The Department of Mechanical and Aerospace Engineering

2020 Strategic Plan
The Department of Mechanical and Aerospace Engineering  
2020 Strategic Plan

Introduction

The purpose of this Strategic Plan is to articulate vision, establish overall objectives, formulate and prioritize specific themes, and define necessary action items for significantly advancing the Mechanical and Aerospace Engineering Department (MAE) at the Missouri University of Science and Technology by 2020. The Plan is focused on achieving quantitative and targeted improvements in research, graduate and undergraduate (UG) education, as well as improving and strengthening alumni relations, and facilitating direct involvement of the alumni in the realization of Departmental goals. The Strategic Plan reflects input from students, faculty, staff, Department Chair, and the MAE Academy. It will be used to direct the construction and implementation of policies, to guide administrative decisions at the Departmental level, and to provide a template for discussing Departmental needs to external constituents. *

Vision

The Mechanical and Aerospace Engineering Department at the Missouri University of Science and Technology will be nationally recognized as a premier program in mechanical and aerospace engineering education, innovation, research, and scholarship.

*Originally Accepted: 12/12/2011, Modified 11/21/2013
Mission

Statement
We will provide a rigorous, productive, and relevant academic learning environment for students, faculty, and staff in the Mechanical and Aerospace Engineering Department by continually focusing on our core missions of teaching, research, and service.

The Mission in Action
We will ensure that graduating students are well-educated and sufficiently prepared in the fundamentals of mechanical and aerospace engineering practice and science, such that they have the ability to solve open-ended problems in these disciplines and the capabilities required in order to become competent, productive, and well-rounded professionals.

We will emphasize scholarship, graduate education, and the development of new knowledge and skills in the traditional areas associated with mechanical and aerospace engineering. Additionally, we will develop cross-cutting multi-disciplinary efforts such that we are widely recognized by local, national, and international research and business communities as respected leaders in research, innovation, and discovery.

We will render meritorious service to our profession through active participation and engagement in service activities in our professional communities at all levels (local, national, and international), as well as in fulfilling campus and departmental governance, outreach, and service activities.
2020

Overall Strategic Objective

**Mechanical Engineering:** The Mechanical Engineering Program at the Missouri University of Science and Technology will be the top program in the State of Missouri and will be ranked within the top 50 Ph.D.-granting Mechanical Engineering Programs in the nation, using the U.S. News and World Report annual collegiate rankings by enhancing our national visibility through our faculty, and graduate and undergraduate programs.

**Aerospace Engineering:** The Aerospace Engineering Program at the Missouri University of Science and Technology will be the top program in the State of Missouri and ranked within the top 35 Ph.D.-granting Aerospace Engineering Programs in the nation, using the U.S. News and World Report annual collegiate rankings by enhancing our national visibility through our faculty, and graduate and undergraduate programs.

2020

Targeted State of Department

The targeted state of the Department of Mechanical and Aerospace Engineering in 2020 should be a significantly improved Department in the areas of faculty, students, and instructional facilities. Due to hires, retirements, etc., the Department should have a significantly different faculty composition. It is important that the Department faculty at that time, therefore, reflect an increased number of female and minority faculty members; however, this must be conjoined with the requirement of maintaining uniformly high standards both at the time of hiring and during the promotion and tenure process. Note that an important measure in determining high national ranking is diversity in faculty; hence, this is critical for the achievement of the strategic objective and strengthens all aspects of our mission.

In order to have significantly raised the national rankings of both Mechanical and Aerospace Engineering Programs and thus have achieved the targeted rankings as given in the strategic objective, the national and international visibility of the faculty in 2020 should be significantly higher than at present in terms of research productivity as measured by increased funding per faculty member, increased research and scholarship activities, focused and relatively well-defined research clusters of faculty working in specific areas of national prominence, and more chaired and endowed professors of high prominence. This may well mean that targeted and highly qualified/desirable faculty candidates in non-traditional areas with non-traditional backgrounds (i.e., degrees not necessarily directly in Mechanical or Aerospace Engineering) should be considered within the
hiring process – with the caveat that such faculty members should be able to meet teaching and service requirements expected of more traditional faculty members. The environment in the Department will foster collaboration between faculty, and the Departmental administration will actively seek to encourage faculty teaming. There should be a number of non-tenure-track faculty within the Department who will focus on undergraduate teaching and hence allow tenure-track faculty to focus more (but not exclusively) on graduate education and research. Care must be taken to have in place strategies and policies that create a separate rewards structure for both the tenure-track and non-tenure track faculty, thus, providing an adequate path to excel in teaching and research scholarship. Undergraduate student to faculty ratios for tenure-track faculty should be established relative to campus but also in light of strategic objectives. The ratio of graduate to undergraduate student enrollment in the Department should be significantly higher than it is now, with increased Ph.D. student supervision for both major degree programs. Greater quality control for undergraduates should be exercised at both the initial point of entry into the Department as well as throughout the academic career of an undergraduate. This will mandate keeping track of grade point average (GPA) trends both in-house, on campus, and nationally, and increased expectations in terms of student performance and academic achievement.

