



JOINT INSTITUTE  
交大密西根学院

## Course Syllabus

Vm511

### Foundation of Solid Mechanics

Summer 2018

#### Course Description:

Basic concepts of finite elasticity. Strain measures in finite deformation elasticity. Stress measures in finite deformation elasticity. Equilibrium equations and transport theorems in finite deformation elasticity. Constitutive laws in finite deformation elasticity.

#### Instructor:

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Office hour: TBD

#### Textbook (Author, Book Title, Publisher, Publication Year, ISBN):

Gerhard A. Holzapfel, Nonlinear Solid Mechanics: A Continuum Approach for Engineering, Wiley, 2000, 978-0-471-82319-3

#### Course Prerequisites:

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Vm211 and Vm311, or graduate standing.

**Course Website:**

<https://umjicanvas.com/courses/538>

**Grading Policy (Assignments %, Project, Exams, etc.):**

Homework 40%, midterm exam 25%, final exam 35%. A double-sided A4-sized sheet of notes is permitted for each exam.

**Honor Code Policy:**

Discussing with classmates on homework problems is allowed, but having someone else's homework solution available when completing one's own homework is regarded as an Honor Code violation.

**Teaching Schedule:**

Week	NO.	Date	Lectures and Exams	Comments
1	1	May 15	Deformation mapping. Motions.	
	2	May 17	Material time derivative.	
2	3	May 22	Metric changes (stretch ratios and change angles).	
	4	May 24	Metric changes (deformed curves, areas, and volumes).	
3	5	May 29	Metric changes with cylindrical coordinates. Rotations.	
	6	May 31	Polar decomposition.	
4	7	June 5	Linearization.	
	8	June 7	Rates. Stress tensors (first Piola-Kirchhoff stress tensor).	
5	9	June 12	Stress tensors (second Piola-Kirchhoff stress tensor and Kirchhoff stress tensor). Balance laws (mass balance,	



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			Reynold's transport theorem).	
	10	June 14	Balance laws (master balance principles, linear momentum balance, angular momentum balance).	
6	11	June 19	Balance laws (energy conservation)	
	12	June 21	Balance laws (entropy inequality)	
7	13	June 26	Objectivity (change of observers).	
	14	June 28	Objectivity (superimposed rigid body rotation).	
8	15	July 3	<b>Midterm exam.</b>	
	16	July 5	Objectivity (objective rates, invariance of elastic material response).	
9	17	July 10	Incompressible isotropic materials.	
	18	July 12	Hyperelastic materials.	
10	19	July 17	Isotropic hyperelastic materials.	
	20	July 19	Incompressible isotropic hyperelastic materials.	
11	21	July 24	Some forms of strain-energy functions. Elasticity tensor.	To be re-scheduled
	22	July 26	Hyperelastic materials with internal variables. Hyperelastic materials with isotropic damage.	To be re-scheduled
12	23	July 31	Plasticity, viscoplasticity, and viscoelasticity.	
	24	August 2	Principle of virtual work. Linearization.	
13	25	August 7	<b>Final exam.</b>	
	26	August 9		