Office of Academic Affairs
Tarleton State University

Master Course Syllabus Outline

Department: Mathematics, Physics & Engineering
Course Prefix/Number: MATH 3360
Official Course Title: Numerical Analysis
Master Syllabus Approved by Department on: __1__/ __15___/ _2008__
                                                        Month   day   year

I.   **Catalog Description:** An introduction to numerical analysis. Topics will be selected from error analysis, solving algebraic equations, interpolation, numerical differentiation and integration, methods for solving systems of equations, approximation theory, and initial value problems of ordinary differential equations.

II. **Prerequisites:** MATH 2414 (Calculus II).

III. **Expanded Course Description:** MATH 3360 provides students with a working knowledge of how to obtain approximate solutions to problems arising in the areas of science, engineering and mathematics. Students will be introduced to approximation techniques applied to topics selected from the following: differentiation and integration, solving algebraic equations, interpolation, functional approximation, solving systems of equations, and solving initial value problems of ordinary differential equations. Students will compare the accuracy of different techniques for a given problems and analyze the error in the approximations.

IV. **Intended Student Outcomes:** Upon successfully completing MATH 3360, students should be able to do the following:
   a.   Recognize sources of error in approximation techniques.
   b.   Demonstrate an understanding of the derivation of and motivation for approximation techniques.
   c.   Choose an appropriate technique for a given problem and apply the technique successfully.
   d.   Interpret the results of the approximation technique and discuss the accuracy of the results.

V.   Unless otherwise stipulated in this master syllabus by the department, the following items are subject to faculty discretion as described in each faculty member's individual course outline/syllabus:
   a) Course Requirements
   b) Required Text(s)
   c) Bibliography

MATH 3360 - Numerical Analysis
Fall 2020

University Policy: Students are responsible for knowing and abiding by the policies and information contained in the Tarleton Student Handbook [TSUSH].

Student Responsibilities: The student is *solely* responsible for:
- Completing each assignment by the specified due date.
- Obtaining assignments and other materials for classes from which they are absent.
- Utilizing, as needed, all available study-aid options (including meeting with the instructor, attending the Supplemental Instruction (SI) sessions, going to the Mathematics Clinic, using tutorial software, purchasing a student solutions manual, hiring a personal tutor, etc.) to resolve any questions that they might have regarding homework, course material, and/or technology projects.
- Giving as much of an effort as it takes to pass this course.

Safety Measures
Tarleton State University has adopted policies and practices for the Fall 2020 term to limit transmission of the novel coronavirus. Students are required to observe the following practices while participating in face-to-face courses and course-related activities (office hours, moving between classes, study spaces, academic services, etc.):
- Self-monitoring – Students should follow CDC recommendations for self-monitoring. **Students who exhibit symptoms of COVID-19 (with or without fever) should participate in class remotely and should not participate in face-to-face instruction.** See https://www.tarleton.edu/roadmap/personal-responsibilities/ for more information. Students who test positive for COVID-19 or experience symptoms consistent with COVID-19 are required to self-report to Tarleton State University via this form.
- Face coverings – All students must properly wear face coverings in all public spaces on campus, including classrooms. If a student refuses to wear a face covering, the instructor will ask the student to leave and join the class remotely. Any student refusing to comply will be reported to the Dean of Students Administrative Office via the Student Affairs Incident Reporting Form. Additionally, the faculty member may choose to teach that day's class remotely for all students.
- Physical Distancing – Physical distancing must be maintained between students, instructors, and others in course and course-related activities.
- Classroom Entrance and Exit – Students should leave classrooms promptly after class activities have concluded each day. Students should not congregate in hallways or other areas and should maintain a safe physical distance when waiting to enter classrooms and other instructional areas.

Personal Illness and Quarantine/Isolation: Students who are required to quarantine (see https://www.tarleton.edu/roadmap/isolation-v-quarantine/) must participate in course and course-related activities remotely and **must not attend face-to-face course activities.** Students in quarantine are expected to participate in courses and course activities/assignments unless they have symptoms too severe to participate. Students placed in isolation should contact the instructor about individual participation in relation to severity of illness. Students who test positive for COVID-19 or who are experiencing symptoms consistent with COVID-19 are

required to self-report to the Dean of Students Administrative Office through the COVID-19 Report Form. For any questions or concerns, please contact the Dean of Students Administrative Office at 254-968-9080.

Academic Conduct: Tarleton State University expects its students to maintain high standards of personal and scholarly conduct. Students guilty of academic dishonesty are subject to disciplinary action. Academic dishonesty includes, but is not limited to, cheating on an examination or other academic work, plagiarism, collusion, and the abuse of resource materials. The faculty member is responsible for initiating action for each case of academic dishonesty that occurs in his or her class.

Services for Students with Disabilities: It is the policy of Tarleton State University to comply with the Americans with Disabilities Act (www.ada.gov) and other applicable laws. If you are a student with a disability seeking accommodations for this course, please contact the Center for Access and Academic Testing, at 254.968.9400 or caat@tarleton.edu. The office is located in Math 201. More information can be found at www.tarleton.edu/caat or in the University Catalog.