The instructional laboratories in the Department should be greatly improved, in terms of quality, relevance, degree of tie-in with lecture coursework, etc. Expectations of service, teaching, and research should be clearly defined and weighted to reflect a well-balanced approach in line with the expectations of institutions that are ranked near and above our desired level. However, expectations should be structured to recognize that every tenure-track faculty member will necessarily have a somewhat different balance between these three areas.

Finally, the Academy should be closely involved with both the Department Chair and faculty in facilitating Departmental goals that require external support and sponsorship, with emphasis on both infrastructure improvement and faculty development.
Strategic Measures

The following measures were suggested by the Department Chair and passed by the Departmental faculty as being viable quantifiable means of assessing current and future levels of performance, specifically within the context of tracking the degree to which the overall objective of this Strategic Plan is met. These measures were selected with consideration of external ranking methodologies and techniques and hence significantly emphasize research/scholarship performance. Means to address these measures as well as specific targets are addressed through the Plan at both the theme and action level.

- Undergraduate student enrollments and student to full-time faculty ratio
- Undergraduate student to graduate student ratio
- Graduate Record Examination (GRE) of graduate students
- B.S., M.S., and Ph.D. degrees awarded per full-time faculty
- Fraction of graduate students on support and Graduate Research Assistant (GRA)/Graduate Teaching Assistant (GTA) ratio
- Journal articles per full time faculty
- Research expenditures per full-time faculty
- Professional society fellows
- Under-represented faculty
- Editor/associate editorship

Benchmark Institutions

When constructing the strategic plan in 2011, the MAE faculty set our objectives to having performance which was equivalent to ME programs in the top 50 and AE programs in the top 35 nationally. These departments constituted our "target set" to which we have been benchmarking our annual performance.

From this larger group of ranked institutions, five benchmark (comparator) departments were chosen and approved by the MAE faculty. Criteria used in selecting the five comparators from the “target set” included: 1) Only public institutions were considered, 2) A majority needed to be departments with both ME and AE programs ranked in our target set, and 3) At least one of the five needed to be a program at an institution used by the S&T campus for best in class (BIC) comparison to ensure alignment with the campus. The chosen benchmark departments include:

1) Iowa State – Both ME and AE programs.
2) North Carolina State – This is a joint ME and AE department.
3) University of California, Davis – This is a joint ME and AE department.
4) Arizona State – This is a joint ME and AE department.
5) Michigan Tech – This is a ME only program, a public TRU and listed as BIC comparator for three of the four BIC measures given in the S&T strategic plan.

In the tables which provide benchmark measures for the respective themes, the baseline data are for 2011 which corresponds to the year this strategic plan was adopted by the faculty of the Department.
Identification of Specific Themes

In order to accomplish the overall strategic objective of this Plan, a number of specific themes have been identified and formulated. These themes are particularly focused on various major aspects of the mission of the Department; faculty, research, teaching, laboratories, and alumni. In subsequent sections, each specific theme will be examined in terms of current measures, target measures, action items to move from current to target measures, and responsible parties. These measures are based on where the Department is at the present time, and on the perceived potential for where the Department should be in 2020, based on the Overall Strategic Objective.

Specific Themes Selected:
A. Enhance national visibility through an expanded and diversified faculty
B. Expand graduate education opportunities and research
C. Improve quality of the undergraduate programs
D. Improve the department instructional laboratories
E. Establish and improve ties with alumni
F. Create a department environment that acknowledges and rewards staff contribution and performance

These specific themes are directly associated with the overall vision laid out in the 2013-2020 Campus Strategic Plan - Rising to the Challenge. These connections are made to specific campus levers for each theme in the relevant section. In addition it is shown that this plan is supportive of the needs of all six customer groups identified in the Campus Plan.
Themes/Actions Items
and the Relation to the Campus Plan
Themes/Actions Items

**Theme A: Enhance national visibility through an expanded and diversified faculty**

**Relevance to the Campus Plan:**
Theme A of the MAE Plan is focused on identifying and developing existing and new technical strengths through focused faculty hiring, faculty development, and merit based performance recognition. These actions support the Campus Plan through:

**Lever 2.1** – Employ transformative and focused hiring, including cluster hires, in selected areas of expertise to support BIC achievements.

