

## **MAE 3360–002: Engineering Analysis Spring 2013 Syllabus**

**Instructor:** Dr. Eric M. Braun  
**Office:** Woolf Hall 323H  
**Email Address:** braun@uta.edu  
**Office Hours:** Wednesday 12:30–2:30 PM, another time is TBD  
Open door policy; email to schedule a meeting at other times  
**Website:** Information will be posted on Blackboard (elearn.uta.edu)  
**Teaching Assistants:** TBD; contact information and availability will be posted on Blackboard

**Meeting Information:** 002 Lecture    Monday, Wednesday    COBA 245W    5:30–6:50 PM

**Description of Course Content:** Mathematical analysis with emphasis on solution techniques and engineering applications. Topics include ordinary differential equations (ODEs), Laplace transformations, numerical solutions for ODEs, initial and boundary value problems, Fourier series, Sturm-Liouville problems and partial differential equations.

**Student Learning Objectives:**

- Develop an understanding of different mathematical methods used to model engineering applications
- Ability to implement and solve mathematical models for engineering problems

**Course Prerequisites:** MATH 2326 (Calculus III), completion of MAE 2360 (Numerical Analysis and Programming) or concurrent enrollment

**Required Textbook:** D.G. Zill and M.R. Cullen, Advanced Engineering Mathematics, 4<sup>th</sup> ed., Jones and Bartlett, 2011.

**Recommended:** R. Bronson and G. Costa, Differential Equations, 3<sup>rd</sup> ed., Schaum's Outline Series, McGraw-Hill, 2006. (563 fully solved problems)

**Attendance:** Attending the class is not mandatory. However, it is strongly encouraged due to high importance of the material covered to the general engineering education. You are welcome to ask questions in class and the example problems in the lectures will be good study material for the exams.

**Collaboration:** Collaboration in the form of discussing the formulation of solutions and results is encouraged for the homework. However, each student must work independently to create the final homework solution. Collaboration should only begin after each individual student has attempted to solve the problem by himself or herself. Collaboration in any form is not allowed on exams. Penalties ranging from point reductions on homework to disciplinary referrals will be assessed if there is evidence that a student is copying work from others or collaborating on exams.

**Examinations:** Two midterms (coverage – first third, second third of semester)  
One final (coverage – cumulative)

**Assignments:** Ten homework assignments

<b>Grading:</b>	10 homework assignments	20% (2% for each assignment)
	2 midterm exams	55% (27.5% for each exam)
	1 cumulative final exam	25%

**Grade Scale:** The letter grade scale will follow university policies (e.g., an A requires a 90–100% cumulative numerical score). Exam scores will be curved depending on the raw average score achieved by the class.

**Policies for Missed Exams, Late Homework Submissions, and Appeals:**

- The outlined lecture schedule and midterm dates are tentative. Please inform me in advance and remind me via email if you are not able to attend the midterms or finals so a makeup exam can be scheduled.
- Homework is due *at the beginning of class*. Late homework is penalized 15% each day and will not be accepted if it is more than 3 days late.
- Grade appeals must be made within one week after the return of the assignment by making an appointment with the instructor or GTA.
- Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current undergraduate catalog.

**Key Assignments:** This course specifically assesses your ability to understand how to formulate solutions to differential equations and other advanced mathematics problems related to engineering. Therefore, certain related assignments in this course must be passed in order to pass the course. During the semester, these assignments will be designated as key assignments. If a key assignment receives a failing grade ( $< 60\%$ ), the student will be given one week to correct deficient sections of the assignment to achieve a passable grade. In order to pass this class you must pass all key assignments. You will not pass the class even if you score perfectly on all exams and other assignments. If the resubmitted key assignment still results in a failing grade, you will not pass the course. Key assignments are specifically announced below. Late key assignments will be accepted with penalties as specified for normal submissions.

**Key Assignment Descriptions:**

- *Linear equations:* Understanding how to solve linear equations is critical for further study of several fields in engineering. Example fields include, but are certainly not limited to, structural dynamics, dynamic measurement systems, circuits, and heat transfer.
- *Numerical methods:* Understanding the basic concepts of numerical methods specifically for solving differential equations is critical for further study of several fields in engineering. Example fields include, but are certainly not limited to, fluid flow, electromagnetic fields, and orbital mechanics.

**Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://web.uta.edu/ses/fao>).

**Americans with Disabilities Act:** The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at [www.uta.edu/disability](http://www.uta.edu/disability) or by calling the Office for Students with Disabilities at (817) 272-3364.

**Academic Integrity:** At UT Arlington, academic dishonesty is completely unacceptable and will not be tolerated in any form, including (but not limited to) "cheating, plagiarism, collusion, the submission for credit

of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts” (UT System Regents’ Rule 50101, §2.2). Suspected violations of academic integrity standards will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student’s suspension or expulsion from the University.

**Student Support Services:** UT Arlington provides a variety of resources and programs designed to help students develop academic skills (which includes report writing), deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may contact the Maverick Resource Hotline by calling 817-272-6107, sending a message to [resources@uta.edu](mailto:resources@uta.edu), or visiting [www.uta.edu/resources](http://www.uta.edu/resources).

**Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

**Student Feedback Survey:** At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory will be asked to complete an online Student Feedback Survey (SFS) about the course and how it was taught. Instructions on how to access the SFS system will be sent directly to students through MavMail approximately 10 days before the end of the term. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback data is required by state law; student participation in the SFS program is voluntary.

**Final Review Week:** A period of five class days prior to the first day of final examinations shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled laboratory experiments; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

### Tentative Lecture Schedule

Date	Course Description	Reading and HW Assignments
Week 1: 1/14–1/18	Introduction: differential equations (DEs) 1st order DEs: Separation of variables	Textbook: 1.1–1.3, 2.1, 2.2 <b>Assign Homework 1</b>
Week 2: 1/21–1/25	1st order DEs: Linear equations 1st order DEs: Solutions by substitutions 1st order DEs: Model examples	Textbook: 2.3, 2.5, 2.7–2.9 <b>Assign Homework 2</b>
Week 3: 1/28–2/1	Homogeneous linear equations - Constant coefficients - Undetermined coefficients	Textbook: 3.1, 3.3 <b>Assign Homework 3</b>
Week 4: 2/4–2/8	Homogeneous linear equations - Undetermined coefficients - Variation of parameters	Textbook: 3.4, 3.5 <b>Assign Homework 4 (Key)</b>
Week 5: 2/11–2/15	Higher order DEs: Linear models - Initial value, boundary value problems	Textbook: 3.8–3.9
Week 6: 2/18–2/22	<b>2/19 Midterm Exam #1: Chapters 1-3</b> Laplace transforms	Textbook: 4.1
Week 7: 2/25–3/1	Inverse Laplace transforms Translation theorems Laplace transform properties - Differentiation	Textbook: 4.2–4.3 <b>Assign Homework 5</b>
Week 8: 3/4–3/8	Laplace transform properties - Differentiation - Integration Dirac delta function	Textbook: 4.4–4.5 <b>Assign Homework 6</b>
Week 9: 3/18–3/22	Laplace transform properties Series solution of a linear DE - Power series, singular points, special functions	Textbook: 5.1 <b>Assign Homework 7</b>
Week 10: 3/25–3/29* *course drop deadline	Numerical Methods - Euler method & error analysis - Runge-Kutta method	Textbook: 6.1–6.2
Week 11: 4/1–4/5	Numerical Methods - Multi-step methods, higher order equations <b>4/4 Midterm Exam #2: Chapters 4-6</b>	Textbook: 6.3–6.4
Week 12: 4/8–4/12	Fourier series - Orthogonal functions - Cosine and sine series	Textbook: 12.1–12.3 <b>Assign Homework 8 (Key)</b>
Week 13: 4/15–4/19	Fourier series - Complex Fourier series - Sturm–Liouville problems	Textbook: 12.4–12.5 <b>Assign Homework 9</b>
Week 14: 4/22–4/26	Separable Partial Differential Equations - Classical PDEs, classification	Textbook: 13.1–13.2 <b>Assign Homework 10</b>
Week 15: 4/29–5/3	Separable Partial Differential Equations - Heat equation, wave equation, Laplace’s equation - Numerical methods	Textbook: 13.3–13.5
Final exam: 5/7, 5:30–8:00 PM	Cumulative final exam	