

# MECHANICAL ENGINEERING (MECHENG)

## MECHENG 101 Computational Tools for Engineers

2 cr. Undergraduate.

Introduction to the use of spreadsheets and equation solvers. Basic engineering and financial applications using these tools.

**Prerequisites:** MATH 231(C) or MATH 221(C).

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 110 Engineering Fundamentals I

4 cr. Undergraduate.

Introduction to engineering disciplines, problem-solving, visualization, technical communication, and data collection and analysis.

**Prerequisites:** MATH 231(C) or MATH 225(C), admis to College of Engineering & Applied Science.

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 111 Engineering Fundamentals II

3 cr. Undergraduate.

Intermediate problem-solving skills, experimentation, technical communication and introduction to engineering design.

**Prerequisites:** MECHENG 110(P).

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 150 How Things Work: Understanding Technology

3 cr. Undergraduate.

An introductory course that explains the technology that affects our everyday life. Topics include: automobiles, computers, telephone, radio, television, etc.

**Prerequisites:** none.

**General Education Requirements:** NS+

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 270 Computer Aided Engineering Laboratory

2 cr. Undergraduate.

Introduction to mechanical design and analysis using parametric CAE tools. Students obtain a foundation in computer-aided design and analysis.

**Prerequisites:** MECHENG 101(P) and MECHENG 111(P); MATH 231(C) or MATH 231(P).

**Course Rules:** Previously MECHENG 370.

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 301 Basic Engineering Thermodynamics

3 cr. Undergraduate.

Basic energy concepts and definitions; First and Second Laws of Thermodynamics; ideal and real gases; thermodynamic properties; introductory cycle analysis.

**Prerequisites:** MATH 233(P) and PHYSICS 209(P).

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 302 Introduction to System Dynamics

3 cr. Undergraduate.

Modeling and analysis of mechanical, electrical, electromechanical, fluid, and combinations thereof; laboratory experiments.

**Prerequisites:** MECHENG 101(P), PHYSICS 210 (P), and a grade of C or better in ELECENG 234(P) and CIV ENG 202(P).

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 320 Introduction to Fluid Mechanics

3 cr. Undergraduate.

Basic law of fluid mechanics with applications to engineering problems and with discussion.

**Prerequisites:** CIV ENG 202(P), ELECENG 234(P) and PHYSICS 209(P).

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 321 Basic Heat Transfer

4 cr. Undergraduate.

Introduction to conduction, convection and radiation heat transfer; heat exchangers; mass transfer analogies; laboratory experiments.

**Prerequisites:** junior standing or greater, MECHENG 301(P) and MECHENG 324(P).

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 323 Fluid Mechanics Laboratory

1 cr. Undergraduate.

Hands-on experiments involving applications of potential flows, boundary layer flows, gas dynamics, aerodynamics, and fluid power.

**Prerequisites:** junior standing and MECHENG 320(P).

**Last Taught:** Spring 2023, Fall 2022, Spring 2022, Fall 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 324 Introduction to Fluid Mechanics

4 cr. Undergraduate.

Introduction to fluid mechanics, fluid statics, integral relations for a control volume, dimensional analysis and similarity, viscous flow in ducts, flow past immersed bodies, open-channel flow, a set of hands-on experiments.

**Prerequisites:** junior standing, CIV ENG 202(P), ELECENG 234(P), and MECHENG 301(P).

**Course Rules:** Students who have previously completed both MECHENG 320 and MECHENG 323 may not receive credit for MECHENG 324.

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

## MECHENG 360 Mechanical Design I

3 cr. Undergraduate.

Kinematic and dynamic analysis of machine members and design applications to linkages, cams, gears, machine balancing and mechanical systems subject to various constraints.

**Prerequisites:** MECHENG 101(P), MECHENG 111(P), and CIV ENG 202(P).

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 364 Advanced Mechanics of Materials and Design of Machine Elements 1**

3 cr. Undergraduate.

Design processes, loads and stresses in 3 dimensions, stress and strain relations, 3 dimensional principle stresses, static failure criteria, fatigue failure criteria, and structural stability applied to the design of Machine Elements like shafts.

**Prerequisites:** CIV ENG 203(P), MATLENG 201(P), MECHENG 110(P), and MECHENG 111(P).

**Course Rules:** Students with have previously completed MECHENG 366 may not receive credit for MECHENG 364 and MECHENG 368.

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 366 Design of Machine Elements**

4 cr. Undergraduate.

Design of mechanical components under steady and fatigue loads.

Design of columns, shafts, fasteners, springs, bearings, gearing, etc. Mini-design projects.

**Prerequisites:** MECHENG 101(P), MECHENG 111(P); MATLENG 201(P); and CIV ENG 303(P).

**Last Taught:** Spring 2021, Fall 2020, Spring 2020, Fall 2019.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 368 Design of Machine Elements 2**

3 cr. Undergraduate.

Application of static and fatigue failure criterion to the design of machine elements including: mechanical fasteners, fastener patterns, welds and bonding, mechanical springs, bearings, gears, clutches, and brakes.

**Prerequisites:** MECHENG 364(P).

**Course Rules:** Students with credit in MECHENG 366 may not receive credit for MECHENG 364 and MECHENG 368.

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 379 Introduction to Mechatronics**

3 cr. Undergraduate.

Basic electrical circuit analysis. Design and analysis of computer-controlled mechanical systems.

**Prerequisites:** junior standing and MECHENG 302(C) or MECHENG 302(P).

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 402 Thermo-Fluid Engineering**

3 cr. Undergraduate.

Analysis and design of systems involving applications of thermodynamics, heat transfer, and fluid mechanics. Applications include heat exchangers, power generation, refrigeration systems, and environmental control.

**Prerequisites:** MECHENG 321(P) and MECHENG 320(P) or MECHENG 324(P).

**Last Taught:** Spring 2021, Fall 2020, Spring 2020, Fall 2019.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 405 Product Realization**

3 cr. Undergraduate/Graduate.

