

Missouri University of Science and Technology

Graduate Catalog

2010-2012

Missouri S&T publishes two catalogs - undergraduate and graduate. Both are official publications of Missouri S&T and may be requested from the Office of Admission or Office of the Registrar.

All statements in the publication are announcements of present policies only and are subject to change at any time without prior notice. They are not to be regarded as offers to contract.

Missouri S&T is an equal opportunity/affirmative action institution.

Statement of Affirmative Action

It is the policy of the Missouri University of Science and Technology to provide full and equal employment opportunities to all qualified persons without regard to race, color, religion, sex, sexual orientation, national origin, age, disability, and status as Vietnam Era Veteran, to prohibit discrimination in recruitment, employment or conditions of employment, including salary and benefits related thereto, to promote employment opportunity and to take affirmative action in this regard.

Affirmative Action means the elimination of existing discriminatory conditions whether purposeful or inadvertent. This nondiscrimination policy applies to all persons.

Title VI of the Civil Rights Act of 1964

"No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."

Title IX of the Education Amendments of 1972

"No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance."

Section 504 of the Rehabilitation Act of 1973

"No otherwise qualified handicapped individual in the United States...shall, solely by reason of the handicap, be excluded from the participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving Federal financial assistance."

Section 303 of the Age Discrimination Act of 1975

"No person in the United States shall, on the basis of age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."

The Americans with Disabilities Act of 1990

Section 102 Discrimination

General Rule. – No covered entity shall discriminate against a qualified individual with a disability because of the disability of such individual in regard to job application procedures, the hiring, advancement, or discharge of employees, employee compensation, job training, and other terms, conditions, and privileges of employment.

Missouri S&T conducts its programs and activities involving admission and treatment of students, employment, teaching, research, and public service in a non-discriminatory manner as prescribed by Federal law and regulation.

Inquiries concerning the above may be addressed to:

Chancellor, Missouri University of
Science and Technology
Rolla, Missouri 65409-9957

Director, Office for Civil Rights
Department of Education
Washington, D.C. 20201

INFORMATION ON THE WORLD WIDE WEB

For the most current information regarding course descriptions go to:<http://registrar.mst.edu/>
Students are also advised to consult the websites of individual department offices.

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Educational Goals of Missouri S&T

As Missouri's technological research university, Missouri University of Science and Technology's mission is to educate tomorrow's leaders. In a world growing increasingly dependent on science and technology, tomorrow's graduates must be prepared to be leaders in more than just their chosen professions. They must also be leaders in business, in government, in education, and in all aspects of society. Missouri S&T is dedicated to providing leadership opportunities for its students. The opportunity to receive an excellent technological education is only part of the educational experience received by students at Missouri S&T. Missouri S&T offers a full range of engineering and science degrees, coupled with business and liberal arts degrees and programs that are vital to the kind of comprehensive education that turns bright young men and women into leaders.

Missouri S&T is nationally recognized for its excellent undergraduate engineering programs, and is distinguished for producing cutting-edge research and key technologies vital to the economic success of Missouri and the nation. Missouri S&T has a distinguished faculty dedicated wholeheartedly to the teaching, research, and creative activities necessary for scholarly learning experiences and advancements to the frontiers of knowledge. Missouri S&T has excellent physical facilities, which support the best possible education in the liberal arts, engineering, science, applied science, and selected interrelated fields.

Missouri S&T's programs in science, engineering, and business, its technology transfer programs, its leadership opportunities, and its learning environment are all integral parts of the total educational package available to students who attend the Missouri University of Science and Technology.

Mission Statement

Missouri University of Science and Technology integrates education and research to create and convey knowledge to solve problems for our state and the technological world.

(Approved January 2008 Board of Curators meeting.)

Vision

The vision of the Missouri University of Science and Technology is to be a top-five technological research university by 2011.

On Jan. 1, 2008, UMR became Missouri University of Science and Technology, or Missouri S&T. Our new name will not only help us gain broader national recognition, but will also give us an identity that fits our mission - to be the state's technological research university.

