Mechanical Engineering 5301 **A. Bronson**
Mathematical Methods **August 22, 2016**

DESCRIPTION OF COURSE: The course educates students on the mathematical techniques needed for modeling, interpreting and predicting the engineering science of outcomes. Students will either reinforce previous mathematical skills or learn effective mathematical techniques to solve equations used to explain engineering and scientific behavior.

EDUCATIONAL OBJECTIVES: The course has the following objectives:

A. Students will have demonstrated the application of ordinary differential equations (ODEs) in the analysis of engineering principles.
B. Students will have the ability of using integral transforms (e.g., Fourier transform and wavelet) in the analysis of experimental data.
C. Students will have the ability to solve partial differential equations as applied to engineering behavior (e.g., transport phenomena and thermodynamic/kinetic reactions).
D. Students will have the basic methodology for tensor analysis.

TEXT:

1. D. G. Zill and W. S. Wright: Advanced Engineering Mathematics, 4th edition, Jones and Bartlett Publishers, 2011.
   Or as an alternate text
2. E. Kreyszig: Advanced Engineering Mathematics, 9th edition, John Wiley & Sons, Inc., 2006

REFERENCES:

1. J. P. Holman: Heat Transfer, 10th ed., McGraw-Hill Companies, New York, 2010.
2. M. J. Moran and H. N. Shapiro: Fundamentals of Engineering Thermodynamics, John Wiley & Sons, New York, 2000.
3. D. R. Poirier and G. H. Geiger: Transport Phenomena in Materials Processing, The Minerals, Metals and Materials Society, 1994.
4. B. R. Munson, D. F. Young, and T. H. Okiishi: Fundamentals of Fluid Mechanics, John Wiley & Sons, 1998.
5. O. Levenspiel: Chemical Reaction Engineering, 3rd Edition, John Wiley & Sons, 1999.
6. H. Mehrer: Diffusion in Solids: Fundamentals, Methods, Materials, Diffusion-Controlled Processes, Springer, 2007.

GRADING: Exams and assignments will weigh as follows:

ITEM	WEIGHT
Assignments*	10 Points/Assignment
Class Examinations	250 points/Examination
Final Examination	350 points

*Assignments will be suggested and the grading will depend on the characteristics of the course.

Assessment of Points Acquired on Examinations	
Final Grade*	Minimum Points
A	0.90 X Total Points
B	0.80 X Total Points
C	0.70 X Total Points
D	0.60 X Total Points

*Examinations will be based on readings assigned for the text by Shackelford, lectures, technical references given in class and class "throwaways." At the end of the semester, a grade of Incomplete will not be given unless hospitalization occurs. Make-up examinations will not be given.

ATTENDANCE POLICY: Attendance will be sporadically taken during the semester and with excessive absences, a student will be dropped from the course. In addition, examinations will be prepared from class notes, readings from technical references given in class and class "throwaways".

COURSE OUTLINE
ME 5301

	Monday of Week	Description of Class Lectures for the Week	Reading Assignment for Class
1.	Aug 22	Introduction, Organization and Schedule	
2.	Aug 29	First order differential equations (ODEs)	Chapter 1
3.	Sep 5	(No Class on Sept 5) Continuation of first-order ODEs	Chapter 1
4.	Sep 12	Second order ODEs	Chapter 2
5.	Sep 19	Higher Order Linear ODEs and Review	Chapter 3
6.	Sep 26	**(Examination on September 28)**	
7.	Oct 3	Linear Algebra: Matrices and Vectors	Chapter 7
8.	Oct 10	Vector Differential Calculus: Grad, Div and Curl	Chapter 9
9.	Oct 17	Continuation of Vector Differential Calculus	
10.	Oct 24	Fourier Analysis	Chapter 11
11.	Oct. 31	Partial Differential Equations (PDEs)	Chapter 12
12.	Nov 7	Continuation of PDEs	Chapter 12
13.	Nov 14	Complex Numbers and Functions	Chapter 13
14.	Nov 21	Power Spectrum Analysis (Thanksgiving week)	
15.	Nov. 28	Continuation of Spectrum Analysis	
	Dec. 5	**Comprehensive Final Examination on Wednesday, Dec. 7, at 10:00 AM – 12:45 PM**	