ENGR 101 Fall 2020
COURSE OUTLINE

Course Description:
This course provides an overview of relevant topics in engineering analytical methods that are most heavily used in the core sophomore-level engineering courses. Topics include algebraic manipulation of engineering equations; use of trigonometry, vectors and complex numbers, sinusoids and harmonic signals, systems of equations and matrices in engineering applications; need for differentiation, and integration in engineering applications. All topics will be presented within the context of an engineering application, and reinforced through extensive examples of their use in the core engineering courses and lab exercises. This course will also provide an introduction to the engineering analysis software, MATLAB.

Textbook: Rattan and Klingbeil, Introductory Mathematics for Engineering Applications, John Wiley & Sons, 2014. ISBN: 978-1-118-14180-9

References:
1. Moore, H., *MATLAB for Engineers* (4th ed.). Prentice Hall, 2014.
2. Gilat, A., Matlab: An Introduction with Applications, 5th ed., John Wiley & Sons, 2015.

Instructors:

Dr. Max Roman   Office: FENS696
Phone: 973-596-5270   E-mail: max.roman@njit.edu
Virtual Office Hours: TF 4-5 pm or by appointment. Please use this link to join office hours during the abovementioned hours.

Dr. Jaskirat Sodhi   Office: FENS267
Phone: 973-596-5220   E-mail: jaskirat.sodhi@njit.edu
Virtual Office Hours: M 12-1 pm and W 2-3 pm or by appointment. Please use this link to join office hours during the abovementioned hours.

Dr. Prateek Shekhar   Office: FENS263
Phone: 973-596-6822   E-mail: prateek.shekhar@njit.edu
Virtual Office Hours: M 4-6 pm or by appointment. Please use this link to join office hours during the abovementioned hours.

Teaching Assistants:
Mr. Chizhong Wang (cw278@njit.edu)
Mr. Weiqiang Dong (wd35@njit.edu)

Times and Venues:

Please note: Common Lectures and Recitations will be offered in a Converged Mode. Webex links will be provided on Canvas. Most labs are offered in an online setting except a few hands-on labs that will require physical presence on-campus.

Common Lecture and Recitation assignments will be run via Back2Classroom App. Please check Registrar's website for more details.

ENGR101 Analytical Methods for Engineering Applications

Sections 03 and 05 Lecture - TR 11:00 am – 12:20 pm, Campus Center Ballroom B (Taught by Dr. Jaskirat Sodhi)
Sections 11 and 013 Lecture - WF 7:30 – 8:50 am, Campus Center Ballroom B (Taught by Dr. Max Roman)

Section 03 Recitation: T 2:30 – 3:50 pm, GITC1400
Section 05 Recitation: T 7:30 – 8:50 am, FMH408
Section 11 Recitation: R 2:30 – 3:50 pm, GITC1100
Section 13 Recitation: R 2:30 – 3:50 pm, FMH408

Section 03 Lab.: M 2:30 – 3:50 pm (Taught by Dr. Prateek Shekhar)
Section 05 Lab.: F 7:30 – 8:50 am (Taught by Dr. Prateek Shekhar)
Section 11 Lab.: T 2:30 – 3:50 pm (Taught by Dr. Jaskirat Sodhi)
Section 13 Lab.: W 12:30 – 1:50 pm (Taught by Dr. Jaskirat Sodhi)

<u>**Grading Policy:**</u>

Attendance	5%
Homework	10%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	20%
Lab	<u>20%</u>
	100%

<u>**Course Web Page:**</u>

All materials associated with this course will be posted on the course web page on Canvas, which can be immediately accessed at canvas.njit.edu. This includes electronic copies (PDF format) of all handouts, homework etc.. Since Canvas allows instructors to send course-related announcements to the entire class, you should plan to check the course page on a regular basis. In addition, you are expected to check your NJIT e-mail at least once every 24 hours during the work week (Mon-Fri).

<u>**Attendance Policy:**</u>

Attendance at all lectures/labs/recitations is required and is worth 5% of the total course grade. Attendance will be taken at the beginning of class/lab/recitation. Excused absence is allowable, but the instructor must be notified and has to pre-approve it (in the case of an emergency, notify the instructor within 24 hours after the class/lab/recitation takes place and show evidence from doctor, police, or other relevant agencies). Each unexcused absence will result in a 1% deduction from the 5% attendance (i.e., 1/5 of the total attendance points). While an attendance grade of 0% (exactly 5 unexcused absences) is possible, any subsequent unexcused absence will result in a grade of "F" for the course. In the case of an excused absence, the student is still responsible for all the missed materials or announcements covered in the class/lab/recitation. The method of handling late or missed work will be determined by the instructor.

