NEW MEXICO TECH
SCIENCE • ENGINEERING • RESEARCH UNIVERSITY

Fall 2024

Distance Courses
August 19, 2024 - December 13, 2024

Center for Graduate Studies

NEW MEXICO TECH
SCIENCE • ENGINEERING • RESEARCH UNIVERSITY

DEGREES

	M.S.	Ph.D.	M.S. Specialization	Ph.D. Dissertation	Course-based only Masters option available

ENGINEERING

Program	M.S.	Ph.D.	M.S. Specialization	Ph.D. Dissertation	Course-based only / Masters option available
Chemical*	●	●	Surface Engineering	Surface Engineering	●
Civil & Environmental	●				
Computer Science*	●	●			
Electrical	●	●		Cyber Electronic Systems	
Engineering Management*	●				●
Materials*	●	●			●
Mechanical*	●	●	Explosives Engineering; Fluid & Thermal Science; Mechatronics Systems & Robotics; Solid Mechanics	Intelligent Energetic Systems	●
Mineral	●	●	Mineral Exploration; Geotechnical & Geomechanical; Explosives Engineering;		
Petroleum	●	●			

SCIENCE

Program	M.S.	Ph.D.	M.S. Specialization	Ph.D. Dissertation	Course-based only / Masters option available
Biology	●				
Chemistry	●	●			
Earth & Environmental*	●	●	Geobiology; Geochemistry; Geology; Geophysics; Hydrology	Geobiology; Geochemistry; Geology; Geophysics; Hydrology	●
Mathematics	●	●	Analysis; Industrial Mathematics; Statistics & Data Science	Applied & Industrial Mathematics	
Physics	●	●	Instrumentation	Astrophysics; Atmospheric Physics; Instrumentation; Mathematical Physics	
Transdisciplinary Biotechnology		●			
Transdisciplinary Cybersecurity*	●	●			●
Science for Teachers*	●				●
Public Engagement*	●				

✱ Programs offering distance/hybrid education courses

GRADUATE CERTIFICATES:

Alternative Licensure - Elementary
Alternative Licensure - Secondary
Technology Leadership*

Cybersecurity*
Electrical Engineering
Explosives Engineering*
Hydrology
Scientific & Professional Communication*

Founded in 1889

$100M+
In research expenditure 2023 - 2024

1200
Undergraduate students

460+
Graduate students

5 NSF
Career awardees in last 3years

Accredited by the Higher Learning Commission

Research at NMT

Socorro NM, USA

Langmuir Laboratory
The Langmuir Laboratory for Atmospheric Research was by built by New Mexico Tech in 1963 and is located at an elevation of 10,630 ft in the Magdalena Mountains.

The Magdalena Ridge Observatory (MRO)
MRO's 2.4-meter telescope is one of the largest in the world that has as its primary mission the characterization of small bodies (both natural and artificial) in the Solar System. MRO discovered the three fastest spinning asteroids in the Solar System and has supported NASA's spacecraft missions.

Petroleum Recovery Research Center (PRRC)
PRRC, being the only research center of its kind in New Mexico, is a scientific research organization dedicated to solving problems related to the oil and gas industry.

The National Cave and Karst Research Institute (NCKRI)
NCKRI was created by Congress to study all aspects of caves and the karst areas in which most of them occur. Projects include cave and karst hydrogeology, geophysics, microbiology, geomicrobiology, environmental management, and planetary geology.

NM Bureau of Geology & Mineral Resources (NMBoG)
Since 1927, the NMBoG has been pursuing geoscience research on the geologic framework of our state. This work includes geologic mapping and assessments of the state's natural resources, as well as research in diverse aspects of the state's geology.

IRIS Portable Array Seismic Studies of the Continental Lithosphere (IRIS PASSCAL)
The IRIS PASSCAL Instrument Center at New Mexico Tech supports cutting-edge seismological research into Earth's fundamental geological structure and processes.

Institute for Complex Additive Systems Analysis (ICASA)
ICASA's mission is to contribute innovative solutions to national security and critical infrastructure protection problems.

