MAE 2360-001/002/007 NUMERICAL ANALYSIS AND PROGRAMMING
Fall 2016
COURSE SYLLABUS

Department of Mechanical and Aerospace Engineering
University of Texas at Arlington

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Blackboard: https://elearn.uta.edu/
All course-wide communications, lecture notes, assignments, submissions will be conducted through the following Blackboard course listing.
2168-MAE-2360-001-NUMERICAL-ANALYSISPROGRAMMING--2016-Fall

Office Hours: Mondays, 11:00 am – noon (or by appointment)
(Possible alternate location during office hours is WH 320 computer lab)

GTA: Graduate Teaching Assistant(s) will be assigned to the course. Relevant information will be updated on Blackboard when the assignments are finalized.

Course Info:

MAE 2360-001 (Lecture)
Class location: COBA 239
Class times: MW 1:00 – 1:50 p.m.

MAE 2360-007 (Lab)
Lab location: WH 406
Lab times: M 2:00 – 4:50 p.m.

MAE 2360-007 (Lab)
Lab location: WH 406
Lab times: F 1:00 – 3:50 p.m

Description: Utilization of digital computers in mechanical and aerospace engineering. Computational algorithms and their representation in FORTRAN, C, and MATLAB. Introduction to linear algebra and numerical methods.

Student Learning Outcomes: This course is intended to help students develop basic programming skills and be able to apply them to solve algebraic equations using numerical methods.
Specific Goals:
1. Exposure to scientific computer programming (C, FORTRAN, MATLAB)
2. Mastery of numerical analysis

Textbooks: None required. (All materials posted on Blackboard)

Optional References: There are several texts that contain material similar to the course. None of these texts are require but may be beneficial for review.
- C Programming: A Modern Approach, by K. N. King, W. W. Norton & Company, 2nd Edition (2008).
- C Programming Language (ANSI C) by B. W. Kernighan and D.M. Ritchie, Prentice Hall, 2nd ed. (1998).
- Numerical Methods for Engineers by Steven Chapra and Raymond Canale (any edition)
- Applied Numerical Methods with MATLAB for Engineers and Scientists by S. Chapra, McGraw-Hill (any edition)

Prerequisites: C or better in MATH (or HONR-SC 2425) (or concurrent enrollment).

Attendance:

At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, **attendance will be recorded through random quizzes and/or recording student attendance. This policy is in effect for both lecture and lab sections of the class.** However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Blackboard. This date is reported to the Department of Education for federal financial aid recipients.

Detailed Grading Policies:

1. Class and lab attendance is required. Quizzes will be given or attendance will be taken sporadically. The resulting average will count as 10% of your overall grade.
    a. The purpose of quizzes are to provide simple problems to test mastery of the subject and provide practice for exams. One half of the value of each quiz is awarded for attendance. The other half is awarded for mastery of the problem.
    b. When attendance is taken, student names will be recorded and full credit for the event will be awarded for attendance.
2. Homework and labs will be posted and turned in through Blackboard. Submission file should be in PDF format and include all applicable elements: problem statement, worked problem (for hand calculations), copy of code and example run showing results. A submission guide will be posted on Blackboard. **Late homework will be penalized 15% per day that it is late (max 3 days – after that it will not be accepted).**
3. **All in class exams will be closed book, closed notes.**
4. **Make-up Exams**: Any makeup exam will be given only under extenuating circumstances. Please notify me at least one week in advance via email if you anticipate an excused absence.
5. **Key Assignments:** The midterm exam and a homework assignment before the final are identified as "key assignments." Successfully completion of these key assignments will be a major indicator of the students' understanding of the course content. Class performance (pass/fail) on the key assignments are reported to Accreditation Board for Engineering and Technology (ABET).
6. Each graded item will have a weighted value depending on the complexity of that particular item. The sum of the weighted values are the total points available. The calculated average for each grading area will be the total points earned divided by the total points available.
7. The final course grade will be determined on the following grading policy and scale.

Table 1: Grading Policy and Scale

GRADING POLICY		GRADING SCALE	
Area	**Weight**		
Quizzes/Participation	10%	A	90 or above
Homework/Lab Reports	30%	B	80 – 89
Midterm	30%	C	70 – 79
Final Exam -Take-home portion 15% -In-class portion 15%	30%	D F	60 – 69 59 or below
Total	100%		

8. Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels; see "Student Support Services" below.

