ChBE STRATEGIC PLAN

Department of Chemical and Biochemical Engineering (ChBE)

ChBE STRATEGIC STATEMENT

The ChBE Department will provide by 2020 a top return on investment (ROI) among the chemical engineering departments in the state, the region, the nation and in the world to students, parents, employers, research partners, and donors. This will be accomplished through education, scholarly pursuits, service and experiential learning opportunities.

MISSION

To integrate education, research and application to prepare graduates for successful careers as engineers, leaders and innovators, to advance, create and convey a knowledge base of chemical engineering and the related disciplines, and to benefit the public welfare.

VISION

The ChBE department will be recognized in the state and region as well as nationally and internationally because of its:
(1) Strong undergraduate and graduate programs,
(2) Cutting edge research,
(3) High quality faculty, students and staff,
(4) Strong and recognized national and international collaborations,
(5) Contributions to the chemical engineering and related professions and community, and
(6) Technological contributions to solve the world’s great challenges.

VALUES

• Collegiality
• Inclusion
• Communication
• Excellence
• Lifelong success
• Partnership
• Integrity
• Creativity
• Diversity
• Sustainability
• Social Responsibility
IDENTIFIED STAKEHOLDERS

- Undergraduate students
- Graduate Students
- Distance and on-line students
- Parents
- Research sponsors
- Employers
- Donors
- Alumni
- Community at large

METRICS FOR RETURN ON INVESTMENT (ROI)

The following metrics will be used for the actions as appropriate.

- Starting salaries of graduates
- Graduates successfully getting jobs
- Number of graduates
- Grant expenditure per faculty
- Peer reviewed journal publications in quality archival journals per faculty
- Doctoral and Master degrees granted per faculty
- Invited talks, Plenary/Keynote talks and presentations nationally and internationally
- Proposals submitted and their funded percentage per faculty
- Number of distance/online/blended programs
- Employer satisfaction with hires/internships
- Research sponsor satisfaction
- Donor satisfaction
- Academic and other ratings
- Student rating of teaching quality

GOVERNANCE AND LEADERSHIP

The Governance and leadership needed for executing and following up with the needed actions toward achieving the levers and associated themes of the Strategic Plan are demonstrated in the following diagram (Figure 1). The obligation toward the Strategic Plan rests on a shared collaboration between the department chairman, faculty, staff, ChBE Academy, ChBE Industrial Advisory Council, alumni and students. The expectations and the role of each group in implementing and managing the plan must be clearly identified and established. Achieving the needed actions that affect the levers will only be possible provided that the necessary resources are made available by the Missouri S&T leadership and alumni, corporate partner and friends. It is worth mentioning that achieving and following up with the actions and levers outlined in this plan require extra time from faculty. Therefore, it will be very hard for any significant fraction of this plan to get done unless more faculty are hired to lower student/faculty ratio and to get more GTAs.
Department Committees

• ABET committee
• Undergraduate studies committee
• Graduate studies committee
• Teaching laboratories committee
• Departmental seminar coordinator
• Promotion and tenure committee
• Faculty search committees
• Scholarships committee

Advising and Supporting Boards

• Industrial Advisory Council
• ChBE Academy and its Board of Directors

Figure 1: Diagram of the ChBE Department Governance and Leadership for executing and following up with the department strategic plan
BENCHMARKING DEPARTMENTS - INSTITUTIONS

Data from NRC (National Research Council) was used to rank 106 Chemical Engineering Departments (Graduate Programs) into three tiers: top 30 schools, middle 46 schools, and bottom 30 schools. S (Survey based) and R (Regression analysis based) Rankings were used. S ranking measures who you are and R ranking measures what you have been (the reputation). There are slight variations between both but the tier location (bottom tier) of the Chemical Engineering Department of MS&T does not change. The following indicators were found statistically relevant in the three tiers: Number of publications per faculty member, number of citations per publication, percentage of faculty members with funding, number of Ph.D. graduates and number of faculty members. The percentage of Non-Tenure Track (NTT) positions was not statistically relevant (and it is approximately 25% across the tiers). The Figure below shows the averages of the indicators for the three tiers.