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Stephen Malott, Vice Chancellor, Administrative Services
Debra Robinson, Vice Chancellor, Student Affairs
Venkata Allada, Vice Provost, Graduate Studies
Harvest L. Collier, Vice Provost, Undergraduate Studies
K. Krishnamurthy, Vice Provost, Research
Robert Schwartz, Vice Provost, Academic Affairs
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Steve Wunning, Caterpillar, Inc., Peoria, IL

Missouri S&T Named Professorships

Mariesa Crow, *Fred W. Finley Distinguished Professorship of Electrical and Computer Engineering*

Nuran Ercal, *Richard K. Vitek/FCR Endowed Chair in Biochemistry*

Samuel Frimpong, *Robert H. Quenon Missouri Professorship in Mining Engineering*

Shubhender Kapila, *MO Soybean Res. Professorship*

Ming Leu, *Keith & Pat Bailey Missouri Professorship in Mechanical Engineering & Aerospace Engineering*

Ann Miller, *Cynthia Tang Missouri Professorship in Computer Engineering*

Rumar Nygaard, *Lester Birbeck Endowed Chair*

Von L. Richards, *Robert V. Wolf Assoc. Professor of Metals Casting in Metallurgical Engineering*

David J. Rogers, *Karl F. Hasselman Missouri Chair in Geological and Petroleum Engineering*

Jagannathan Sarangapani, *Rutledge-Emerson Professor in Electrical Engineering*

Jay Switzer, *Castleman/FCR Missouri Professorship of Discovery in Chemistry*

Thomas Weigert, *Daniel St. Clair Endowed Chair in Computer Science*

Donald Wunsch, *Mary Finley Missouri Professorship in Computer Engineering*

Reza Zoughi, *Schlumberger Distinguished Professor of Electrical & Computer Engineering*

Curators' Professors

Harlan U. Anderson of Ceramic Engineering (Emeritus)

Bassem F. Armaly of Mechanical Engineering

Richard K. Brow of Ceramic Engineering

K. Chandrashekhara of Mechanical & Aerospace Engineering

Franklin Yih Cheng of Civil Engineering (Emeritus)

Alfred L. Crosbie of Mechanical Engineering

Delbert E. Day of Ceramic Engineering (Emeritus)

Lokesh Dharani of Mechanical Engineering

James Drewniak of Electrical Engineering

Walter Eversman of Mechanical & Aerospace Engineering

Nicholas Leventis of Chemistry (Emeritus)

Don H. Madison of Physics

Rajiv S. Mishra of Materials Science and Engineering

Michael Schulz of Physics

James O. Stoffer of Chemistry (Emeritus)

David A. Summers of Mining Engineering

Wei-Wen Yu of Civil Engineering (Emeritus)

Curators' Teaching Professorship

Abdeldjelil Belarbi of Civil Engineering

James J. Bogan of Arts, Languages and Philosophy

James S. Drallmeier of Mechanical Engineering

Larry Gragg of History & Political Science

Frances Dee Haemmerlie Montgomery of Psychology

Leonard F. Koederitz of Geological & Petroleum Engineering (Emeritus)

Roger A. LaBoube of Civil Engineering

Yinfa Ma of Chemistry

Kent D. Peaslee Materials Science & Engineering

O. Allan Pringle of Physics

David C. Van Aken of Materials Science and Engineering

About the Campus

One of the four campuses in the University of Missouri System, Missouri University of Science and Technology was founded in 1870 as the University of Missouri School of Mines and Metallurgy and was one of the first technological institutions west of the Mississippi River. It became the University of Missouri-Rolla in 1964, Missouri University of Science and Technology in 2008, and remains one of the nation's best technological universities.

The 284-acre campus is located in Rolla, Mo., a town of 16,000 in the heart of the Ozarks. The university offers bachelor of arts and bachelor of science degrees in 30 fields of study, including engineering, science, humanities, business and social sciences. Master of science degrees are offered in 27 disciplines, the doctor of philosophy in 20 and the doctor of engineering in eight.

The Missouri S&T campus is home to 50 research and academic support centers. Externally sponsored program expenditures have increased about 120% since FY2001, from \$17.23 million to \$38.08 million in FY2009. In FY2009, Missouri S&T received a record \$42.57 million in new grant and contract awards. Missouri S&T will enhance its research activity and performance to be recognized as a top-five technological research university, distinguishing itself by interdisciplinary collaborations of national significance.

