

2021 - 2022

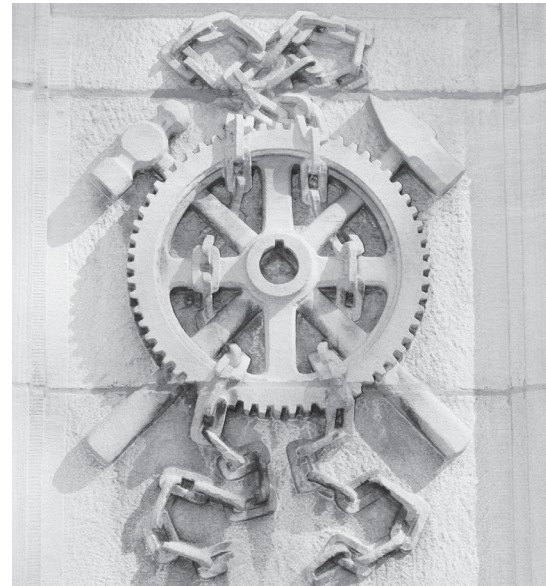
SYSTEMS ENGINEERING

Distance graduate degrees & certificate programs

MISSOURI
S&TTM

CONTENTS

Missouri S&T.....	3
Points of Distinction.....	4-5
Requirements for Admissions.....	6
Requirements for Completion	7
M.S. Core Courses.....	7
Certificate Descriptions.....	8-12
Ph.D. Program.....	12-13
Faculty Information.....	14-15
Contact Information.....	15



A Top Technological Research University



Founded in 1870, Missouri University of Science and Technology (Missouri S&T) is one of the nation's top technological research universities and one of four universities of the University of Missouri (UM) System. The university offers over 90 degree programs in engineering, science, computing and technology, business, social sciences, and humanities, including 21 Ph.D. programs.

Over 7,600 students from across the U.S. and around the world choose to study at Missouri S&T. More than 500 faculty educate these outstanding students at one of the state's only universities that is classified as highly selective. Over 80 percent of the degrees granted by Missouri S&T are in the STEM disciplines. Its annual research expenditures, currently around \$40.4 million, are climbing.

History of Missouri S&T

Founded as the Missouri School of Mines and Metallurgy, the school took advantage of the land-grant opportunities offered by the federal government through the Morrill Act. In 1963, following the establishment of the UM System, the school became known as the University of Missouri-Rolla. In 2008, the university changed its name to Missouri University of Science and Technology to broadcast more clearly its position as a leading STEM-focused university dedicated to discovery, creativity, and innovation to benefit the citizens of Missouri, the nation, and the world. As one of the original land-grant universities in the state, Missouri S&T is poised to capitalize in the coming years on the growing importance of STEM education throughout the state and the nation.

Graduate Distance Education

To meet the needs of working professionals, Missouri S&T offers 19 master's degrees and about 70 graduate certificate programs through distance education. Graduate programs include 13 engineering disciplines, business, psychology, technical communication, science and technology, of which many are nationally ranked. A limited number of doctoral programs are available through distance.

Systems Engineering at Missouri S&T

As one of the leading systems engineering programs in the nation, Missouri S&T is recognized as the only university in the world to have four INCOSE Stevens Doctoral Award recipients. Missouri S&T's systems engineering faculty members are active leaders in systems engineering and architecting research, conferences and other professional activities and associations. Included in their ranks are a national academy of engineering member, seven IEEE Fellows, an INCOSE Fellow and two IISE Fellows. The program includes nine teaching and adjunct faculty from industry. Diversity of specialization is enhanced through affiliated faculty members from Missouri S&T's Electrical and Computer Engineering and Mechanical and Aerospace Engineering departments.

Since its inception in 2000, the systems engineering program has awarded more than 610 MS degrees, and 21 PhDs. The diversity of engineering specialization, technological diversity, and strong interdisciplinary research continues to make Missouri S&T the ideal leader in systems engineering education and research, both nationally and internationally.

POINTS OF DISTINCTION

Missouri S&T and Systems Engineering

The Systems Engineering Graduate Program builds on sound engineering undergraduate education and experience, and maintains engineering specialization diversity in its graduates at both the M.S. and Ph.D. levels.

Systems engineering research is supported by interdisciplinary research and collaboration. Research areas include: Cyber Physical Systems, Modeling and Simulation, Model Based Systems Engineering, Machine and Deep Learning, System of Systems Architecting, Complex Adaptive Systems, Human Systems Integration, and Infrastructure Systems.

Research

Missouri S&T's research mission began in 1964 when the Missouri School of Mines and Metallurgy became one of the four universities of the University of Missouri System. The same year, the first two state-funded research centers were established on campus, the precursors to today's Materials Research Center and the Energetic Materials, Rock Characterization, and Geomechanics Center. Recently the Center for Science, Technology, and Society was created to integrate humanistic approaches to technological and scientific issues. Over the past 60 years, these centers have been joined by additional state-supported research centers in high performance computing, intelligent systems, infrastructure studies, energy and environment, and biomedical research. These centers house state-of-the-art equipment, research specialists, technicians, and administrative support personnel to assist expert faculty with externally sponsored research.

In 2020, 85% of funds for externally-sponsored research came from federal funding agencies. The largest (in order of funding) were the National Science Foundation (NSF), U.S. Department of Transportation (DOT), Department of Energy (DOE), and Department of Defense (DOD). With NSF, Missouri S&T has a long history of successes in the MRI program, CAREER awardees, and EAGER and GOALI awards.

Missouri S&T is well known for its industry-focused research programs. Currently there are six active industry consortia, three of which have more than a dozen industry members. The three largest consortia are: Center for Electromagnetic Compatibility (NSF I/UCRC), Center for Aerospace Manufacturing Technologies, and the Kent D. Peaslee Steel Manufacturing Research Center. This industry activity is supported by an active Economic Development/Technology Transfer Office. Patent and licensing activity are on an upward trend with over 85 patents and disclosures filed in each of the past three years (2017-20). Royalty income in 2020, for example was over \$650,000.

The scholarly productivity of the faculty goes well beyond the STEM disciplines to provide rich benefit and national recognition to S&T. With a number of prestigious grants funded by such agencies as the National Endowment for the Humanities (NEH) and Fulbright Program, S&T is home to some of the most highly productive social science and humanities scholars in the State of Missouri.

Future-focused Research

Solving the world's greatest challenges

As one of the world's leading technological research universities, Missouri S&T is nationally recognized for its research and scholarship. Missouri S&T's interdisciplinary approach to research involves students working alongside world-class faculty in a variety of fields.

