Mining Engineering

Strategic Plan

FY 2010 – FY 2020

Introduction
The “Mining Industry of the Future” will continue to face tough challenges, whose solutions will require highly qualified graduates and advanced research initiatives. The expanding global mineral markets will continue to increase the demand for highly qualified graduates. Missouri S&T must position itself at the frontier of Mining Engineering education and research to provide relevant solutions to industry needs. The “State of Excellence” that should guide our collective effort must focus on excellence in education and research, availability of resources and facilities, and strong networks of alumni and industry, and our global partners. This strategic plan reflects considerable reach, and aspires for program pre-eminence in the U.S. and the global community among Mining Engineering degree programs.

Mission
The Mining Engineering Program at Missouri S&T provides superb education and training to undergraduate and graduate students for the mining and construction industries of Missouri, USA and those global mining companies with strategic interests in the USA. The programs provide students with total quality education and research capabilities to make a difference in our State and the technological world.

Vision
Missouri S&T will be recognized as the global university of choice for mining engineering education, research and graduate employees for the mining industry.

Core Values
Our vision of global leadership will be achieved through the following seven core values that form the basis of Missouri S&T’s tradition of excellence in Mining Engineering education and research.

Excellence: The efforts of faculty, staff, alumni, industry partners and related organizations create an environment that promotes excellence in education and research.

Ethics: We value truth, honesty, integrity and hard work as abiding principles for professional excellence.
Experience: Through its experimental mine facilities, internships, cooperative education and field trips, students receive hands-on experience, which is vital to the practice of the profession.

Exposure: S&T reaches out to global frontiers through its Board of industry executives, alumni, research and professional societies, and our global partners.

Leadership: S&T provides opportunities for students to lead various societies, such as, SME, NSSGA, WIM, and ISEE and competitions like the mine design, mucking and mine rescue competitions.

Passion: S&T educates graduates with a passion for the mining industry’s growth and competitiveness.

Tradition: S&T maintains the tradition of excellence, unity, collegiality and family that have been the bedrock of its mining engineering programs.

Strategic Objectives

In the pursuit of excellence and global leadership in Mining Engineering education and research, the following strategic objectives will provide impetus as guiding principles.

1. Maintain and Expand Outstanding Mining Engineering Education Portfolio
2. Enrich the Student Experience
3. Broaden Mining Engineering Research
4. Expand S&T’s Mining Engineering Capacity
5. Strengthen National and Global Partnerships

Strategic Objective 1

Maintain and Expand outstanding Mining Engineering Education Portfolio

Missouri S&T will pursue initiatives that will strengthen Mining Engineering as the global program of choice. Toward this goal, Missouri S&T will create and maintain a well-diversified Mining Engineering program and establish the BS in Mineral Process Engineering. S&T will also expand the ME (Online) and the Explosives Engineering programs to Industries and communities.

Strategic Goal 1.1: Maintain and Strengthen Missouri S&T Mining Engineering as a top Program of Choice in the US and the Globe

Action 1.1.1: Maintain ABET Accreditation: S&T shall maintain currency in the ABET Program Educational Objectives and Outcomes, appropriate assessment and continuous improvements that meet accreditation standards.
Action 1.1.2: Maintain Our Brand KEA88: S&T shall ensure that the average 3-D Job Readiness Factor of 88% is maintained for all its graduating seniors.

Action 1.1.3: Achieve 100% Freshmen Internship: S&T shall work with its Development Board and industry leaders to ensure the achievement of 100% freshmen internship opportunities.

Action 1.1.4: Increase Competitive Scholarship: S&T shall provide opportunities, encourage and sponsor our students to increase competitive scholarship by 20 percent per annum.

Action 1.1.5: Increase Teaching Resources: The number of faculty will increase 40%; number of staff by 30% and GTAs by 100% by 2016.

Action 1.1.6: Minimize Attrition Rate: Undergraduate attrition rate will reduce for all years to almost zero percent by 2016.

Action 1.1.7: Attract Significant Number of HS Students: Freshmen in Mining Engineering from high school will increase by 60% by 2016.

Action 1.1.8: Attain Appropriate Levels of Enrollment: Undergraduate enrollment will increase to 250, graduate students will increase to 50 and Online ME will grow to 100 students by 2020 (see Table 1).