Missouri S&T enrolls more than 6,800 students from 47 states and 51 countries. More than 70 percent of students study in engineering, science or computer fields, but Missouri S&T also offers liberal arts, humanities, social science, and business degrees, as well as certification in select education fields. In 2007, Missouri S&T officially started offering an MBA. Many of the nation's top companies actively recruit graduates from all disciplines. In 2008-2009, more than 600 different employers recruited Missouri S&T students. The average starting salary for those earning undergraduate degrees exceeds \$57,000.

8 - Campus Life/History/Information

Campus Life

Missouri S&T offers a number of campus living options, including fraternity and sorority houses, traditional residence halls and the new Residential College. The university has more than 200 student organizations, including a dozen student design teams, a competitive NCAA Division II athletic program, student professional societies, a student radio station, and theatre and music programs. Each year, Missouri S&T students help to organize one of the largest St. Pat's celebrations in the nation.

University of Missouri Structure and History

The four University of Missouri campuses are located in Rolla, Columbia, Kansas City and St. Louis. Governing these campuses is the Board of Curators whose members are appointed by the Governor of Missouri and confirmed by the Missouri Senate. The president of the university directs and coordinates programs of all four campuses with assistance from staff in finance, business management, academic affairs, research, extension, development, public information, and other university services. The activities of each campus are under the supervision of a chancellor, who directs campus affairs within policies established by the UM Board of Curators and the president.

The University of Missouri has a long and proud history. It was established at Columbia in 1839, only 18 years after Missouri became a state. A land-grant university, UM is recognized as the first state university west of the Mississippi River. The university remained a single campus institution until 1870 when the University of Missouri School of Mines and Metallurgy (now Missouri S&T) was established at Rolla. Campuses at St. Louis and Kansas City were added in 1963.

On July 1, 1964, the UM Board of Curators took action to rename the University of Missouri School of Mines and Metallurgy to the University of Missouri-Rolla. The campus became Missouri University of Science and Technology on Jan. 1, 2008.

Accreditation

The University has been accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools, <http://www.ncahigherlearningcommission.org>, 30 North LaSalle Street, Suite 2400, Chicago, Illinois, 606025-2504. (312)263-0456 Further information on specialized accreditation by department is available in the Missouri S&T Fact Book or at: <http://ira.mst.edu/accreditation.html>.

For More Information

If you have additional questions, contact the Director of Admissions, Missouri University of Science and Technology, Rolla, MO 65409-1060, or call (800) 522-0938 or visit <http://admissions.mst.edu>. You also may wish to contact one of the following offices for specific information:

- Career Opportunities Center (573) 341-4343
- Counseling & Disability Support Services (573) 341-4211
- Disability Support Services (573) 341-4222
- Distance & Continuing Education (573) 341-6576
- Extended Learning (573) 341-4132
- Intercollegiate Athletics (573)341-4175
- International Affairs (573)341-4208
- Registrar (573) 341-4181
- Residential Life & Student Support (573) 341-4218
- Student Diversity Programs (573) 341-4212
- Student Financial Aid (573) 341-4282
- University Police (573)341-4300
- Vice Chancellor Student Affairs (573)341-4292
- Women in Engineering & Science Programs (573) 341-4212

Calendar

Fall Semester 2010

| | |
|---|-------------|
| International Student Orientation | August 10 |
| Residence Halls Open for first-time Freshman only 9:00 a.m. | August 14 |
| Freshman Opening Week Orientation Begins | August 16 |
| Transfer Student Orientation | August 19 |
| Registration Period via Joe'SS ends | August 22 |
| Classes Begin 8:00 a.m | August 23 |
| Labor Day Holiday | September 6 |
| Mid-Semester | October 16 |
| Thanksgiving Vacation Begins 8:00 a.m | November 21 |
| Thanksgiving Vacation Ends 8:00 a.m | November 29 |
| Last Class Day | December 10 |
| Final Exams Begin 8:00 a.m | December 13 |
| Final Exams End 6:00 p.m | December 17 |
| Semester Closes 6:00 p.m | December 17 |
| Residence Halls Close 6:00 p.m. | December 18 |
| December Commencement 11:00 a.m | December 18 |

