# Expected Course Offerings
## *Mechanical Engineering*

The schedule below is based on historical patterns and expected scheduling. The semester and location in which a course may be offered **is subject to change** due to instructor availability, student demand, and the need to provide an appropriate balance of subjects and course levels in all semesters. Courses may be offered at the Applied Physics Laboratory (APL) (3VL), online (O), or Virtual Live (8VL), as indicated.

| Course # | Course Name | Pre-Req* | Summer | Fall | Spring |
|---|---|---|---|---|---|
| **Core Courses** | | | | | |
| 535.641 | Mathematical Methods for Engineers | Vector analysis &  differential equations | O | O | O |
| **Recommended Courses** | | | | | |
| 535.609 | Topics in Data Analysis | | O | O | O |
| 535.610 | Computational Methods of Analysis | | | O | O |
| 535.742 | Applied Machine Learning for Mechanical Engineers | | O | O | O |
| 535.743 | Intermediate Applied Artificial Intelligence in Mechanical Engineering | | | O | O |
| 535.766 | Numerical Methods | | | | O |

| Course # | Course Name | Pre-Req* | Summer | Fall | Spring |
|---|---|---|---|---|---|
| **Advanced Manufacturing Focus Area - Group 1** | | | | | |
| 535.628 | Computer-Integrated Design and Manufacturing | | | | O |
| 535.659 | Manufacturing Systems Analysis | | | O | |
| 535.660 | Precision Mechanical Design | | | O | O |
| 535.673 | Mechanized Assembly: Hardware and Algorithms | | O | | |
| **Advanced Manufacturing Focus Area - Group 2** | | | | | |
| 535.606 | Advanced Strength of Materials | | | | O |
| 535.607 | Mechanics of Solids and Structures: Theory and Applications I | | | O | |
| 535.618 | Fabricatology - Advanced Materials Processing | | | O | O |
| 535.623 | Intermediate Vibrations | Undergraduate vibrations course | | O | O |
| 535.627 | Computer-Aided Design | | O | O | O |
| 535.633 | Intermediate Heat Transfer | Undergraduate heat transfer course | | | O |
| 535.638 | Mechanical Packaging for Electronics Systems | | O | O | |
| 535.642 | Control Systems for Mechanical Engineering Applications | | | O | |
| 535.671 | Aerospace Materials, Structures and Design | | TBD *in development | | |
| 535.672 | Advanced Manufacturing Systems | | O | | |
| 535.684 | Modern Polymeric Materials | | | O | |
| 535.720 | Mechanics of Composite Materials and Structures | | | O | O |
| 535.721 | Advanced Composite Materials & Manufacturing Processes | | | O | O |
| 515.601 | Structure and Properties of Materials | | See Materials Science and Engineering Course Offering page for schedule | | |
| 515.622 | Micro and Nano Structured Materials and Devices | | | | |
| 515.655 | Metal Additive Manufacturing | | | | |
| 515.658 | Design for Additive Manufacturing | 515.655 | | | |
| 515.661 | Introduction to Polymer Science | | | | |
| **Aerospace Engineering Focus Area - Group 1** | | | | | |
| 535.606 | Advanced Strength of Materials | | | | O |
| 535.607 | Mechanics of Solids and Structures: Theory and Applications I | | | O | |
| 535.612 | Intermediate Dynamics | | | O | |
| 535.620 | Fluid Dynamics I | | | | O |
| 535.623 | Intermediate Vibrations | Undergraduate vibrations course | | O | O |
| 535.670 | Advanced Aerodynamics | | | O | |
| 535.752 | Advanced Flight Dynamics and Control of Aerospace Vehicles | | | O | |
| 535.761 | Hypersonic Aerothermodynamics | | | | O |
| **Aerospace Engineering Focus Area - Group 2** | | | | | |
| 535.608 | Hypersonic Technologies and Systems | | | O | |
| 535.625 | Turbulence | | | VL (odd years) | |
| 535.627 | Computer-Aided Design | | O | O | O |
| 535.628 | Computer-Integrated Design and Manufacturing | | | | O |
| 535.632 | Applied Finite Elements | | O | O | O |
| 535.642 | Control Systems for Mechanical Engineering Applications | | | O | |
| 535.643 | Plasticity | | | | O |
| 535.652 | Thermal Systems Design and Analysis | | | O | |
| 535.660 | Precision Mechanical Design | | | O | O |
| 535.671 | Aerospace Materials, Structures and Design | | TBD *in development | | |
| 535.684 | Modern Polymeric Materials | | | | O |
| 535.706 | Mechanics of Solid Structures: Theory and Applications II | | | | O |
| 535.720 | Mechanics of Composite Materials and Structures | | | O | O |
| 535.721 | Advanced Composite Materials & Manufacturing Processes | | | O | O |
| 535.724 | Dynamics of Robots and Spacecraft | | | | O |