ENGINEERING FOR EXTREMES

Mastering extreme environments with unique materials and innovative approaches for modeling and design in diverse fields such as hypersonics, ballistic impact, and high radiation environments

INFRASTRUCTURE

Understanding our infrastructure needs and developing new approaches to rehabilitate and manage infrastructure for the future

MANUFACTURING AND ECONOMIC DEVELOPMENT

Building industries and creating jobs through innovative materials, processes, and manufacturing systems while building collaboration with a wide variety of industrial partners

SMART SYSTEMS

Merging advanced computation and big data with transportation systems, architecture, energy infrastructure for a safe and secure lifestyle of the future

SUSTAINABLE ENERGY, MINERALS, AND RESOURCES

Innovating techniques to extract and utilize energy, critical minerals, and earth's resources in a sustainable manner

The College of Engineering and Computing (CEC) comprises nine departments and offers 17 undergraduate programs, 18 undergraduate minors and 21 master's degree and/or Ph.D. programs. This is one of the widest arrays of engineering programs offered in the United States.

Bachelor of science degrees are offered in aerospace engineering, architectural engineering, ceramic engineering, chemical engineering, civil engineering, computer engineering, computer science, electrical engineering, engineering management, environmental engineering, geological engineering, geology and geophysics, mechanical engineering, metallurgical engineering, mining engineering, nuclear engineering, and petroleum engineering. All of the engineering and computer science programs are ABET accredited. In addition, students may specialize in one of more than 60 emphasis areas within these degree programs.

At the graduate level, CEC offers a broad array of master's degrees and Ph.D. programs. Ph.D.s are offered in all departments, and some departments offer multiple Ph.D. programs. The college has made great strides in increasing enrollment of doctoral students.

Missouri S&T's Smart Engineering Systems Lab (SESL) develops new models and tools for building complex systems architectures that are intelligent, modular, and adaptive and contributes heavily to systems architecting research. The engineering tools and algorithms that are developed by the interdisciplinary teams can be used in building today's complex systems.

Research Challenges. The Systems Engineering Graduate Program, along with its more than 610 graduates, contributes to the research challenges

of systems engineering imposed by today's complex, adaptive, distributed, cooperative, and dynamically changing engineering systems.

The Virtual and Augmented Reality Systems Engineering Lab (VASEL) has been established to complement ongoing and future research work within the department, the S&T campus and across the UM system. The research conducted in this lab aims at addressing current and future challenges faced at the boundaries and interfaces of science, technology and engineering research that are essential to propelling us to the next level in scientific advances to address societal needs. These challenges found at the nexus of various domains require experts from all backgrounds of science and engineering to facilitate research that leads to emergence of new disciplines and the generation of knowledge, particularly when it comes to complex systems design and development.

The focus of the VASEL is the research and development of techniques and platforms that are essential to understanding the complementary and competitive teaming of humans with natural and engineered systems. The design and evaluation of human response to extreme events such as earthquakes and floods informs our understanding of developing protocols to address these natural events. Human response to manufactured events such as fires, shootings and even cyber-attacks similarly will lead to engineered strategies facilitated by the virtual environments used as experimental platforms

SERC-UARC. Missouri S&T is one of 22 collaborating universities that participate in this university affiliated research center supported by the Department of Defense. Department faculty serve as Principal Investigator and Co-Principal Investigator on SERC-sponsored projects. Missouri S&T heavily contributes enterprises

and system of systems vision of SERC. System of Systems Analysis and Architecting and Flexible Intelligent Learning Architectures for SoS FILA-SoS are projects led by Missouri S&T SERC Senior Principal Investigator.

Faculty and Teaching Philosophy. Missouri S&T, through its modular and adaptive Systems Engineering (MS) degree program and world-renowned faculty, responds to the needs of engineering students throughout the world. Since 2000, more than 610 students have graduated from the systems engineering program.

The systems engineering pedagogy is to expose students to the wide range of influences that program managers and engineers face in real programs, along with engineering tools that are needed to produce the best balanced development of today's complex systems, while incorporating "real-world" problems that expand the students knowledge base in the area of "system life-cycle."

Students are exposed to a variety of opinions, tools and methodologies. The end point of the inclusion of design prototyping, electronics, software development and validation from a real world customer is a more personal understanding of the process and results of systems engineering realities. This is achieved through project teams consisting of faculty advisors, industry mentors, and Ph.D. students.

Complex Adaptive Systems Conference. For the past twenty-nine years, Missouri S&T has provided a forum for international researchers who are interested in Computational Intelligence. This strong leadership for over two decades in applied Computational Intelligence is an asset in designing and operating complex systems of the future.

SYSTEMS ENGINEERING

Requirements for Admissions

The Master's Degree Program requires the successful completion of six core courses and four approved specialization track courses or graduate certificate courses.

The Graduate Certificate Program requires satisfactory completion of four courses.

Systems Engineering Core Courses address fundamental systems engineering topics, concepts and principles and complex system management.

In addition, there is a course addressing economic decision analysis to reflect the reality that program decisions consisting of the total life cycle must include a proper understanding of economic consequences.

The Specialization Tracks provide you with the ability to address your technology education needs in the context of the overall Systems Engineering program. Some specialization tracks include artificial intelligence, cyber security, modeling and simulation, human systems integration, health care, infrastructure, model based engineering and digital engineering. With the permission of the program director, a student may propose a different field other than those shown, or a combination of shown fields, and have it accepted, if it meets the program and university criteria.

Almost 90 percent of students start in the Systems Engineering Graduate Certificate Program. Certificate courses taken for graduate credit can apply to the M.S. degree, once accepted into the degree program. If the four-course sequence is completed with a grade of B or better (3.0 or greater) in each of the courses taken, students can be admitted to the master's program in systems engineering without taking the GRE. The certificate program may be followed by six additional three credit hour courses to complete the M.S. degree. Once admitted to the program, students must take the designated courses to receive the graduate certificate.

Admission Requirements for Graduate Certificate

- A bachelor's degree in engineering or physical science
- Satisfactory Cumulative Undergraduate GPA (2.75 for regular status)
- Minimum of 12 months of work experience preferred, or currently accepted into the graduate degree program at Missouri S&T

For current admission requirements, go online to <https://distance.mst.edu/distance-programs/distance-graduate-degrees/systems-engineering/>

SPECIALIZATION TRACK SUBSTITUTION OPTION

One of the following graduate certificates may be substituted for a specialization track with the permission of the program director.