Within the bottom tier, we eliminated schools according to faculty size, location, and program size. The following five Chemical Engineering Departments will be used for benchmarking based on:

KANSAS STATE UNIVERSITY

MICHIGAN TECHNOLOGICAL UNIVERSITY

OKLAHOMA STATE UNIVERSITY - MAIN CAMPUS

MISSISSIPPI STATE UNIVERSITY

UNIVERSITY OF ARKANSAS - MAIN CAMPUS

This is based on the assumption that the quality of the undergraduate program correlates with the strength of the graduate program.

These schools will be contacted to obtain their current hard data directly and to arrange a site visit with them.

The above list of benchmarking Chemical Engineering Departments will be assessed periodically (every 3-5 years) to be updated accordingly.
Figure 2: Average indicator and percentage of faculty members with funding versus tier of graduate programs (Top Tier – Top 30 schools, Middle Tier – Middle 50 schools, Bottom Tier – Bottom 30 schools)
**PREVIOUS ChBE STRATEGIC PLAN**

**Previous ChBE Strategic Plan**

We prepared a development (strategic) plan in 2010 and revised the plan in 2011 according to the previous Missouri S&T Strategic Plan. The plan was discussed and finalized by the faculty and reviewed by our Academy. Many key goals and actions have been achieved. This plan has been revised and extended according to the themes, levers and actions of the new Missouri S&T strategic plan.

**CONSIDERATIONS FOR THE DEVELOPMENT OF THE NEW ChBE STRATEGIC PLAN**

**The New ChBE Strategic Plan Development**

A new strategic plan is being developed according to the themes, levers and actions of the new Missouri S&T strategic plan and as per the given instructions. A lever is defined as a main action that consists of collection of actions.

In the process of developing of the new strategic plan, the following considerations have been considered:

- The ChBE themes are similar to S&T strategic themes
- The ChBE Levers are either similar to S&T levers or they are modified/changed as appropriate
- Actions, Starting date, Duration, Resources required, One-time costs, Recurring costs, Revenue benefits, Owners, and Key metrics to track for each lever are made specific to the department and resources available (e.g., chair/faculty/staff time, funding, priority of obligation, facilities, support from S&T administrators and committees, etc.)
- Metrics for levers, actions, metric, baseline, targets for each lever/action are also made specific to the department and resources available (e.g., chair/faculty/staff time, funding, priority of obligation, facilities, support from S&T administrators and committees, etc.)
- Some themes share the same levers/actions
DRAFT ChBE STRATEGIC PLAN

DRAFT STRATEGIC THEMES LEVERS AND ACTIONS

The following are the themes, levers and actions of the proposed ChBE Strategic Plan. In parentheses the related themes and levers of Missouri S&T Strategic plan are indicated.

1. Develop and inspire creative thinkers and leaders for life-long success (Theme 1)

1.1. Provide measurable experiential learning activities to all students (Levers 1.1, 3.3)

1.1.1. Establish a list of current activities that are related to experiential learning according to the S&T guidelines (Action 1.1.1)

Start Date: May 1, 2014
Duration: 4 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Approval of the list by faculty members
Baseline: This action will generate the baseline
Targets: Gaining approval of faculty members

1.1.2. Propose (if possible and needed) new activities (e.g., international education course, interactions of AIChE student chapter with international AIChE student chapters, international joint research and collaboration for degrees, international exchange program, campus and other department design and other teams, involve in UG experiments development, summer internship/externship, outreach to K-12 for ChBE and STEM, design projects with industry, etc.). This will be done in consultation with career center VPUGS office, industrial advisory council, ChBE academy board and alumni (Action 1.1.5)

Start Date: August 1, 2014
Duration: 4 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Number or percentage of students involved, number of new activities and approval of the activities by faculty members
Baseline: Current activities to be defined by Action 1.1.1 above
Targets: Proposing new activities and gaining approval of faculty members

1.1.3. Develop, incorporate and implement new extracurricular activities and sustain, encourage and support the current extracurricular activities to all students (if possible). Document, follow up and assess the outcomes of the current activities: ChemE Car team, IGEM
team, Campus design team, etc., Professional Organizations (AIChE Student Chapter, Omega Chi Epsilon Honor Society, and Alpha Chi Sigma Professional Chemistry Fraternity, etc.), Undergraduate research projects (OURE, ChBE 390, and ChBE 390H) (Action 1.1.2)