Energetic Materials Research and Testing Center (EMRTC)
EMRTC has performed internationally recognized research for over 70 years. Core areas of expertise include detonation theory, explosives chemistry, warhead design, ballistic penetrator and gun system design, explosive formulation development, reactive hydrodynamic calculations, and safety and characterization testing.

New Mexico Cybersecurity Center of Excellence (NMCCoE)
NMCCoE was created by the legislature in 2019 to serve as a catalyst for cybersecurity research and workforce development in New Mexico by coordination and facilitating collaborations among NM colleges and universities, government agencies, and private sector.

Chemical Engineering

The Department of Chemical Engineering offers coursework and research thesis with an emphasis on surface engineering and industry focused skills. Opportunities to work in close collaboration with national laboratory scientists and in industry funded projects are available. Diverse research areas include: Catalysis & Reactions Engineering; Nanotechnology; Renewable Energy; Biomedical Engineering; Polymer Science; Molecular and Multi-scale Modeling; and Colloidal Science and Interfacial Phenomena.

Fall 2024 Chemical Engineering Course Offerings:

CH E 5049 - Nanostructures & Nanotechnology   M/W/F   0800 - 0850

An introduction to physical basics of nanosystems, physics and chemistry of nanostructure synthesis and fabrication. Other topics include: semiconductor nanostructures, magnetic nanostructures and spintronics, molecular nanostructures, electron transport in nanosystems, optical effects in nanosystems, nanomachines, nanoscale biological assemblies, nanocomposite materials.

CH E 5068 - Surfaces, Interfaces, & Colloids   M/W/F   1000 - 1050

Kinetics and thermodynamics of nano-scale particle interactions with emphasis on colloidal phenomena, surfactants, electrostatic, London, and van der waals interactions, gas adsorption, sedimentation and diffusion, osmotic and Donnan equilibrium, rheology, surface tension, and the electrical double layer.

CH E 5076 - Drug Delivery Techniques   T/R   0930 - 1045

Focus is on current developments in drug delivery techniques, with a brief discussion of common clinical techniques. Read, digest, and critically analyze scientific work from leading research laboratories.

Times are Mountain time UTC/GMT -7 hrs Daylight time (add one hour) March 10, 2024 until November 3, 2024

The Department of Computer Science and Engineering is focused on an exciting and rapidly growing body of knowledge with constantly changing emphasis. The curriculum of the department includes courses in both theory and application. It prepares students to apply the principles of logic and mathematics to the design and construction of hardware and software systems using current engineering paradigms and also exposes them to major applications of computing.

Fall 2024 Computer Science Course Offerings:

CSE 5067 - Soft Computing   W   1800 - 2030

Artificial neural networks, with emphasis on multiplayer feedback networks, self-organizing networks, and Hopfield-style networks. Learning algorithms. Introduction to fuzzy systems and evolutionary computing. Engineering applications of soft computing.

Addressing many of the greatest challenges to society requires understanding and integrating the methods, theories, techniques, and perspectives of multiple disciplines to develop new approaches to solve complex, real-world challenges. The mission of the Transdisciplinary Cybersecurity graduate programs is to prepare students with a broad understanding of cybersecurity from the foundational documents that have guided the development of the discipline to the ethical, legal, and psychological challenges that cybersecurity professionals face. Students further engage in hands-on cybersecurity risk analysis, data analysis, and policy development. In addition, technical electives provide expertise that students will need to solve real-world challenges in cybersecurity.

Transdisciplinary Cybersecurity

Fall 2024 Transdisciplinary Cybersecurity Offerings:

CYBS 5002 - Cybersecurity Ethics & Law   M   1800 - 2100

A cybersecurity ethics and law course in which students learn standards of professional, ethical behavior in cybersecurity fields by examining case studies, ethical questions, and legal debates from the history of computing and cybersecurity.