*See catalog of complete list and description of prerequisites

# Expected Course Offerings
## *Mechanical Engineering*

The schedule below is based on historical patterns and expected scheduling. The semester and location in which a course may be offered **is subject to change** due to instructor availability, student demand, and the need to provide an appropriate balance of subjects and course levels in all semesters. Courses may be offered at the Applied Physics Laboratory (APL) (3VL), online (O), or Virtual Live (8VL), as indicated.

| Course # | Course Name | Pre-Req* | Summer | Fall | Spring |
|---|---|---|---|---|---|
| 535.731 | Engineering Materials: Properties and Selection | | | O | O |
| 535.732 | Fatigue and Fracture of Materials | | | | O |
| 535.735 | Computational Fluid Dynamics | | | O | |
| 535.741 | Optimal Control and Reinforcement Learning | | | | O |
| 535.752 | Advanced Flight Dynamics and Control of Aerospace Vehicles | | | O | |
| 535.761 | Hypersonic Aerothermodynamics | | | | O |
| 515.655 | Metal Additive Manufacturing | | | | |
| 515.658 | Design for Additive Manufacturing | | See program Course Offering page for schedule<br><br>515.XXX - Materials Science & Engineering<br><br>525.XXX - Electrical & Computer Engineering | | |
| 515.661 | Introduction to Polymer Science | | | | |
| 525.609 | Continuous Control Systems | | | | |
| 525.645 | Modern Navigation Systems | | | | |
| 525.661 | UAV Systems and Control | | | | |
| 525.777 | Control System Design Methods | | | | |
| **Biomechanical Engineering Focus Area - Group 1** | | | | | |
| 535.661 | Biofluid Mechanics | | | O | |
| 535.663 | Biosolid Mechanics | | | | O |
| 535.667 | Biomechanics of Human Movement | | | O | O |
| 535.750 | Biomechanics of the cell: From nano- and micro-mechanics to cell organization and function | | | O | O |
| 585.601 | Physiology for Applied Biomedical Engineering | | See Applied Biomedical Engineering Course Offering page for schedule | | |
| 585.631 | Introduction to Biomechanics | | | | |
| **Biomechanical Engineering Focus Area - Group 2** | | | | | |
| 535.607 | Mechanics of Solids and Structures: Theory and Applications I | | | O | |
| 535.664 | Fundamental Principles for Bio-microfluidic Systems | | TBD *in development | | |
| 535.720 | Mechanics of Composite Materials and Structures | | | O | |
| 515.606 | Chemical and Biological Properties of Materials | Undergraduate chemistry & biology | | | |
| 525.786 | Human Robotics Interaction | Linear algebra, differential equations | See program Course Offering page for schedule<br><br>515.XXX - Materials Science & Engineering<br><br>525.XXX - Electrical & Computer Engineering<br><br>585.XXX - Applied Biomedical Engineering | | |
| 585.631 | Introduction to Biomechanics | | | | |
| 585.708 | Biomaterials | | | | |
| 585.710 | Biochemical Sensors | | | | |
| 585.720 | Orthopedic Biomechanics | 585.601 and 585.602 | | | |
| 585.726 | Biomimetrics in Biomedical Engineering | | | | |
| 585.729 | Cell and Tissue Engineering | Ordinary differential equations | | | |
| 585.747 | Advances in Cardiovascular Medicine | 585.601 and 585.602 | | | |
| **Fluid Mechanics and Thermal Science Focus Area - Group 1** | | | | | |
| 535.620 | Fluid Dynamics I | | | O | |
| 535.621 | Intermediate Fluid Dynamics | Undergraduate fluid mechanics course | | | O |
| 535.633 | Intermediate Heat Transfer | | | | O |
| 535.634 | Applied Heat Transfer | Undergraduate heat transfer course | O | | |
| 535.735 | Computational Fluid Dynamics | | | O | |
| 515.602 | Thermodynamics and Kinetics of Materials | | See program Course Offering page for schedule<br>515.XXX - Materials Science & Engineering<br>575.XXX - Environmental Engineering<br>615.XXX - Applied Physics | | |
| 575.601 | Fluid Mechanics | | | | |
| 615.761 | Introduction to Oceanography | Mathematics through calculus | | | |
| **Fluid Mechanics and Thermal Science Focus Area - Group 2** | | | | | |

