MATERIALS SCIENCE AND ENGINEERING (MATLENG)

Materials Science and Engineering Courses

MATLENG 150 It's a Material World: The Role of Materials in Society
3 cr. Undergraduate.
Introductory course on the nature of materials and their role in the development of society. Historical perspectives, current societal issues, and future trends are discussed.
Prerequisites: none.
General Education Requirements: NS+
Last Taught: Spring 2009, Spring 2008, Spring 2007, Spring 2006.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 201 Engineering Materials
4 cr. Undergraduate.
Basic behavior and processing of engineering materials emphasizing metals and alloys and including ceramics and plastics. Laboratory work is included.
Prerequisites: a score of 1 on chemistry placement test or a grade C or better in CHEM 100(P).
Last Taught: Spring 2025, Fall 2024, Spring 2024, Fall 2023.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 299 Topics in Materials:
1-3 cr. Undergraduate.
Work on new material in materials. Section title and credits announced whenever course is offered.
Prerequisites: specific courses dependent on topic.
Course Rules: May be retaken with change in topic to 6 cr max.
Last Taught: Fall 2008, Spring 2006, Fall 2005, Spring 2005.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 316 Thermodynamics of Materials
3 cr. Undergraduate.
Chemical thermodynamics and application of thermodynamics to single and multi-component materials systems. Topics include heat and mass balance, enthalpy, entropy, free energy, reaction equilibria, behavior of solutions; phase diagrams.
Prerequisites: MATH 233(P), PHYSICS 209(P) or PHYSICS 219(P), MATLENG 201(P) and CHEM 104(P) OR CHEM 105(P).
Last Taught: Fall 2024, Fall 2023.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 316G Thermodynamics of Materials
3 cr. Undergraduate.
Chemical thermodynamics and application of thermodynamics to single and multi-component materials systems. Topics include heat and mass balance, enthalpy, entropy, free energy, reaction equilibria, behavior of solutions; phase diagrams.
Prerequisites: MATH 233(P), PHYSICS 209(P) or PHYSICS 219(P), MATLENG 201(P) and CHEM 104(P) OR CHEM 105(P).
Last Taught: Fall 2024, Fall 2023.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 330 Materials and Processes in Manufacturing
3 cr. Undergraduate.
Principles and practice of manufacturing processes for engineering materials. Processes include casting, forging, rolling, extrusion, sintering and machining. Laboratory work is included.
Prerequisites: MATLENG 201(P).
Last Taught: Spring 2025, Fall 2024, Summer 2024, Spring 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 380 Engineering Basis for Materials Selection
3 cr. Undergraduate.
The study of the basis for materials selection in the design of engineering systems. Materials design parameters, classes of materials case studies in material's selections.
Prerequisites: MATLENG 201(P).
Last Taught: Spring 2025, Spring 2024, Spring 2023, Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 385 Introduction to Biomaterials
3 cr. Undergraduate.
Introduction to the fundamentals of biomaterials including ceramics, metals, and polymers. Important issues in the selection, design, manufacturing, and evaluation of biomaterials. Current applications, and emerging technologies.
Prerequisites: junior standing and MATLENG 201(P).
Last Taught: Spring 2021, Spring 2020, Spring 2018, Spring 2017.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 402 Physical Metallurgy
3 cr. Undergraduate/Graduate.
Crystal binding and electron theory of solids, phase diagrams, diffusion, nucleation and growth, recrystallization, precipitation hardening, solidification, austenite decomposition.
Prerequisites: junior standing and MATLENG 201(P).
Last Taught: Spring 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 402G Physical Metallurgy
3 cr. Undergraduate/Graduate.
Crystal binding and electron theory of solids, phase diagrams, diffusion, nucleation and growth, recrystallization, precipitation hardening, solidification, austenite decomposition.
Prerequisites: junior standing and MATLENG 201(P).
Last Taught: Spring 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 410 Mechanical Behavior of Materials
3 cr. Undergraduate/Graduate.
An introduction to the mechanical behavior of metals, ceramics, polymers and composite materials. Topics include elastic, plastic and viscoelastic deformation, fracture, fatigue, and creep.
Prerequisites: junior standing and MATLENG 201(P); or graduate standing; or consent of instructor.