Spring Semester 2011

| | |
|--|------------|
| International Student Orientation | January 3 |
| Registration Period via Joe'SS Ends | January 9 |
| Residence Halls Open for all residents 1:00 p.m. | January 9 |
| Classes Begin 8:00 a.m | January 10 |
| Martin Luther King, Jr. Recognition Holiday | January 17 |
| Mid-Semester | March 5 |
| Spring Recess Begins 8:00 a.m | March 10 |
| Spring Recess Ends 8:00 a.m | March 14 |
| Spring Break Begins 8:00 a.m | March 27 |
| Spring Break Ends 8:00 a.m | April 4 |
| Last Class Day | April 29 |
| Final Exams Begins 8:00 a.m | May 2 |
| Final Exams End 6:00 p.m | May 6 |
| Semester Closes 6:00 p.m | May 6 |
| Residence Halls Close 6:00 p.m. | May 7 |
| May Commencement - Graduate Ceremony 6:00 p.m. | May 6 |
| May Commencement - Undergraduate Ceremony 11:00 a.m. | May 7 |

Summer Session 2011

| | |
|--|---------|
| Registration Period via Joe'SS ends | June 5 |
| Residence Halls Open for all residents | June 5 |
| Classes Begin 8:00 a.m | June 6 |
| Independence Day Holiday | July 4 |
| Final Exams Begin 8:00 a.m. | July 28 |
| Final Exams End 12:30 p.m. | July 29 |
| Residence Halls Close 6:00 p.m. | July 29 |
| Semester Closes 12:30 p.m. | July 29 |

Calendar

Fall Semester 2011

| | |
|---|-------------|
| International Student Orientation | August 9 |
| Residence Halls Open for first-time Freshman only 9:00 a.m. | August 12 |
| Freshman Opening Week Orientation Begins | August 14 |
| Transfer Student Orientation | August 18 |
| Registration Period via Joe'SS ends | August 21 |
| Classes Begin 8:00 a.m | August 22 |
| Labor Day Holiday | September 5 |
| Mid-Semester | October 15 |
| Thanksgiving Vacation Begins 8:00 a.m | November 20 |
| Thanksgiving Vacation Ends 8:00 a.m | November 28 |
| Last Class Day | December 9 |
| Final Exams Begin 8:00 a.m | December 12 |
| Final Exams End 6:00 p.m | December 16 |
| Semester Closes 6:00 p.m | December 16 |
| Residence Halls Close 6:00 p.m. | December 17 |
| December Commencement 11:00 a.m | December 17 |

Spring Semester 2012

| | |
|--|------------|
| International Student Orientation | January 3 |
| Registration Period via Joe'SS Ends | January 8 |
| Residence Halls Open for all residents 1:00 p.m. | January 8 |
| Classes Begin 8:00 a.m | January 9 |
| Martin Luther King, Jr. Recognition Holiday | January 16 |
| Mid-Semester | March 3 |
| Spring Recess Begins 8:00 a.m | March 15 |
| Spring Recess Ends 8:00 a.m | March 19 |
| Spring Break Begins 8:00 a.m | March 25 |
| Spring Break Ends 8:00 a.m | April 2 |
| Last Class Day | April 27 |
| Final Exams Begins 8:00 a.m | April 30 |
| Final Exams End 6:00 p.m | May 4 |
| Semester Closes 6:00 p.m | May 4 |
| Residence Halls Close 6:00 p.m. | May 5 |
| May Commencement - Graduate Ceremony 6:00 p.m. | May 4 |
| May Commencement - Undergraduate Ceremony 11:00 a.m. | May 5 |

Summer Session 2012

| | |
|--|---------|
| Registration Period via Joe'SS ends | June 3 |
| Residence Halls Open for all residents | June 3 |
| Classes Begin 8:00 a.m | June 4 |
| Independence Day Holiday | July 4 |
| Final Exams Begin 8:00 a.m. | July 26 |
| Final Exams End 12:30 p.m. | July 27 |
| Residence Halls Close 6:00 p.m. | July 27 |
| Semester Closes 12:30 p.m. | July 27 |

Graduate Degree Programs

The Missouri University of Science and Technology offers master of engineering, master of science, master of arts (available as a cooperative degree program with UMSL), master of science for teachers, master of business administration, doctor of philosophy, and doctor of engineering degrees. Studies fall into the general areas of business, economics, engineering, English, science and technology.