Civil and Environmental

Contemporary Structural Engineering
Geoenvironmental Engineering
Geotechnical Earthquake Engineering
Infrastructure Renewal
Project Engineering and
Construction Management

Computer Science

Big Data Management and Analytics
Big Data Management and Security
Computational Intelligence
Cyber Security
Information Systems & Cloud Computing
Wireless Networks and Mobile Systems

Electrical and Computer Engineering

Advanced Control Systems
Automation Engineering and PLC
Computational Intelligence
Electric Machines and Drives
Electric Power Systems Engineering
Information Assurance & Security
Officer Essentials
Cyber Physical Systems

Engineering Management

Engineering Management
Financial Engineering
Lean Six Sigma
Project Engineering and
Construction Management
Project Management
Safety Engineering

Manufacturing Engineering

CAD/CAM & Rapid Product Realization
Manufacturing Systems

Mechanical and Aerospace Engineering

Composite Materials and Structures
Control Systems
Energy Conversion & Transport
Engineering Mechanics
Manufacturing Automation

Please refer to <https://distance.mst.edu/distance-programs/distance-graduate-certificates/> for a graduate certificate that you are interested in to share with your advisor.

SYSTEMS ENGINEERING MS

Requirements for Completion

A minimum of 30 credits of coursework from the areas listed must be completed with a cumulative grade point average of 3.0 (on a 4.0 scale) and a C grade or better in each course. Accumulation of more than 9 hours of C or F results in dismissal from the program. A maximum of nine units may be transferred from other universities if taken for graduate credit with a B or better and equitable to a course at Missouri S&T. All courses applied to the degree require prior written advisor approval recorded on the study plan in the student's file. There is no thesis or comprehensive examination requirement. It is the responsibility of each student to apply for graduation with the Missouri S&T Registrar's Office during their last semester. Assistance on this final step can be provided by the Engineering Management and Systems Engineering (EMSE) Department. More details about requirements can be found in the university catalog at catalog.mst.edu and are available from EMSE upon request. Details about the program can also be found at emse.mst.edu.

As one of the leading systems engineering programs in the nation, S&T is the only university in the world to have four International Council on Systems Engineering Stevens Doctoral Award Recipients. Missouri S&T Systems Engineering Program is approved for INCOSE Equivalency Program. Our graduates are

able to bypass the knowledge exam on their path to becoming an Associate Systems Engineering Professional (ASEP) or Certified Systems Engineering Professional (CSEP).

Systems Engineering Specific Graduate Certificates

- Systems Engineering
- Model Based Systems Engineering
- Computational Intelligence
- Cyber Physical Systems
- Financial Engineering

The graduate certificate programs consist of four core courses and are designed for working professionals. Certificate courses taken for graduate credit can apply to the M.S. degree, if the student applies and is admitted. The 12 credits of coursework from the certificate courses must be completed with a cumulative grade point average of 3.0 (on a 4.0 scale). If the four-course sequence is completed with a grade of B or better in each of the courses taken, students can be admitted to the M.S. program in Systems Engineering without taking the GRE, when they apply for the M.S. To complete the M.S. degree, you must take six additional three-credit courses.

MS Core Courses

Systems Architecting and Analysis

SYS ENG 5101 System Engineering and Analysis (LEC 3.0)

The concepts of Systems Engineering are introduced through a project. Students work in virtual teams. The topics covered are architecture development, basic system architectural design techniques, functional decomposition, design and technical review objectives, and initial specifications. *Prerequisite: graduate or senior standing.*

SYS ENG 6102 Information Based Design (LEC 3.0)

This course is an introduction to the use of common data analytical methods and analysis for the purpose of decision making during the design phase of engineering system development. Through the introduction to such analytical methodologies, the systems engineering tool belt is made more effective as it is the foundation to decision analysis. *Prerequisite: graduate standing.*

SYS ENG 6104 Systems Architecting (LEC 3.0)

Tools and concepts of architecting complex engineering systems. Ambiguity in Systems Architecting and Fuzzy Systems; Search as an Architecting Process; Architecting Heuristics; Systems Scoping and Attribute Selection; Assessing Architectures; Systems Aggregation, Partitioning; Systems Behavior Generation; System Science and Thinking, Cyber Physical Systems. *Prerequisite: graduate standing.*

SYS ENG 6103 Systems Life Cycle Costing (LEC 3.0)

Methods of economic evaluation for engineering projects involving complex systems. Economic impacts on choosing system alternatives, life cycle costing, economic decisions involving risk and uncertainty, and engineering cost estimation for projects in government, defense, and commercial industries. *Prerequisite: graduate standing.*

SYS ENG 6196 Systems Engineering Capstone (LEC 3.0)

The topics covered are Systems Engineering Management Plan (SEMP), Systems Engineering processes, process re-engineering, standards, and systems engineering case studies. Students will apply the skills and theory that they mastered in previous five core courses to the analysis of assigned cases.

SYS ENG 6542 Model Based Systems Engineering (LEC 3.0)

Provides the student with understanding of the use of models to represent systems and validate system architectures. The student will gain proficiency in using a systems modeling language and shifting systems engineering from a document centric to a model centric paradigm. *Prerequisites: graduate standing. (Co-listed with COMP SCI 6102)*

SYSTEMS ENGINEERING GRADUATE CERTIFICATES

Systems Engineering | Model Based Systems Engineering | Computational Intelligence | Cyber Physical Systems

Systems Engineering

[distance.mst.edu/distance-programs/
distance-graduate-certificates/systems-engineering/](https://distance.mst.edu/distance-programs/distance-graduate-certificates/systems-engineering/)

The Graduate Certificate in Systems Engineering is designed to provide graduate engineers with the advanced knowledge and skills necessary for the conception and implementation of complex systems. The emphasis is on the processes by which complex systems are conceived, planned, designed, built, tested, and certified. The systems engineering experience can be applied to defense, space, aircraft, communications, navigation, sensor, computer software, computer hardware, transportation, and other aerospace and commercial activities. The graduate courses selected for the program will count toward an M.S. degree in Systems Engineering. Graduate certificate students will be admitted to the M.S. program in Systems Engineering, if they complete the four course sequence, namely; Sys Eng 5101, 6102, 6103, and 6104 with a grade of B or better in each course taken.

Core Courses:

SYS ENG 5101 Systems Engineering and Analysis
SYS ENG 6102 Information Based Design
SYS ENG 6103 System Life Cycle Costing
SYS ENG 6104 Systems Architecting

Model Based Systems Engineering

[distance.mst.edu/distance-programs/
distance-graduate-certificates/
model-based-systems-engineering/](https://distance.mst.edu/distance-programs/distance-graduate-certificates/model-based-systems-engineering/)

Recent advances in technology demands and the increased level of interconnectivity achieved through Internet and broadband communication technology is leading to systems that are increasingly complex. To manage this complexity, computational modeling and data resources have become nearly ubiquitous in Systems Engineering, driving the profession from a document-centric paradigm to a model-centric one. Model Based Systems Engineering provides the means to construct models that capture system structure, behavior, and requirements and maintain consistency of these models automatically between collaborating engineers. These models can then be used in tandem with engineering and mathematics tools to quickly gain insight into the overall system performance over the entire lifecycle before a system component is ever made.