This interdisciplinary course for engineering and art students considers the diverse aspects of the product realization process.

**Prerequisites:** junior standing and advanced to major in an Art & Design program; or BME 305(P), BME 310(P), and BME 325(P); or IND ENG 350(P), IND ENG 360(P), and IND ENG 370(P); or MECHENG 321(C), MECHENG 360(P), MECHENG 368(P), and MECHENG 370(P); or graduate standing and consent of instructor.

**Course Rules:** ART 405 and MECHENG 405 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2024.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 405G Product Realization**

3 cr. Undergraduate/Graduate.

This interdisciplinary course for engineering and art students considers the diverse aspects of the product realization process.

**Prerequisites:** junior standing and advanced to major in an Art & Design program; or BME 305(P), BME 310(P), and BME 325(P); or IND ENG 350(P), IND ENG 360(P), and IND ENG 370(P); or MECHENG 321(C), MECHENG 360(P), MECHENG 368(P), and MECHENG 370(P); or graduate standing and consent of instructor.

**Course Rules:** ART 405 and MECHENG 405 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2024.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 411 Heat Transfer**

3 cr. Undergraduate/Graduate.

Concepts of heat transfer including conduction, convection, and radiation; steady-state and transient conduction; laminar and turbulent convection; phase changes; black-body and real surface radiation; heat exchangers.

**Prerequisites:** junior standing and MECHENG 321(P).

**Last Taught:** Fall 2023.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 411G Heat Transfer**

3 cr. Undergraduate/Graduate.

Concepts of heat transfer including conduction, convection, and radiation; steady-state and transient conduction; laminar and turbulent convection; phase changes; black-body and real surface radiation; heat exchangers.

**Prerequisites:** junior standing and MECHENG 321(P).

**Last Taught:** Fall 2023.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 415 Modern Thermomanufacturing Processes**

3 cr. Undergraduate/Graduate.

An introduction to thermal management and techniques applied to chemical vapor deposition, welding, thermal spraying, and machining (cutting and grinding).

**Prerequisites:** junior standing, CIV ENG 303(P), and MECHENG 321(P) or equivalent; or consent of instructor.

**Last Taught:** Spring 2010, Fall 2008.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 415G Modern Thermomanufacturing Processes**

3 cr. Undergraduate/Graduate.

An introduction to thermal management and techniques applied to chemical vapor deposition, welding, thermal spraying, and machining (cutting and grinding).

**Prerequisites:** junior standing, CIV ENG 303(P), and MECHENG 321(P) or equivalent; or consent of instructor.

**Last Taught:** Spring 2010, Fall 2008.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 420 Intermediate Fluid Mechanics**

3 cr. Undergraduate/Graduate.

Navier-Stokes Equations; CFD package training; Potential Flows; Boundary-Layer Approximation; Turbulent Flows; Porous-Media Flows, Turbomachinery Flows.

**Prerequisites:** junior standing and MECHENG 320(P).

**Last Taught:** Spring 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 420G Intermediate Fluid Mechanics**

3 cr. Undergraduate/Graduate.

Navier-Stokes Equations; CFD package training; Potential Flows; Boundary-Layer Approximation; Turbulent Flows; Porous-Media Flows, Turbomachinery Flows.

**Prerequisites:** junior standing and MECHENG 320(P).

**Last Taught:** Spring 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 423 Applied Fluid Mechanics**

3 cr. Undergraduate/Graduate.

Principles of fluid mechanics as applied to elements of fluid machinery, power transmission devices and control systems.

**Prerequisites:** junior standing and MECHENG 320(P).

**Last Taught:** Fall 2003, Fall 1997.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 423G Applied Fluid Mechanics**

3 cr. Undergraduate/Graduate.

Principles of fluid mechanics as applied to elements of fluid machinery, power transmission devices and control systems.

**Prerequisites:** junior standing and MECHENG 320(P).

**Last Taught:** Fall 2003, Fall 1997.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 425 Aerodynamics of Wind Turbines**

3 cr. Undergraduate/Graduate.

Introductory and intermediate wind turbine aerodynamics; wind and wind turbine interaction in energy transmission.

**Prerequisites:** junior standing and MECHENG 320(P); or consent of instructor.

**Last Taught:** Fall 2019.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 425G Aerodynamics of Wind Turbines**

3 cr. Undergraduate/Graduate.

Introductory and intermediate wind turbine aerodynamics; wind and wind turbine interaction in energy transmission.

**Prerequisites:** junior standing and MECHENG 320(P); or consent of instructor.

**Last Taught:** Fall 2019.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 430 Energy Modeling**

3 cr. Undergraduate/Graduate.

Electrical/thermal energy modeling through lectures and hands-on classroom work along with use of energy modeling software.

**Prerequisites:** junior standing or consent of instructor.

**Course Rules:** ELECENG 430 and MECHENG 430 are jointly offered and count as repeats of one another.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 430G Energy Modeling**

3 cr. Undergraduate/Graduate.

Electrical/thermal energy modeling through lectures and hands-on classroom work along with use of energy modeling software.

**Prerequisites:** junior standing or consent of instructor.

**Course Rules:** ELECENG 430 and MECHENG 430 are jointly offered and count as repeats of one another.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 432 Internal Combustion Engines**

3 cr. Undergraduate/Graduate.

Thermodynamic principles of internal combustion engines; cycles, combustion, engine operation; carburation, ignition, performance analysis; engine balancing; super charging.

**Prerequisites:** junior standing and MECHENG 301(P).

**Last Taught:** Spring 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 432G Internal Combustion Engines**

3 cr. Undergraduate/Graduate.

Thermodynamic principles of internal combustion engines; cycles, combustion, engine operation; carburation, ignition, performance analysis; engine balancing; super charging.

**Prerequisites:** junior standing and MECHENG 301(P).

**Last Taught:** Spring 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 434 Air Conditioning System Design**

3 cr. Undergraduate/Graduate.

