ME 5301/CE 6303 **A. Bronson**
Mathematical Methods/Engineering Analysis **August 2019**

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) 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 and Springer 2016.
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 are 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 Zill and Wright's 4th edition (or Zill's 6th edition), 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 of five, 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 5390

	Monday of Week	Description of Class Lectures for the Week	Reading Assignment for Class
1.	Aug 25	Introduction, Organization and Schedule	
2.	Sept 2	First order differential equations (ODEs)	Chapter 1
3.	Sept 9	Continuation of first-order ODEs	Chapter 1
4.	Sept 16	Second order ODEs	Chapter 2
5.	Sept 23	Higher Order Linear ODEs and Review	Chapter 3
6.		**(Examination on Sept 25)**	
7.	Sept 30	Linear Algebra: Matrices and Vectors	Chapter 7
8.	Oct 7	Vector Differential Calculus: Grad, Div and Curl	Chapter 9
9.	Oct 14	(**Columbus Day, Oct. 14, not observed in TX**) Continuation of Vector Differential Calculus	
10.	Oct 21	Fourier Analysis	Chapter 11
11.	Oct 28	Partial Differential Equations (PDEs)	Chapter 12
12.	Nov 4	Continuation of PDEs	Chapter 12
13.	Nov 11	Complex Numbers and Functions	Chapter 13
14.	Nov 18	Power Spectrum Analysis	
15.	Nov 25	Continuation of Spectrum Analysis	
16.	Dec 2	Review	
	Dec 13	**Comprehensive Final Examination on Dec. 11, Wednesday, at 10:00 – 12:45 PM**	