This graduate certificate program provides practicing engineers the opportunity to develop the necessary skills in the use of current modeling techniques to develop and simulate complex, multi-disciplinary engineering systems. In addition, engineers will learn methods to automate data acquisition for system development, establish rules for reusability of model resources, and acquire necessary skills for simulating the designed systems.

SYS ENG 6110 Risk Modeling and Optimization under Uncertainty (LEC 3.0)

Risk analysis of products and systems will be explored. Traditional probabilistic risk assessment techniques will be covered along with recent approaches (i.e., stochastic programming, robust optimization, and dynamic programming) that use historical data based risk models to realize optimal risk management. *Prerequisite: graduate standing. (Co-listed with ENG MGT 6415).*

SYS ENG 6542 Model Based Systems Engineering (LEC 3.0)

Provides the student with understanding of the use of models to represent systems and validate system architectures. The student will gain proficiency in using a systems modeling language and shifting systems engineering from a document centric to a model centric paradigm. *Prerequisite: graduate standing. (Co-listed with COMP SCI 6102)*

SYS ENG 6239 Smart Engineering System Design (LEC 3.0)

Covers the tools, techniques and methods used in developing Flexible Intelligent Learning Architectures for system of systems (SoS) and cyber physical systems (CPS) through evolutionary approach. Meta-architecture generation algorithms, SoS and CPS architecture evaluation methods, executable architectures, many meta-architecture objectives trade. *Prerequisite: graduate standing.*

SYS ENG 6412 Mathematical Programming (LEC 3.0)

An introduction to linear optimization and its engineering applications; problem modeling, search-based optimization, the simplex method for solving linear problems, multi-objective optimization, discrete dynamic programming. Applications of optimization in the fields such as transportation, project management, manufacturing and facility location will be discussed. *Prerequisites: Stat 3113 or equivalent and (ENG MGT 5414 or MATH 3103 or MATH 3108) (Co-listed with MATH 6665).*

The information contained in this document is subject to change, and classes listed may not be offered each semester. If there are any questions regarding your program of interest, please refer to the university's website, or contact the program director directly.

Computational Intelligence

distance.mst.edu/distance-programs/distance-graduate-certificates/computational-intelligence/

Recent advances in information technology and the increased level of interconnectivity that society has achieved through Internet and broadband communication technology created systems that are very much different. The world is facing an increasing level of systems integration leading toward Systems of Systems (SoS) that adapt to changing environmental conditions. The number of connections between components, the diversity of the components and the way the components are organized can lead to different emergent system behavior. Computational Intelligence tools are an integral part of these systems in enabling adaptive capability in their design and operation.

This graduate certificate program provides practicing engineers the opportunity to develop the necessary skills in the use and development of computational intelligence algorithms based on evolutionary computation, neural networks, fuzzy logic, and complex systems theory. Engineers can also learn how to integrate common sense reasoning with computational intelligence elective courses such as data mining and knowledge discovery.

Core Courses:

COMP ENG 5310/ ELEC ENG 5310/SYS ENG 5211

Computational Intelligence (LEC 3.0)

Introduction to Computational Intelligence (CI), Biological and Artificial Neuron, Neural Networks, Evolutionary Computing, Swarm Intelligence, Artificial Immune Systems, Fuzzy Systems, and Hybrid Systems. CI application, case studies covered include digital systems, control, power systems, forecasting, and time-series predictions. *Prerequisite: Comp Sci 1510 or programming competency.*

Select one course from the following:

SYS ENG 5212/ELEC ENG 5370 Introduction to Neural Networks and Applications (LEC 3.0)

The course provides an introduction to basic neural network architectures and their applications. Students learn to construct neural networks and train them to solve engineering problems, specifically pattern recognition and function approximation. Mathematical analysis of network architectures, training algorithms and practical applications of neural nets.

COMP SCI 5401 Evolutionary Computing (LEC 3.0)

Introduces evolutionary algorithms, a class of stochastic, population-based algorithms inspired by natural evolution theory (e.g., genetic algorithms), capable of solving complex problems for which other techniques fail. Students will implement course concepts, tackling science, engineering and/or business problems. *Prerequisites: COMP SCI 2500 and a statistics course.*

COMP SCI 5400 Introduction to Artificial Intelligence (LEC 3.0)

A modern introduction to AI, covering important topics of current interest such as search algorithms, heuristics, game trees, knowledge representation, reasoning, computational intelligence, and machine learning. Students will implement course concepts covering selected AI topics. *Prerequisite: COMP SCI 2500.*

Elective Courses:

Select two courses not taken as a core course:

COMP SCI 5400 Introduction To Artificial Intelligence (LEC 3.0)

(Refer to core course description above)

COMP SCI 5401 Evolutionary Computing (LEC 3.0)

(Refer to core course description on this page)

COMP ENG 6330/ELEC ENG 6340/SYS ENG 6214/STAT 6239 Clustering Algorithms (LEC 3.0)

An introduction to the cluster analysis and clustering algorithms rooted in computational intelligence, computer science and statistics. Clustering in sequential data, massive data and high dimensional data. Students will be evaluated by individual or group research projects and research presentations. *Prerequisites: At least one graduate course in statistics, data mining, algorithms, computational intelligence, neural networks, consistent with student's degree program.*

COMP SCI 6400 Advanced Topics in Artificial Intelligence (LEC 3.0)

Advanced topics of current interest in the field of artificial intelligence. This course involves reading seminal and state-of-the-art papers as well as conducting topical research projects including design, implementation, experimentation, analysis, and written and oral reporting components. *Prerequisite: COMP SCI 5400 or COMP SCI 5401 or COMP ENG 5310.*

COMP SCI 6401 Advanced Evolutionary Computing (LEC 3.0)

Advanced topics in evolutionary algorithms, a class of stochastic, population-based algorithms inspired by natural evolution theory, capable of solving complex problems for which other techniques fail. Students will conduct challenging research projects involving advanced concept implementation, empirical studies, statistical analysis, and paper writing. *Prerequisite: COMP SCI 5401.*

SYSTEMS ENGINEERING GRADUATE CERTIFICATES

SYS ENG 6215/COMP ENG 6320/ELEC ENG 6360

Adaptive Dynamic Programming (LEC 3.0)

Review of Neurocontrol and Optimization, introduction to Approximate Dynamic Programming (ADP), Reinforcement Learning (RL), combined concepts of ADP and RL, Heuristic Dynamic Programming (HDP), Dual Heuristic Programming (DHP), Global Dual Heuristic Programming (GDHP) and case studies. *Prerequisite: SYS ENG 5212/ELEC ENG 5370.*

SYS ENG 6216/COMP SCI 6402/COMP ENG 6302

Advanced Topics in Data Mining (LEC 3.0)

Data mining and knowledge discovery utilizes both classical and new algorithms, such as machine learning and neural networks, to discover previously unknown relationships in data. Key data mining issues to be addressed include knowledge representation and knowledge acquisition (automated learning).