### Table 1 Student Enrollment Trends: FS06 – FS2020

<table>
<thead>
<tr>
<th>Enrollment Classification</th>
<th>FS06</th>
<th>FS07</th>
<th>FS08</th>
<th>FS09</th>
<th>FS10</th>
<th>FS20 F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>35</td>
<td>38</td>
<td>40</td>
<td>40</td>
<td>35</td>
<td>50</td>
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<tr>
<td>Upper Class Majors</td>
<td>85</td>
<td>95</td>
<td>100</td>
<td>105</td>
<td>135</td>
<td>200</td>
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<tr>
<td>Total Undergraduate</td>
<td>120</td>
<td>133</td>
<td>140</td>
<td>145</td>
<td>170</td>
<td>250</td>
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<tr>
<td>Master of Science</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>Doctor of Philosophy</td>
<td>13</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>Master of Engineering</td>
<td>25</td>
<td>28</td>
<td>32</td>
<td>35</td>
<td>45</td>
<td>100</td>
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<tr>
<td>Total Graduate</td>
<td>40</td>
<td>45</td>
<td>53</td>
<td>60</td>
<td>70</td>
<td>150</td>
</tr>
<tr>
<td>Total All Students</td>
<td>160</td>
<td>178</td>
<td>193</td>
<td>205</td>
<td>240</td>
<td>400</td>
</tr>
</tbody>
</table>

FS20 F – forecast for FS 2020

**Strategic Goal 1.2:** Create and Maintain a Well-Diversified Mining Engineering Program at Missouri S&T

Action 1.2.1: Combined BS/MBA for S&T Mining Engineering: Create a combined program by FS 2015 to expand the knowledge of management, accounting and finance by graduating seniors.

Action 1.2.2: Combined BS Mining Engineering and MS Minerals-Energy Economics: Create a combined program by 2015 to expand the knowledge of economics and project finance by graduating seniors.

Action 1.2.3: BS in Mineral Process Engineering: Develop a major in Mineral Process Engineering by 2020 to expand knowledge and frontiers in minerals, coal and materials processing.
Action 1.2.4: *MS in Explosives Engineering*: Expand the masters in Explosives Engineering to incorporate a teaching faculty and the doctoral program.

Action 1.2.5: *Emphases in Mine Automation and Maintenance Engineering*: Create an emphasis by 2016 in these two areas to provide mining engineers with expertise in automation and equipment maintenance.

**Strategic Goal 1.3:** *Establish the BS in Mineral Process Engineering 2020*

Action 1.3.1: *The Botswana Minerals Opportunity*: The program will provide an opportunity to further nurture our relationship with UB and the mining industry of Botswana in the processing of diamonds, coal, base and ferrous metals.

Action 1.3.2: *The Tianfu Mining University Opportunity*: Strengthen the mineral processing capacity for research and education in rare earth minerals.

Action 1.3.3: *The Saudi Mining Opportunity*: Establish the mineral processing potential to assist the Saudi minerals sector.

Action 1.3.4: *US Minerals Engineering Market*: Play a Significant Role in developing mineral process engineers for the mining industry of United States.

**Strategic Goal 1.4:** *Expand the ME (Online) Program to the Global Mining Industry and Communities*

Action 1.4.1: *Program Marketing*: Put in place a strategic marketing plan, strategy and focus for North and South America, Africa, Asia and Australia. Develop comprehensive website, brochures and relevant materials for these markets by 2013.

Action 1.4.2: *Graduate Mining Engineering Courses*: Increase the graduate course offerings for the ME (Online) Program to 30 courses by 2015.

Action 1.4.3: *Additional Instructors*: Build the Mining Engineering faculty strength to 15 by 2020 and recruit at least 15 instructors from industry and academia by 2015.

Action 1.4.4: *Doctor of Engineering (DE) Online*: Create and deliver the DE in Mining Engineering Program by 2015.

Action 1.4.5: *Advanced Distance Education Technology*: Transfer 70% of the course offerings in the ME (Online) Program to the current state-of-the-art technology by 2015.

**Strategic Goal 1.5:** *Expand Explosives Engineering Program*

Action 1.5.1: *Additional Faculty*: Add one NTT Faculty member to the program by 2013.
Action 1.5.2: Program Expansion: Develop the PhD Program in Explosives Engineering by 2015.

**Strategic Goal 1.6:** Increase the Number of Mining Engineering Faculty

Action 1.6.1: The number of faculty will increase 40%; Add one NTT Faculty member to the program by 2013.

Action 1.6.2: Endow a $3 million Chair in Mining Engineering with emphasis on Energy from Coal, Oil Sands or Oil Shale by 2020.

