1. Course number and name: **MEEN 3250 – Analytical Methods**
2. Credits and contact hours: **3 credits**
3. Instructor's or course coordinator's name: **Dr. Yunwei Xu**
4. Required Textbook:

   Numerical Method for Engineers and Scientists, 3rd Edition

   Amos Gilat and Vish Subramaniam

   ISBN: 978-1-118-55493-7
5. Specific course information

   a. Applications of mathematical methods and computational techniques to typical engineering problems. Topics include analysis of linear systems, numerical integration of ordinary differential equations, conditions for optimality and an introduction to finite element analysis.

   b. Prerequisite: **MATH 3410 and MEEN 2240**

   c. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the programs: **Required**
6. ABET criteria:

   An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

7. Specific goals for the course:

Mechanical and Energy Engineering								
	Course Leaning Outcomes MEEN 3250	**ABET EAC Student Outcomes**						
		1	**2**	**3**	**4**	**5**	**6**	**7**
1	**Understand vectors and their operations in 2D and 3D space**	X						
2	**Use 2D and 3D vectors to solve mechanical engineering problems: statics and dynamics**	X						
3	**Calculate vector integrals: line integrals, surface integrals and volume integrals**	X						
4	**Use integrals to solve mechanical engineering problems: measure areas, calculate fluid pressures, compute volumes, find centers of mass and mass moment of inertias**	X						
5	**Find roots for algebra equation using Iterative method and Newton's method**	X						
6	**Understand Lagrange interpolation method**	X						
7	**Understand Newton interpolation method**	X						
8	**Find numerical value for integration using Trapezoidal and Simpson's method**	X						
9	**Solve linear equations using Gaussian elimination method**	X						
10	**Solve first ODE using Euler method and RK method**	X						
11	**Solve higher order ODE using Euler method and RK method**	X						

8. Brief list of topics to be covered:

Solve nonlinear equations using a variety of numerical methods such as Newton's Method	Numerically differentiate using finite difference approximations and Taylor's series expansions
Numerically solve a system of linear equations	Numerically integrate using techniques such as Newton-Cotes Formulas and Simpson's rules
Solve matrix eigenvalue problem	Solve ordinary differential equations using a variety of numerical methods
Apply curve fitting and interpolation techniques to data sets	Understand numerical Fourier methods*
Solve boundary value problems using numerical techniques*	*time permitting