CYBS 5005 - Data Science for Cybersecurity   T/R   1400 - 1515

Data assembly, exploration, analysis, visualization, and inference. Python libraries such as NumPy, Pandas, and scikit-learn. Students are expected to explore problems related to cybersecurity threats, risks, and incidents that are important for businesses to become safer and less vulnerable to cyberattacks.

CYBS 5041 - Advanced Cryptography   T/R   1100 - 1215

This course provides an overview of modern cryptographic theory and techniques, mainly focusing on their application into real systems.

CYBS 5061 - Foundations of Cybersecurity   T   1530 - 1830

This course will explore the ideas, literature, and worked examples that established the foundations of information security. The course introduces the concept of the Information Domain as the fundamental primitive that is the axis for introducing the policy requirements of Confidentiality, Integrity and Availability that motivate the need for Information Security.

Engineering Management

The Graduate Degree Program in Engineering Management at New Mexico Tech is specifically designed for engineers, scientists, and technologists holding a bachelor's degree in their respective fields who seek the knowledge and practical skills required to lead project teams and organizations through today's competitive and fast changing business environment. Our focus is to provide students with a challenging experience that prepares them to develop and articulate a business case for their next engineering or technology design and development project and lead their team and organization to a successful outcome.

Fall 2024 Engineering Management Course Offerings:

EMGT 5001 - Management Science for Engineering Management   W   1700 - 2000

This course will expose participants to up-to-date Management Science applications in engineering and technology organizations. Techniques include linear programming, inventory models, and Material requirements planning.

EMGT 5002 - Financial Management   T   1700 - 2000

This course begins with study of the interaction between financial and accounting systems and continues with a discussion of cash flow analysis. This foundation is followed by discussion of the latest in corporate financial management and capital budgeting techniques.

EMGT 5004 - Engineering Statistics   T   1700 - 2000

This course is designed to provide engineering managers with a basic foundation for data-driven decision making. Decisions by modern engineering managers increasingly require a range of statistical skills. Decisions by modern engineering managers increasingly require a range of statistical skills including gathering and describing data, designing samples and experiments, drawing statistical inferences and conclusions, evaluating the confidence of conclusions, developing regression models for anticipating future behavior and use of statistical quality control and six Sigma to drive process improvement.

EMGT 5006 - Managing HR in Technology Organizations   R   1700 - 2000

The study of human resource management within technology and engineering organizations at the project, department, and enterprise levels. Leading project teams, managing employee performance and productivity, diagnosing organizational issues, developing strategic human resource plans, managing employee compensation, and responding to the changing legal workplace environment will be among the topics discussed in this seminar base on research and practice.

EMGT 5007 - Technology Entrepreneurship   M   1700 - 2000

Entrepreneurship is important for new startups and existing companies. This course is focused on development of skills that will assist in the advancement of innovations that will help innovators gain resources to support their efforts. Topics covered include game-theory based negotiation exercises, development of the value proposition for new products and services, and design of the business model in hyper-competitive environments.

EMGT 5089 - Introduction to Space Industry   W   1700 - 2000

The course is designed for students interested in the history, law, regulation, and policy of the space industry. Students will learn about the legal frameworks that govern space activities, including treaties such as the Outer Space Treaty and the Moon Agreement, federal acts such as the Commercial Space Launch Act, the National Space Policy, the SPACE Act, and the Artemis Accords, and federal agencies such as NASA, FCC, NOAA, and the FAA. The course will also cover key policy issues, including commercialization, emerging technologies, and environmental and ethical issues.

From its founding in the 1950s, the Hydrology Program in the Earth and Environmental Science (E&ES) department at New Mexico Tech has been working across disciplines to answer water questions that impact society and the world. Our focus is on building scientific understanding of fundamental processes that will shape global water sustainability for years in the future, and training students to apply these insights in their careers.

Fall 2024 Hydrology Course Offerings:

GEOL 4040 - Hydrology Theory & Field Methods   M/W/F   1100 - 1150

Fundamentals of hydrological flow and transport will be presented. Precipitation, runoff processes, and flood generation. Capillarity, unsaturated flow, and infiltration. Laws of flow in porous media, hydraulic storage, and flow to wells.