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# Expected Course Offerings
## *Mechanical Engineering*

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| Course # | Course Name | Pre-Req* | Summer | Fall | Spring |
|---|---|---|---|---|---|
| 535.614 | Fundamentals of Acoustics | | | | O |
| 535.625 | Turbulence | 535.620 | | VL (odd years) | |
| 535.652 | Thermal Systems Design and Analysis | Undergraduate courses in thermodynamics & heat transfer | | O | |
| 535.661 | Biofluid Mechanics | | | O | |
| 535.662 | Energy and Environment | | | | O |
| 535.664 | Fundamental Principles for Bio-microfluidic Systems | | TBD *in development | | |
| 535.670 | Advanced Aerodynamics | 535.620 | | O | |
| 535.737 | Multiscale Modeling and Simulation of Mechanical Systems | | O | | |
| 535.761 | Hypersonic Aerothermodynamics | | | | O |
| 535.771 | Naval Architecture Design | | TBD *in development | | |
| 535.773 | Acoustical Oceanography | | | O | |
| 515.622 | Micro and Nano Structured Materials and Devices | | See program Course Offering page for schedule 515.XXX - Materials Science & Engineering 565.XXX - Civil Engineering | | |
| 565.680 | Marine Geotechnical Engineering | | | | |
| **Hypersonic Technologies Focus Area - Group 1** | | | | | |
| 535.608 | Hypersonic Technologies and Systems | | | O | |
| 535.721 | Advanced Composite Materials & Manufacturing Processes | | | O | O |
| 535.734 | Ultra-high Temperature Materials | | TBD *in development | | |
| 535.752 | Advanced Flight Dynamics and Control of Aerospace Vehicles | | | O | |
| 535.761 | Hypersonic Aerothermodynamics | | | | O |
| **Hypersonic Technologies Focus Area - Group 2** | | | | | |
| 535.620 | Fluid Dynamics I | | | | O |
| 535.627 | Computer-Aided Design | | O | O | O |
| 535.633 | Intermediate Heat Transfer | Undergraduate heat transfer course | | | O |
| 535.634 | Applied Heat Transfer | Undergraduate heat transfer course | O | | |
| 535.670 | Advanced Aerodynamics | | | O | |
| 535.671 | Aerospace Materials, Structures and Design | | TBD *in development | | |
| 535.735 | Computational Fluid Dynamics | | | O | |
| 575.601 | Fluid Mechanics | | See Environmental Engineering Course Offering page for schedule | | |
| **Ocean Engineering Focus Area - Group 1** | | | | | |
| 535.606 | Advanced Strength of Materials | | | | O |
| 535.607 | Mechanics of Solids and Structures: Theory and Applications I | | | O | |
| 535.620 | Fluid Dynamics I | | | | O |
| 535.621 | Intermediate Fluid Dynamics | Undergraduate fluid mechanics course | | | O |
| 615.761 | Intro to Oceanography | | See Applied Physics Course Offering page for schedule | | |
| **Ocean Engineering Focus Area - Group 2** | | | | | |
| 535.614 | Fundamentals of Acoustics | | | | O |
| 535.625 | Turbulence | 535.620 | | VL (odd years) | |
| 535.627 | Computer-Aided Design | | O | O | O |
| 535.632 | Applied Finite Elements | | O | O | O |
| 535.721 | Advanced Composite Materials & Manufacturing Processes | | | O | O |
| 535.732 | Fatigue and Fracture of Materials | | | | O |
| 535.735 | Computational Fluid Dynamics | | | O | |
| 535.771 | Naval Architecture Design | | TBD *in development | | |
| 535.773 | Acoustical Oceanography | | | O | |
| 525.645 | Modern Navigation Systems | | See program Course Offering page for schedule 525.XXX - Electrical and Computer Engineering 565.XXX - Civil Engineering 615.XXX - Applied Physics | | |
| 565.680 | Marine Geotechnical Engineering | | | | |
| 565.682 | Design of Ocean Structures | | | | |
| 615.775 | Physics of Climate | | | | |
| **Robotic, Dynamics, and Controls Focus Area - Group 1** | | | | | |
| 535.622 | Robot Motion Planning | | O | | O |
| 535.630 | Kinematics and Dynamics of Robots | | | O | O |
| 535.642 | Control Systems for Mechanical Engineering Applications | | | O | |
| 535.724 | Dynamics of Robots and Spacecraft | | | | O |