The design of systems for heating and cooling spaces. Selection and design of central heating, cooling and energy distribution systems.

**Prerequisites:** junior standing, MECHENG 321(P), and IND ENG 210(P).

**Last Taught:** Spring 2024.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 434G Air Conditioning System Design**

3 cr. Undergraduate/Graduate.

The design of systems for heating and cooling spaces. Selection and design of central heating, cooling and energy distribution systems.

**Prerequisites:** junior standing, MECHENG 321(P), and IND ENG 210(P).

**Last Taught:** Spring 2024.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 435 Power Plant Theory and Design**

3 cr. Undergraduate/Graduate.

Application of engineering principles to design and analysis of power-production systems. Fossil fuel, nuclear, and gas-turbine power plants. Alternative power generation. Environmental aspects.

**Prerequisites:** junior standing and MECHENG 301(P).

**Last Taught:** Fall 2021, Spring 2020.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 435G Power Plant Theory and Design**

3 cr. Undergraduate/Graduate.

Application of engineering principles to design and analysis of power-production systems. Fossil fuel, nuclear, and gas-turbine power plants. Alternative power generation. Environmental aspects.

**Prerequisites:** junior standing and MECHENG 301(P).**Last Taught:** Fall 2021, Spring 2020.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 436 Solar Engineering**

3 cr. Undergraduate/Graduate.

Estimation of energy needs for solar heating and cooling systems for buildings; insolation; solar collector/energy storage design; applications to space heating/cooling, water heating.

**Prerequisites:** junior standing and MECHENG 301(P).**Last Taught:** Spring 2016, Fall 2014.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 436G Solar Engineering**

3 cr. Undergraduate/Graduate.

Estimation of energy needs for solar heating and cooling systems for buildings; insolation; solar collector/energy storage design; applications to space heating/cooling, water heating.

**Prerequisites:** junior standing and MECHENG 301(P).**Last Taught:** Spring 2016, Fall 2014.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 438 Mechanical Engineering Experimentation**

3 cr. Undergraduate.

Training and understanding data acquisition systems; experiment planning; sensor calibration; professional report writing and communication; industrial projects.

**Prerequisites:** IND ENG 369(P); MECHENG 302(P), MECHENG 360(P), and MECHENG 368(C).**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 451 Applied Optics in Engineering**

3 cr. Undergraduate/Graduate.

Principles of geometric and physical optics. Introduction to lasers. Topics from current engineering uses of optics, including measurement systems and laser machining.

**Prerequisites:** senior standing and PHYSICS 210(P); or consent of instructor.**Last Taught:** Spring 2022.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 451G Applied Optics in Engineering**

3 cr. Undergraduate/Graduate.

Principles of geometric and physical optics. Introduction to lasers. Topics from current engineering uses of optics, including measurement systems and laser machining.

**Prerequisites:** senior standing and PHYSICS 210(P); or consent of instructor.**Last Taught:** Spring 2022.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 453 Design Thinking Studio**

3 cr. Undergraduate.

This is an interdisciplinary course that will introduce students to a designer's mindset and will foster key design abilities in an experiential learning environment.

**Prerequisites:** none.**Course Rules:** Counts as a repeat of MECHENG 490 with similar topic.**Last Taught:** Spring 2024.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 455 Processing of Plastics**

3 cr. Undergraduate/Graduate.

Description of plastics as polymers and polymer composites. Study of various technologies to manufacture plastics. Analytical description of flow and heat transfer in polymers.

**Prerequisites:** MECHENG 320(P) and MECHENG 321(P).**Last Taught:** Fall 2016, Spring 2015.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 455G Processing of Plastics**

3 cr. Undergraduate/Graduate.

Description of plastics as polymers and polymer composites. Study of various technologies to manufacture plastics. Analytical description of flow and heat transfer in polymers.

**Prerequisites:** MECHENG 320(P) and MECHENG 321(P).**Last Taught:** Fall 2016, Spring 2015.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 456 Metal Casting Engineering**

3 cr. Undergraduate/Graduate.

Pattern and core design; molding technology; pouring and feeding castings; metallurgy of cast engineering alloys and their foundry practice; casting design.

**Prerequisites:** junior standing and MATLENG 201(P).**Course Rules:** MATLENG 456 and MECHENG 456 are jointly offered and count as repeats of one another.**Last Taught:** Fall 2023.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 456G Metal Casting Engineering**

3 cr. Undergraduate/Graduate.

Pattern and core design; molding technology; pouring and feeding castings; metallurgy of cast engineering alloys and their foundry practice; casting design.

**Prerequisites:** junior standing and MATLENG 201(P).**Course Rules:** MATLENG 456 and MECHENG 456 are jointly offered and count as repeats of one another.**Last Taught:** Fall 2023.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 457 Engineering Composites**

3 cr. Undergraduate/Graduate.

Study of the structure-property relationships in composite materials. Properties of fibers and other reinforcements. Metal, polymer and ceramic matrix composites.

**Prerequisites:** junior standing and MATLENG 201(P).**Course Rules:** MECHENG 457 and MATLENG 457(455) are jointly offered and count as repeats of one another.**Last Taught:** Spring 2024.**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 457G Engineering Composites**

3 cr. Undergraduate/Graduate.

Study of the structure-property relationships in composite materials. Properties of fibers and other reinforcements. Metal, polymer and ceramic matrix composites.

**Prerequisites:** junior standing and MATLENG 201(P).

**Course Rules:** MECHENG 457 and MATLENG 457(455) are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2024.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 460 Nanomaterials and Nanomanufacturing**

3 cr. Undergraduate/Graduate.

Structure, properties, processing and manufacture of nanoparticles, nanotubes, nanofibers, bulk nanomaterials, nanocomposites including polymer, metal, ceramic, natural and biocomposites; nanofluidics, nanorheology, nanomachines, and nanotribology.