HYDR 5007 - Hydrogeochemistry   T/R   1100 - 1215

The thermodynamics and aqueous chemistry of natural waters, with emphasis on groundwater. Chemical equilibrium concepts, surface chemistry, redox reactions, and biochemistry. The interaction of water with the atmosphere and geologic Materials. Basic concepts applied to problems of groundwater quality evolution, water use, and groundwater contamination.

HYDR 5013 - Watershed Dynamics and Ecohydrology   M/W/F   1300 - 1350

Processes governing hydrological flow rates and pathways through watershed systems, emphasizing physical understanding and modeling of hillslope runoff production and in-channel flood routing. Interactions between terrestrial plants and water, nutrients, and light resources in semiarid ecosystems and riparian zones.

HYDR 5015 - Geomicrobiology   M/W/F   1300 - 1350

Exploration of the basis for interactions between the microorganisms and the geosphere. Topics include redox geochemistry, microbial metabolism and the diversity of microbial lifestyles, microbe mineral interactions, contaminant degradation and bioremediation, microbial paleobiology, and the co-evolution of life and the Earth.

HYDR 5016 - Geofluids   T/R   1230 - 1345

The role of groundwater in geologic processes. Fluid flow impelling mechanisms within the earth's crust to depths of 10 km. The role of groundwater in hydrothermal ore deposit formation, contact metamorphism, geothermal systems, petroleum generation/migration, overpressure/underpressure formation in sedimentary basins, and seismicity.

HYDR 5089 - Statistical Methods in Environmental Science   T/R   0800 - 0915

This class explores a set of statistical models useful for solving problems in hydrology and environmental sciences. Topics will include extreme value distributions and environmental risk analysis, Bayesian mixing models, turbulent boundary layers and statistical fluid mechanics, spectral analysis (overview of Fourier and wavelet transforms) as well as applications of machine learning to solving problems in hydrology and environmental science.

Materials Engineering

The Department of Materials & Metallurgical Engineering at New Mexico Tech offers MS, ME and PhD Materials Engineering degrees in research areas that include Metals, Ceramics, Polymers, Soft Matter, Biomaterials, Energetic Materials, Computational Materials Science, Additive Manufacturing, and Nano/Quantum Materials.

Fall 2024 Materials Engineering Course Offerings:

MTLS 4045 - Introduction to Composite Materials T/R **0930 - 1045**

Reinforcement Materials, glass, Kevlar, polyethylene, carbon, boron, silicon carbide, alumina, metallic fibers. Interface between the matrix and fiber. Polymer matrix, metal matrix, and ceramic matrix composites. Mechanism of fiber strengthening. Micromechanics and macromechanics of composite Materials, their strength and fracture behavior.

MTLS 5009 - Statistical Mechanics of Simple Materials M/W/F **1000 - 1050**

Basics of phase space, theories of microcanonical, canonical and grandcanonical ensemble, applications to gases, fluids and solids, phase transitions.

MTLS 5060 - Failure Analysis M/W/F **0900 - 0950**

Failure analysis is the science of unraveling why a product failed unexpectedly. The results of the failure analysis may be used to design a better product, or as evidence in litigation. This course will cover the proper methodology for investigating a failure, the common failure modes of structures and machines, fractography, the procedure for writing a failure analysis report, and the legal implications.

MTLS 5099 - Introduction to Quantum Materials T/R **0930 - 1045**

Physical basics of quantum materials, physics and chemistry of nanosynthesis and fabrication, semiconductor and superconductor quantum materials, magnetic nanostructures and spintronics, molecular nanostructures, electron transport in quantum materials, optical effects in quantum materials, nanomachines, nanoscale biological assemblies, quantum nanocomposite materials.