ELEC ENG 5320 Neural Networks for Control (LEC 3.0)

Introduction to artificial neural networks and various supervised and unsupervised learning techniques. Detailed analysis of some of the neural networks that are used in control and identification of dynamical systems. Applications of neural networks in the area of control. Case studies and a term project.

SYS ENG 5212/ELEC ENG 5370 Introduction to Neural Networks and Applications (LEC 3.0)

The course provides an introduction to basic neural network architectures and their applications. Students learn to construct neural networks and train them to solve engineering problems, specifically pattern recognition and function approximation. Mathematical analysis of network architectures, training algorithms and practical applications of neural nets. *Prerequisites: Graduate Standing. (Co-listed with Elec Eng 5370).*

COMP ENG 6310/MECH ENG 6447/AERO ENG 6447/ENG MGT 6410/COMP SCI 6202 Markov Decision Processes (LEC 3.0)

Introduction to Markov Decision Processes and Dynamic Programming. Application to Inventory Control and other optimization and control topics. *Prerequisite: Graduate standing in background of probability or statistics.*

SYS ENG 6213 Deep Learning and Advanced Neural Networks (LEC 3.0)

Advanced artificial neural network architectures, namely; Radial-Basis Function Networks, Support Vector Machines, Committee Machines, Principal Components Analysis, Information-Theoretic Models, Stochastic Machines, Neurodynamic Programming, Temporal Processing are the topics covered. *Prerequisite: SYS ENG 5212 or equivalent neural network course.*

Cyber Physical Systems

distance.mst.edu/distance-programs/distance-graduate-certificates/network-centric-systems/

Cyber Physical Systems with different levels of implementation that entail complex logic with many levels of reasoning in intricate arrangement, organized by web of connections and demonstrating self-driven adaptability are emerging. They will impact manufacturing industry, defense, healthcare,

energy, transportation, emergency response, agriculture and society overall. The graduate certificate in Cyber Physical Systems is a joint effort between computer engineering and systems engineering to provide practicing engineers with the necessary skills to develop and design the operation of complex adaptive systems. These four courses count toward a M.S. degree in systems engineering or computer engineering and they address the intersection between computer engineering, systems engineering, and architecting. The requirement are the successful completion of two core courses and two elective courses from the list below. A grade of "B" or better is required in each course before the student is eligible for the master of science program.

Core Course:

SYS ENG 6321/COMP ENG 6410 Modeling Complex Systems (LEC 3.0)

Engineering Systems of today are non-linear, distributed, global, and adaptive to their environment in both space and time, thereby creating emergent behaviors. This course covers the current modeling tools and techniques used in modeling and architecting these complex systems. *Prerequisites: Graduate Standing. (Co-listed with COMP ENG 6410).*

COMP ENG 5410 Introduction to Computer Communication Networks (LEC 3.0)

Design of computer networks with emphasis on network architecture, protocols and standards, performance considerations, and network technologies. Topics include: LAN, MAN, WAN, congestion/flow/error control, routing, addressing, broadcasting, multicasting, switching, and internetworking. A modeling tool is used for network design and simulation. *Prerequisites: Comp Eng 3150 or computer hardware competency and Stat 3117 or Stat 3115 or Stat 5643 or equivalent.*

Elective Courses:

COMP ENG 5420 Introduction to Network Security (LEC 3.0)

This course examines basic issues in network management, testing, and security; it also discusses key encryption, key management, authentication, intrusion detection, malicious attack, and insider threats. Security of electronic mail and electronic commerce systems is also presented. *Prerequisite: Comp Eng 5410 or Comp Sci 5600.*

COMP ENG 5430/SYS ENG 5323 Wireless Networks (LEC 3.0)

Introduction to wireless communications and networking. Topics include transmission fundamentals, wireless channel, coding techniques and error control, satellite and cellular networks, cordless systems, mobile IP and management, multiple access techniques and wireless protocols, wireless LAN, IEEE 802.11, and adhoc and sensor networks. *Prerequisites: Hardware competency, Elec Eng 3420 or Comp Eng 3150 and graduate standing. (Co-listed with Elec Eng 5430 and Sys Eng 5323).*

COMP ENG 5510 Fault-Tolerant Digital Systems (LEC 3.0)

Design and analysis of fault-tolerant digital systems. Fault models, hardware redundancy, information redundancy, evaluation techniques, system design procedures. *Prerequisites: Comp Eng 2210 and Comp Eng 2211.*

SYS ENG 6322/COMP ENG 6510 Resilient Networks (LEC 3.0)

This course presents reliability and fault tolerance for network-centric systems, including models, metrics, and analysis techniques. This course also concentrates on security, including technical tools and methods for audit and assessment as well as management and policy issues. *Prerequisites: Sys Eng 6410, Comp Eng 6410, or Comp Eng 5420. (Co-listed with COMP ENG 6510).*

COMP ENG 6420/SYS ENG 6324 Wireless Ad Hoc and Sensor Networks

Introduction to ad hoc and sensor networks, IEEE standards, heterogeneity, quality of service, wireless channel issues, energy awareness, power and topology control, routing, scheduling, rate adaptation, self-organization, admission and flow control, energy harvesting, security and trust levels, hardware and applications. *Prerequisite: Comp Eng 5430 or Comp Eng 5420 or equivalent. (Co-listed with Elec Eng 6430 and Sys Eng 6324).*

COMP ENG 6430 High Speed Networks (LAB 1 and LEC 2.0)

A state-of-the-art survey of high-speed networks, modeling and simulation, quality of service (QoS) for multimedia applications and management schemes, TCP congestion control, ATM and Internet traffic management, Internet Service Architecture (ISA), and Internet routing protocols. *Prerequisites: Comp Eng 5410 and hardware competency for ECE students, Comp Sci 4600 for computer science students, or consent of the instructor.*

COMP ENG 6440/COMP SCI 6602 Network Performance Analysis (LEC 3.0)

Provides an introduction to performance modeling and analysis of computer networks. Topics include stochastic processes; performance measurement and monitoring; quantitative models for network performance, e.g., Markovian models for queues; simulation; and statistical analysis of experiments. *Prerequisites: Comp Eng 5410 or Comp Sci 4600; Stat 3117 or 5643. (Co-listed with Comp Sci 6602).*

COMP SCI 6600 Formal Methods in Computer Security

The course presents various vulnerabilities and threats to information in cyberspace and the principles and techniques for preventing and detecting threats, and recovering from attacks. The course deals with various formal models of advanced information flow security. A major project will relate theory to practice. *Prerequisites: A grade of "C" or better in both Comp Sci 3600 and Comp Sci 5200.*

COMP SCI 6604 Mobile and Sensor Data Management

Architectures of mobile computing systems; Mobile-IP support in mobile computing systems; location data management, Broadcasting and indexing, replication control; caching, fault tolerance and reliability of mobile systems; adhoc and sensor routing schemes, key management. *Prerequisite: Comp Sci 4601.*

Obtain two graduate certificates and your master's in Systems Engineering

At Missouri S&T it is possible to obtain two graduate certificates as part of your master's degree track in Systems Engineering. The sequence of required course curriculum in each emphasis area is listed below.