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| Course # | Course Name | Pre-Req* | Summer | Fall | Spring |
|---|---|---|---|---|---|
| 535.752 | Advanced Flight Dynamics and Control of Aerospace Vehicles | | | O | |
| 525.609 | Continuous Control Systems | | | | |
| 525.610 | Microprocessors for Robotic Systems | | | See program Course Offering page for schedule | |
| 525.626 | Feedback Control in Biological Signaling Pathways | | | | |
| 525.645 | Modern Navigation Systems | | | | |
| 525.661 | UAV Systems and Control | 525.609 | | 525.XXX - Electrical and Computer Engineering | |
| 525.777 | Control System Design Methods | | | | |
| 525.786 | Human Robotics Interaction | Linear algebra, differential equations | | | |
| 605.613 | Introduction to Robotics | | | 605.XXX - Computer Science | |
| 605.716 | Modeling and Simulation of Complex Systems | | | | |
| **Robotic, Dynamics, and Controls Focus Area - Group 2** | | | | | |
| 535.603 | Applied Optimal Control | | | VL | |
| 535.612 | Intermediate Dynamics | Mathematics through calculus & linear algebra | | O | |
| 535.623 | Intermediate Vibrations | Undergraduate vibrations course | | O | O |
| 535.627 | Computer-Aided Design | | O | O | O |
| 535.628 | Computer-Integrated Design and Manufacturing | | | | O |
| 535.635 | Introduction to Mechatronics | Mathematics through calculus & linear algebra | | | APL |
| 535.638 | Mechanical Packaging for Electronics Systems | | O | O | |
| 535.645 | Digital Control and Systems Applications | 535.642 | O | | |
| 535.659 | Manufacturing Systems Analysis | | | O | |
| 535.660 | Precision Mechanical Design | | | O | O |
| 535.673 | Mechanized Assembly: Hardware and Algorithms | | O | | |
| 535.741 | Optimal Control and Reinforcement Learning | 535.641 | | | O |
| 535.782 | Haptic Applications | | O | | |
| 665.681 | Application of Sensing Systems | | See Robotics and Autonomous Systems Course Offering page for schedule | | |
| **Solids/Mechanics of Materials Focus Area - Group 1** | | | | | |
| 535.606 | Advanced Strength of Materials | | | | O |
| 535.607 | Mechanics of Solids and Structures: Theory and Applications I | | | O | |
| 535.623 | Intermediate Vibrations | Undergraduate vibrations course | | O | O |
| 535.632 | Applied Finite Elements | | O | O | O |
| 535.731 | Engineering Materials: Properties and Selection | | | O | O |
| **Solids/Mechanics of Materials Focus Area - Group 2** | | | | | |
| 535.612 | Intermediate Dynamics | Mathematics through calculus & linear algebra | | O | |
| 535.618 | Fabricatology - Advanced Materials Processing | | | O | O |
| 535.627 | Computer-Aided Design | | O | O | O |
| 535.643 | Plasticity | 535.606 | | | O |
| 535.660 | Precision Mechanical Design | | | O | O |