Last Taught: Fall 2024, Fall 2023.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 410G Mechanical Behavior of Materials
3 cr. Undergraduate/Graduate.
An introduction to the mechanical behavior of metals, ceramics, polymers and composite materials. Topics include elastic, plastic and viscoelastic deformation, fracture, fatigue, and creep.
Prerequisites: junior standing and MATLENG 201(P); or graduate standing; or consent of instructor.
Last Taught: Fall 2024, Fall 2023.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 411 Materials Laboratory
3 cr. Undergraduate.
Experiments demonstrating the basic laws governing the processing, structure, and properties of materials.
Prerequisites: junior standing and MATLENG 201(P).
Last Taught: Fall 2024, Fall 2023, Fall 2022, Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 431 Welding Engineering
3 cr. Undergraduate/Graduate.
An engineering course on joining processes; reaction of materials to welding, brazing and soldering; distortion; process and material selection and structural engineering considerations.
Prerequisites: junior standing and MATLENG 201(P).
Last Taught: Spring 2022, Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 431G Welding Engineering
3 cr. Undergraduate/Graduate.
An engineering course on joining processes; reaction of materials to welding, brazing and soldering; distortion; process and material selection and structural engineering considerations.
Prerequisites: junior standing and MATLENG 201(P).
Last Taught: Spring 2022, Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 443 Transport Phenomena in Materials Processing
3 cr. Undergraduate/Graduate.
A study of phenomena related to transport of mass, energy, and momentum with applications to materials processing.
Prerequisites: junior standing, MATLENG 316(P); and ELECENG 234(P) or MATH 234(P); or graduate standing.
Last Taught: Spring 2025, Spring 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 443G Transport Phenomena in Materials Processing
3 cr. Undergraduate/Graduate.
A study of phenomena related to transport of mass, energy, and momentum with applications to materials processing.
Prerequisites: junior standing, MATLENG 316(P); and ELECENG 234(P) or MATH 234(P); or graduate standing.
Last Taught: Spring 2025, Spring 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 452 Ceramic Materials
3 cr. Undergraduate/Graduate.
Ceramic bonding, crystallography and structure, defects and Brouwer diagram, mass and electrical transport of ceramics, phase equilibria, mechanical properties, and processing of ceramics including sintering.
Prerequisites: junior standing and MATLENG 201(P) or graduate standing.
Course Rules: Not open for cr to students with cr in MATLENG 451(ER).
Last Taught: Fall 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 452G Ceramic Materials
3 cr. Undergraduate/Graduate.
Ceramic bonding, crystallography and structure, defects and Brouwer diagram, mass and electrical transport of ceramics, phase equilibria, mechanical properties, and processing of ceramics including sintering.
Prerequisites: junior standing and MATLENG 201(P) or graduate standing.
Course Rules: Not open for cr to students with cr in MATLENG 451(ER).
Last Taught: Fall 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 453 Polymeric Materials
3 cr. Undergraduate/Graduate.
Structure, crystallinity of polymers, amorphous polymers and elastomers, synthesis method, polymerization, copolymerization, polymer characterization, polymer solutions, and viscoelasticity, deformation mechanics of polymers.
Prerequisites: MATLENG 201(P).
Course Rules: Not open for credit to students with credit in MATLENG 451(ER).
Last Taught: Spring 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 453G Polymeric Materials
3 cr. Undergraduate/Graduate.
Structure, crystallinity of polymers, amorphous polymers and elastomers, synthesis method, polymerization, copolymerization, polymer characterization, polymer solutions, and viscoelasticity, deformation mechanics of polymers.
Prerequisites: MATLENG 201(P).
Course Rules: Not open for credit to students with credit in MATLENG 451(ER).
Last Taught: Spring 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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); or graduate standing.
Course Rules: MATLENG 457 and MECHENG 457 are jointly offered and count as repeats of each other.
Last Taught: Spring 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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); or graduate standing.
Course Rules: MATLENG 457 and MECHENG 457 are jointly offered and count as repeats of each other.
Last Taught: Spring 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 461 Environmental Degradation of Materials
3 cr. Undergraduate/Graduate.
Technical and economic aspects of material degradation including corrosion and corrosion control. Forms of corrosion, other degradation mechanisms, thermodynamics, kinetics, materials, design, protection strategies.