Tutoring*: The Tutoring and Learning Center (TLC) offers free tutoring for Tarleton State University students. Tutors help clarify concepts introduced in class and will help you become an independent learner. Our tutors are selected based on their academic performance and interpersonal skills and receive training each semester to become certified tutors. Tutoring sessions include one to three students per one-hour session and are held online and in designated locations in the Library. In order to adhere to social distancing guidelines, we invite students to schedule tutoring sessions by email at tutoring@tarleton.edu or by phone at 254-968-9293. If you have further questions please email our office at tutoring@tarleton.edu or visit the Tutoring and Learning Center online at tarleton.edu/tlc.*

Absence Policy: Class absence policies will be established and enforced by each individual course instructor. The course instructor may recommend to the Dean of Students that a student be dropped from a course if excessive absences prevent satisfactory progress.

Makeup Policy: Each course instructor has the responsibility and authority to determine if work can be made-up because of absences. Students may request make-up considerations for valid and verifiable reasons such as the following:
- Illness
- Death in the immediate family
- Legal proceedings
- Participation in sponsored University activities (It is the responsibility of students who participate in University-sponsored activities to obtain a written explanation for their absence from the faculty/staff member who is responsible for the activity.)

Drop Policy: A student who withdraws from a course before the thirteenth class day of a regular semester or before the fifth class day in a summer term receives no grade, and the course will not be listed on that student's permanent record. A student who withdraws from a course before the end of the tenth week of a regular semester or the fourteenth class day of a summer term receives a grade of W.

Calculator Policy: All students are required to have an approved graphing calculator when taking this course. During the administration of a test, the use of calculators may be restricted, at the discretion of the instructor. Students may also be restricted to the use of a calculator that does not have course notes stored in the memory. The instructor reserves the right to examine and delete material from the memory of a student's calculator before approving its use on an exam.

MATH 3360 - Numerical Analysis   **Fall 2020**

Instructor: Dr. Peter W. White   **Office:** MATH 331
Phone #: 968-1982   **e-mail:** white@tarleton.edu
Math Office #: 968-9168   **Office Hours:** TBA
Web: https://faculty.tarleton.edu/white/

Text: Numerical Analysis by Burden, Faires and Burden, 10th edition, ISBN-13: 978-1-305-25366-7.

Attendance Policy: Attendance will be taken of the face-to-face students in case it is need for contact tracing. Attendance will not be a component of the final grade. The student is responsible for all material covered in class. The class sessions will be recorded and posted in Canvas. The student may not be allowed to turn in late work or make up exams or quizzes unless they have a verifiable university recognized absence.

Submission of Work: To submit your work from a remote location, scan it or take a picture (PDF's are preferable) and send that via email to: white@tarleton.edu . There are several apps for smart-phones that can "scan to PDF", such as Cam Scanner, Genius Scan and Scannable. If this is not possible, then other arrangements will be made (possibly USPS).

Homework Policy: Exercises from the end of the sections will be assigned and due-dates will be given in class or via the website: https://faculty.tarleton.edu/white/ .

Quizzes: Not likely, but possible if deemed necessary by the instructor.

Projects: A limited number of computer programs, using Matlab (or equivalent software), will be required. Some of these will be deemed minor and incorporated into the homework, others will be major. The instructor will use Matlab and/or Mathematica for demonstration purposes.

Exams: There will be three or four exams and one comprehensive final exam given during the semester. Each exam will be equally weighted. The comprehensive final exam will count as 20% of the possible points in the course. The final exam will be distributed on Monday, November 30 and will be due at 10 pm on Friday, December 4. All exams will be take home.

Calculator Policy: Yes, the students in this course will need a graphing calculator. The instructor will use a TI-8* overhead for demonstration purposes.

Grading Policy: 50% of the course will be exams and projects, 30% homework, 20% comprehensive final. Grades will be determined based on the percentages of the total points possible given in the table below:

A	90-100%
B	80-89%
C	68-79%
D	55-67%
F	0-54%

Course Content:

I. Preliminary Material
    A. Introduction to Matlab and Matlab Programming
    B. Review of Calculus

    C.   Round-Off Errors and Computer Arithmetic
    D.   Algorithms and Convergence
II.   Solutions of Equations in One Variable
    A.   The Bisection Method
    B.   Fixed Point Iteration
    C.   The Newton-Raphson Method
    D.   Error Analysis for Iterative Methods
    E.   Accelerating Convergence; Taylor Series
III.   Interpolation and Polynomial Interpolation
    A.   Interpolation and the Lagrange Polynomial
    B.   Divided Differences
    C.   Hermite Interpolation
    D.   Cubic Spline Interpolation
IV.   Numerical Differentiation and Integration
    A.   Numerical Differentiation
    B.   Richardson's Extrapolation
    C.   Elements of Numerical Integration
        1. Composite Numerical Integration
        2. Romberg Integration
        3. Adaptive Quadrature
        4. Gaussian Quadrature
        5. Improper Integrals
V.   Direct Methods for Solving Linear Systems
    A.   Linear Systems of Equations
    B.   Pivoting Strategies
    C.   Algebra and Matrix Inversion
    D.   The Determinant of a Matrix
    E.   Matrix Factorization

Notes:
- In the event that the university is closed for a scheduled class time, whatever was scheduled for that day and/or whatever was due that day will be scheduled and/or due on the next scheduled class time.
- You are expected to present a valid TSU ID upon request.
- **All items contained in this syllabus are subject to change as the semester progresses. Students will be notified in advance of any changes.**