Master of engineering degree

- geotechnics
- manufacturing engineering
- mining engineering

Master of science degree

- aerospace engineering
- biology, applied and environmental
- ceramic engineering
- chemical engineering
- chemistry
- civil engineering
- computer engineering
- computer science
- electrical engineering
- engineering management
- environmental engineering
- explosives engineering
- geological engineering
- geology and geophysics
- information science & technology
- manufacturing engineering
- materials science and engineering
- mathematics (applied)
- mechanical engineering
- metallurgical engineering
- mining engineering
- nuclear engineering
- petroleum engineering
- physics
- systems engineering
- technical communication

Master of science for teachers degree

- chemistry
- earth sciences
- mathematics
- physics

Master of arts degree

Available as a cooperative degree program with the corresponding departments of the University of Missouri-St. Louis. (A maximum of 12 graduate semester hours may be taken at Missouri S&T)

- economics
- English

Master of business administration

- business administration

Doctor of philosophy degree

- aerospace engineering
- ceramic engineering
- chemical engineering
- chemistry
- civil engineering
- computer engineering
- computer science
- electrical engineering
- engineering management
- geological engineering
- geology and geophysics
- materials science and engineering
- mathematics
- mechanical engineering
- metallurgical engineering
- mining engineering
- nuclear engineering
- petroleum engineering
- physics
- systems engineering

Doctor of engineering degree

- chemical engineering
- civil engineering
- electrical engineering
- geological engineering
- mechanical engineering
- mining engineering
- nuclear engineering
- petroleum engineering

Graduate minors

- Explosives Engineering
- Technical Communication

Graduate Certificates

Graduate Certificates

- Actuarial Science
- Business Essentials
- CAD/CAM and Rapid Product Realization
- Composite Materials and Structures
- Computational Intelligence
- Contemporary Structural Engineering
- Control Systems
- Business Intelligence
- Electric Machine and Drives
- Electrical Power Systems Engineering
- Engineering Management
- Engineering Mechanics
- Enterprise Resource Planning
- Explosives Engineering
- Financial Engineering
- Financial Mathematics
- Geoenvironmental Engineering
- Geotechnical Earthquake Engineering
- Geotechnics
- Human Computer Interaction
- Human Systems Integration
- Information Assurance and Security
- Infrastructure Renewal
- Leadership in Engineering Organizations
- Lean Six Sigma
- Manufacturing Automation
- Manufacturing Systems
- Military Construction Management
- Military Geological Engineering
- Mining Engineering
- Multimedia and Information Systems
- Network Centric Systems
- Project Engineering & Construction Mgt
- Project Management
- Psychology of Leadership
- Psychometrics
- Quality Engineering
- Software Design and Development
- Systems Engineering
- Wireless Networks and Mobile Systems

Discipline

Mathematics
 Business Administration
 Manufacturing Engineering
 Aerospace Engineering/Mechanical Engineering
 Systems Engineering/Computer Engineering/Computer Science
 Civil Engineering
 Mechanical Engineering
 Information Science & Technology
 Electrical Engineering
 Electrical Engineering
 Engineering Management
 Engineering Mechanics
 Information Science & Technology
 Mining Engineering
 Engineering Management/Systems Engineering
 Mathematics
 Civil Engineering
 Civil Engineering
 Geological Engineering
 Information Science & Technology
 Engineering Management/Information Science & Technology
 Computer Engineering/Computer Science
 Civil Engineering
 Engineering Management/Psychology
 Engineering Management
 Mechanical Engineering
 Manufacturing Engineering
 Civil Engineering/Engineering Management
 Geological Engineering
 Mining Engineering
 Computer Science
 Computer Engineering/Systems Engineering
 Civil Engineering/Engineering Management
 Engineering Management/Information Science & Technology
 Information Science and Technology/Psychology
 Mathematics/Psychology
 Engineering Management
 Computer Science
 Systems Engineering
 Computer Science

The Provost is responsible for the administration of all graduate work at Missouri S&T. In cases where your program can be demonstrably improved, the Provost can approve departures from the graduate faculty rules. Each department may have its own rules beyond the general ones listed and should be contacted if further information is desired at: <http://grad.mst.edu/>.