Prerequisites: junior standing and MATLENG 201(P).
Last Taught: Fall 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 461G Environmental Degradation of Materials
3 cr. Undergraduate/Graduate.
Technical and economic aspects of material degradation including corrosion and corrosion control. Forms of corrosion, other degradation mechanisms, thermodynamics, kinetics, materials, design, protection strategies.
Prerequisites: junior standing and MATLENG 201(P).
Last Taught: Fall 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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, Spring 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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, Spring 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 471 Heat Treatment of Materials
3 cr. Undergraduate/Graduate.
Study of the heat treatment processes and their effect on the microstructure and properties of metals. Emphasis is on steels, but all alloy systems of importance are covered.
Prerequisites: junior standing and MATLENG 201(P); or graduate standing.
Last Taught: Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 471G Heat Treatment of Materials
3 cr. Undergraduate/Graduate.
Study of the heat treatment processes and their effect on the microstructure and properties of metals. Emphasis is on steels, but all alloy systems of importance are covered.
Prerequisites: junior standing and MATLENG 201(P); or graduate standing.
Last Taught: Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 481 Electronic Materials
3 cr. Undergraduate/Graduate.
Modern principles of semiconductor fabrication, crystals, electrical and thermal conductivity phenomena, band gap and structure, doping effects, dielectric and optical properties, semiconductor homo and hetero-junctions, solar cells, thermo-electric materials; with projects.
Prerequisites: junior standing and PHYSICS 210(P) or PHYSICS 220(P); or consent of instructor.
Course Rules: MATLENG 481 and ELECENG 481 are jointly offered; they count as repeats of one another.
Last Taught: Spring 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 481G Electronic Materials
3 cr. Undergraduate/Graduate.
Modern principles of semiconductor fabrication, crystals, electrical and thermal conductivity phenomena, band gap and structure, doping effects, dielectric and optical properties, semiconductor homo and hetero-junctions, solar cells, thermo-electric materials; with projects.
Prerequisites: junior standing and PHYSICS 210(P) or PHYSICS 220(P); or consent of instructor.
Course Rules: MATLENG 481 and ELECENG 481 are jointly offered; they count as repeats of one another.
Last Taught: Spring 2025.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 483 Materials for Energy Systems
3 cr. Undergraduate/Graduate.
Processing, structure, and properties of materials used in energy systems. Focus on materials applied to solid oxide fuel cells, photovoltaics, and advanced secondary batteries.
Prerequisites: junior standing and MATLENG 201(P); or graduate standing.
Last Taught: Fall 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 483G Materials for Energy Systems
3 cr. Undergraduate/Graduate.
Processing, structure, and properties of materials used in energy systems. Focus on materials applied to solid oxide fuel cells, photovoltaics, and advanced secondary batteries.
Prerequisites: junior standing and MATLENG 201(P); or graduate standing.
Last Taught: Fall 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 485 Introduction to Computational Materials Modeling and Simulations
3 cr. Undergraduate/Graduate.
Basic principles of materials modeling and molecular simulation techniques used to study the properties and behavior of materials at the molecular level.
Prerequisites: junior standing and MATLENG 201(P).
Course Rules: Counts as a repeat of MATLENG 690 with similar topic.
Last Taught: Fall 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 485G Introduction to Computational Materials Modeling and Simulations
3 cr. Undergraduate/Graduate.
Basic principles of materials modeling and molecular simulation techniques used to study the properties and behavior of materials at the molecular level.
Prerequisites: junior standing and MATLENG 201(P).
Course Rules: Counts as a repeat of MATLENG 690 with similar topic.
Last Taught: Fall 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 490 Senior Design Projects I
1 cr. Undergraduate.
Project identification and planning; proposals, project management, ethics, professional responsibilities, standards and team procedures. Written and oral engineering reports and proposals. For first semester seniors.
Prerequisites: senior standing and MATLENG 411(C).
Last Taught: Fall 2024, Fall 2023, Fall 2022, Fall 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 491 Senior Design Projects II
3 cr. Undergraduate.
Independent and team design projects under the direction of a faculty member. Written and oral engineering reports must be submitted on each design project undertaken.
Prerequisites: MATLENG 490(P).