**Strategic Objective 2**

**Enrich the Student Experience**

S&T will provide well-diversified environments, with currency in technology, to produce highly qualified graduates for industry, academia and other employers.

**Strategic Goal 2.1:** Renew and Expand Laboratory Capacity

Action 2.1.1: Existing Laboratory Expansion: The capacity of existing rock mechanics, mine atmospheric control, explosives, mine surveying, mine health and safety, mine power and drainage, and mineral processing laboratories will be expanded to cater for the expanding programs by 2016.

Action 2.1.2: New Laboratories: Two new virtual laboratories in surface and underground mining methods and equipment will be added to the program by 2015.

Action 2.1.3: Laboratory Maintenance Fund: Create an annual maintenance fund of $240K to maintain laboratory facilities and equipment by 2020.


Action 2.1.5: Additional Technical Staff: Hire an additional technical staff specifically for maintaining teaching and research laboratories.

**Strategic Goal 2.2:** Increase Students Exposure to the Mining Industry Community

Action 2.2.1: Freshmen Internship: Attain 100% internship opportunities for all Mining Engineering freshmen by 2015.

Action 2.2.2: Internship Opportunities: Attain 100% internship opportunities for all Mining Engineering students by 2015.

Action 2.2.3: Industry Mentorship: The program will ensure that at least 80% of the undergraduate students in Mining Engineering will enroll in the SME Mentorship Program by 2015.
Action 2.2.4: *Exposure to Conference:* The program will ensure that at least 90% of the students in Mining Engineering will attend at least one conference before graduation by 2020.

Action 2.2.4: *Exposure to Extra-Curricular Activities:* The program will ensure that at least 95% of the students will participate in the four chapter societies (ISEE, NSSGA, SME and WIM) and the three competitive teams (SME-NSSGA Design, Mine Rescue and Mucking) in mining engineering attend at least one conference before graduation by 2020.

**Strategic Goal 2.3: Increase Faculty-Student Interactions**

Action 2.3.1: *Academic Advising:* Attain 100% student academic advising by faculty by 2013.

Action 2.3.2: *Student Career Advising:* Mining Engineering faculty will intensify their efforts in advising at least 80% of the student on career issues by 2015.

Action 2.3.3: *Faculty Supervision of OURE Students:* Increase the number of OURE students in the Mining Engineering program to 15 by 2015.

**Strategic Goal 2.4: Increase Students Research Exposure**

Action 2.4.1: *Faculty Supervision of OURE Students:* Increase the number of OURE students in the Mining Engineering program to 15 by 2015.

Action 2.4.2: *Involvement with Faculty Research:* At least 20% of the undergraduate students will be involved with faculty research by 2020.

Action 2.4.3: *Graduate Student Publication:* The program will ensure that all graduate students will publish at least 3 refereed journal papers before graduation by 2015.

Action 2.4.4: *Exposure to Conference:* The program will ensure that at least 90% of the students will attend at least one conference before graduation by 2020.

Action 2.4.5: *Undergraduate Conference Presentations:* The program will ensure that at least 20% of students will make one conference presentation by 2020.

Action 2.4.6: *Graduate Conference Presentations:* The program will ensure that 100% of students will make three conference presentations by 2015.

**Strategic Goal 2.5: Provide Environments for Students to Develop Professional Behavior Attributes**

Action 2.5.1: *Exposure to Extra-Curricular Activities:* The program will ensure that at least 95% of the students will participate in the four chapter societies (ISEE, NSSGA, SME and WIM) and the three competitive teams (SME-NSSGA Design, Mine Rescue and Mucking) in mining engineering attend at least one conference before graduation by 2020.
NSSGA Design, Mine Rescue and Mucking) in mining engineering attend at least one conference before graduation by 2020.

Action 2.5.2: Exposure to Conference: The program will ensure that at least 90% of the students will attend at least one conference before graduation by 2020.

Action 2.5.3: Internship Opportunities: Attain 100% internship opportunities for all Mining Engineering students by 2015.

Action 2.5.4: Industry Mentorship: The program will ensure that at least 80% of the undergraduate students in Mining Engineering will enroll in the SME Mentorship Program by 2015.

Action 2.5.5: Undergraduate Conference Presentations: The program will ensure that at least 20% of students will make one conference presentation by 2020.

Action 2.5.6: Graduate Conference Presentations: The program will ensure that 100% of students will make three conference presentations by 2015.

Strategic Objective 3

Broaden Mining Engineering Research

Mining Engineering research will be advanced using fundamental and applied research initiatives via individual efforts and collaborative partnerships.