Cyber Physical Systems Emphasis

SYS ENG 5101 Systems Engineering and Analysis
SYS ENG 6102 Information Based Design
SYS ENG 6103 Systems Life Cycle Costing
SYS ENG 6104 Systems Architecting
Receive Systems Engineering Graduate Certificate

SYS ENG 6321 Modeling Complex Systems
COMP ENG 5410 Introduction to Computer Communication Networks
SYS ENG 5323 Wireless Networks
SYS ENG 6322 Resilient Networks
Receive Network Centric Graduate Certificate

SYS ENG 6542 Model Based Systems Engineering
SYS ENG 6196 Systems Engineering Capstone
Receive Master of Science in Systems Engineering

Engineering Management Emphasis

SYS ENG 5101 Systems Engineering and Analysis
SYS ENG 6102 Information Based Design
SYS ENG 6103 Systems Life Cycle Costing
SYS ENG 6104 Systems Architecting
Receive Systems Engineering Graduate Certificate

ENG MGT 5320 Project Management
ENG MGT 5111 Management for Engineers
ENG MGT6211 Advanced Financial Management
ENG MGT 5412 Operations Management Science
Receive Engineering Management Graduate Certificate

SYS ENG 6196 Systems Engineering Capstone
SYS ENG 6542 Model Based Systems Engineering
Receive Master of Science in Systems Engineering

Project Management Emphasis

SYS ENG 5101 Systems Engineering and Analysis
SYS ENG 6102 Information Based Design
SYS ENG 6103 Systems Life Cycle Costing
SYS ENG 6104 Systems Architecting
Receive Systems Engineering Graduate Certificate

ENG MGT 5320 Project Management
ENG MGT 6322 Case Studies in Project Management
ENG MGT 6323 Global Project Management
ENG MGT Elective: Contact your advisor(s) for alternative course
Receive Project Management Graduate Certificate

SYS ENG 6196 Systems Engineering Capstone
SYS ENG 6542 Model Based Systems Engineering
Receive Master of Science in Systems Engineering

Continued on the next page...

Emphasis Areas Continued...

Financial Engineering Emphasis

SYS ENG 5101 Systems Engineering and Analysis
SYS ENG 6102 Information Based Design
SYS ENG 6103 Systems Life Cycle Costing
SYS ENG 6104 Systems Architecting
Receive Systems Engineering Graduate Certificate

ENG MGT 5212 Intelligent Investing
SYS ENG 5212 Introduction to Neural
ENG MGT 6213 Financial Engineering
ENG MGT 6211 Advanced Financial Engineering
Receive Financial Engineering Graduate Certificate

SYS ENG 6542 Model Based Systems Engineering
SYS ENG 6196 Systems Engineering Capstone
Receive Master of Science in Systems Engineering

Computational Intelligence Engineering Emphasis

SYS ENG 5101 Systems Engineering and Analysis
SYS ENG 6102 Information Based Design
SYS ENG 6103 Systems Life Cycle Costing
SYS ENG 6104 Systems Architecting
Receive Systems Engineering Graduate Certificate

SYS ENG 5211 Computational Intelligence
SYS ENG 5212 Introduction to Neural Networks
and Applications
SYS ENG 6213 Deep Learning and Advanced Neural Networks
SYS ENG Elective: Contact your advisor(s) for
alternative course
**Receive Computational Intelligence Engineering
Graduate Certificate**

Sys Eng 6542 Model Based Systems Engineering
Sys Eng 6196 Systems Engineering Capstone
Receive Master of Science in Systems Engineering

Model Based Systems Engineering Emphasis

SYS ENG 5101 Systems Engineering and Analysis
SYS ENG 6102 Information Based Design
SYS ENG 6103 Systems Life Cycle Costing
SYS ENG 6104 Systems Architecting
Receive Systems Engineering Graduate Certificate

Sys Eng 6239 Smart Engineering System Design
SYS ENG 6110 Risk Modeling and Optimization
under Uncertainty
SYS ENG 6412 Mathematical Programming
SYS ENG Elective: Contact your advisor(s) for
alternative course
**Receive Model Based Systems Engineering
Graduate Certificate**

SYS ENG 6196 Systems Engineering Capstone
SYS ENG 6542 Model Based Systems Engineering
Receive Master of Science in Systems Engineering

SYSTEMS ENGINEERING Ph.D. Program

Admission to Program

Applicants need a B.S. in engineering, physical science or math; M.S. in Systems Engineering or related field with a minimum GPA of 3.5; a minimum of three years of postgraduate work; $V \geq 155$, $Q \geq 148$, $A \geq 4.0$. A Statement of Purpose and Three Letters of Recommendation are required for all students. A Qualifying Exam is required by the 5th semester of coursework. All requirements should be completed within an eight year period. A comprehensive exam is required near the completion of classes.

A candidate for the Ph.D. in Systems Engineering must complete the equivalent of at least three years of full-time work beyond the bachelor's degree. The content of all Ph.D. programs are individually structured by the student in consultation with and approved by the student's advisory committee. All requirements for the degree must normally be completed within an eight year period. At appropriate points in their program, Ph.D. students must pass both a qualifying examination and a comprehensive examination. Off-campus students are expected to complete all requirements listed in the Missouri University of Science and Technology Graduate Catalog (catalog.mst.edu) under the section entitled Doctor of Philosophy Degrees and follow all procedures listed under the Procedures for Ph.D. Candidates.

The total credit requirements for graduation are in general 54 credits after the successful completion of M.S. degree in Systems Engineering or 84 credits after a B.S. degree. Actual courses taken will be determined by the candidate's committee and his or her program of study. The student will be expected to complete all requirements listed in the Missouri S&T Graduate Catalog.