Last Taught: Spring 2025, Spring 2024, Spring 2023, Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 511 Advanced Materials Characterization
3 cr. Undergraduate/Graduate.
Theory and operation of advanced materials characterization instrumentation including thermal analysis (TGA, DSC, DMA), XRD, SEM/EDS, FTIR/Raman, 3D confocal microscopy. Prereq: junior standing and MATLENG 411(P).
Last Taught: Spring 2019, Spring 2018.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 511G Advanced Materials Characterization
3 cr. Undergraduate/Graduate.
Theory and operation of advanced materials characterization instrumentation including thermal analysis (TGA, DSC, DMA), XRD, SEM/EDS, FTIR/Raman, 3D confocal microscopy. Prereq: junior standing and MATLENG 411(P).
Last Taught: Spring 2019, Spring 2018.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 585 Advanced Biomaterials
3 cr. Undergraduate/Graduate.
Theory and application of advanced biomaterials including cardiovascular devices, orthopedic applications, drug delivery systems, biosensors, and tissue engineering.
Prerequisites: senior standing; MATLENG 385(P) or BME 385(P); or consent of instructor.
Course Rules: BME 585 and MATLENG 585 are jointly offered and count as repeats of one another.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 585G Advanced Biomaterials
3 cr. Undergraduate/Graduate.
Theory and application of advanced biomaterials including cardiovascular devices, orthopedic applications, drug delivery systems, biosensors, and tissue engineering.
Prerequisites: senior standing; MATLENG 385(P) or BME 385(P); or consent of instructor.
Course Rules: BME 585 and MATLENG 585 are jointly offered and count as repeats of one another.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 690 Topics in Materials:
3 cr. Undergraduate/Graduate.
Lectures on special topics in materials engineering and science.
Prerequisites: junior standing or greater or consent of instructor.
Course Rules: May be retaken with change in topic to max of 9 cr.
Last Taught: Fall 2021, Fall 2019.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 690G Topics in Materials:
3 cr. Undergraduate/Graduate.
Lectures on special topics in materials engineering and science.
Prerequisites: junior standing or greater or consent of instructor.
Course Rules: May be retaken with change in topic to max of 9 cr.
Last Taught: Fall 2021, Fall 2019.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 699 Independent Study
1-3 cr. Undergraduate/Graduate.
Prerequisites: junior standing or greater or consent of instructor.
Course Rules: May be retaken to max of 6 cr applied toward undergraduate degree.
Last Taught: Summer 2025, Summer 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 699G Independent Study
1-3 cr. Undergraduate/Graduate.
Prerequisites: junior standing or greater or consent of instructor.
Course Rules: May be retaken to max of 6 cr applied toward undergraduate degree.
Last Taught: Summer 2025, Summer 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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/

MATLENG 701 Properties of Solids
3 cr. Graduate.
The applications of physics to the understanding of the properties of solids, including lattice mechanics, band theory, electrical, thermal, magnetic, and defect properties.
Prerequisites: graduate standing and MATLENG 402(P).
Last Taught: Spring 2025, Spring 2024, Spring 2022, Spring 2021.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 702 Advanced Materials Thermodynamics
3 cr. Graduate.
Thermodynamics of materials including solutions, mixtures, and interfaces. Topics including statistical interpretation of entropy, chemical reactions, Ellingham diagrams, phase diagrams, and intermediate phases.
Prerequisites: graduate standing and MATLENG 442(P).
Last Taught: Fall 2023, Fall 2022, Fall 2020, Spring 2017.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 710 Advanced Mechanical Behavior of Materials
3 cr. Graduate.
Advanced topics on the mechanical properties of materials including plasticity, anelasticity, fracture, creep, fatigue, and the effects of temperature, rates, and processing history.
Prerequisites: graduate standing and MATLENG 410(P).
Last Taught: Spring 2021, Spring 2019, Fall 2017, Fall 2016.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 720 Kinetic Processes in Materials
3 cr. Graduate.
Absolute reaction rate theory, defects in materials, diffusion, phase transformation in metals.
Prerequisites: graduate standing and MATLENG 442(P).
Last Taught: Fall 2024, Spring 2023, Spring 2022, Fall 2020.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 731 Deformation Processing
3 cr. Graduate.