**Prerequisites:** junior standing and MATLENG 201(P).

**Course Rules:** MATLENG 460 and MECHENG 460 are jointly offered; they count as repeats of each other.

**Last Taught:** Spring 2024.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 460G Nanomaterials and Nanomanufacturing**

3 cr. Undergraduate/Graduate.

Structure, properties, processing and manufacture of nanoparticles, nanotubes, nanofibers, bulk nanomaterials, nanocomposites including polymer, metal, ceramic, natural and biocomposites; nanofluidics, nanorheology, nanomachines, and nanotribology.

**Prerequisites:** junior standing and MATLENG 201(P).

**Course Rules:** MATLENG 460 and MECHENG 460 are jointly offered; they count as repeats of each other.

**Last Taught:** Spring 2024.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 462 Intermediate Design of Machinery**

3 cr. Undergraduate/Graduate.

Consideration of complicated loadings and combined stresses. Design against fatigue. Design and analysis of machine systems. Consideration of special topics in machine element design.

**Prerequisites:** junior standing and MECHENG 366(P).

**Last Taught:** Spring 2020, Spring 2019.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 462G Intermediate Design of Machinery**

3 cr. Undergraduate/Graduate.

Consideration of complicated loadings and combined stresses. Design against fatigue. Design and analysis of machine systems. Consideration of special topics in machine element design.

**Prerequisites:** junior standing and MECHENG 366(P).

**Last Taught:** Spring 2020, Spring 2019.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 463 Introduction to Finite Elements**

3 cr. Undergraduate/Graduate.

Generation and assembly of finite element matrices in one- and two-dimensional problems. Modeling and practical applications in solid mechanics, heat transfer and fluid flow.

**Prerequisites:** junior standing; CIV ENG 203(P), CIV ENG 303(P), or ELECENG 234(P); and MECHENG 311(C), MECHENG 320(C), or MECHENG 321(C).

**Course Rules:** CIV ENG 463 and MECHENG 462 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2023, Fall 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 463G Introduction to Finite Elements**

3 cr. Undergraduate/Graduate.

Generation and assembly of finite element matrices in one- and two-dimensional problems. Modeling and practical applications in solid mechanics, heat transfer and fluid flow.

**Prerequisites:** junior standing; CIV ENG 203(P), CIV ENG 303(P), or ELECENG 234(P); and MECHENG 311(C), MECHENG 320(C), or MECHENG 321(C).

**Course Rules:** CIV ENG 463 and MECHENG 462 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2023, Fall 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 465 Friction and Wear**

3 cr. Undergraduate/Graduate.

Friction and wear of engineering materials. Effect of environment, surface interactions, lubrication, and material properties. Techniques of analysis and measurement.

**Prerequisites:** junior standing and MATLENG 201(P).

**Course Rules:** MATLENG 465 and MECHENG 465 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 465G Friction and Wear**

3 cr. Undergraduate/Graduate.

Friction and wear of engineering materials. Effect of environment, surface interactions, lubrication, and material properties. Techniques of analysis and measurement.

**Prerequisites:** junior standing and MATLENG 201(P).

**Course Rules:** MATLENG 465 and MECHENG 465 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 466 Design of Composite Structures**

3 cr. Undergraduate/Graduate.

Hands-on design, analysis, and manufacturing of composite fiber reinforced plastic beams, columns, and plates; failure analysis and damage tolerance design of composite structures; bolted and bonded joints.

**Prerequisites:** junior standing and CIV ENG 203(P) or CIV ENG 303(P)

**Course Rules:** CIV ENG 466 and MECHENG 466 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2024, Spring 2020.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 466G Design of Composite Structures**

3 cr. Undergraduate/Graduate.

Hands-on design, analysis, and manufacturing of composite fiber reinforced plastic beams, columns, and plates; failure analysis and damage tolerance design of composite structures; bolted and bonded joints.

**Prerequisites:** junior standing and CIV ENG 203(P) or CIV ENG 303(P)

**Course Rules:** CIV ENG 466 and MECHENG 466 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2024, Spring 2020.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 469 Introduction to Biomechanical Engineering**

3 cr. Undergraduate/Graduate.

Mathematical modeling of human body; dynamics of human motion; neuromuscular control human movement; stress analysis of bones and joints; concurrent mechanical problems in medicine.

**Prerequisites:** CIV ENG 202(P) and CIV ENG 303 (P); or consent of instructor.

**Course Rules:** MECHENG 469 and CIV ENG 469 are jointly offered and count as repeats of one another.

**Last Taught:** Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 469G Introduction to Biomechanical Engineering**

3 cr. Undergraduate/Graduate.

Mathematical modeling of human body; dynamics of human motion; neuromuscular control human movement; stress analysis of bones and joints; concurrent mechanical problems in medicine.

**Prerequisites:** CIV ENG 202(P) and CIV ENG 303 (P); or consent of instructor.

**Course Rules:** MECHENG 469 and CIV ENG 469 are jointly offered and count as repeats of one another.

**Last Taught:** Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 472 Introduction to Wind Energy**

3 cr. Undergraduate/Graduate.

Principles of wind turbines; wind characteristics; rotor dynamics of wind turbines; turbine design and integration; controls and electrical systems; grid connection.

**Prerequisites:** junior standing or consent of instructor.

**Course Rules:** ELECENG 472 and MECHENG 472 are jointly offered and count as repeats of one another.

**Last Taught:** Fall 2016, Fall 2015.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 472G Introduction to Wind Energy**

3 cr. Undergraduate/Graduate.

Principles of wind turbines; wind characteristics; rotor dynamics of wind turbines; turbine design and integration; controls and electrical systems; grid connection.

**Prerequisites:** junior standing or consent of instructor.

**Course Rules:** ELECENG 472 and MECHENG 472 are jointly offered and count as repeats of one another.

**Last Taught:** Fall 2016, Fall 2015.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 473 Applied Dynamics**

3 cr. Undergraduate/Graduate.

Application of dynamic principles to a variety of engineering situations. Behavior of particle systems and rigid body motion in space. Analysis of traffic accidents, shock machines, rockets and satellites, missiles and projectiles, dynamic balancing, gyroscopes and inertial navigation.