Strategic Goal 3.1: Increase the Number of Research Faculty

Action 3.1.1: Research Faculty: Increase the number of research faculty by 50% by 2020.

Action 3.1.2: Endowed Chair in Energy: Endow a $3 million Chair in Mining Engineering with emphasis on Energy form Coal, Oil Sands or Oil Shale by 2020.

Action 3.1.3: Emerging Areas: Build research strength in mineral processing, carbon capture and sequestration, synthetic fuels, automation and robotics, and intelligent maintenance engineering by 2020.

Action 3.1.4: Botswana Collaboration: Strengthen collaborative research with the faculty at the University of Botswana in emerging research areas (Action 3.1.2).

Action 3.1.5: Industry Collaboration: Develop collaborative research partnerships with industries represented on the Mining Engineering Development Board.
Action 3.1.6: Global Partnerships: Develop global collaborative opportunities in North and South America, Africa, Asia and Australia.

Strategic Goal 3.2: Expand Graduate Program
Action 3.2.1: Graduate Enrollment: Increase the number graduate student enrollment by 100% by 2020.
Action 3.2.2: Graduate Courses: Develop additional graduate courses to increase the graduate course offerings to 30 by 2016.
Action 3.2.3: Graduate Quality Metrics: Develop and put in place quality measures to ensure sustainable graduate program quality by 2015.
Action 3.2.4: Graduate Internship: Create opportunities to expose at least 60% of the graduate students to the mining industry via internships by 2015.
Action 3.2.5: Graduate Scholarships: Increase competitive graduate scholarships by 50% in 2015.

Strategic Goal 3.3: Expand RMERC Research Initiatives
Action 3.3.1: Center Funding: Increase the Level of Funding by 50%
Action 3.3.2: Research Faculty: Continue to expand the research faculty associated with RMERC to 50% above current levels by 2015.
Action 3.3.3: Emerging Research Areas: Build stronger research strength in mineral processing, carbon capture and sequestration, and synthetic fuels by 2020.

Strategic Goal 3.4: Play a Leading Role in S&T Energy Research
Action 3.4.1: Energy Faculty: Hire at least 2 additional faculty with research focus in synthetic fuels (oil shale/oil sands, coal-to-liquids), and carbon capture and sequestration by 2020.
Action 3.4.2: Energy Organizations: Identify at least 2 energy research organizations for partnership in research and development by 2020.
Action 3.4.3: Energy Consortium: Develop an energy research consortium with the coal industry to expand energy research focused on coal by 2020.

Strategic Goal 3.5: Strengthen Mining and Nuclear Engineering Research Collaboration
Action 3.5.1: Collaborations with Nuclear Engineering Faculty: Provide environments for Mining and Nuclear Engineering faculty to collaborate in radioactive waste cleaning and storage, forensic tools for tagging explosives and blast-resistant barricades for nuclear power plants by 2012.
Action 3.5.2: *New Synergies:* Create new synergies in alternate energy research, and environmental risks mitigation of nuclear wastes with national and international research organizations by 2016.

**Strategic Goal 3.6:** *Strategic Research Consortium in Mine Health and Safety*

Action 3.6.1: *Strategic Consortium:* Create a nationally recognized research consortium with the University of Utah and Colorado School of Mines in mine health and safety by 2015.

Action 3.6.2: Consortium Expansion: Identify and include as members S&T’s researchers with capacity and capability to contribute to this consortium.

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**Strategic Objective 4**

**Expand S&T Mining Engineering Capacity**

S&T will expand and create additional resources and facilities to match capacity expansion initiatives.

**Strategic Goal 4.1:** *Complete the New Experimental Mine Building by 2013*

Action 4.1.1: *Classroom Capacity:* Develop classroom capacity to seat about 180 people.


Action 4.1.3: *Office Capacity:* Create adequate office space for faculty, staff and Students.

**Strategic Goal 4.2:** *Expand Existing Laboratory Capacity*


Action 4.2.2: *Mine Atmospheric Control:* Expand the Mine Atmospheric Control Laboratory at the new Mine Building by renewing and recalibrating instruments and expanding capacity by 2015.

Action 4.2.3: *Mineral Processing:* Expand the Mineral Processing Laboratory RMERC by renewing and recalibrating instruments and expanding capacity by 2015.

Action 4.2.4: *Explosives Facility:* Complete the Explosives Facility by 2015.