Application of engineering principles to shape generation by deformation processing. Analysis of forging, stamping, drawing. Effect of deformation material properties and behavior.
Prerequisites: graduate standing and MAtLENG 410(P).
Last Taught: Spring 2025, Fall 2021, Fall 2019, Fall 2017.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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, Fall 2014, Spring 2013.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 740 Heterogeneous Equilibria
3 cr. Graduate.
Quantitative description of heterogeneous equilibria for unary, binary, and ternary systems from the thermodynamic point of view; composite systems and current experimental techniques in high temperature materials.
Prerequisites: graduate standing, MECHENG 301(P), and MATLENG 201(P).
Last Taught: Fall 2013, Fall 2011, Fall 2009, Spring 2008.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 747 Fatigue in Engineering Materials
3 cr. Graduate.
Influence of repeated stress in engineering design, fatigue testing machines, and procedures, factors influencing fatigue properties, theories of fatigue failure.
Prerequisites: graduate standing and CIV ENG 401(P) or consent of instructor.
Course Rules: Previously CIV ENG 732. CIV ENG 747, MATLENG 747, and MECHENG 747 are jointly offered and count as repeats of one another.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 750 Thin Solid Films
3 cr. Graduate.
Application of materials science to thin films. Nucleation, growth, and characterization. Discussion of optical, electrical, and mechanical behavior in terms of atomic order and chemistry. Consideration of specific deposition methods and applications.
Prerequisites: graduate standing, MATLENG 201(P), and PHYSICS 210(P).
Last Taught: Spring 2010, Spring 2007, Spring 2003, Fall 1997.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 760 Surface Analysis of Solids
3 cr. Graduate.
Introduction to thermodynamics, structure and quantum theory of surfaces. Fundamentals of spectroscopic methods for analysis of surfaces. Applications to practical surface analysis problems: catalysis, thin films, polymers, ceramics, metallurgy and corrosion, coatings, glasses and composites.
Prerequisites: graduate standing or consent of instructor.
Last Taught: Spring 2015, Spring 2002, Spring 1997, Fall 1994.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 783 Electrochemistry of Fuel Cells and Batteries
3 cr. Graduate.
Covers the electrochemistry of fuel cells, batteries and electrolytic methods, including thermodynamics and kinetics of electrode reactions and associated mass transport in electrochemical systems, and measurement techniques in electrochemical systems.
Prerequisites: MATLENG 316(P), MATLENG 443(P), or MATLENG 483(P); or consent to instructor.
Course Rules: Advanced course that builds upon MATLENG 483. Counts as a repeat of MATLENG 890 with similar topic.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 785 Atomistic Modeling and Simulation of Materials
3 cr. Graduate.
Fundamental principles describing materials in terms of electrons and atoms; relations with macroscopic behaviors; modeling and simulation techniques including ab initio, density functional theory, molecular dynamics, and others.
Prerequisites: graduate standing.
Last Taught: Spring 2023, Spring 2022.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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 2015, Spring 2015, Spring 2014.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 888 Candidate for Degree
0 cr. Graduate.
Available for graduate students who must meet minimum credit load requirements.
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: Summer 2023, Summer 2018, Spring 2016, Summer 2013.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 890 Advanced Topics in Materials:
3 cr. Graduate.
Lectures on special topics in materials engineering and science.
Prerequisites: graduate standing; consent of instructor.
Course Rules: May be repeated with change in topic to max of 9 cr.
Last Taught: Fall 2022, Fall 2021, Fall 2018, Fall 2015.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 990 Masters Thesis
1-9 cr. Graduate.
Prerequisites: graduate standing and consent of instructor.
Course Rules: Repeatable to 12 cr max.
Last Taught: Summer 2025, Spring 2025, Fall 2024, Summer 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 998 Doctoral Thesis
1-12 cr. Graduate.
Prerequisites: graduate standing and consent of instructor.
Course Rules: Repeatable.
Last Taught: Summer 2025, Spring 2025, Fall 2024, Summer 2024.
Current Offerings: https://catalog.uwm.edu/course-search/

MATLENG 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: Summer 2025, Fall 2024, Summer 2023, Spring 2023.
Current Offerings: https://catalog.uwm.edu/course-search/