**Lever 2.2** – Leverage S&T as Missouri’s technological research university.

**Lever 2.3** – Develop a culture of excellence in research, scholarship and creative activity among faculty, staff, and students.

Theme A of the MAE Plan also promotes faculty diversity and inclusion on several levels including recruitment, hiring, and development. This supports the Campus Plan through:

**Lever 3.4** – Promote inclusion and increase diversity of faculty, staff and students to remain relevant and competitive in a global environment.

**Key customer groups impacted:** Research based graduate students, research investors.

**Measures for Theme A:**

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>Targeted (2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenure/Tenure-Track (T/TT) faculty</td>
<td>31</td>
<td>45</td>
</tr>
<tr>
<td>Non-Tenure-Track (NTT) teaching faculty</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Female faculty</td>
<td>0</td>
<td>2+</td>
</tr>
<tr>
<td>Minority faculty</td>
<td>1</td>
<td>2+</td>
</tr>
<tr>
<td>Undergraduate student</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(no Freshman Engineering (FE))/faculty ratio</td>
<td>&gt; 25</td>
<td>19</td>
</tr>
<tr>
<td>% Professional Society Fellows in faculty</td>
<td>29</td>
<td>&gt; 60 of full Professors</td>
</tr>
<tr>
<td>Endowed (chaired) faculty</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Faculty expertise/areas</td>
<td>Traditional</td>
<td>Traditional and emerging</td>
</tr>
</tbody>
</table>
The Department of Mechanical and Aerospace Engineering
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Themes/Actions Items

Action Item A.1: Develop a general hiring strategy and hiring/replacement priorities plan
A.1.a Develop a comprehensive hiring plan. (Department Chair, Technical Committee Chairs, Timeframe: Starting 2012, update annually – see related Department hiring plan document)
A.1.b Establish a mechanism and precedent for Technical Committees to give input on hiring. (Department Chair and Technical Committee Chairs, Timeframe: Starting 2012, implement annually)
A.1.c Reorganize current Technical Committees as deemed necessary, in order to reflect traditional and emerging areas. (Department Chair, Technical Committee Chairs, Timeframe: 2013, completed)

Action Item A.2: Hire nationally prominent faculty (chaired, named professorships)
A.2.a Work closely with Advancement/Alumni/Corporations to obtain funds and support in order to endow professorships and chairs. (Department Chair, Academy, Development, Timeframe: Explore donor potential 2012, complete 2020, $3M per endowed chair, $1M per endowed professorship)
A.2.b Technical Committees identify high-impact research areas and external individuals. (Technical Committee Chairs, Timeframe: Define areas 2012, tie to Department hiring plan annually)
A.2.c Augment/upgrade some current positions (existing faculty with excellence and consistency in research) to named professorships. (Department Chair, Academy, Development, Timeframe: Starting in 2012, complete 2020, $500K per named professorship)

Action Item A.3: Focus faculty teaming and mentorship
A.3.a Make concerted effort to identify/form research clusters in existing strength areas, led by established faculty. (Department Chair, Current Chaired Professors, Department Faculty, Technical Committee Chairs, Timeframe: Starting 2012, areas defined 2013, review annually)
A.3.b Hire new faculty in existing cluster areas. (Department Chair, Current Chaired Professors, Search Committee Chairs, Timeframe: Starting 2012, implement annually)
A.3.c Hire chaired/named professor in new area and facilitate this individual in forming a new cluster with designated faculty lines (new positions, dedicated). (Department Chair, Timeframe: 2012-2013, delayed)
A.3.d Leverage Department faculty hires with interdisciplinary research centers. (MRC, ISC, ERC, ERDC, etc.). (Department Chair, Department Faculty in interdisciplinary research centers, Timeframe: 2012-2017, complete annually)
A.3.e Nominate faculty to fellow status in national technical organizations. (Department Chair, Chair of Awards and Nominations Committee, Timeframe: Starting 2012, annually)
A.3.f Establish and implement a formal young faculty mentoring program. (Department Chair, Department Faculty, Timeframe: Establish in 2012, implement annually)