Start Date: February 1, 2015
Duration: 6 years
Resources required: personnel time, funding
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Percentage of students participate, number of activities, positive feedback from students
Baseline: The current activities with the current percentage of students participating
Targets: 100% student participation, positive feedback from students

1.2. Encourage and enhance collaboration and student access to faculty and staff, and help in providing opportunities for professional and leadership development (Levers 1.2, 1.3, 1.4, 1.5)

1.2.1. Establish a list of current activities and possible opportunities of collaboration among faculty, student and staff within the department, S&T, campuses of UM System and Missouri universities
Start Date: September 1, 2014
Duration: 4 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Approval of the list by faculty members
Baseline: No list exists
Targets: Gaining approval of faculty members

1.2.2. Specify the current practice and availability of student access to faculty and define ways to enhance it that will help student academic development and progress
Start Date: January 1, 2015
Duration: 6 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Approval of the current practices by faculty members
Baseline: No list exists
Targets: Gaining approval of faculty members
1.2.3. Identify the opportunities for professional and leadership development for faculty, student and staff
Start Date: January 1, 2015
Duration: 6 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Approval by faculty members
Baseline: No list exists
Targets: Gaining approval of faculty members

1.2.4. Develop, incorporate, implement new activities, maintain the current ones of actions above, document follow up and assess the outcomes
Start Date: August 1, 2015
Duration: 5.5 years
Resources required: personnel time, funding
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Number of new and current activities and collaboration, number or percentage of students involved, faculty and staff benefited
Baseline: No list exists
Targets: 100% of student, staff and faculty benefited, 3 publications per year from joint effort with other institutions, collaboration with at least two institutions from each continent (at least total of 10 institutions to collaborate with)

1.3. Encourage and enhance students’ participation in multidisciplinary design teams, laboratory and research organizations and projects, etc. (Levers 1.1, 1.2, 1.4)

1.3.1. List the current activities, describe them and document the number of active participants
Start Date: September 1, 2014
Duration: 4 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Approval of the list by faculty members
Baseline: No list exists
Targets: Gaining approval of faculty members
1.3.2. Define new opportunities within the department, with other departments, across campus and with other Missouri universities
   Start Date: January 1, 2015
   Duration: 6 months
   Resources required: personnel time
   One-time costs
   Recurring costs
   Revenue benefits
   Owners: Chair and faculty
   Key metric to track: Approval by faculty members
   Baseline: No list exists
   Targets: Gaining approval of the faculty members

1.3.3. Identify and establish mechanism(s) for awareness and encouraging all students to participate
   (a) Identify and establish mechanism(s) for awareness
      Start Date: August 1, 2015
      Duration: 6 months
      Resources required: personnel time
      One-time costs
      Recurring costs
      Revenue benefits
      Owners: Chair and faculty
      Key metric to track: Approval by faculty members
      Baseline: No list exists
      Targets: Gaining approval of the faculty members

      (b) Encouraging all students to participate
      Start Date: August 1, 2015
      Duration: 5.5 years
      Resources required: personnel time, funding
      One-time costs
      Recurring costs
      Revenue benefits
      Owners: Chair and faculty
      Key metric to track: Number of programs/activities, percentage of student participation
      Baseline: No list exists
      Targets: 5 programs outside the department, 100% student participation

1.3.4. Incorporate the actions above, document, follow up and assess the outcomes
   Start Date: August 1, 2015
   Duration: 5.5 years
   Resources required: personnel time, funding
   One-time costs
   Recurring costs
   Revenue benefits
Owners: Chair and faculty
Key metric to track: Number of programs/activities, percentage of student participation
Baseline: No list exists
Targets: 5 programs outside the department, 100% student participation

1.4. Enhance and develop national and international interactions and collaborations opportunities and interactions with industry, national labs and research centers (Levers 1.2, 1.4, 1.5)

1.4.1. List the current collaborations, describe them and document the number of active participants
   Start Date: January 1, 2015
   Duration: 6 months
   Resources required: personnel time
   One-time costs
   Recurring costs
   Revenue benefits
   Owners: Chair and faculty
   Key metric to track: Approval of the list by faculty members
   Baseline: No list exists
   Targets: Gaining approval of faculty members