High Level Course Topics Covered:

C Language and Programming Topics	Numerical Methods Topics
1. Unix through UTA Omega Account 2. Algorithms, Pseudocode, Syntax and Semantics: 3. C Programming Language Overview 4. Major Parts of a C Program 5. General form of a Simple Program 6. Reserved Keywords 7. Identifiers 8. Statements/Compound Statements 9. Code Formatting/Indentation/Style 10. Comments 11. Most Basic Program 12. Preprocessor Directives 13. Macros 14. Functions 15. GNU Library 16. Variables 17. Formatted Input/Output 18. Pointers 19. Strings 20. Structures 21. File Input/Output	22. Approximations and Error 23. Roots 24. Numerical Differentiation 25. Numerical Integration 26. Random Number Generators and Monte Carlo Method 27. Matrices for Linear Systems 28. Solving Simultaneous Equations 29. Regression Analysis (Curve fitting) 30. Statistical Analysis 31. Sorting Algorithms 32. Ordinary Differential Equations 33. Numerical Integration of Ordinary Differential Equations **Other Topics** **MATLAB** 34. Comparison with C 35. Scripts (m-files) 36. Variables 37. Operators 38. Control Structure 39. Functions 40. Formatted I/O 41. Plotting **FORTRAN** 42. Comparison with C 43. Simple Programs

Tentative Course Schedule:

Week	Date	Topic(s)	Date	Topic(s)	Lab -002	Lab -007
1	8/29/16	1-3	8/31/16	4-10	Lab 1	Lab 1
2	9/5/16	holiday	9/7/16	11-13	holiday	Lab 2
3	9/12/16	14-15	9/14/16	16	Lab 2	Lab 3
4	9/19/16	16	9/21/16	17	Lab 3	Lab 4
5	9/26/16	18	9/28/16	18	Lab 4	Lab 5
6	10/3/16	18,19	10/5/16	19	Lab 5	Review
7	10/10/16	20	10/12/16	**midterm**	Review	Lab 6
8	10/17/16	21	10/19/16	22	Lab 6	Lab 7, 34-41
9	10/24/16	23	10/26/16	24	Lab 7, 34-41	Lab 8
10	10/31/16	25	11/2/16	26	Lab 8	Lab 9
11	11/7/16	27	11/9/16	28	Lab 9	**
12	11/14/16	29	11/16/16	30-31	**	**
13	11/21/16	32	11/23/16	33	**	holiday
14	11/28/16	42-43	11/30/16	*	**	Review
15	12/5/16	*	12/7/16	*	Review	(no lab)

***** Remaining lectures will close out topics not previously completed.

** Remaining labs will be used to close out topics not previously completed and provide assistance on homework and take-home final.

Organization of the Course:

The course will primarily focus on the C language and programming techniques through the midterm exam. The second half of the course will focus on Numerical Methods using C and MATLAB. The student is expected to apply the programming concepts learned in the C language to the new syntax of MATLAB. While the basics of MATLAB will be presented, the coverage of MATLAB will not be as extensive as the coverage of the C language. MATLAB concepts will be primarily introduced during lab. The course will conclude with a brief overview of FORTRAN.

The lectures will follow the course notes provided on Blackboard. Portions of the lecture content may be continued during lab. In some instances, the notes cover concepts beyond the scope of this course. Those concepts are provided for completeness of coverage and are not the primary focus of the course.

The course notes are composed of four primary files:

Filename	Content
C Notes.docx	notes on the C language
Numerical Methods.docx	notes on numerical methods topics
MATLAB.docx	comparison of MATLAB with the C language and introductory topics on MATLAB
FORTRAN.docx	comparison of FORTRAN with the C language

These files are stored on Blackboard and will occasionally be updated throughout the semester. The most current version of each file will be the version stored on Blackboard.