Action Item A.4: Develop and implement coordinated startup funds and faculty sponsorship plan
A.4.a Plan proactively for resources for competitive startup fund packages. (Department Chair, Timeframe: Starting 2012, implement annually)
A.4.b Find funding to increase startup packages by seeking/creating external ‘named sponsorships.’ (Department Chair, Academy, Advancement, Timeframe: Starting 2012, $200K per faculty startup package, delayed)

Action Item A.5: Develop strategies for female/minority faculty recruitment
A.5.a Identify/contact strong Ph.D. students from this group across the country that should be available within necessary timeframe. (Department Chair, Technical Committee Chairs, Timeframe: Starting 2012, implement annually)
A.5.b Work closely with NSBE, SHPE, SWE, AISES, etc., to build candidate pool. (Department Chair, Search Committee Chairs, Timeframe: Starting 2012, annually)
A.5.c Leverage campus initiatives and foundation grants for startup packages for strong female/minority candidates. (Department Chair, Timeframe: Starting 2012, $300K per faculty startup package, delayed)

Action Item A.6: Develop Non-Tenure-Track Faculty Plan
A.6.a Establish performance expectation guidelines for NTT faculty. (Department Chair, Timeframe: 2012, completed)
A.6.b Produce promotion guidelines, similar to P&T guidelines for Tenure Track faculty. (P&T Committee Chair, Department Chair, Timeframe: 2012, completed)
**Theme B: Expand graduate education opportunities and research**

**Relevance to the Campus Plan:**
Theme B of the MAE Plan promotes growth of the graduate program with a focus on the PhD component. This growth is encouraged through improved funding to support students, visibility of faculty research programs, among other actions. These efforts support the Campus Plan actions described under:

**Lever 1.2** – Foster innovation and creativity for faculty, staff and students.
**Lever 3.1** – Evaluate current academic programs and create, modify, eliminate or combine in order to ensure a relevant portfolio that supports S&T's Carnegie classification as a national research university.
**Lever 4.5** – Engage in transformative doctoral student recruiting/retention and placement.

**Key customer groups impacted:** Research based graduate students, research investors, distance and online students.

**Measures for Theme B:**

<table>
<thead>
<tr>
<th>Measure</th>
<th>2011</th>
<th>Targeted (2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average GRE (Qualitative)</td>
<td>728</td>
<td>760</td>
</tr>
<tr>
<td>Average GRE (Analytical)</td>
<td>3.37</td>
<td>3.5</td>
</tr>
<tr>
<td>Master Thesis students (per T/TT)</td>
<td>108</td>
<td>1.25</td>
</tr>
<tr>
<td>Ph.D. (Doctoral) students (per T/TT)</td>
<td>44</td>
<td>2.5</td>
</tr>
<tr>
<td>Master Non-Thesis students (per T/TT)</td>
<td>37</td>
<td>1.25</td>
</tr>
<tr>
<td>Certificate (per T/TT)</td>
<td>41</td>
<td>1.25</td>
</tr>
<tr>
<td>Total number of graduate students (all categories)</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>Undergraduate (no FE)/total graduate student ratio</td>
<td>3.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Research expenditures/(T/TT faculty)/year</td>
<td>124K</td>
<td>200K</td>
</tr>
<tr>
<td>Journal articles/(T/TT faculty)/4 year period</td>
<td>4.5</td>
<td>7.0</td>
</tr>
<tr>
<td>T/TT Faculty who are journal editors or associate editors</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Percentage of T/TT faculty involved on national technical committees</td>
<td>8</td>
<td>50</td>
</tr>
<tr>
<td>GRA/GTA ratio</td>
<td>2.1</td>
<td>3</td>
</tr>
</tbody>
</table>
Themes/Actions Items

Action Item B.1: Increase size and quality of Ph.D. programs
Develop a program for graduate fellowships in order to support doctoral students during their first year of Ph.D. work. (Graduate Chair, Department Chair, and Academy/Development, Timeframe: 2012-2016, $25K per Ph.D. student, four fellowships)

Action Item B.2: Improve graduate student recruitment
Develop formal outreach approach to outstanding on-campus undergraduate students. Strengthen connections with key international universities. Utilize current graduate students and recent graduates for recruitment/information dissemination about graduate program. (Graduate Chair, Department Chair, Timeframe: Develop 2012-2013, implement annually)