| 535.663 | Biosolid Mechanics | | | | O |
| 535.671 | Aerospace Materials, Structures and Design | | TBD *in development | | |
| 535.684 | Modern Polymeric Materials | | | O | |
| 535.706 | Mechanics of Solids and Structures: Theory and Applications II | 535.606 recommended | | | O |
| 535.720 | Mechanics of Composite Materials and Structures | | | O | O |
| 535.721 | Advanced Composite Materials & Manufacturing Processes | | | O | O |
| 535.732 | Fatigue and Fracture of Materials | Undergraduate courses in materials & mechanics | | | O |
| 535.748 | Stress Waves, Impacts and Shockwaves | | | | VL (even years) |
| 515.601 | Structure and Properties of Materials | | | | |
| 515.602 | Thermodynamics and Kinetics of Materials | | | | |
| 515.606 | Chemical and Biological Properties of Materials | Undergraduate chemistry & biology | See program Course Offering page for schedule | | |
| 515.611 | Computational Molecular Dynamics | | | | |
| 515.617 | Nanomaterials | | | | |
| 515.622 | Micro and Nano Structured Materials and Devices | | 515.XXX - Materials Science and Engineering | | |
| 515.627 | Chemistry of Nanomaterials | | | | |
| 515.655 | Metal Additive Manufacturing | | | | |
| 515.658 | Design for Additive Manufacturing | 515.655 | 525.XXX - Electrical and Computer Engineering | | |
| 515.661 | Introduction to Polymer Science | | | | |
| 525.606 | Electronic Materials | | | | |

*See catalog of complete list and description of prerequisites

# Expected Course Offerings
## *Mechanical Engineering*

The schedule below is based on historical patterns and expected scheduling. The semester and location in which a course may be offered **is subject to change** due to instructor availability, student demand, and the need to provide an appropriate balance of subjects and course levels in all semesters. Courses may be offered at the Applied Physics Laboratory (APL) (3VL), online (O), or Virtual Live (8VL), as indicated.

| Course # | Course Name | Pre-Req* | Summer | Fall | Spring |
|----------|-------------|----------|--------|------|--------|
| 565.604 | Structural Mechanics | | | | |
| 565.680 | Marine Geotechnical Engineering | | [565.XXX - Civil Engineering](#) | | |
| 565.682 | Design of Ocean Structures | | | | |
| 565.731 | Structural Dynamics | 535.641 | | | |
| **Independent Study/Thesis Courses** | | | | | |
| 535.800 | Independent Study | | O | O | O |
| 535.820 | Master's Graduate Research | Approval form completed and approved by advisor(s) and program chair | O | O | O |
| 535.821 | Master's Graduate Thesis | | O | O | O |

**\*See catalog for complete description of prerequisites for each course**

\*See catalog of complete list and description of prerequisites