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"NMT facilitates a broad-based STEM program that provides a foundation for success academically and in the workforce"

Emma Stover
MS student and TA
Physics Department

"NMT has given me a phenomenal environment to nurture my intellectual curiosity and provided me with the resources necessary to pursue my research and personal goals"

Stephen Albritton
MS student
Mechanical Engineering Department

"New Mexico Tech's expertise in academics and research enables students to create and support the technologies of now and the future"

McKenna Gold
Research Engineer
Electrical Engineering Department

Mechanical Engineering

The Department of Mechanical Engineering offers PhD with Dissertation in Intelligent Energetic Systems and MS (with thesis) and ME (without thesis) degrees in Mechanical Engineering. Master's students can choose a specialization among Solid Mechanics; Mechatronics Systems and Robotics; Fluid and Thermal Sciences; and Explosives Engineering or pursue general Mechanical Engineering Master's degree.

Fall 2024 Mechanical Engineering Course Offerings:

MENG 5004 - Advanced Mechanics of Materials   T/R   1100 - 1215

Development of advanced mechanics of Materials principles and techniques for use in engineering design and problem solving. Topics include material yielding, torsion, unsymmetrical bending of beams, shear stresses in thin-walled structures, curved beams, beams on elastic foundations, axisymmetric thin-walled shells and thick-walled cylinders, column stability, stress concentrations, and material failure behavior under steady and cyclic loading.

MENG 5017 - Advanced Finite Element Analysis   T/R   1100 - 1215

An introduction to the numerical analysis calculus of variation, weak form of a differential equation, weighted residual techniques, solution of one-dimensional problems by the finite element method, bending problems, Lagrange and Hermite interpolation functions, isoparametric elements, numerical integration, two-dimensional problems, solution of Poisson and Laplace equations, triangular and quadrilateral elements, elasticity problems, theorem of minimum potential energy stiffness matrix, examples.

MENG 5035 - Drones   T/R   0930 - 1045

Drones will present the design, fundamentals, programming (Matlab), and analysis of different types of drones. This course introduces the basics of aerospace engineering, the classification and applications of drones, and techniques and approaches to the design and manufacturing of drones, including fixed-wing unmanned and micro air vehicles (UAV & MAV), flapping-wing drones, tilt-rotors/tilt-wings, multirotors, etc.

MENG 5041 - Vibrations in an Elastic Continuum   T/R   0800 - 0915

Analysis of single and multi degree-of-freedom systems for time dependent loads, including periodic and impact loads. Thin-walled structures—beams, plates, and shells. Dynamic stability of thin-walled structures.

MENG 5043 - Control System Design   T/R   1100 - 1215

This course provides an introduction to the analysis and design of advanced control systems. The frequency domain analysis, root locus analysis, design process, PID controller and compensator design will be emphasized. Fundamental limitations of feedback will be discussed and advanced PID design techniques will be presented. Model-based techniques such as pole placement will be discussed for the SISO case. Throughout the course we will emphasize the concepts of robust control, including tradeoffs between sensitivity and performance.

MENG 5045 - Introduction to Explosives Engineering   T/R   0930 - 1045

Introduction to the broad field of explosives science and technology. Basic organic chemistry, decomposition reactions, properties of explosives, thermodynamics of explosives, shock wave theory, detonation theory, initiators, Gurney equations, blast effects and demolition.

MENG 5046 - Detonation Theory   F   1100 - 1350

Development of classical detonation model for full order detonation of secondary explosives. Ideal versus non-ideal detonation. Burn-rate models for pyrotechnics. Derivation and application of the Mie-Gruneisen equation of state. The concept of deflagration to detonation transition.

MENG 5051 - Optimal Control Systems   M/W/F   0800 - 0850

Formulation of stochastic dynamic systems models, combined with optimal full-state and reduced-state estimators are introduced. Various cost functionals are defined and used to design real-time control algorithms that produce specific desired system responses. Mathematical measures of control robustness are defined which allow the student to gain an appreciation for predicting and measuring system stability margins under sub-optimal conditions.

MENG 5052 - Explosives Technology & Applications   F   0800 - 1030

Focus on the application of explosives mechanics. Fundamentals of explosive welding/cutting, shaped charges, explosive-drives flux compression generators, spallations, explosives initiation methods, explosives applied testing methods, etc.