Residency Requirements

All students are expected to follow the Missouri S&T Graduate Student Residency requirements. Off-campus students can meet the department residency requirement with the following requirements: the Qualifying Exam must be taken on campus by the 5th semester of coursework; the student will have at minimum two video conferences per month with his/her research advisor; the student is expected to meet with the Ph.D. committee on a regular basis with at least two meetings per semester; the Ph.D. Comprehensive Exam must be taken on campus; the student has the option of conducting research that is beneficial to the student's professional work; the Defense of Dissertation must take place on campus.

Dissertation Requirements

Students will conduct original research demonstrated by journal or referred proceedings, publications under the supervision of a doctoral advisor, and communicate their findings, write a dissertation on research conducted, and provide satisfactory defense of their dissertation in a final oral examination. Students are required to publish their work in approved journals and referred proceeding. A minimum of three articles is expected.

Qualifying Exam

The objective of the Systems Engineering Ph.D. qualifying exam is to test the knowledge and understanding of the graduate student on systems engineering fundamentals and assess the student's level of knowledge in engineering statistics and optimization. For more information on qualifying exam, contact the department graduate staff. It is expected that the graduate student will have a clear understanding of the research issues in the student's area of interest, its implications in industrial applications (primarily in the industrial domain the student is working), possible impact of successful research contributions to systems engineering literature, and be able to identify up to five journals in this area. The oral exam is restricted to the areas of research specialization selected by the student and the three journal papers that student selected out of six provided a week in advance to students taking the exam and will continue until there is a consensus not to ask further questions by the faculty.

Comprehensive Exam

The student's advisory committee will administer the comprehensive examination after the student has completed the coursework for the Ph.D. program and one published refereed conference proceedings or journal paper. The examination is written and oral. Upon successful completion of the written examination, the student will be orally examined by the advisory committee.

Dissertation

The dissertation, embodying the results of an original investigation, must be written upon a subject approved by the student's advisor.

Ph.D. Course Requirements

Core Curriculum* - 24 Credit Hours

SYS ENG 5101 Systems Engineering and Analysis
SYS ENG 6101 Advance Research Methodologies*
SYS ENG 6104 Systems Architecting*
SYS ENG 6110 Optimization Under Uncertainty*
SYS ENG 6239 Smart Engineering System Design
SYS ENG 6412 Mathematical Programming*
SYS ENG 6321 Modeling Complex Systems
SYS ENG 6542 Modeling Based System Engineering

Systems Engineering Electives (6 credit hours)

Specialization Electives (24 credit hours)

Research (30 credit hours)

TOTAL (84 CREDIT HOURS)

Areas of Research Specialization:

Cyber Physical Systems
Modeling and Simulation
Model Based Systems Engineering
System of Systems Architecting
Complex Adaptive Systems
Human System Integration
Infrastructure Systems

*Denotes the core courses students need to take and have a GPA of 3.5 before taking the oral Ph.D. qualifying exam.

Ph.D. Dissertation Titles

An Approach to System of Systems Resiliency Using Architecture and Agent Based Behavioral Modeling, *Paulette Bootz Acheson, December 2020*

Development of a System Architecture for the Prediction of Student Success Using Machine Learning Techniques, *Tatiana Cardona, July 2020*

Predicting Complex System Behavior Using Hybrid Modeling and Computational Intelligence, *Vinayaka Nagendra Harikishan Gude Divya Samapth, June 2020*

Microgrid Design, Control and Performance Evaluation for Sustainable Energy Management in Manufacturing, *Md. Monirul Islam, March 2020*

Computational Model for Neural Architecture Search, *Ram Deepak Gottapu, December 2019*

Application of Computational Intelligence to Explore and Analyze System Architecture and Design Alternatives, *Gene Lesinki, December 2019*

Biofuel Supply Chain Restructuring — An Economic Viability and Environmental Sustainability Investigation for Enhancing Second Generation Biofuel Adoption, *Rajkamal Kesharwani, August 2019*

Algorithm for a Tabu -- Ant Colony Optimizer, *David D. Haynes, May 2019*

Cognition-Based Approaches for High-Precision Text Mining, *George J. Shannon, July 2017*

Multi-Objective Combinatorial Optimization Problems in Transportation and Defense Systems, *Hadi Farhangi, May 2017*

Domain Independent Method to Assess System of Systems Meta-Architecture Using Domain Specific Fuzzy Information, *Louis Edward Pape II, December 2015, INCOSE 2013 Doctoral Award Winner*

Multi-Level Evolutionary Algorithms for Resource Allocation Utilizing Model-Based Systems Engineering, *Banuchander Reddy Poreddy, December 2015*

Computational Intelligence Based Complex Adaptive System-of-System Architecture Evolution Strategy, *Siddhartha Agarwal, May 2015, INCOSE 2014 Doctoral Award Winner*

Detection and Recognition of RIF Devices Based on Their Unintended Electromagnetic Emission Using Stochastic and Computational Intelligence Methods, *Shikhar Prasad Acharya, December 2014*

A Contingency Base Camp Framework Using Model Based Systems Engineering and Adaptive Agents, *Dustin Nottage, July 2014*

Sustainability Analysis In Integrated Inventory Control And Transportation Systems, *Brian Schaefer, May 2014*

Searched Based System Architecture Development Using A Holistic Modeling Approach, *Renzhong Wang, August 2012, INCOSE 2008 Doctoral Award Winner*

Architecture Value Mapping: Using a Linguistic Information Representation Scheme and Fuzzy Cognitive Maps as a Reasoning Mechanism for Multi-Criteria Conceptual Design Evaluation, *Atmika Singh, December 2011*

Assessing System Architectures: The Canonical Decomposition Fuzzy Comparative Methodology, *Jason Dauby, November 2009, INCOSE 2010 Doctoral Award Winner*

Modeling Network Traffic on a Global Network-Centric System with Artificial Neural Networks, *Douglas Keith Swift, December 2007*

Architecting System of Systems: Artificial Life Analysis of Financial Market Behavior, *Nil Hande Kilicay-Ergin, June 2007*

SYSTEMS ENGINEERING

Participating Faculty

Engineering Management and Systems Engineering Faculty

Allada, Venkat, Ph.D., Professor

Engineering Management and Systems Engineering
Product Platform Design, Mass Customization, Product Innovation, Lean Manufacturing, Intelligent Manufacturing Systems, Process Planning Supply Chain Management, Systems Engineering Process and Design

Canfield, Casey, Ph.D., Assistant Professor

Engineering Management and Systems Engineering
Human Systems Integration, Human Factors, Automation, Energy Systems, Smart Cities, Organizational Behavior, Decision Science, Risk Analysis, Risk Communication, Data Visualization, Policy Analysis, Behavioral Interventions, Program Evaluation, Implementation Science, Stakeholder Engagement

Corns, Steven, Ph.D., Associate Professor

Engineering Management and Systems Engineering
Associate Chair of Graduate Studies
Computational Intelligence, Complex Systems, Bioinformatics

Dagli, Cihan, Ph.D., Professor

Engineering Management and Systems Engineering, Founder and Director of Systems Engineering Graduate Program, INCOSE Fellow, IISE Fellow, Associate Editor, Intelligent Systems, International Journal of General Systems
Systems Engineering and Architecting, Cyber Physical Systems, Deep Learning, Machine Learning and Computational Intelligence

Enke, David, Ph.D., Professor

Engineering Management and Systems Engineering
Financial Engineering, Investments, Stocks, Derivatives, Portfolio Management, Financial Risk Management, Enterprise Risk Management, Financial Forecasting, Volatility Forecasting, Trading, Hedge Fund Replication, Computational Intelligence, and Artificial Intelligence.

