

Mathematical Methods 1
MEC 507
Fall 2018

Instructor: Dr. Kazem Mahdavi, Professor of Mathematics
Office: Academic Building A 511
Office Hours: TTh 3:00- 4:50 pm, or by appointment
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Class Meeting Time: TTh 5:00 - 6:20 pm
Room: B313

Notice: We will use Black Board to provide information and communicate with students

Textbook: Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition

Prerequisite: Graduate standing in mechanical engineering and/or permission of the instructor.

Course Description: An introduction to the use of mathematical analysis techniques for the solution of engineering analysis techniques, for the solution of engineering analysis problems, and the simulation of engineering systems. Both continuous and discrete methods are covered. Initial and boundary value problems for ordinary and partial differential equations are treated.

1. **Functions of complex variables:** Cauchy-Riemann equations (analytic functions), harmonic functions, multi-valued functions and branch cuts, Cauchy theorem and integral formula, Taylor and Laurent series (singularities), residue theorem and contour integration
2. **Calculus of variations:** Basic concepts. Extremisation of functionals, Brachistochrone problem, isoperimetric problem, constrained extremisation, Hamilton's principle; applications.
3. **Linear Mathematics:** Vector space (dimension and basis), inner product (normed vector spaces), Gram-Schmidt orthogonalization, projections, change of basis, linear operator, linear equations, eigenvalue problems and diagonalization
4. **Ordinary differential equations:** Sturm-Liouville theory, ODE's (local analysis), Classification of ODE's, Methods of Undetermined Coefficients, Variation of

Parameters, Series Solutions of Regular and Regular Singular Equations, Bessel, Legendre, Airy, and other special functions. (For these topics, students are required to review, on their own, the methods of separation of variables for partial differential equations, Fourier Series, and Laplace Transforms from their undergraduate classes.)

Evaluation Methods

homework	50 points
First test	100 points
Second test	100 points
Final	150 points

Notice:

1. to get a passing grade for this course your final exam grade should be at least 105 (70%)
2. Also, student should attend class regularly. See the university attendance policy at the end of this document.

HOMEWORK

You will have weekly homework. In order to learn the course materials and develop necessary skills, you should do your homework on time. No late homework will be accepted. I strongly encourage students to form a study group to do their homework.

Attendance

Attending this class is compulsory. Regular attendance is very important and is a factor in helping students to succeed in the course. You may fail the course if you do not attend the class regularly. See the university attendance policy at the end of this document.

Test and Quiz Dates (Tentative):

Quiz might be given without prior announcement

Test 1 will be in October

Test 2 will be in November

Final will be on Wednesday Dec 19, 3:15 – 5:45pm

Grades

93%-100%	A
90%-92%	A-
87%-89%	B+
83%-86%	B
80%-82%	B-
77%-79%	C+
73%-76%	C
70%-72%	C-
67%-69%	D+
63%-66%	D
60%-62%	D-
0%- 59%	F

Learning Outcomes for AMS 361, Applied Differential Equations

- 1.) Build differential equations models of phenomena in:
 - * physical sciences;
 - * biological sciences;
 - * engineering.
- 2.) Demonstrate skill with solution methods for first-order ordinary differential equations.
 - * linear equations;
 - * separable and exact nonlinear equations.
- 3.) Demonstrate skill with solution methods of second- and higher order ordinary differential equations.
 - * homogeneous equations with constant coefficients;
 - * non-homogenous equations;
 - * methods of undetermined coefficients and variation of parameters;
 - * series solutions;
 - * using the theory Laplace transforms to solve differential equations.
- 4.) Demonstrate skill with the theory for solving systems of first-order linear differential equations.
 - * mastery of necessary tools of matrix algebra;
 - * basic theory of vector-valued solutions;
 - * solving homogeneous linear system with constant coefficients, including complex and repeated eigenvalues;
- 5.) Use computer software techniques to validate analytical solutions, and to visualize solutions of differential equations.

Policies and Expectations

Please refer to the following link in terms of Policies and Expectations of the students. <http://admissions.sunykorea.ac.kr/academics/29>

Cell phones, IPODs and other electronic devices use are not allowed.

Please, set your cell phones and pagers to silent mode, and turn off all your electronic devices during the class time. If you are expecting an emergency call, please notify the professor in advance, sit near the door, and answer the phone outside. You will not be allowed to wear an IPOD or other electronic devices during an exam.

Photography and recording is prohibited during the class.

Academic Integrity

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 at <http://www.stonybrook.edu/uaa/academicjudiciary/>

Americans With Disabilities Act: If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Academic Affairs. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Critical Incident Management: Stony Brook University 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.

Course Evaluations: Stony Brook University values student feedback in maintaining the high quality education it provides and is committed to the course evaluation process, which includes a mid-semester assessment as well as an end-of-the-semester assessment, giving students a chance to provide information and feedback to an instructor which allows for development and improvement of courses. Please click the the following link to access the course evaluation system: <http://stonybrook.campuslabs.com/courseeval/>

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)

- i) 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.
 - ii) 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.
 - iii) 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.
 - iv) 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.
- i) Extreme emergencies (e.g. death in the family)
 - ii) Severe medical reasons with doctor's note (Not a slight illness)
 - iii) 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.

FYI, retake policy is now changed

http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/records_registration/multiple_registrations.php).

Incomplete (I)

If circumstances beyond the student's control inhibit the student's ability to complete the work for a course on time, the student is responsible for informing the instructor of the circumstances immediately. At the discretion of the instructor, a temporary report of I (Incomplete) may be assigned, signifying that the student has been granted additional time to complete the requirements for the course. After granting an I, the instructor will set a date for completion of the requirements. That date will be no later than November 1 for courses begun the preceding spring semester or summer session and no later than March 15 for courses begun the preceding fall semester.

Students may not complete coursework for which an Incomplete was assigned by auditing or registering again for a subsequent offering of the course. If the instructor determines that circumstances merit it, the instructor may request an extension of the original Incomplete by written notification to the Registrar. This extended deadline will be no later than the last day of classes of the semester following the one in which the course was taken. Longer extensions for extraordinary reasons must be approved by

petition to the appropriate academic office. If the work is not satisfactorily completed by the applicable or extended deadline, the final grade of I/F, U, or NC, as appropriate, will be assigned. The grade of I/F will be averaged as F when computing the grade point average (g.p.a.) or determining other measures of the student's academic standing.