

MEC320 – Numerical Methods in Engineering Design and Analysis

The State University of New York, Korea

Fall 2020

Instructor: Hamid Hefazi , B619 Academic Building (hamid.hefazi@sunykorea.ac.kr)

Class hours: TR: 5:00 – 6:20 (Even weeks 2,4, 6...in person) Odd weeks On-line. (B105 Academic Building)

Office Hours: Wednesday 2:00 - 4:00 (or by appointment)

Textbook: Chapra S. C., Canale. R. P., “Numerical Methods for Engineers”, McGraw-Hill Education, 7th ed. 2014

[https://www.academia.edu/31722261/Numerical Methods for Engineers 7th Edition steven chapra](https://www.academia.edu/31722261/Numerical_Methods_for_Engineers_7th_Edition_steven_chapra)

Grading:

Homework	20%
Midterm 1	20%
Midterm2	20%
Final Exam	40%

Grading Scale: Grading on the Curve and normalized to 100

A [100, 95] % A- (95, 90] % B + (90, 85] % B (85, 80] % B - (80, 75] % C+ (75, 70] % C (70, 65] % C- (65, 60] % D+ (60, 55] % D (55, 50] % F (50, 0] % Note: Percentages will be rounded up to the next number.

Policies:

- Homework exercises and the corresponding solutions will be posted on the Blackboard. Original students' solutions will be held by the department. Students can view their graded work upon request.
- The Blackboard can be accessed at <https://blackboard.stonybrook.edu/>.
- The time and details about the exams will be announced in the class (and also posted on the Blackboard) and may subject to change.
- It is the responsibility of students to make sure that they can access the Blackboard and that they have a working email registered with it. The Blackboard should be checked frequently for new materials.
- Exams will be closed book and note. A standard calculator will be required.

- Abiding to ABET accreditation requirements, there would be “Competency Questions” in the exams. These include basic questions testing the following Course Learning Objectives. Any student who fails to get a full credit on these questions cannot pass the course. The time and other details for the Competency Exams will be announced in the class.

Course Learning Objectives:

- Be able to numerically find roots of nonlinear scalar equations
 - Be able to numerically solve systems of linear algebraic eqns.
 - Be able to interpolate and extrapolate a data set
 - Be able to differentiate and integrate numerically
 - Be able to pose and understand the nature of an optimal design problem
 - Be able to solve unconstrained and constrained optimization problems numerically.
 - Be able to find numerical solutions of two-point BVP's
 - Be able to find numerical integrations of ODE IVP's
 - Be able to use methods of curve fitting
- **Course Outline:**

Week 1 (Aug. 25, Aug. 27)	Significant Figures, Types of Error, Computer Arithmetic
Week 2	Finding real roots of nonlinear equations
Week 3	Remarks on solutions to a system of nonlinear equations
Week 4	Systems of linear equations, Gauss elimination, Pivoting
Week 5	Curve Fitting, Newton’s divided-difference method, Linear Splines
Week 6	Quadratic and Cubic Splines, Inverse Interpolation. Midterm 1
Week 7	Mathematical Programming, Formulation of Physical Problems
Week 8	Unconstraint optimization, Golden-section method
Week 9	LP: Graphical method, Optimization with software, Midterm
Week 10	Optimization with software, Numerical integration
Week 11	Review , Midterm 2
Week 12	Newton-Cotes formulas, Gauss quadrature, Differentiation
Week 13	Differentiation, IVP’s: Euler’s and Heun’s Methods
Week 14	Runge-Kutta Methods, Systems of Initial Value Problems
Week 15	Boundary Value Problems: Shooting & Finite Difference Methods

Disability Support Services (DSS):

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.

Academic Integrity Statement:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person’s work as your own is always wrong. Faculty 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

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'.
Example)
 - If the class is a 150 minute class, and is held once a week, the 4th unexcused absence of a student will lead to an F grade of the course.
 - If the class is a 75 minute class, and is held twice a week, the 7th unexcused absence of a student will lead to an F grade of the course.
 - If the class is a 50 minute class, and is held three times a week, the 10th unexcused absence of a student will lead to an F grade of the course.
 - In Intensive English Course (IEC), if a student misses the class more than 40 hours in a semester, the student will receive an F grade on the course.
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.