1.4.2. Define new opportunities and their benefits and impacts
   Start Date: May 1, 2015
   Duration: 8 months
   Resources required: personnel time
   One-time costs
   Recurring costs
   Revenue benefits
   Owners: Chair and faculty
   Key metric to track: Approval by faculty members
   Baseline: No list exists
   Targets: Gaining approval of the faculty members

1.4.3. Identify and establish mechanism(s) of implementation of new opportunities and for sustaining and enhancing the current collaborations
   Start Date: May 1, 2015
   Duration: 8 months
   Resources required: personnel time
   One-time costs
   Recurring costs
   Revenue benefits
   Owners: Chair and faculty
   Key metric to track: Approval by faculty members
   Baseline: No list exists
   Targets: Gaining approval of the faculty members
1.4.4. Incorporate the actions above, document, follow up and assess the outcomes
Start Date: August 1, 2015
Duration: 5.5 years
Resources required: personnel time, funding
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Number of programs/activities, percentage of student participation, number of joint publication
Baseline: No list exists
Targets: 5 programs outside the department, 100% student participation

1.5. Enhance student, faculty and staff mentoring and advising (Levers 1.2, 4.6, Action 1.2.10)

1.5.1. Define and assess the current practices of mentoring and advising student, faculty and staff
Start Date: January 1, 2015
Duration: 8 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Approval by faculty members
Baseline: No list exists
Targets: Gaining approval of the faculty members

1.5.2. Establish mechanism(s) and new ways (if possible) for enhanced mentoring and advising and develop standards/criteria for enhancing advising
Start Date: May 1, 2015
Duration: 8 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Approval by faculty members
Baseline: No list exists
Targets: Gaining approval of the faculty members

1.5.3. Implement, follow up, document and assess the outcomes
Start Date: August 1, 2015
Duration: 5.5 years
Resources required: personnel time, funding
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: percentage of students, faculty and staff benefited, positive feedback
Baseline: No list exists
Targets: 100% of students, faculty and staff benefited, positive feedback

2. Enhance reputation and raise visibility (Theme 2)

Through the levers and actions below, the department will identify ways of utilizing the Missouri S&T research centers and their resources to achieve the department goals and this Theme 2.

2.1. Maintain ABET accreditation, assessment, continuing learning and curriculum improvement (Theme 2)

2.1.1. Establish a structured mechanism with rubrics for assessing student outcomes and program educational objectives. Methodology for continuing improvement to be implemented on a regular basis
Start Date: January 1, 2014
Duration: 8 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
 Owners: Chair and faculty
Key metric to track: Assessment tools
Baseline: Preliminary developed approach exists
Targets: Gaining approval of the faculty members

2.1.2. Analyze and evaluate the assessments developed for 2.1.1. Identify corrective actions if needed, implement the findings for continuous improvement. Follow up and document the activities on a regular basis
Start Date: January 1, 2014
Duration: 7 years
Resources required: personnel time, funding ($10,000/year)
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Performing the analyses and establishing the findings
Baseline: The current practice
Targets: Sustained Process and obtained ABET

2.1.3. Develop ABET self-study report (SSR)
Start Date: January 1, 2014
Duration: 6 months
Resources required: personnel time, funding
One-time costs: $3000
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: SSR report sections
Baseline: Previous ABET SSR report
Targets: Submitted SSR report to ABET

2.1.4. Prepare for ABET site visit
Start Date: January 1, 2014
Duration: 1 year
Resources required: personnel time, funding
One-time costs: $3000
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: All the documents that need to be prepared
Baseline: Previous ABET visit
Targets: Complete the visit and obtain ABET

2.2. Achieve student to faculty ratio of 16-to-1 (consistent with campus overall ratio), diversify faculty in areas related to Missouri S&T best-in-class research areas, promote inclusion and maintain diversity of students and staff (Levers 2.1, 2.2, 3.4)

2.2.1. Fill the department vacant faculty positions with a focus on diversity (encourage women, underrepresented minorities, and people with disabilities to apply). Recruit candidates in areas related to Missouri S&T best-in-class areas compatible with the Department vision statement.
Start Date: January 1, 2014
Duration: 3 years
Resources required: personnel time, funding
One-time costs: Startup package
Recurring costs
Revenue benefits
Owners: Chair and faculty, Provost/Chancellor
Key metric to track: Hiring faculty
Baseline: Hiring 1 faculty member
Targets: Hire additional 4 faculty members (Total 5) (to make total of 13 FTE faculty members)

