## MEGR Graduate Courses
### Spring 2020 Offerings

Students wishing to take more than one Special Topics (7090/8090) course may require a duplicate permit. Pre-requisite errors require an authorization permit. Please submit a permit request at [https://mees.uncc.edu/graduate-programs/graduate-permit-request](https://mees.uncc.edu/graduate-programs/graduate-permit-request).

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<th>Course No.</th>
<th>Course Name and Description</th>
<th>Prerequisites/Co-requisites</th>
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| MEGR 6000/8000-001 (T. Xu) CRN 20655/20659 | Research Seminar  
Presentations on the current research in Mechanical Engineering, Engineering Science, and related fields. Required for all doctoral students in the MEES program. | None |
| MEGR 6166/8166-001 (Y. Chen) CRN 26197/26214 | Mechanical Behavior of Materials I  
Macroscopic and microscopic aspects of elastic and plastic deformation and fracture of engineering materials; applications of dislocation theory to an interpretation and control of mechanical properties; temperature, strain rate and texture effects. | MEGR 3282 with a minimum grade of D. |
| MEGR 7090/8090-001 (K. Falaggis) CRN 26198/26207 | Special Topics: Engineering Analysis II (Satisfies Graduate Mathematics)  
An overview of Linear Algebra including Matrix-Matrix operations, Types of Matrices, Gaussian Elimination, Rank of a Matrix, Eigenvalues and Eigenvectors, Singular Value Decomposition, Approximations of Functions with Fourier Series, Discrete Fourier Transform, Hankel Transform, Orthogonal Polynomials. | None |
| MEGR 7090/8090-004 (N. Zheng) CRN 21775/21776 | Special Topics: Mechanics of the Human Locomotor System  
This course will introduce dynamic analysis of the human musculoskeletal system. Students will learn to develop 3-D rigid body models of human movement, and to learn to calculate internal forces in muscles and joints during daily and sports activities. Students will learn how to use motion capture system and simulation software of human locomotion. | None |
| MEGR 7090/8090-005 (M. Davies) CRN 22328/22329 | Special Topics: Waves and Optics  
Ray analysis of optical elements (mirror, lenses and systems of lenses, prisms). Reflection and refraction at plane and spherical surfaces, thin and thick lenses, lens maker’s equation, field of view, and numerical aperture. Wave properties of light, superposition of waves, diffraction, interference, polarization, and coherence. | MATH 2171 and MEGR 3122 with a grade of C or better or permission of the instructor. |
| MEGR 7090/8090-007 (IH. Yang) CRN 26200/26209 | Special Topics: Bioelectronic Medicine  
Topics in Bioelectronic Medicine. See instructor for more details. | None; permission of the instructor. |
| MEGR 7090/8090-008 (H. Cherukuri) CRN 26201/26210 | Special Topics: Machine Learning in Manufacturing and Materials Science  
Various techniques in Supervised Learning with applications to manufacturing and materials. | None; permission of the instructor. |
| MEGR 7090/8090-090 (J. Xu) CRN 21187/21190 | Special Topics: Numerical Simulation in Mechanical Engineering  
Topics in numerical simulation in mechanical engineering. See instructor for more details. | None; permission of the instructor. |
| MEGR 7108/8108-001 (A. Tabarraei) CRN 20657/22547 | Finite Element Analysis & Applications (MS Core)  
An introduction to the finite element method and its application to engineering problems. Application of the displacement methods to plane stress, plane strain, plate bending and axisymmetrical bodies. Topics may include but are not limited to: dynamics, heat conduction, and structural mechanics. | None |
| MEGR 7113/8113-001 (R. Keanini) CRN 26202/26211 | Dynamics & Thermodynamics of Compressible Flow  
Compressible flow equations, isentropic flow, normal shock waves, Fanno and Rayleigh line flows. Nonsteady one dimensional flow. | MEGR 3111 and MEGR 3114, both with a minimum grade of D. |
| MEGR 7119/8119 (G. Elliott) CRN 26519/26520 | Thermal Applications in Biomedical Engineering  
Application of thermodynamic and heat transfer principles to the analysis of biomedical systems. Topics include: thermodynamic and transport properties of biological tissue, thermoregulation, design and use of cryosurgical probes, and numerical modeling methods. | None |
| MEGR 7130/8130-001 (A. Ghasemi) CRN 24759/24762 | Introduction to Control Systems  
Introduction to key principles behind feedback control, including closed-loop time domain and frequency domain analysis, root locus design, state feedback, robustness margins, and loop shaping. | None |
| MEGR 7132/8132-090 (N. Garrett/M. Uddin) CRN 26203/26212 | Advanced Automotive Power Plants  
Follow-up course to Automotive Power Plants. Topics include: combustion, thermodynamic efficiency, fuel efficiency, torque and power, emissions, etc. | MEGR 7131 or 8131 with a minimum grade of C. |
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<td>MEGR 7133/8133-090</td>
<td>Applied Vehicle Aerodynamics</td>
<td>An introduction to road vehicle dynamics; acceleration and braking, road loads, steady-state cornering, suspension, steering system, and tire behavior.</td>
<td>MEGR 2240, MEGR 3111 and MEGR 3114, all with a grade of C or better; permission of the instructor.</td>
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<td>MEGR 7135/8135-001</td>
<td>Advanced Tire Mechanics (MS Core)</td>
<td>In-depth analysis of the tire and its influence on vehicle performance, including: design, materials, construction, structural response, rolling resistance, force and moment generation, NVH, wet and dry traction, wear, high speed limit, and Standards. Tire models, their limitations, and their governing equations. Graduate students develop an experiment (in addition to a literature review), gather data, submit an abstract to the Fall Tire Society Conference, and write a rough draft of a paper.</td>
<td>MEGR 2144 and MEGR 3121, both with a minimum grade of C; permission of the instructor.</td>
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<td>MEGR 7182/8182-001</td>
<td>Machine Tool Metrology</td>
<td>Machine tool accuracy and performance testing. Modeling and measurement of volumetric accuracy using parametric error separation and quasi-static error models. Use of homogeneous transformations for error mapping. Linear and higher order thermal models. Error budgeting and management. Axis of rotation metrology, spindle accuracy, and cutting performance tests. Laboratory experience on CNC machine tools using heterodyne laser interferometers, capacitance gages, and other computer assisted sensor systems for machine checking.</td>
<td>MEGR 2180 and MEGR 3281, both with a minimum grade of D and MEGR 6181 with a minimum grade of C; permission of the instructor.</td>
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<td>MEGR 7213/8213-001</td>
<td>Introduction to Computational Fluid Dynamics</td>
<td>Introductory topics in Computational Fluid Dynamics, including mathematical properties of governing equations, fundamentals of discretization, finite difference and finite volume methods, turbulence modeling, and grid generation.</td>
<td>Graduate level MATH 6171 with a minimum grade of C; permission of the instructor.</td>
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<td>MEGR 7956-001</td>
<td>Graduate Design I</td>
<td>First of a two-semester sequence leading to a major integrative experience in applying the principles of design and project management to the design of a major mechanical engineering system. Teamwork and communication skills are emphasized.</td>
<td>MSME or MSE programs only. Requires submission of MS Plan of Study and selection of design capstone option.</td>
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