Action 4.2.5: *Mine Survey:* Expand the Mine Survey Laboratory, in the New Mine Building, with appropriate instrumentation by 2015.
Strategic Goal 4.3: Develop New Laboratories
Action 4.3.1: Virtual Surface Mining Laboratory: Establish the new Virtual Surface Mining Laboratory in McNutt by 2012.
Action 4.3.2: Virtual Underground Mining Laboratory: Establish the new Virtual Underground Mining Laboratory in McNutt by 2014.

Strategic Goal 4.4: Create Endowment Opportunities
Action 4.4.1: Endowed Mining Engineering: Endow the S&T Mining Engineering Program at $10 million by 2020.
Action 4.4.2: Endowed Chair in Energy: Endow a $3 million Chair in Mining Engineering with emphasis on Energy from Coal, Oil Sands or Oil Shale by 2020.

Strategic Goal 4.5: Increase Personnel Resources
Action 4.5.1: Research Faculty: Increase the number of research faculty by 50% by 2020.
Action 4.5.2: Staff Levels: Hire an additional technical staff specifically for maintaining teaching and research laboratories and 2 administrative staff to support faculty and students by 2015.
Action 4.5.3: Program Support: Hire a Program Support Specialist to support the marketing, recruiting, website development and maintenance and the publication needs by 2012.

Strategic Goal 4.6: Maintain Strong Enrollment and Recruiting Efforts
Action 4.6.2: Campus Graduate Students: Increase on-campus graduate students to at least 50 by 2020.
Action 4.6.3: Distance Graduate Students: Increase distance enrollment capacity to at least 100 by 2020
Action 4.6.4: Explosives Summer Camp: Sustain and strengthen explosives summer camp for marketing and recruiting students.
Action 4.6.5: Mining Industry Night: Maintain a permanent annual Mining Industry Night for marketing and recruiting freshmen and sophomores.
Action 4.6.6: Enrolment Management: Establish a marketing and recruiting program for sustainable enrollment in Mining Engineering by 2013.
Strategic Objective 5
Strengthen National and Global Partnerships

S&T will engage national and global universities, industries and research organizations as partners in education and research.

Strategic Goal 5.1: Maintain a Strong Development Board

Action 5.1.1: Strong and Active Board: Maintain a strong, diversified and active Development Board with top industry executives.

Action 5.1.2: Counsel of the Board: The Chair and the faculty will always seek and use the counsel of the Board for important decisions that affect the direction of Mining Engineering at Missouri S&T.

Strategic Goal 5.2: Enhance Missouri S&T-UB Partnership

Action 5.2.1: Faculty-Faculty Interactions: Missouri S&T will pursue initiatives that will enhance faculty-faculty interactions within the two organizations.

Action 5.2.2: Research Partnership: Launch the “Research Partnership for Growth” Initiative in 2011-2012 to spur research collaboration among Missouri S&T-UB faculty/staff and the Botswana mining industry.

Action 5.2.3: Faculty and Students Exchanges: The two universities will exchange faculty and students periodically.

Action 5.2.4: Continuous Improvements: The two universities shall seek ways to improve the partnership periodically.

Strategic Goal 5.3: Develop S&T-Saudi Initiative on Mining Education

Action 5.3.1: TT and NTT Faculty: Hire a minimum of 4 TT and 3 NTT faculty members in Mining Engineering for the Saudi Mining Program by 2016.

Action 5.3.2: Leadership and Administrative Personnel: Hire a minimum of 2 leadership and 3 administrative personnel for the Saudi Mining Program by 2013.

Action 5.3.2: SMP Strategic Plan: Develop a 5-year strategic plan for the SMP Mining Program by 2012.

Action 5.3.3: S&T Mining Engineering – Saudi Mining Program Relationship: Develop synergistic relationship to attain a strong relationship between Missouri S&T’s Mining Engineering and the Saudi Mining Program by 2012.

Action 5.3.4: Graduate Assistantship Portfolio: Hire at least 10 PhD students to provide instructional assistantship per year over the 5-year program duration.
Strategic Goal 5.4: Develop Other S&T International Initiatives

Action 5.4.1: Asia/Pacific Region: Strengthen strategic alliances with existing academic agreements with institutions in Australia and China. Develop new academic agreements with universities in Singapore and Indonesia.

Action 5.4.2: Africa Initiatives: Strengthen strategic alliances with the University of Botswana and the University of Mines and Technology in Ghana.

Action 5.4.3: Latin American Initiatives: Strengthen strategic alliances with the universities in Brazil and Peru.