2.2.2. Submit proposals for new faculty members as part of the Missouri S&T strategic plan and related cluster hires. Recruit faculty members to be assigned to our department and/or jointly with other departments
Start Date: August 1, 2013
Duration: 3 years
Resources required: personnel time, funding
One-time costs: Startup package
Recurring costs
Revenue benefits
Owners: Chair and faculty, Provost/Chancellor
Key metric to track: Hiring faculty members
Baseline: Obtained new NTT faculty position
Targets: Higher additional 4 faculty members (to make total of 17-18 FTE faculty members)

2.2.3. Outreach to faculty members for joint appointments in ChBE with the goal of achieving greater diversity. Identify candidates from different departments, campuses, universities, national labs and companies with chemical engineering backgrounds or with expertise related to chemical engineering research fields
Start Date: August 1, 2013
Duration: 3.5 years
Resources required: personnel time
One-time costs:
Recurring costs
Revenue benefits
Owners: Chair and faculty
Key metric to track: Number of faculty members
Baseline: One faculty with joint appointment
Targets: 5 faculty members

2.2.4. Obtain endowed chairs and endowed professorships for current accomplished faculty members and new hires
Start Date: August 1, 2013
Duration: 7.5 years
Resources required: personnel time
One-time costs:
Recurring costs
Revenue benefits
Owners: Development office, Provost, Chancellor
Key metric to track: Number of faculty members with professorships or endowed chairs
Baseline: No baseline exists
Targets: 2 endowed chairs and 3 endowed professorships

2.3. Expand and further improve the quality of the undergraduate and graduate programs, teaching and research laboratories, infrastructure and facilities to provide students with state of the art instructional technology (Levers 2.3, 2.5, 2.6, 3.1, 3.3, 4.2, 4.3)

2.3.1. Establish state-of-the-art teaching laboratories, infrastructure and facilities
  2.3.1.1. Develop an undergraduate teaching laboratory plan
  2.3.1.2. Revamp and rebuild existing laboratory course experiments into experimental modules for improved learning and to handle increased enrollment
  2.3.1.3. Acquire/develop new laboratory course modules
2.3.1.4. Raise funding and outreach to corporations, alumni and friends to sponsor course modules
2.3.1.5. Submit proposals to internal and external funding sources to support new modules.
2.3.1.6. Design, construct, test, implement and assess the newly developed modules
   Start Date: January 1, 2013
   Duration: 8 years
   Resources required: personnel time, funding
   One-time costs:
   Recurring costs
   Revenue benefits
   Owners: Chair, faculty, Development office, Provost, Chancellor
   Key metric to track: Funding obtained, modules structure established, equipment/systems added, number of new modules added, number of students benefited
   Baseline: Old and out dated experiments and facilities, new lab space in a new building
   Targets: establish state-of-the-art industrial control system and related simulations and software, integrated the control system to all experimental modules, establish 10 experiments, 100% of the students benefited

2.3.2. Expand and improve undergraduate and graduate curricula
2.3.2.1. Assess the current undergraduate and graduate curricula and propose modifications and/or changes if needed.
2.3.2.2. Modify, revise and/or change undergraduate and graduate curricula to improve student success with the goal of increasing the graduation rate of undergraduate students
2.3.2.3. Establish combined BS/MS degree program
2.3.2.4. Diversify the elective courses which would include related courses offered by other departments
2.3.2.5. Meet the needs of transfer and Co-Op students in cooperation with admission office
2.3.2.6. Promote K-12 Outreach activities
   Start Date: August 1, 2013
   Duration: 7.5 years
   Resources required: personnel time, funding
   One-time costs:
   Recurring costs
   Revenue benefits
   Owners: Chair, faculty
   Key metric to track: Modification/changes made to the curricula, ABET student outcomes, positive feedback from alumni/employers
   Baseline: Old curricula
   Targets: Implement the modification/changes on the curricula, attain ABET student outcomes, Obtain 75% or above satisfaction of student, alumni, and employers

2.3.3. Increase 0.5 GTAs and/or equivalent with the sponsorship of corporate, alumni, and friends.
   Start Date: August 1, 2014
   Duration: 8 years
Resources required: personnel time, funding
One-time costs:
Recurring costs
Revenue benefits
Owners: Chair, faculty, development office, Provost, Chancellor
Key metric to track: Number of 0.5 equivalent GTA
Baseline: 2.5 GTA (0.5 equivalent)
Targets: 10 GTA (0.5 equivalent)

