MATH 4355 - Spring 2025
Methods of Applied Mathematics
Course Syllabus

- **Class Time** M & W 4-5.15 pm
- **Classroom:** SCI 3.250
- **Modality** Face to face

- **Instructor Office & Email:** FO 2.408 C; vish@utdallas.edu
- **Office Hours:** M 2.30-3.30pm. These office hours are nominal. Students can meet me at other times. To do so first converge upon a mutually convenient time & then send me a reminder 24 hours in advance. Please also see the information about the optional session below.
- **Grader** Mr. Mahesh Ranpati Dewage; mkr200000@utdallas.edu

Optional Problem Session Starting January 31st, I will hold weekly, on every Friday, an optional problem session from 1-2pm in FO 2.404. Though optional this session has been very beneficial to students. It serves as an interactive office hour.

Grades and the Like:

- *Attendance:* 5 %. Attendance will be called at times not announced in advance.
- *HW:* 35 %. HWs must be returned in person to me (unless otherwise indicated) **ONLY** at times (i.e., day and time of day) indicated on the HW. HWs cannot be returned either before or after the time indicated.
- *2 Midterm Examinations:* Worth 30 % each. The first will take place on March 5th, 2025 and the second on April 23rd, 2025. Both will be held in class. Exams are closed book. No notes or electronic devices are permitted. Cellphones etc., must be turned off.
- **NB:** Class activities (including HWs and attendance) continue after April 23rd 2025, till the last day of classes (viz., May 7th 2025).

Grading Scale: $\geq 98 A+; [92, 98) : A; [87, 92) : A-; [84, 87) B+; [80, 84) B; [77, 80) : B-; [74, 77) : C+; [70, 74) : C; [65, 70) : C-; [62, 65) : D+; [58, 62) : D; [50, 58) : D- < 50 : F$

Syllabus & Learning Outcomes:

- Various types of matrix products and their uses;
- Schur complements and their use in matrix inversion and positivity;
- Inner products, orthogonal projections and their uses in least squares.
- Eigenvalues, Schur triangularization; spectral theorem; SVD and applications.
- Applications to clustering and the perceptron.
- Multivariate differentiability; the chain rule; Multivariate optimization.
- Convexity; strong convexity; Lagrange multipliers; subgradients; KKT conditions.
- Fourier series and transforms; Gaussians and the undertainty principle
- Orthognal polynomials with emphasis on the Chebyshev polynomials.
- Time permitting: Basics of tensors; CUR decompositions.

Textbooks: Class notes which will be made available on elearning. Other reading materials will be suggested as the course progresses.
Generalities: Cheating will not be tolerated; ample decorum must be maintained in the classroom.