Mathematics 5222
Vector and Tensor Analysis
Spring 2016

Instructor: Dr. Grow
Office: 103 Rolla Building
Office Hours: 1:00-2:00 pm MWF or by appointment
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Course Description: This is an introductory course in tensor and vector analysis with applications, designed primarily for students in applied mathematics, science, and engineering. The selection of topics and the manner in which they are presented are intended to equip students with a knowledge and mastery of those concepts and techniques of tensor and vector calculus most frequently encountered in the applied sciences. Moreover, the tensor formalism will be used to study various aspects of differential geometry of general interest and applicability. In my classroom presentation of the subject, I will try to maintain a healthy balance between conveying an intuitive understanding, developing computational facility, and encouraging conceptual rigor. Because of the wide scope of the subject and the varied interests of the audience, no one semester course in tensor and vector analysis can satisfy everyone who enrolls. Consequently, the course will conclude with approximately three weeks of guided independent study on a topic of the individual student's choice, subject to my approval, in tensor and vector analysis or its applications.

Texts: *A Brief on Tensor Analysis* (2^{nd} ed.) by James G. Simmonds (Springer, New York, 1994).
Tensor Calculus, a Concise Course by Barry Spain (Dover Publications, Mineola, NY, 1960).

Tentative List of Topics to be Covered:
BTA Chapter 1. Introduction: Vectors and Tensors
BTA Chapter 2. General Bases and Tensor Notation
BTA Chapter 3. Newton's Laws and Tensor Calculus
TCCC Chapter 1. Tensor Algebra
TCCC Chapter 2. The Line Element
TCCC Chapter 3. Covariant Differentiation
TCCC Chapter 4. Geodesics and Parallelism
TCCC Chapter 5. Curvature Tensor

Additional References:
Tensor Calculus by J.L. Synge and A. Schild (Dover Publications, Mineola, NY, 1978).
Tensor Analysis, Theory and Applications to Geometry and Mechanics of Continua by I.S. Sokolnikoff (Wiley, New York, 1964).
Tensor Analysis on Manifolds by R.L. Bishop and S.I. Goldberg (Macmillan, New York, 1968).

Your grade will be based on the following schedules:

Chapter Homework Assignments (approx. 9 sets)	40%
Midterm Exam (Friday, March 11)	15%
Independent Study Topic (select by April 4)	15%
Final Exam (Thursday, May 12, 3:00-5:00 PM)	30%

Course Average:	80%-100%	60%-79%	40%-59%	0%-39%
Letter Grade in Course:	A	B	C	F