2.3.4. Expand and further improve the research laboratories
Start Date: January 1, 2013
Duration: 8 years
Resources required: personnel time, funding
One-time costs:
Recurring costs
Revenue benefits
Owners: Chair, faculty, Development office, Provost, Chancellor
Key metric to track: Research expenditure on equipment, number and type of research labs and equipment
Baseline: some labs exist
Targets: establish 5 state-of-the-art research labs in areas related to Missouri S&T best in class clusters.

2.4. Expand and provide web – based and distance learning courses, blended courses, tracks/emphases, certificates and degrees and provide students with state of the art instructional technology (Levers 2.5, 3.2, 3.6, 4.1, 4.3)

2.4.1. List the current activities, describe them and document the number of active participants
Start Date: January 1, 2015
Duration: 6 months
Resources required: personnel time, funding
One-time costs:
Recurring costs
Revenue benefits
Owners: Chair, faculty
Key metric to track: Approval by faculty members
Baseline: No list exist
Targets: Obtaining approval of faculty

2.4.2. Maintain the current biochemical engineering emphasis if the resources are available and maintain the graduate certificate for Process Safety
Start Date: January 1, 2014
Duration: continuing process
Resources required: personnel time, funding
One-time costs:
Recurring costs
Revenue benefits
Owners: Chair, faculty, VP Distance Education, Provost
Key metric to track: Approval by faculty members
Baseline: Existing programs
Targets: Maintaining them

2.4.3. Define new opportunities within the department, with other departments and with other institutions for certificates and degrees to be offered via web, distance education, and blended learning
Start Date: August 1, 2014
Duration: 1 year
Resources required: personnel time, funding
One-time costs:
Recurring costs
Revenue benefits
Owners: Chair, faculty, VP Distance Education, Provost
Key metric to track: Approval by faculty members
Baseline: No list exist
Targets: gaining the faculty approval

2.4.4. Develop and implement certificates, combined BS/MS degree program and MS and PhD degrees to be offered via distance education and/or jointly offered with other institutions
Start Date: August 1, 2015
Duration: 5 years
Resources required: personnel time, funding
One-time costs:
Recurring costs
Revenue benefits
Owners: Chair, faculty, VP Distance Education, Provost
Key metric to track: Approval by faculty members
Baseline: Process safety certificate
Targets: offering MS and PhD degree and one specialized certificate

2.5. Increase the department research initiatives, externally sponsored research and scholarly performance and productivity (Levers 2.3, 4.5)

2.5.1. Similar to the actions of Lever 2.2 and action 2.3.3 above

2.5.2. Promote the current research strength and expand on the research areas related to the Missouri S&T strategic research area
2.5.2.1. Identify and add emerging research areas through new hires, current faculty members and addition of joint and adjunct appointments
2.5.2.2. Establish an active research committee for the department
Start Date: August 1, 2014
Duration: 6 years
Resources required: personnel time, funding
One-time costs:
Recurring costs
Revenue benefits
Owners: Chair, faculty, VPs, Provost, Chancellor
Key metric to track: Approval by faculty members
Baseline: Current status
Targets: Gaining the faculty approval

2.5.3. Increase the department external research expenditures (externally sponsored research)
2.5.3.1. Increase external research expenditures per faculty per year and increase the number of submitted competitive proposals to at least 3 per year per faculty depending on the level of funding a faculty member has
2.5.3.2. Increase industrial research contracts and establish industrial consortium
2.5.3.3. Enhance participation in and secure funding from campus research centers such as Energy Research and Development center, Materials Research Center, Environmental Research Center, Biomedical Science and Engineering Research center and others
2.5.3.4. Increase research communications within the department through the department research committee
2.5.3.5. Obtain NSF Research Experience for Undergraduate (REU) and Department of Education GAANN funding
2.5.3.6. Increase interaction with national labs and other campuses and universities for joint proposals
2.5.3.7. Reduce the teaching load for faculty members with more than $100,000 annual research expenditures and increase the teaching load to those with less than $100,000 annual research expenditures
   Start Date: August 1, 2014
   Duration: 6 years
   Resources required: personnel time, funding
One-time costs:
Recurring costs
Revenue benefits
Owners: Chair, faculty, development office, sponsor project office, VPs, Provost, Chancellor
Key metric to track: $100,000 external research expenditure per faculty per year
Baseline: Current status
Targets: Achieving the key metrics above