**Prerequisites:** junior standing and CIV ENG 202(P).

**Last Taught:** Spring 2019, Spring 2018.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 473G Applied Dynamics**

3 cr. Undergraduate/Graduate.

Application of dynamic principles to a variety of engineering situations. Behavior of particle systems and rigid body motion in space. Analysis of traffic accidents, shock machines, rockets and satellites, missiles and projectiles, dynamic balancing, gyroscopes and inertial navigation.

**Prerequisites:** junior standing and CIV ENG 202(P).

**Last Taught:** Spring 2019, Spring 2018.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 474 Introduction to Control Systems**

4 cr. Undergraduate/Graduate.

Modeling of continuous systems; stability considerations, analysis and design of feedback control systems in time and frequency domains.

**Prerequisites:** senior standing, ELECENG 301(P); a grade of C or better in ELECENG 234(P) and CIV ENG 202(P).

**Last Taught:** Fall 2023.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 474G Introduction to Control Systems**

4 cr. Undergraduate/Graduate.

Modeling of continuous systems; stability considerations, analysis and design of feedback control systems in time and frequency domains.

**Prerequisites:** senior standing, ELECENG 301(P); a grade of C or better in ELECENG 234(P) and CIV ENG 202(P).

**Last Taught:** Fall 2023.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 475 Vibrations in Mechanical Design**

3 cr. Undergraduate/Graduate.

Integrated treatment of mathematical modeling and analysis of mechanical systems, analysis of vibrations and performance under different loading conditions.

**Prerequisites:** senior standing, CIV ENG 202(P), and ELECENG 234(P).

**Last Taught:** Fall 2023.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 475G Vibrations in Mechanical Design**

3 cr. Undergraduate/Graduate.

Integrated treatment of mathematical modeling and analysis of mechanical systems, analysis of vibrations and performance under different loading conditions.

**Prerequisites:** senior standing, CIV ENG 202(P), and ELECENG 234(P).

**Last Taught:** Fall 2023.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 476 Introduction to Robotics**

3 cr. Undergraduate/Graduate.

Fundamentals of manipulators, sensors, actuators, end-effectors and product design for automation, computer vision and pattern recognition.

**Prerequisites:** ELECENG 234(P) and MECHENG 360(P).

**Last Taught:** Fall 2023, Spring 2020.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 476G Introduction to Robotics**

3 cr. Undergraduate/Graduate.

Fundamentals of manipulators, sensors, actuators, end-effectors and product design for automation, computer vision and pattern recognition.

**Prerequisites:** ELECENG 234(P) and MECHENG 360(P).**Last Taught:** Fall 2023, Spring 2020.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 479 Advanced Mechatronics**

3 cr. Undergraduate/Graduate.

Semiconductor electronics; embedded programming; sensor instrumentation; digital and analog electronics; filtering, actuators; advanced communication protocols; wireless communications; mobile robot modeling for mechatronics application; design, development and feedback control of a mechatronic system.

**Prerequisites:** senior standing or consent of instructor;

MECHENG 379(P).

**Last Taught:** Summer 2021, Spring 2021.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 479G Advanced Mechatronics**

3 cr. Undergraduate/Graduate.

Semiconductor electronics; embedded programming; sensor instrumentation; digital and analog electronics; filtering, actuators; advanced communication protocols; wireless communications; mobile robot modeling for mechatronics application; design, development and feedback control of a mechatronic system.

**Prerequisites:** senior standing or consent of instructor;

MECHENG 379(P).

**Last Taught:** Summer 2021, Spring 2021.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 490 Topics in Mechanical Engineering:**

1-3 cr. Undergraduate/Graduate.

Recent theoretical and applied topics in mechanical engineering.

**Prerequisites:** junior standing and consent of instructor.**Course Rules:** May be retaken with change in topic to max of 9 cr.**Last Taught:** Spring 2024.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 490G Topics in Mechanical Engineering:**

1-3 cr. Undergraduate/Graduate.

Recent theoretical and applied topics in mechanical engineering.

**Prerequisites:** junior standing and consent of instructor.**Course Rules:** May be retaken with change in topic to max of 9 cr.**Last Taught:** Spring 2024.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 496 Senior Design Project**

3 cr. Undergraduate.

Engineering design project in a simulated industrial environment. Student design team works on a problem in collaboration with college faculty and vendors. Formal report writing.

**Prerequisites:** MECHENG 270(P), MECHENG 321(C), MECHENG 360(P), and MECHENG 368(P).**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 542 Introduction to Technology Entrepreneurship**

3 cr. Undergraduate.

Introductory concepts related to technology entrepreneurship including opportunity identification, analysis and new venture planning. Prepares students to recognize and pursue viable technology-based entrepreneurial opportunities.

**Prerequisites:** junior standing and admis to Technology Entrepreneurship Certificate or admis to business or engineering major.**Course Rules:** Counts as repeat of BUS ADM 495 or MECHENG 490 with same topic. BUS ADM 542 and MECHENG 542 are jointly offered and count as repeats of one another.**Last Taught:** Fall 2014.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 543 Introduction to Technology Management and Innovation**

3 cr. Undergraduate.

Introductory concepts related to technology management and technological innovation. Prepares students to evaluate and plan technology commercialization projects.

**Prerequisites:** junior standing and admis to Technology Entrepreneurship Certificate or admis to business or engineering major.**Course Rules:** Counts as repeat of BUS ADM with the same topic.

BUS ADM 542 and MECHENG 543 are jointly offered and count as repeats of one another.

**Last Taught:** Fall 2014.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 544 New Product Development**

3 cr. Undergraduate/Graduate.

Concepts related to product development including product concept development and testing, and product design. Prepares students to work in cross-functional product development teams.

**Prerequisites:** junior standing or greater and admis to Technology Entrepreneurship Certificate; or admis to business or engineering major.**Course Rules:** Counts as repeat of BUS ADM 795 with same topic.