Tentative Lab Assignments:

Lab No.	Description
1	Omega Unix and Intro to C
2	Variable types, for loop, if/else
3	Preprocessor Directives, Switch/Case Program Control, Operators
4	Omega File Transfer, Functions
5	Arrays/Matrices and Pointers
6	Pointers and Structures
7	C File I/O, importing into MATLAB
8	Strings
9	Introduction to MATLAB

Important Dates:

- **Homework assignments**: typically be made weekly
- **First Day of Class (COBA 239):** Monday, August 28, 2016
- **First Lab (WH 406):** -001: Monday, August 28, /2016; -007: Friday, September 2, 2016
- **Midterm (tentative):** Wednesday, October 12, 2016 in COBA 239
- **Take-Home portion of Final Due:** 11:59 PM, Sunday, December 4, 2016
- **Last Day of Class:** Wednesday, December 7, 2016
- **Final Exam:** Monday, 12/12/2016 from 11 - 1:30 p.m in COBA 239 (university scheduled time)

Descriptions of major assignments and examinations:

Midterm Exam: This exam will test the student's mastery of programming concepts and the C language. This exam will be some combination of matching, multiple choice, short answer, and implementing C language programs by hand using pen/pencil on paper.

Key Homework Assignment: This assignment will test the student's mastery of the C language. This homework assignment will be significantly longer than other assignments and worth more in value. It will be a significant portion of the homework grade.

Final Exam Take-Home Portion: This exam will be similar in nature to the homework assignments but will test student implementation of topics related to numerical methods. This portion will typically take 10 or more hours to complete. The majority of the content will be in MATLAB with potential content in the C language and FORTRAN.

Final Exam In-class portion: This exam will test the student's mastery of numerical methods, MATLAB programming and limited concepts of FORTRAN. This exam will be some combination of matching, multiple choice, short answer, and implementing short MATLAB programs by hand using pen/pencil on paper.

Expectations for Out-of-Class Study:

Beyond the time required to attend each class and lab meeting, students enrolled in this course should expect to spend at least an additional 9 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc.

Woolf Hall 406 – Computer Teaching Lab Policies:

1. WH 406 must be officially reserved for all events including classroom instructions due to the limited space equipped with computers and scheduling logistics.
2. WH 406 is a computer teaching lab. Faculty and Instructors must be present while students occupy this room. When an instructor leaves the room, students are to leave WH 406 as well.
3. **Use WH 320 outside of lab hours, available for MAE student access 24/7.**
4. **WH 406 doors are not to be propped open.** Propped doors are considered a security breach by the UTA Police Department and a hazard violation by the Fire Inspector.
5. **Food, drink, and tobacco products are prohibited in WH 406.**

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://wweb.uta.edu/aao/fao/).

Disability Accommodations:

UT 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), The Americans with Disabilities Amendments Act (ADAAA),* and *Section 504 of the Rehabilitation Act.* 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 disability. Students are responsible for providing the instructor with official notification in the form of **a letter certified** by the Office for Students with Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability.

Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

Non-Discrimination Policy:

The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos.

Title IX Policy:

The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. *For information regarding Title IX, visit* www.uta.edu/titleIX or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or jmhood@uta.edu.

Academic Integrity:

Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

> *I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*
>
> *I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) 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. Additional information is available at https://www.uta.edu/conduct/.

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.

Official course-wide announcements and communications will primarily be initiated through Blackboard and sent to MavMail.

Campus Carry:

Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit http://www.uta.edu/news/info/campus-carry/

Student Feedback Survey:

At the end of each term, students enrolled in face-to-face and online classes categorized as "lecture," "seminar," or "laboratory" are directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback via the SFS database is aggregated with that of other students enrolled in the course. Students' anonymity will be

protected to the extent that the law allows. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law and aggregate results are posted online. Data from SFS is also used for faculty and program evaluations. For more information, visit http://www.uta.edu/sfs.

Final Review Week:

For semester-long courses**,** a period of five class days prior to the first day of final examinations in the long sessions 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 activities such as required field trips or performances; 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.

Note: The take home portion of the final exam will be due by 11:59 PM in Blackboard the night before final review week starts.

Emergency Exit Procedures:

Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit. For COBA 239 exit the rear of the room and take a right to the stairwell. Follow the stairwell down and exit the building directly in front of the stairwell. For WH 406, exit the lab and take a right or left. Proceed to the end of the hallway and take the stairs to the first floor to exit the building. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

MavAlert:

Please subscribe to the MavAlert system that will send information in case of an emergency to your cell phones or email accounts. Anyone can subscribe at https://mavalert.uta.edu/ or https://mavalert.uta.edu/register.php

Student Support Services:

UT Arlington provides a variety of resources and programs designed to help students develop academic skills, 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 visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at http://www.uta.edu/universitycollege/resources/index.php.

Grade Grievances:

Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog.

"As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. –Stanley Ryan Sifford."

Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381