2.5.4. Increase scholarly performance, productivity, and state, regional, national and international reputation
2.5.4.1. Increase the number of quality faculty publications to a minimum of 3 journal articles per faculty per year.
2.5.4.2. Increase the participation in state, regional, national and international conferences, symposia and invited talks (3 or more presentations per faculty per year), provide invited talks to universities and companies in US and around the world and participate in consultation
2.5.4.3. Grant 5 PhD degree and 5 MS degree per year. (Missouri Department of Higher Education (MDHE) requires 5 MS and 3 PhD degrees per year (average of three years)
2.5.4.4. Develop appropriate faculty working load and reduce teaching load for faculty members who are active in submitting proposals, research grants and scholarly activities. The baseline is achieving the minimum research expenditures, publications and graduated PhD degree
2.5.4.5. Acquire funding in the form of GTA and/or alumni or corporate fellowships to PhD students.
2.5.4.6. Cover the tuition of graduate students on support including the 3 credit hours in summer and return part of the tuition for research credit hours to the related faculty member to support research activities
2.5.4.7. Establish faculty development fund of $100,000 or more per year
   Start Date: January 1, 2014  
   Duration: 6 years  
   Resources required: personnel time, funding  
   One-time costs:  
   Recurring costs  
   Revenue benefits  
   Owners: Chair, faculty, development office, sponsor project office, VPs, Provost, Chancellor  
   Key metric to track: 3 papers or more in archival journals per faculty member per year, 1 PhD and 1 MS degree granted per faculty per year  
   Baseline: Current status  
   Targets: Achieving the key metrics above

2.5.5. Celebrate department successes
2.5.5.1. Develop sustainable plan and mechanism to market department achievements to raise its visibility and to convey its return on investment  
2.5.5.2. Announce all successes and notable activities using all available means  
2.5.5.3. Increase the nomination of faculty, staff, students and alumni for campus and external awards
2.5.5.4. Increase number of awards, recognition, and fellows in professional organizations of the department faculty members, staff, students and alumni
2.5.5.5. Recognize our faculty, staff, students and alumni for professional and campus accomplishments and services
2.5.5.6. Update and maintain attractive and informative department and research websites, publish effective department newsletters and brochures and publicize the achievements of our faculty, staff, students and alumni 
   Start Date: January 1, 2014  
   Duration: 6 years  
   Resources required: personnel time, funding  
   One-time costs:  
   Recurring costs  
   Revenue benefits  
   Owners: Chair, faculty, development office, sponsor project office, VPs, Provost, Chancellor
3. Achieve sustainable growth to ensure best return on investment (Theme 3)

The department has been and will continue to contribute to increasing the standard of living of Missourians

3.1. Maintain and increase enrollment without increasing student/faculty ratio, market the department’s strengths and establish awareness of student opportunities and benefits and increase the opportunities for scholarships (Lever 3.7)

3.1.1. Define the current activities and possible opportunities
   Start Date: January 1, 2015
   Duration: 6 months
   Resources required: personnel time
   One-time costs
   Recurring costs
   Revenue benefits
   Owners: Chair and faculty, admission and enrollment office, freshmen engineering office
   Key metric to track: Approval of the list by faculty members
   Baseline: No list exists
   Targets: Gaining approval of faculty members

3.1.2. (a) Improving student success with the goal of increasing the graduation rate of our undergraduate students
   (b) Promote K-12 outreach activities
   Start Date: August 1, 2015
   Duration: 5.5 years
   Resources required: personnel time, funding
   One-time costs
   Recurring costs
   Revenue benefits
   Owners: Chair and faculty, admission and enrollment office, freshmen engineering office
   Key metric to track: Percentage increase in enrollment and their geographical distribution, number of activities and collaborations
   Targets: Achieving the key metrics above