BUS ADM 544 and MECHENG 544 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2016, Spring 2015.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 544G New Product Development**

3 cr. Undergraduate/Graduate.

Concepts related to product development including product concept development and testing, and product design. Prepares students to work in cross-functional product development teams.

**Prerequisites:** junior standing or greater and admis to Technology Entrepreneurship Certificate; or admis to business or engineering major.**Course Rules:** Counts as repeat of BUS ADM 795 with same topic.

BUS ADM 544 and MECHENG 544 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2016, Spring 2015.**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 546 Global Innovation Management**

3 cr. Undergraduate/Graduate.

Concepts related to collaborative innovation in global networks including diverse collaboration models, innovation processes, and capabilities.

Prepares students to manage global collaborative innovation projects.

**Prerequisites:** junior standing or greater and admis to Technology Entrepreneurship Certificate; or admis to business or engineering major.

**Course Rules:** CCounts as repeat of BUS ADM 795 with same topic. BUS ADM 546 and MECHENG 546 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2016.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 546G Global Innovation Management**

3 cr. Undergraduate/Graduate.

Concepts related to collaborative innovation in global networks including diverse collaboration models, innovation processes, and capabilities.

Prepares students to manage global collaborative innovation projects.

**Prerequisites:** junior standing or greater and admis to Technology Entrepreneurship Certificate; or admis to business or engineering major.

**Course Rules:** CCounts as repeat of BUS ADM 795 with same topic. BUS ADM 546 and MECHENG 546 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2016.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 548 Technology Venturing Project**

3 cr. Undergraduate.

A capstone course for students to demonstrate their knowledge and skills related to technology/product commercialization. Prepares students to lead their (or corporate) technology ventures.

**Prerequisites:** junior standing or greater; admis to Technology Entrepreneurship Certificate or admis to business or engineering major; BUS ADM 543(P) or MECHENG 542(P).

**Course Rules:** BUS ADM 548 and MECHENG 548 are jointly offered and count as repeats of one another.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 574 Intermediate Control Systems**

3 cr. Undergraduate/Graduate.

State space; frequency domain methods of modelling, analysis and design of control systems; digital control; and multivariate systems.

**Prerequisites:** senior standing and MECHENG 474(P) or ELECENG 474(P); or graduate standing.

**Course Rules:** ELECENG 574 and MECHENG 574 are jointly offered and count as repeats of each other. Not open for cr to students who have cr in ELECENG 503 or MECHENG 478.

**Last Taught:** Spring 2020, Spring 2019.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 574G Intermediate Control Systems**

3 cr. Undergraduate/Graduate.

State space; frequency domain methods of modelling, analysis and design of control systems; digital control; and multivariate systems.

**Prerequisites:** senior standing and MECHENG 474(P) or ELECENG 474(P); or graduate standing.

**Course Rules:** ELECENG 574 and MECHENG 574 are jointly offered and count as repeats of each other. Not open for cr to students who have cr in ELECENG 503 or MECHENG 478.

**Last Taught:** Spring 2020, Spring 2019.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 584 Biodynamics of Human Motion**

3 cr. Undergraduate/Graduate.

Techniques for collecting, analyzing and interpreting human motion data. Special emphasis will be placed on performing data analysis using the software package, Matlab.

**Prerequisites:** junior standing, ELECENG 234(P), and CIV ENG 202(C).

**Course Rules:** IND ENG 584 and MECHENG 584 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2013, Spring 2012.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 584G Biodynamics of Human Motion**

3 cr. Undergraduate/Graduate.

Techniques for collecting, analyzing and interpreting human motion data. Special emphasis will be placed on performing data analysis using the software package, Matlab.

**Prerequisites:** junior standing, ELECENG 234(P), and CIV ENG 202(C).

**Course Rules:** IND ENG 584 and MECHENG 584 are jointly offered and count as repeats of one another.

**Last Taught:** Spring 2013, Spring 2012.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 699 Independent Study**

1-3 cr. Undergraduate/Graduate.

**Prerequisites:** junior standing and consent of instructor.

**Course Rules:** Limited to max of 6 cr applied toward undergrad degree.

**Last Taught:** Spring 2023, Fall 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 699G Independent Study**

1-3 cr. Undergraduate/Graduate.

**Prerequisites:** junior standing and consent of instructor.

**Course Rules:** Limited to max of 6 cr applied toward undergrad degree.

**Last Taught:** Spring 2023, Fall 2021.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 700 CEAS Graduate Seminar**

1-3 cr. Graduate.

Seminar in professional ethics, oral and written communication, contemporary social issues, career development, time management, and laboratory safety.

**Prerequisites:** graduate standing.

**Course Rules:** CV ENG 700, COMPSCI 700, ELECENG 700, IND ENG 700, MATLENG 700 and MECHENG 700 are jointly offered and count as repeats of one another

**Last Taught:** Fall 2020, Spring 2020, Fall 2019, Spring 2019.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 701 Advanced Linear System Analysis**

3 cr. Graduate.

Theory and analysis of linear dynamic systems; discrete and continuous state models; linear algebra for dynamic systems; state transition matrix, numerical methods; and applications.

**Prerequisites:** graduate standing.

**Course Rules:** ELECENG 701 and MECHENG 701 are jointly offered and count as repeats of one another.

**Last Taught:** Fall 2022, Fall 2020, Fall 2018, Fall 2016.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>



**MECHENG 702 Advanced Engineering Thermodynamics**

3 cr. Graduate.

Laws of thermodynamics, property relations, equations of state; introduction to statistical and irreversible thermodynamics; applications to perfect gases, perfect crystals, and homogeneous solutions.

**Prerequisites:** graduate standing, MECHENG 301(P) and MECHENG 321(P) or equivalent.

**Last Taught:** Spring 2024, Spring 2023, Spring 2022, Fall 2020.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 703 Principles of Combustion**

3 cr. Graduate.

