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| **COURSE NUMBER:** Vm211 | **COURSE TITLE:** Statics and Mechanics of Materials |
| **CREDIT: 4** | **PREREQUISITES:** (Vp140 or Vp160) and (Vv156 or Vv186) |
| **TEXTBOOKS/REQUIRED MATERIAL:**<br>*Statics and Mechanics of Materials*, 2nd ed., R. C. Hibbeler, 2004 | **PREPARED BY:** Shane Johnson<br>**DATE OF PREPARATION:** Nov. 4, 2012<br>**DATE OF UC APPROVAL:** Oct. 30, 2013 |
| **INSTRUCTOR(S):** Shane Johnson | **SCIENCE/DESIGN:** n/a |
| **CATALOG DESCRIPTION:**<br>Statics: Moment and force resultants, equilibrium. Mechanics of deformable bodies: stress/strain, classification of material behavior, generalized Hooke's law. Engineering applications: axial loads, torsion of circular rods and tubes bending and shear stresses in beams, deflection of beams, combined stresses, stress and strain transformation. | **COURSE TOPICS:**<br>**Statics**<br>i. Force Vectors<br>ii. Force System Resultants<br>iii. Equilibrium of a Rigid Body<br>iv. Structural Analysis (Trusses, Frames)<br>v. Geometric Properties and Distributed Loadings<br>**Mechanics**<br>vi. Stress and Strain<br>vii. Mechanical Properties of Materials<br>viii. Axial Load<br>ix. Torsion<br>x. Bending<br>xi. Transverse Shear<br>xii. Combined Loadings<br>xiii. Stress and Strain Transformation<br>xiv. Design of Beams (Equation of the elastic curve) |
| **COURSE STRUCTURE/SCHEDULE**: Lecture: twice per week, 90 minutes each | |
| **COURSE OBJECTIVES [Course Outcomes in brackets]** | 1. To provide the knowledge of the basic theories and experience with through applying theory to solve real engineering problems in statics, mechanics, and structural analysis. [1, 2, 3, 8, 9, 10, 11]<br>2. To provide the knowledge and experience needed to communicate problems and solutions to others. [4, 5, 6] |
| **COURSE OUTCOMES [Program Outcomes in brackets]** | After completing Vm211, students should be able to:<br>1. Calculate force and moment resultants & develop an understanding of static equivalence [a]<br>2. Draw free body diagrams (Support reactions)<br>3. Assign loadings to mechanical systems<br>4. Satisfy equations of friction and equilibrium [a]<br>5. Do structural analysis for truss structures (Assumptions and applications, Method of Joints, Method of Sections) [a]<br>6. Geometric Properties and Distributed Loadings (Center of mass/gravity, moment of intertia, resultant forces for distributed loadings)<br>7. Analyze Internal Loadings (Shear and Moment Diagrams) [a]<br>8. Analyze stresses due to axial stress, shear stress<br>9. Calculate modulus of elasticity, poisons ratio, shear modulus from stress vs. strain diagrams [a]<br>10. Understand basic mechanics of materials terminology [a]<br>11. Apply theory to analyze thermal stresses and strains [a]<br>12. Apply theory to analyze statically indeterminate axial members [a]<br>13. Apply theory to analyze torsional stresses & strains in circular shafts, power transmission [a]<br>14. Apply theory to analyze bending behavior of homogeneous and composite, prismatic and tapered beams [a]<br>15. Apply theory to analyze shear behavior of beams and shear flow [a]<br>16. Apply theory to analyze stresses in thin-walled pressure vessels [a]<br>17. Apply theory to analyze stresses in members subject to combined loadings (tension, compression, shear, torsion, and bending) [a]<br>18. Use Mohr's circle to analyze stress and strain components [a, k]<br>19. Transform stress and strain components from one orientation of the coordinate system to another orientation |
| **ASSESSMENT TOOLS [Course Outcomes in brackets]** | Homework<br>Midterm exam [Statics Only, 1-7]<br>Exam 2 [Mechanics, 1-15]<br>Final Exam [1-19] |