3.2. Reduce student to faculty ratio to the Missouri S&T target ratio (16-to-1) while contributing to Missouri S&T strategic research areas, improving diversity and promoting inclusion (Levers 2.1, 2.2, 3.4)
Similar to lever 2.2 and its actions
3.3. Expand, develop and maintain degrees, tracks/emphases and certificate programs that increase enrollment and enhance web – based, distance and blended learning course offerings (Levers 2.5, 3.2, 3.6, 4.1, 4.3)
Similar to Lever 2.4 and its actions

3.4. Improve teaching and research facilities, laboratories and techniques and provide students with the state of the art instructional technology to enhance student learning and research and to expand experiential training (Levers 2.3, 2.5, 2.6, 3.1, 3.3, 4.2, 4.3)
Similar to Lever 2.3 and its actions

3.5. Increase the department research initiatives, funding and scholarly activities (Levers 2.3, 4.5)
Similar to Lever 2.5 and its actions

3.6. Ensure that undergraduate and graduate students graduate on time (Lever 4.7)

3.6.1. Assess the recent status for both undergraduate and graduate students and document the results. For assessing students graduating on time, the number of semesters on campus while taking classes in the department are used.
Start Date: July 1, 2015
Duration: 6 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty, VPs for undergraduate and graduate studies offices
Key metric to track: Approval of the faculty members, percentage of students that graduate on time.
Baseline: No baseline exists
Targets: Gaining approval of faculty members

3.7. Enhance fund-raising from alumni, corporate partners and friends and establish a lifetime engagement strategy (Levers 3.2, 3.5, 3.9)

3.7.1. Assess the recent status and document the findings
Start Date: July 1, 2015
Duration: 6 months
Resources required: personnel time
One-time costs
Recurring costs
Revenue benefits
Owners: Chair and faculty, development office
Key metric to track: Approval of faculty, development office and alumni
Baseline: No baseline exists
Targets: Gaining approval of faculty members
4. Increase and facilitate meaningful access to and interact with renowned faculty (Theme 4)

Levers 1.4, 2.3, 2.4, 2.5, 2.6, 3.3, 3.4 above contribute also to Theme 4 as per Missouri S&T Theme 4 and its Levers 4.1, 4.2, 4.3, 4.5, 4.6, 4.7

4.1. Facilitate the interaction of undergraduate and graduate students with renowned faculty via teaching, research and extracurricular activities and expand the access to renowned faculty through enhanced recruiting and retention (Levers 4.4, 4.8)

4.1.1. Assess the recent status, document the findings and define means for effective interaction
   Start Date: July 1, 2015
   Duration: 6 months
   Resources required: personnel time
   One-time costs
   Recurring costs
   Revenue benefits
   Owners: Chair and faculty
   Key metric to track: Approval of faculty, development office and alumni
   Baseline: No baseline exists
   Targets: Gaining approval of faculty members

4.1.2. (a) Establish and implement with development office a mechanism to ensure targeted interactions
   (b) Establish endowment for lectureship series
   (c) Invite leaders from academia, industry, national labs, research centers, and government to give seminars and interact with students
   (d) Promote student participation in Missouri S&T symposia, conferences, regular and special seminars, etc.
   Start Date: January 1, 2016
   Duration: 5 years
   Resources required: personnel time, funding
   One-time costs
   Recurring costs
   Revenue benefits
   Owners: Chair, faculty, development office
   Key metric to track: establishing the mechanism, the desired number and type of interactions and the percentage of students benefited
   Baseline: No baseline exists
   Targets: Achieving sustainable mechanism for such interaction, ensure 100% of the students have access and interactions

4.2. Promote non-conventional activities outside of classroom (Lever 4.9)

4.2.1. Define the non-conventional activities outside of classroom that can be implemented
   Start Date: July 1, 2015
Duration: 6 months  
Resources required: personnel time, funding  
One-time costs  
Recurring costs  
Revenue benefits  
Owners: Chair and faculty, VP of undergraduate studies  
Key metric to track: Approval of faculty  
Baseline: Current activities  
Targets: Gaining approval of faculty members

4.2.2. Promote and implement the defined non-conventional activities outside of the classroom  
Start Date: January 1, 2016  
Duration: 5 years  
Resources required: personnel time, funding  
One-time costs  
Recurring costs  
Revenue benefits  
Owners: Chair and faculty  
Key metric to track: Number of activities, percentage of students who participate  
Baseline: No baseline exists  
Targets: Noticeable number of students participates (1/3 of the students)