MEEN 3250   Analytical Methods for MEE Engineers Syllabus   Fall 2012

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Lecture Time: MWF 10:00am-10:50am room B140
Office Hours: Monday 3:00pm-5:00pm or by appointment.

Required Textbook: Advanced Engineering Mathematics, 10th edition
Erwin Kreyszig
ISBN-10: 0470458364
ISBN-13: 978-0470458365

Course Description:
Applications of mathematical methods and computational techniques to typical problems in mechanical and energy engineering practice. Topics include vector calculus, numerical methods and probability and statistics.
Pre-requisites: MATH 2730.

Course Learning Outcomes (CLO):
Upon successful completion of this course, students will be able to:
1.   Understand vectors and their operations in 2D and 3D space
2.   Calculate vector integrals: line integrals, surface integrals and volume integrals
3.   Find roots for algebra equation using Iterative method and Newton's method
4.   Understand Lagrange, Newton and Spline interpolation method
5.   Find numerical value for integration using Trapezoidal and Simpson's method
6.   Solve linear equations using Gaussian elimination method and LU method
7.   Solve ODE using Euler method and R-K method
8.   Understand the basic idea of Galerkin and FEM method
9.   Understand most common statistics distributions
10.   Find the confidence interval of population mean and population proportion
11.   Testing of Hypothesis for large and small samples

CLO	ABET Student Outcomes (SO)										
	SO1	**SO2**	**SO3**	**SO4**	**SO5**	**SO6**	**SO7**	**SO8**	**SO9**	**SO10**	**SO11**
1	X				X				X		
2	X				X				X		
3	X				X				X		
4	X				X				X		
5	X				X				X		
6	X				X				X		
7	X				X				X		
8	X				X				X		
9	X				X				X		
10	X				X				X		
11	X				X				X		

Grades:

Homework	10%		≥ 90	A
Pop Quizzes	10%		80-89.9	B
Exam#1	25%		70-79.9	C
Exam#2	25%		60-69.9	D
Exam#3	25%		< 60	F
Attendance	5%			
Total	100%			

Homework: Homework is due one week after it is assigned, unless otherwise stated. Please turn in your homework on the due day before the lecture starts. **NO late homework will be collected.** Definition of "late": when the class is over and instructor steps out of the classroom, homework turned in thereafter is considered to be "late" and is not going to be collected.

Exam and Quiz: quizzes are open book and notes. Exams are closed book closed notes with one page of formula sheet (A4 size, both sides). **There will be NO make-up exam/quiz.** Only students who missed an exam with valid excuse (for instances: medical emergency of him/herself and close relatives, with valid hospital records or doctor's note) will be given make-up exam.

Disability Accommodations: If you need academic accommodations for disability you must have document which verifies the disability and makes you eligible for accommodations, then you can schedule an appointment with the instructor to make appropriate arrangements.

Academic Dishonesty:
There is a zero tolerance policy. Cheating of whatsoever will result in an automatic 'F' in this course and the matter will be turned over to the appropriate student disciplinary committee.

EXAM DATES
Exam #1 on Friday, October 5th, 10:00am-10:50am (12:00pm ?)
Exam #2 on Friday, Nov 9th, 10:00am-10:50am (12:00pm ?)
Exam #3 on Wednesday, Dec 12th, 8:00 a.m. - 10:00 a.m.

MEEN 3250
Analytical Methods for MEE Engineers Schedule Overview
(Please note the schedule may change based on the needs during the semester)

Week	Date	Monday	Wednesday	Friday	HW Due
#1	**Aug.27th - Aug.31st**	-	**Course overview, 9.1 Vectors in 2-Space and 3-Space**	**9.2 Inner Product 9.3 Cross Product**	**09/07**
#2	**Sep.3rd - Sept.7th**	- No class	**9.4 Vector and Scalar Functions and Fields. Derivatives**	**Curves. Arc Length. Curvature. Torsion**	**09/14**
#3	**Sept.10th – Sept.14th**	**Calculus Review: Functions of Several Variables; Gradient of a Scalar Field; directional derivatives, tangent planes;**	**extrema of functions of several variables; Lagrange multipliers**	**Divergence of a Vector Field Curl of a Vector Field**	**09/21**
#4	**Sept.17th – Sept.21st**	**10.1 Line Integrals 10.2 Path Independence of Line Integrals**	**10.3 Calculus Review: Double Integrals**	**10.4 Green's Theorem in the Plane**	**09/28**
#5	**Sept.24th – Sept.28th**	**10.5 Surfaces for Surface Integrals 10.6 Surface Integrals**	**10.7 Triple Integrals. Divergence Theorem of Gauss**	**10.8 Further Applications of the Divergence Theorem**	**10/05**
#6	**Oct.1st – Oct. 5th**	**10.9 Stokes's Theorem Review of vector calculus**	**Part III: Numerical methods: Read 19.1; 19.2 Solution of Equations by Iteration (Newton, Secant, Fixed-point)**	**Exam #1-vector calculus**	**10/12**
#7	**Oct. 8th – Oct.12th**	**19.2 Solution of Equations by Iteration (Newton, Secant, Fixed-point)**	**19.3 Interpolation: Lagrangian; Divided difference;**	**19.4: Spline interpolation**	**10/19**
#8	**Oct. 15th – Oct.19th**	**19.5 Numerical integration: rectangular, trapezoidal; Simpson rules (1/3,3/8): Numerical differentiation**	**20.1 linear system: Gauss elimination**	**20.2 linear system: LU factorization; Cholesky method**	**10/26**
#9	**Oct. 22nd – Oct.26th**	**20.3 sloution by Gauss-Seidel Iteration; Norm; ill-condition matrix**	**20.6 Eigenvalues 20.8 power method for Eigenvalues**	**21.1 Euler method; improved Euler method**	**11/02**

#10	Oct. 29th – Nov.2nd	R-K method RKF method Backward Euler method	21.2 multistep methods: Adam-Bashforth and Adam-moulton method	21.3 Methods for higher order ODEs; Euler method; 4th order RK	11/09
#11	Nov.5th –Nov.9th	Handout: Boundary-value problem: Galerkin Method; FEM	Part III: Statistics 24.1 data representation, experiments, probability, basic theorems	**Exam #2- Numerical methods**	11/16
#12	Nov.12th –Nov.16th	24.5 RV, pdf; 24.6 mean, Variance	24.7 Binomial, Poisson distribution	24.8 Normal distribution	-
#13	Nov.19th –Nov.23rd	24.9 Distribution of several RV: discrete/continuous, marginal, dependence, addition rules	25.2 point estimation 25.3 confidence interval: Large sample size, Small sample size	- No class Thanksgiving	11/30
#14	Nov.26th –Nov.30th	25.3 confidence interval: Small sample size 25.3 Confidence interval: population proportion	25.4 Hypothesis testing: large sample mean, p-vale;	Hypothesis testing: p-vale;	12/07
#15	Dec.3rd – Dec. 7th	25.4 Hypothesis testing: Small sample mean;	25.4 Hypothesis testing: Large sample population proportion	-	-
#16	Dec. 12th	**Exam 3 - Statistics**			-