Chemical kinetics and thermodynamics, conservation equations for multicomponent reacting systems, detonation, premix, diffusion and turbulent flames.

**Prerequisites:** graduate standing, MECHENG 302(P) and MECHENG 321(P) or equivalent.

**Last Taught:** Fall 2020, Fall 2018, Spring 2004, Spring 2002.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 706 Continuum Mechanics**

3 cr. Graduate.

Basic concepts of the continuum models used in the various fields of mechanics including fluid mechanics, rheology, elasticity, fracture mechanics, and plasticity.

**Prerequisites:** graduate standing.

**Last Taught:** Fall 2022, Spring 2018.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 707 Transport in Porous Media**

3 cr. Graduate.

Introduction to fluid mechanics in porous media, single- and multi-phase flows, volume averaged transport equations, convection heat transfer, consolidating porous media, volume averaging theory, applications.

**Prerequisites:** graduate standing.

**Last Taught:** Fall 2023, Fall 2021, Spring 2020, Fall 2017.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 710 Advanced Transport Processes**

2 cr. Graduate.

Vector and tensor analysis of practical engineering problems; basic laws of mass, momentum and energy transport; transport phenomena in porous media reacting and non-reaction media.

**Prerequisites:** graduate standing and MECHENG 321(P) or equivalent.

**Last Taught:** Fall 2023, Spring 2022, Spring 2020, Spring 2018.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 711 Thermal Radiation and Conduction**

3 cr. Graduate.

Radiative properties of and radiative transfer in absorbing, emitting and scattering media; transient and steady state heat conduction; multi-mode heat transfer applications.

**Prerequisites:** graduate standing and MECHENG 311(P) or MECHENG 321(P).

**Last Taught:** Spring 2024, Spring 2022, Fall 2020, Fall 2018.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 712 Convection Heat and Mass Transfer**

3 cr. Graduate.

Conservation equations; laminar developed and developing flows; laminar boundary layers; high speed flows; turbulent flow and heat transfer; natural convection; mass transfer; special engineering applications.

**Prerequisites:** graduate standing and MECHENG 311(P) or MECHENG 321(P).

**Last Taught:** Spring 2019, Fall 2016, Spring 2015, Fall 2013.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 714 Energy Transport in Microscale Systems**

3 cr. Graduate.

Introducing thermophysics of microscale systems including statistical, non-equilibrium thermodynamics, particle transport theory, energy carriers in different materials and phases, and applications including mems and nanotechnology.

**Prerequisites:** graduate standing, MECHENG 320(P) and MECHENG 321(P).

**Last Taught:** Fall 2001.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 715 Numerical Methods in Engineering**

3 cr. Graduate.

Differential equation solutions with finite difference and finite volume methods; grid generation technique; finite element methods; applications to solid mechanics, heat transfer, and fluid mechanics.

**Prerequisites:** graduate standing and MATH 413(P) or consent of instructor.

**Last Taught:** Spring 2024, Spring 2023, Fall 2021, Fall 2020.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 718 Nonlinear Control Systems**

3 cr. Graduate.

Advanced concepts and methodologies in modeling and design of nonlinear control systems. Lyapunov theory; describing functions; variable structure control.

**Prerequisites:** graduate standing, ELECENG 474(P) or MECHENG 474(P) or equivalent; ELECENG 701(P) or MECHENG 701(P); or consent of instructor.

**Course Rules:** ELECENG 718 and MECHENG 718 are jointly offered and count as repeats of one another. Not open for credit to students with credit in MECHENG 778.

**Last Taught:** Fall 2021, Fall 2016, Fall 2010, Spring 2007.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 721 Fundamentals of Fluid Flow**

3 cr. Graduate.

Inviscid, viscous and compressible flow; potential flow in aerodynamics; analytical solutions of navier-stokes equation; laminar and turbulent boundary layers, jets, wakes, and separating flows; applications.

**Prerequisites:** graduate standing and MECHENG 320(P).

**Last Taught:** Fall 2023, Spring 2022, Spring 2021, Fall 2018.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 722 Advanced Fluid Mechanics**

3 cr. Graduate.

Formulations of navier-stokes and energy equations; turbulence models; solutions to wall, free shear layer, and recirculating flows; turbulence energy spectrum; applications to industrial problems.

**Prerequisites:** graduate standing and MECHENG 320(P).

**Last Taught:** Spring 2019, Fall 2016, Spring 2015, Spring 2012.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 723 Computational Fluid Dynamics and Heat Transfer**

3 cr. Graduate.

Finite difference methods for solving boundary layer equations, Navier-Stokes equations, etc. Laminar and turbulent flows.

**Prerequisites:** graduate standing or consent of instructor.**Last Taught:** Spring 2017, Fall 2015, Spring 2009, Spring 2007.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 725 Fluid Power and Turbomachinery**

2 cr. Graduate.

Concept of hydraulic systems; hydraulic motors; valves; hydraulic circuits; pneumatic systems; axial and radial gas turbines, pumps, compressors; steam turbines; hydraulic turbines; wind turbines.

**Prerequisites:** graduate standing and MECHENG 320(P).**Last Taught:** Fall 2022, Spring 2021, Spring 2019, Fall 2017.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 726 Mechanical Vibrations**

3 cr. Graduate.

Free and forced vibrations of multiple degree of freedom systems using modern matrix methods.

**Prerequisites:** graduate standing; MECHENG 475(P) or equivalent.**Course Rules:** CIV ENG 726 and MECHENG 726 are jointly offered and count as repeats of one another. Students may not receive credit for both courses.**Last Taught:** Fall 2020, Spring 2019, Spring 2015, Spring 2013.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 732 Solidification Processing**

3 cr. Graduate.

Solidification phenomena and its engineering application to metals, semiconductors, ceramics, properties of cast products. Foundry processes.

**Prerequisites:** graduate standing and MATLENG 330(P).**Course Rules:** MATLENG 732 and MECHENG 732 are jointly offered and count as repeats of one other.**Last Taught:** Fall 2018, Fall 2016.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 733 Sensors and Systems**

3 cr. Graduate.

