 11, 2019. The last day to withdraw from a course with a grade of a W is Tuesday March 26, 2019.

DISABILITY STATEMENT

Wheeling Jesuit University offers students with documented disabilities individual accommodations on a case-by-case basis with confidentiality in compliance with the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973. Ultimately, all students are responsible for their own academic achievement and must attend classes, complete course assignments, and fulfill all university requirements for their chosen field of study. It is up to students with disabilities to seek out available assistance on campus and to utilize individualized accommodations. In order to receive accommodations under Section 504 and ADA, students with disabilities must self-identify to the University, provide current (within three years) and comprehensive documentation concerning the nature and extent of the disability, and communicate their needs to the Disability Services Director located in the ground level of Ignatius Hall, Room G24, or call 304-243-4484 before each semester begins.

ACADEMIC INTEGRITY STATEMENT

As an integral part of this course, I will strictly enforce the academic integrity policy of Wheeling Jesuit University (see www.wju.edu/academics/catalogs/). Sanctions for academic offenses include a "reduction in grade or a failing grade" on the assignment, test, or exam in which the offense occurred. Depending on the violation's severity, the penalty can also include failing the course regardless of one's previous grades. Cheating during an exam or test—for example, by using unauthorized sources—will result in a zero for that exam or test. Failing to cite all sources in a written assignment also constitutes a serious violation of academic integrity. These offenses can result in suspension and even dismissal from the University. I will inform the Faculty Academic Integrity Officer of each violation by filing an *Academic Integrity Citation Form* which will be added to the offending student's record. Although not intended to be an exhaustive list, the following constitute acts of academic dishonesty: plagiarism, deceit, cheating, fabricating data, the use of fictitious sources, the use of devices or sources not authorized by your instructor, presenting as one's own the work of another person, and allowing someone to copy your paper, exam answers, or other work.

STUDENT EMAIL ACCOUNT AND BLACKBOARD

Please check your Wheeling Jesuit University email account every day since it is the primary means of communication used by this institution. I will use it to inform you of changes to our

class schedule or to share other course-related information. You should also routinely check our course's Blackboard page since it will contain downloadable files related to the course's lab and chapter assignments as well as links relevant to our course.

USE OF ELECTRONIC DEVICES IN CLASS

Please do not videotape or record our class lectures and discussions without speaking with me first. Outside times devoted to in-class computer labs, you may not use a smart phone, laptop, desktop computer, tablet or other similar electronic device with internet connectivity. If you must bring your smart phone with you, please keep it out of sight and in its silent mode at all times. During computer labs, you may not surf the web, use a messaging app, or work on material for another course. Other than a scientific calculator, you may not use or even have with you any other kind of electronic device (tablet, laptop, desktop computer, smart phone, etc.) while taking an exam. Without my explicit permission, you will receive a zero on any exam on which you use an electronic device other than your scientific calculator; I will also file an *Academic Integrity Citation Form* which will be added to your student record and could lead to other sanctions.

ACADEMIC RESOURCE CENTER

The Academic Resource Center (ARC) is a totally free academic-support service available to all enrolled Wheeling Jesuit University students and staffed almost exclusively by WJU students recommended for employment by WJU faculty. The ARC is located in Bishop Hodges Library and is open five days a week: Sundays 6:00-8:00 PM and Mondays-Thursdays 1:00-9:00 PM. Please visit the ARC's website (readily accessible on the Cardinal homepage under "Quick Links" or as the first listing under "Student Services") to learn about the ARC's services (emphasizing writing, math, and the sciences) and to schedule appointments.

SUCCEEDING IN THIS COURSE

Your chances of succeeding in this course and fruitfully understanding the assigned topics are greatly enhanced if you aim to: **(1)** arrive on time, take meticulous notes during class, offer informed comments or questions, and work consistently on the chapter and lab assignments; **(2)** read diligently the course's assigned chapters and bring the textbook to class every day; **(3)** abide by the norms of academic integrity; and **(4)** avail yourself, as needed, of my help and of the

services provided by the Bishop Hodges Library, the Academic Resource Center or ARC (located in the Bishop Hodges Library; 304-243-4473), Disability Services (Ignatius Hall G24; 304-243-4484), the Health Center (McDonough 219; 304-243-2275), and the Counseling Center (Ignatius Hall G23; 304-243-2081). I am happy to help you: please call (304-243-2269) or email (ltampe@wju.edu) me if you have questions. I encourage you to use the link in our course's Blackboard page to make an online appointment to see me in my office (Donahue 127E). Please be proactive: let me know as soon as possible of any special circumstances or difficulties that could potentially affect your class attendance or even your final course grade.