ENGR101 Analytical Methods for Engineering Applications

Homework Policy:

Homework will be assigned on a weekly basis, and is worth 10% of the final course grade. Unless otherwise noted, all weekly homework is due (on Canvas) BEFORE the start of recitation one week from the week of assigning the homework. Your homework will be graded and will be returned during recitation so that any questions or concerns can be immediately addressed. TO ENSURE THAT YOUR HOMEWORK GETS GRADED, PLEASE INCLUDE THE SECTION NUMBER AT THE TOP RIGHT-HAND CORNER. While students are encouraged to work homework problems together, copying of another student's completed homework problem(s) (including MATLAB code and/or output) is considered a violation of the University's Academic Integrity Policy and will be dealt with accordingly.

Lab Policy:

The mathematics concepts presented in lecture will be reinforced through hands-on, physical application in the laboratory. All required computations and results for each laboratory will be turned in the following week BEFORE the start of lab. Laboratory assignments will be accepted up to one week late with a penalty of 20%. Laboratory assignments more than one week late must still be completed but will receive a grade of zero. Since the laboratory is a mandatory component of this course, THE COMPLETION OF ALL LABORATORY ASSIGNMENTS IS REQUIRED FOR A PASSING COURSE GRADE. If at all possible, students who miss a laboratory assignment should request instructor approval to attend another laboratory section.

Seven of the lab assignments consist of a writing component, a 250-word laboratory abstract. Each single-paragraph abstract must summarize the objective, motivation, approach, results and conclusions. Guidelines on how to write an abstract will be discussed in lab. The abstracts will be graded for form, style, correctness, and overall writing proficiency, and will constitute a portion of the total laboratory grade. Students will receive graded feedback on each laboratory abstract, which will allow for continuous improvement throughout the course.

Exam Policy:

Student performance will be assessed through three midterm exams and one final exam, as indicated on the course schedule. There will be NO MAKE-UP EXAMS.

Exams will be conducted online and require the use of Respondus LockDown browser coupled with Webex via a second device. To make sure that everyone is well prepared, an ungraded practice exam will be administered before the first exam so that any technical difficulties may be worked out prior to the exam. You must have access to a microphone and a camera to show your video during the exams. Failure to comply will result in serious consequences on your exam and overall grade. Once again, any issues must be discussed with the instructor ahead of time.

ANY FORM OF CHEATING ON EXAMS WILL RESULT IN AN "F" FOR THE COURSE. This includes looking at another person's exam or copying another person's work for exams. The NJIT Honor Code will be upheld. Violations will be brought to the immediate attention of the Dean of Students. The student who compromised as well as the student who allowed will BOTH be awarded the SAME penalty.

Technology Policy:

While the professor is discussing the lecture/lab/recitation, all monitors should be turned off. If anyone caught typing or browsing internet, the student will be asked to leave the class for the day and this will count as an absence. Cell Phone use or Texting during class is NOT allowed.

ENGR101 Analytical Methods for Engineering Applications

Academic Integrity Policy:
"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found here.
Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"

Other Policy:
If a student is getting a grade lower than a C at the withdrawal deadline, he/she may be required to withdraw from the course.

ENGR101 Analytical Methods for Engineering Applications   **4 Credits**
Tentative Course Schedule for Lectures

Week	Topic
1	Introduction Application of Algebra in Engineering - Linear Equations
2	Application of Algebra in Engineering - Quadratic Equations
3	Trigonometry - One and Two-Link Planar Robots
4	Trigonometry - One and Two-Link Planar Robots Review for Exam #1
5	**Exam** #1 2-D Vectors in Engineering
6	Complex Numbers in Engineering
7	Sinusoids and Harmonic Signals in Engineering
8	Review for Exam#2 **Exam** #2
9	Systems of Equations and Matrices in Engineering
10	Introduction to Derivatives in Engineering Applications of Derivatives in Dynamics
11	Applications of Derivatives in Electric Circuits Review for Exam#3
12	**Exam** #3 Applications of Derivatives in Mechanics of Materials
13	Further Applications of Derivatives in Engineering
14	Make-up Week and Review for Final Exam

ENGR101 Analytical Methods for Engineering Applications　　　　**4 Credits**
Tentative Course Schedule for Labs

Week	Topic
1	Introduction and Meet the Lab TA
2	Introduction to MATLAB and Basic tools used in MATLAB (Onramp)
3	Built-in MATLAB Functions. Manipulating Matrices in MATLAB (Onramp)
4	Lab #1: Application of Algebra in Engineering: The One-Loop Circuit
5	Lab #1a: Application of Algebra in Engineering: The One-Loop Circuit (Physical Lab)
6	Lab #2: Trigonometric Relationships in One and Two-Link Planar Robots
7	Lab #3: Measurement and Analysis of Harmonic Signals
8	Lab #4: Applications of Vector and Trigonometry (Physical Lab)
9	MATLAB: User Controlled Input and Output
10	Lab #5: Penny-wise problem (Physical Lab)
11	Lab #6: Systems of Equations in Engineering: The Two-Loop Circuit (Physical Lab)
12	MATLAB: Symbolics, Selection Structure and Logical Functions
13	Lab #7: Derivatives in Engineering: Velocity and Acceleration in Free-Fall
14	MAKE UP LAB WEEK