Physical principles and working of sensors, interfacing, and sensor networks.

**Prerequisites:** graduate standing and ELECENG 305(P) or consent of instructor.**Course Rules:** BME 733, ELECENG 733, and MECHENG 733 are jointly offered and count as repeats of one another.**Last Taught:** Fall 2023, Fall 2021, Fall 2020, Fall 2019.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 760 Dynamic Problems in Design**

3 cr. Graduate.

Analytical methods for solution of typical vibrating and balancing problems encountered in mechanical systems. Special emphasis on methods of suppression and control.

**Prerequisites:** graduate standing and MECHENG 360(P).**Last Taught:** Spring 2023, Fall 2019, Fall 2017, Spring 2016.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 762 Mechanical Systems Analysis**

3 cr. Graduate.

An integrated treatment of mathematical modeling and analysis of mechanical systems. Modeling of machine elements and systems; performance under transient, periodic and random loads.

**Prerequisites:** graduate standing and MECHENG 365(P).**Last Taught:** Spring 2002, Fall 2000, Spring 1999, Fall 1997.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 765 Mechanical Reliability and Probabilistic Design**

3 cr. Graduate.

Advanced design theory and methodology incorporating probabilistic and statistical concepts. Design of mechanical and structural members for specific reliability and confidence level. Case histories and applications.

**Prerequisites:** graduate standing, MECHENG 360(P) and MECHENG 365(P); or consent of instructor.**Last Taught:** Spring 2021, Spring 2020, Spring 2016, Fall 2014.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 773 Advanced Dynamics**

3 cr. Graduate.

General theory of dynamic behavior from the viewpoint of Lagrangian and Hamiltonian mechanics. Application of energy principles to dynamical analysis of mechanical systems.

**Prerequisites:** graduate standing; MECHENG 580(P) or CIV ENG 580(P); or consent of instructor.**Course Rules:** CIV ENG 773 and MECHENG 773 are jointly offered and count as repeats of one another.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 785 Optimization Methods in Engineering**

3 cr. Graduate.

Optimization as engineering design tool; nonlinear programming; computational techniques for unconstrained and constrained problems; conjugate gradient, sumt, reduced gradient, feasible directions methods; design applications.

**Prerequisites:** graduate standing; ELECENG 234(P), and COMPSCI 151(P) or equivalent.**Course Rules:** IND ENG 785 and MECHENG 785 are jointly offered and count as repeats of one another.**Last Taught:** Fall 2020, Fall 2019, Fall 2018, Fall 2016.**Current Offerings:** <https://catalog.uwm.edu/course-search/>**MECHENG 816 Optimal Control Theory**

3 cr. Graduate.

Analysis and synthesis of discrete and continuous optimal control systems; linear quadratic regulators; dynamic programming and variational methods; applications.

**Prerequisites:** graduate standing, ELECENG 474(P) or MECHENG 474(P) or equivalent, and ELECENG 701(P) or MECHENG 701(P); or consent of instructor.**Course Rules:** ELECENG 816 and MECHENG 816 are jointly offered and count as repeats of one another.**Last Taught:** Spring 2017, Spring 2011, Fall 2008, Spring 2006.**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 819 Adaptive Control Theory**

3 cr. Graduate.

Adaptive control systems including mathematical foundations, estimation, model reference adaptive control, self tuning regulators, numerical methods, applications.

**Prerequisites:** graduate standing, ELECENG 474(P) or MECHENG 474(P), and ELECENG 701(P) or MECHENG 701(P); or consent of instructor.

**Course Rules:** ELECENG 819 and MECHENG 819 are jointly offered and count as repeats of one another.

**Last Taught:** Fall 2018, Spring 2014, Spring 2009, Fall 2007.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 880 Bioengineering Seminar**

1 cr. Graduate.

Presentations by bioengineering affiliated faculty, invited speakers, and graduate students.

**Prerequisites:** graduate standing.

**Course Rules:** CIV ENG 880, COMPSCI 880, ELECENG 880, IND ENG 880, MATLENG 880, and MECHENG 880 are jointly offered and count as repeats of one another. May be repeated to 3 cr max.

**Last Taught:** Spring 2017, Fall 2016, Spring 2016, Fall 2015.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 888 Candidate for Degree**

0 cr. Graduate.

Available for graduate students who must meet minimum credit load requirement.

**Prerequisites:** graduate standing.

**Course Rules:** Fee for 1 cr assessed; unit does not count towards credit load for Fin Aid. Repeatable. Satisfactory/Unsatisfactory only.

**Last Taught:** Spring 2024, Summer 2019, Fall 2018, Summer 2017.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 890 Advanced Topics in Mechanical Engineering:**

1-3 cr. Graduate.

Recent theoretical and applied developments in mechanical engineering.

Topics selected from areas in thermal-fluid engineering, machine design and controls, and chemical process engineering.

**Prerequisites:** graduate standing and consent of instructor.

**Course Rules:** May be repeated with change in topic to max of 9 cr.

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 990 Masters Thesis**

1-9 cr. Graduate.

**Prerequisites:** graduate standing and consent of instructor.

**Course Rules:** Repeatable.

**Last Taught:** Spring 2024, Fall 2023, Summer 2023, Spring 2023.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 998 Doctoral Thesis**

1-12 cr. Graduate.

**Prerequisites:** graduate standing and consent of instructor and graduate program committee.

**Course Rules:** Repeatable.

**Last Taught:** Spring 2024, Fall 2023, Summer 2023, Spring 2023.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>

**MECHENG 999 Advanced Independent Study**

1-3 cr. Graduate.

**Prerequisites:** graduate standing and consent of instructor and graduate program committee.

**Course Rules:** Repeatable to 15 cr max.

**Last Taught:** Spring 2024, Fall 2023, Spring 2023, Fall 2022.

**Current Offerings:** <https://catalog.uwm.edu/course-search/>