TITLE IX STATEMENT

Wheeling Jesuit University seeks to provide an environment that is free of bias, discrimination, and harassment. If you have been the victim of sexual harassment, misconduct, or assault we encourage you to report this. If you report this to a faculty member, she or he must notify our college's Title IX coordinator about the basic facts of the incident (you may choose whether you or anyone involved is identified by name). For more information about your options at WJU, please go to http://wju.edu/titleix/.

COURSE OUTLINE

A summary of important dates is included below. Please bring your copy of the textbook to every class since we will work through five of its chapters in addition to the lab assignments. The topics we will discuss are included further below. Because due dates and the order of topics may vary during the course of the semester, please contact your classmates in the event of an absence to make up for missed work.

Important Dates – Spring 2019	
January	Mon 7 Start of Semester Fri 11 Last Day to Add/Drop
February	Wed 6 Exam 1 Mon 11 Advisory Grades Due
March	4 – 10 Spring Break Mon 18 Exam 2 Fri 22 PowerPoint Presentation Topic Tues 26 Last Day to Withdraw with a Grade of W
April	Tues 2 Research Day – No Classes 12 – 26 In-Class PowerPoint Presentations 18 – 22 Easter Break Fri 26 Last Day of Classes Tues 30 Cumulative Final Exam 2:00 PM to 4:30 PM

Chapter Topics

    Chemical Engineering (Chapter 6)

        Topics include: a description of chemical engineering, atoms and molecules, Avogadro's number, the periodic table, isotopes, atomic number (Z), mass number (A), relative atomic mass (i.e., weighted average of isotopes), heating value, stoichiometry, hydrocarbons, combustion, air-to-fuel ratio (mass and molar), and distillation or fractionating columns.

    Civil Engineering (Chapter 7)

        Topics include: a description of civil engineering, structural engineering (trusses and the method of joints), matrix operations (multiplication and using the Gauss-Jordan method to find the inverse of a matrix), using Microsoft Excel to do matrix operations, geotechnical engineering (e.g., building in Dubai, pile foundations, properties of soils, and effective stress), water resource engineering (reservoir capacity, conservation of mass, and how to estimate a reservoir's required capacity and yield), and transportation engineering (highway capacity, the follow rule, and the two-second rule).

    Computer Engineering (Chapter 8)

        Topics include: a description of computer engineering, decimal and binary numbers, binary arithmetic, binary logic, truth tables, and Moore's law.

Electrical Engineering (Chapter 9)

Topics include: a description of electrical engineering, electrical circuits, resistance and Ohm's law, the power law, series and parallel circuits, and Kirchhoff's laws (voltage and current).

Mechanical Engineering (Chapter 12)

Topics include: a description of mechanical engineering, thermal design, and mechanical design. The elements of thermal design include the equations for the three modes of heat transfer (conduction, convection, and radiation), basic elements of fluid mechanics (density, viscosity, gauge pressure, absolute pressure, Reynolds number, hydrostatic equation, and Bernoulli's equation), and basic elements of thermodynamics (the internal energy of closed systems and the first law of thermodynamics). The elements of mechanical design focus on machine elements (gears, angular speed, gear ratio, and torque).

Lab Topics

Lab 01: Matrix Multiplication using Excel

Lab 02: Matrix Inversion using Excel

Lab 03: Solving Systems of Linear Equations in 2, 3, or more Variables using Excel

Lab 04: Linear Least Square Fitting using Excel

Lab 05: Quadratic Least Square Fitting using Excel

Lab 06: Introduction to MATLAB

Lab 07: Plotting Functions of One and Two Independent Variables using MATLAB