MENG 5080 - Computational Fluid Dynamics and Reactive Flow   T/R   1400 - 1515

Introduction to Computational Fluid Dynamics and application of CFD tools to thermal and fluid flow problems. Coupling of fluid flow with combustion chemistry. Discussion of combustion modeling, importance of the mixing intensity, heterogeneous and homogeneous chemical reactions, and application of computer analysis to chemically reacting flow problems.
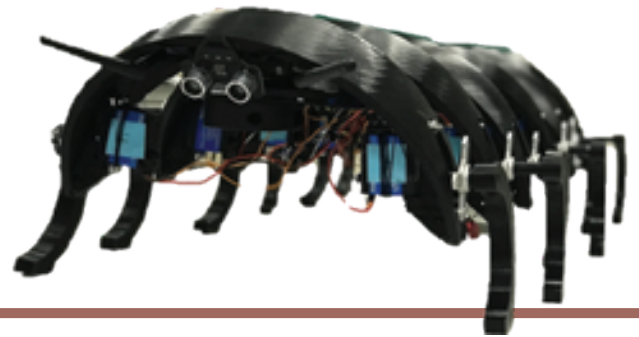
MENG 5089 - Engineering Mechanics of Composite Structures   T/R   0930 - 1045

Composite structures, Macro-mechanics to Structural design and development. Development of analytical procedures for determining material properties, effective experimental methods and prediction of structural behavior.

Public Engagement & Communication

The MS in Public Engagement in Science, Design and Communication teaches students to research, critically analyze and communicate information and technology to diverse communities.

Fall 2024 Scientific & Professional Communication Offerings:

PCOM 5003 - Applied Research Methods   T/R   1530 - 1645

This practice-based seminar gives students a thorough background in Humanities research methods including quantitative, qualitative, mixed methods, and user experience research. Students will create and perform pilot studies and will become familiar with the Institutional Review Board (IRB) submission and approval process for performing university-sanctioned research. Students will understand how to apply research methods and how to design and interpret studies that collect relevant, accurate, and useful data.

PCOM 5005 - Ethical & Social Issues in Public Engagement   W   1415 - 1645

This seminar examines how values influence STEM research as well as the ethics and politics of STEM communication and policy. Students will gain practical skills in ethics relevant to their professional work, analyzing how research, design, communication, and policy decisions may incorporate, or fail to incorporate, diverse stakeholders' interests. The course explores barriers and power relationships that can prevent certain groups from enjoying the full benefits of scientific and technological change. Assignments will challenge students to operate as public-responsible researchers or communicators and ask them to consider how products and policies can challenge inequality and promote the common good.

TCOM 5005 - Science Writing   T/R   1400 - 1515

This course provides an overview of science writing genres designed to reach multiple audiences (e.g., specialists, policymakers, students, the public) with an emphasis on nonspecialist audiences. The course is useful both to students pursuing a career as a professional science or technical writer and to students in the sciences hoping to improve their communication skills.

TCOM 5011 - Persuasive Communication   T/R   1230 - 1345

This course introduces rhetorical theory and persuasive techniques for communication from promotional documents to grants. Students gain practical experience in design, writing, and illustrating promotional texts. A central focus of the class is on preparing and submitting a real-world grant proposal, and introduces writing for both government and small foundation grants.

NMT's World Famous Taxidermy Drones

This project focuses on developing flapping-wing drone systems using taxidermied birds, replicating natural flight and unlocking numerous possibilities. These drones are notably distinguished by their significant reduction in noise pollution compared to traditional models, alongside increased controllability and maneuverability. With applications spanning from wildlife monitoring to military usage, these drones constitute a groundbreaking technological advancement. This project has gained 6 Billion views across the world.

New graduate scholarships of $773K for NM high school graduates studying STEM

Degree Seeking

Non-Degree Seeking

Online and/or in-person

$1,375 + fees per semester
for 3 credits

https://www.nmt.edu/gradstudies/   graduate@nmt.edu   +1 575 835 5513