Gosavi, Abhijit, Ph.D., Associate Professor

Engineering Management and Systems Engineering
Simulation-Based Optimization, Markov Decision Processes, Airline Revenue Management, Total Productive Maintenance

Hodges, Sheryl, Ph.D., Assistant Teaching Professor

Engineering Management and Systems Engineering
Financial Engineering, Decision Making Under Uncertainty, Manufacturing and Service Operations

Kwasa, Benjamin, Ph.D., Assistant Professor

Engineering Management and Systems Engineering
Organization Design in the Design of Complex Systems, Unmanned Aerial Systems Integration, Value-Driven Design, Multidisciplinary Design Optimization, Heuristic Optimization, Systems Design, Systems Engineering, Preference Formulation and Communication, Risk Simulation in Design and Modeling, Engineering Education, Meta-Modeling, Decision Analysis

Liu, Jinling, Ph.D., Assistant Professor

Engineering Management and Systems Engineering
Artificial Intelligence, Biomedical Informatics, Precision Medicine, Big Data Analytics, System Biology, Immunology, Causal Inference, Multi-Omics Data

Long, Suzanna, Ph.D., Professor

Chair of Engineering Management and Systems Engineering
Critical Infrastructure Systems, Strategic Management, Sustainable Infrastructures, Management of Supply Chain and Transportation, Systems Management, Organizational Behavior, Sociotechnical Systems Analysis.

Marley, Robert, Ph.D., Professor

Engineering Management and Systems Engineering
Human Systems Integration, Ergonomics

Raper, Stephen, Ph.D., Associate Professor

Engineering Management and Systems Engineering, Associate
Chair of Undergraduate Studies in Engineering Management
Packaging Engineering, Engineering Management, Undergraduate Education

Schuman, Joan, Ph.D., Associate Teaching Professor

Engineering Management and Systems Engineering
Project Management and Engineering Education

Spurlock, David, Ph.D., Associate Teaching Professor

Engineering Management and Systems Engineering
Managerial Decision Making, Change Management, General Management

Affiliated Faculty

Chandrashekhara, K, Ph.D., Curators' Professor

Mechanical and Aerospace Engineering

Agarwal, Siddhartha, Ph.D., Adjunct

*Engineering Management and Systems Engineering,
Indian Institute of Technology - Indian School of Mines*

Sarangapani, Jagannathan, Ph.D., Professor

Electrical and Computer Engineering

Wunsch II, Donald, Ph.D., Mary Finley

*Missouri Distinguished Professor
Electrical and Computer Engineering*

Do, Quoc, Ph.D.

*President, System Engineering Societies of Australia,
Frazer-Nash Consultancy Ltd, Adelaide, Australia*

Hoffman, Gerald, Ph.D., Adjunct

*Engineering Management and Systems Engineering,
Hallmark Cards*

Pape, Louis Edward, PhD. Adjunct

*Engineering Management and Systems Engineering
The Boeing Company, Associate Technical Fellow*

Yildirim, Gonca, Ph.D., Adjunct

*Engineering Management and Systems Engineering,
Çankaya University, Ankara, Turkey*

Department Contact Information

Dr. Cihan Dagli

*Founder and Director of Systems Engineering
Graduate Program/Student Advisor*
Phone: 573-647-9125
Email: dagli@mst.edu

Theresa Busch & Jeanette Waters (Certificates & Masters)

Karen G. Swope (Doctorate)

*Engineering Management and Systems Engineering
Graduate Student Services*
Phone: 573-341-4572
Email: syseng@mst.edu | Web: emse.mst.edu

Systems Engineering Department Mailing Address

223 Engineering Management
600 West 14th St.
Rolla, MO 65409-0370

Admissions and Enrollment

Global Learning

Student Support Services
Phone: 573-341-6591
Fax: 573-341-4992
Email global@mst.edu
Web: distance.mst.edu
G8 Norwood Hall, 320 W. 12th St.
Rolla MO 65409-1560

Technology Support

I.T. Media Services

Phone: 573-341-4526
Email: itms@mst.edu
Web: it.mst.edu/services/media-services/

AT A GLANCE



Campus

For 150 years, Missouri S&T was founded in 1870 as the Missouri School of Mines (MSM). In 1964, it became the University of Missouri-Rolla (UMR), and in 2008, the university was renamed Missouri University of Science and Technology to better reflect its mission and vision.

Missouri S&T was the first U.S. university to attain ISO (International Organization for Standardization) 14001 certification in environmental management

Home to one of the nation's most comprehensive geothermal energy systems. Online since 2015, the system has reduced energy usage by over 50 percent campus wide

The University of Missouri System's only highly selective university.

Location

Missouri S&T is located in Rolla, Missouri. The city, with a population of around 20,000, is located off Interstate 44, halfway between Springfield and St. Louis, Mo.

For Rolla area information, go online to visitrolla.com

Enrollment

Over 7,600 total students from 50 states and 50 foreign countries

Academic Calendar

Two primary semesters and one summer semester
Fall (Aug-Dec); Spring (Jan-May); and Summer (June-July)

Faculty

Approximately 500 full-time faculty — 99% of full-time tenured and tenure-track faculty have doctorates, or the highest degree in their field

Research

More than 25 research centers, labs and institutes foster interdisciplinary research

Focused research in advanced manufacturing, advanced materials for sustainable infrastructure, energy and the environment, materials for extreme environments, and smart living

S&T named state's only National Center of Academic Excellence in Information Assurance and Cyber Defense Research

Nearly half of S&T graduates complete a research project

S&T Rankings

Number 1 public university in Missouri (*College Factual*, 2020 and *Washington Monthly*, 2020)

Number 2 engineering program for non-traditional students and veterans (*College Factual*, 2019)

Number 8 university in the nation for annual return on investment (*Business Insider* 2020)

Ranked 23rd overall and 17th among public universities for Best Online Graduate Engineering Programs (*U.S. News and World Report*, 2020)