MEC 320: Numerical Methods in Engineering Design and Analysis

The State University of New York Korea – Stony Brook University

Fall 2021

INSTRUCTOR	Dr. Jongseong Choi	jongseong.choi@sunykorea.ac.kr	Academic Building B625
CLASSES	MW	2:00 – 3:20 pm	online
OFFICE HOURS	M	3:30 – 5:30 pm, or by appointment	B625

COURSE TEXTBOOK

Numerical Methods for Engineers, Chapra S. C., Canale. R. P., McGraw-Hill Education, 8 ed., 2020.

ASSIGNMENTS

As basic preparation for each lecture, you should read the assigned material before coming to class. In-class discussion and examples are designed to help prepare you for homework assignments. In addition to the reading and homework assignments, you should review your past class notes on a daily basis.

Homework: Individual homework is assigned weekly throughout the semester. They will be given every Wednesday. Homework assignment should be scanned and submitted through Blackboard (https://blackboard.stonybrook.edu/) before Wednesday at 11:59 pm of the following week. You can drop one worst score at the end of the course. The detailed course schedule is provided in the following pages of '**Course Schedule**'.

EXAMINATION

There are two midterm examinations and one comprehensive final examination. For all examinations, you can bring one sheet (both sides) for equations and notes. You can bring your TI-30X calculator, pencil(s), and eraser. The use of smartphones, laptop, iPad, or any other sources of communication is strictly prohibited. For the grading, point deduction will occur when you do not represent: the engineering approach, energy flow diagram (EFD), list of assumptions and equations, and sufficient details of the solution. Problem solution format will be provided in detail on the following page.

COURSE GRADING

Homework & Attendance	15%
Midterm #1	25%
Midterm #2	25%
Final Exam	35%
TOTAL	100%

Grading will be curved and normalized to 100% then given in a scale of:

92 ≤	A	< 100	74 ≤	C+	< 78
88 ≤	A-	< 92	70 ≤	C	< 74
85 ≤	B+	< 88	67 ≤	C-	< 70
81 ≤	B	< 85	64 ≤	D+	< 67
78 ≤	B-	< 81	60 ≤	D	< 64

COURSE SCHEDULE

On behalf of Ministry of Education's directive, the University has moved all the classes to 100% online starting this coming Monday, August 30, and continue until October 18, 2021. Therefore, the classes are organized as fully online sessions until further guideline is provided by the University. The location of midterm and final exams will be determined based on further guideline coming up. Please find details in the following pages of '**Course Schedule**'. The link for the online classroom will be provided on the Blackboard.

SAFETY GUIDELINE

Everyone participating in any in-person sessions or meetings ***must wear a mask or face covering at all times*** or have the appropriate documentation for medical exemption. Any student not in compliance with this policy will be asked to leave the classroom. If students need to drink or eat, they should step out of the classroom to do so. Please refer to the 'Guidelines for Fall 2020 in COVID-19 Situation' for more

information.'

COURSE LEARNING OBJECTIVES	ASSESSMENT TOOL
1. Be able to numerically find roots of nonlinear scalar equations	Exams/ Homework
2. Be able to numerically solve systems of linear algebraic eqns.	Exams/ Homework
3. Be able to interpolate and extrapolate a data set	Exams/ Homework
4. Be able to differentiate and integrate numerically	Exams/ Homework
5. Be able to pose and understand the nature of an optimal design problem	Exams/ Homework
6. Be able to solve unconstrained and constrained optimization problems numerically.	Exams/ Homework
7. Be able to find numerical solutions of two-point BVP's	Exams/ Homework
8. Be able to find numerical integrations of ODE IVP's	Exams/ Homework
9. Be able to use methods of curve fitting	Exams/ Homework

BLACKBOARD
All homework assignments and solutions will be posted on the Blackboard course account (http://blackboard.stonybrook.edu/). For problems logging in, go to the coordinator of the department. It is your responsibility to make sure that you can access the blackboard system.

ACADEMIC HONESTY
The campus policies on academic honesty are available on the Web (http://naples.cc.sunysb.edu/CAS/ajc.nsf/pages/info). Academic dishonesty is an extremely serious offense and will not be tolerated in any form. Academic dishonesty in general is the presentation of intellectual work that is not originally yours. Examples include, *but are not limited to*, copying or plagiarizing class assignments including homework, reports, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted. Faculty members are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website: http://www.stonybrook.edu/commcms/academic_integrity/index.html

SPECIAL NOTE ON ADA
If you have a physical, psychological, medical or learning disability that may impact your course work, please contact One-Stop Service Center, Academic Building A201, (82) 32-626-1117. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

CRITICAL INCIDENT MANAGEMENT STATEMENT
The State University of New York, Korea expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

ATTENDANCE POLICY of SUNY KOREA
1. All students of SUNY Korea are required to attend every class.
2. Unexcused absences will affect seriously the student's final grade in the course.
3. If a student has over 20% unexcused absence, the student's final course grade will be an 'F'.
4. Students should report the reason of absence to the instructor in advance, or immediately after the absence.
5. When a student excuses his/her absence, the student must provide documentation of the reason for the absence to the instructor.
6. The instructor of the course reserves the right to excuse absences.
7. The course instructor may excuse the absence if the submitted documentation fulfills the conditions

below. • Extreme emergencies (e.g. death in the family) • Severe medical reasons with doctor's note (Not a slight illness) • Very important events (e.g. national conference, official school event)

8. At the end of semester, the course instructor should submit a copy of the attendance sheet to the Academic Affairs Office.

PROBLEM SOLUTION FORMAT

For both homework and examination, use empty A4-size paper, only one side and only one problem per page. If more than one page is needed for a problem, all pages must be transmitted in order. At the top of the paper, you write the following information from left:

Your name (first, last)	Student ID number	Problem number (i.e. HW1, HW2, …)	Page number (i.e. 1/3, 2/3, 3/3, …)

Then, provide the information listed below:

Find: List what the problem wants you to find. You use this information to decide on the system you'll be analyzing, and how you'll sketch the appropriate energy flow diagram. This information will also drive your choice of basic equation(s) for problem solution since the one(s) you chose must include the quantity (or quantities) of interest.

Energy Flow Diagram (EFD): Your Energy Flow Diagram (EFD) will identify your system boundary, indicate where energy and mass flow into/out of your system, and which forms these flows take. Your EFD will guide your choice of terms in the basic equations that you keep or reject.

Given: Given information serves three purposes. First, it helps you determine which terms in your basic equations you can settle on immediately. Second, it helps you determine how many basic equations you need—the number of basic equations must equal the number of unknowns. Third, it provides guidance for constructing your EFD.

Assumptions: Assumptions are listed to help you eliminate terms in your basic equations. e.g. "Steady state," "Uniform flow," "Ideal gas," etc.

Solution: This includes correct units.