Action Item B.3: Improve graduate student productivity/quality
Establish guidelines for recommended number of publications for graduate students. (Graduate Chair, Department Chair, Timeframe: 2012, deleted 2012)

Action Item B.4: Establish data-base for tracking Ph.D. placement and career path, and work to place best students (especially those already in professional roles) in academia. (Graduate Chair, Department Chair, Timeframe: 2012-2014)

Action Item B.5: Review current graduate curriculum regulations/requirements in order to support growth of graduate program (to meet targeted measures). (Graduate Chair, Department Chair, Timeframe: 2012, completed)

Action Item B.6: Significantly increase research funding per faculty
B.6.a Develop incentives through faculty workload policy and available merit raises in order to increase/reward proposal writing and grants awarded and to encourage faculty to pursue high risk/high reward funding in targeted situations. As part of faculty workload policy, decrease teaching loads in a coordinated fashion for research active faculty and for new (tenure-track) faculty. (Department Chair, Timeframe: 2013, implement annually)
B.6.b Find external support for a technician and a secretary for support of research activities. (Department Chair, Academy, Timeframe: 2013-2015, $60K (rate) for technician, $40K (rate) for secretary)

Action Item B.7: Increase faculty scholarly activities
Develop incentives through faculty workload policy and available merit raises in order to increase/reward important scholarly activities such as writing of books, prestigious journal articles, etc. Develop plan to showcase and advertise faculty scholarly activities both within the Department and across the campus and research communities. (Department Chair, Technical Committee Chairs, Graduate Chair, Timeframe: Starting 2012, implement annually)

Action Item B.8: Increase national and international visibility of faculty
Develop incentives through faculty workload policy and available merit raises in order to encourage faculty to apply for prestigious awards in their research communities, take leadership roles in their professional communities and to become fellows in their professional societies. For junior and mid-level faculty, use incentives to encourage faculty to become involved in their professional communities and apply for awards specifically for young faculty. (Awards Committee, Department Chair, Timeframe: Start in 2012, three award applications per year)
Themes/Actions Items

**Theme C: Improve quality of the undergraduate programs**

Relevance to Campus Plan:
The Theme C of the MAE Plan brings attention to ensuring continual improvement in the quality of the undergraduate program in an environment of strong and growing enrollment. These actions clearly support the Campus Plan through actions under:

**Lever 2.2 – Leverage S&T as Missouri’s technological research university.**

Key customer groups impacted: Undergraduate students, employers.

Measures for Theme C:

<table>
<thead>
<tr>
<th>Measure</th>
<th>2011</th>
<th>Targeted 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate student (no freshman) to T/TT faculty ratio</td>
<td>&gt; 25</td>
<td>19</td>
</tr>
<tr>
<td>Undergraduate student (no freshman) to total faculty ratio</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>Total student (UG and Graduate) to T/TT faculty ratio</td>
<td>33</td>
<td>25</td>
</tr>
<tr>
<td>Entrance GPA requirements (from FE - non transfer)</td>
<td>2.5</td>
<td>*</td>
</tr>
<tr>
<td>Entrance GPA requirements (transfer)</td>
<td>2.5</td>
<td>*</td>
</tr>
<tr>
<td>Entrance coursework requirement</td>
<td>min grades in specific courses</td>
<td>*</td>
</tr>
<tr>
<td>Off-campus technical/fundamental course substitutions</td>
<td>Open</td>
<td>*</td>
</tr>
<tr>
<td>Retention rate and average time to graduate</td>
<td>**</td>
<td>TBD</td>
</tr>
<tr>
<td>Senior assessment method</td>
<td>Fund. Eng. Exam (required)</td>
<td>Department exam</td>
</tr>
</tbody>
</table>

* Targets to be established; see action item C.1
** Data being obtained
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Themes/Actions Items

Action Item C.1: Monitor and manage the undergraduate enrollment with focus on student to faculty ratio and on improving the quality of undergraduate students admitted into the programs
Examine current student quality measures and issues and suggest methods and measures for review of the faculty in order to ensure increased emphasis on student quality. Improve and strengthen the entrance criteria for admittance into the Department by developing a plan for objective and Department-specific evaluation of entering students. Explore requiring a departmental entrance examination that will be required for all students. Construct a data-base tool that provides complete and cross-checked pre-requisite histories on all students that is cross-linked with current student performance to allow identification of weak links in requirements/academic paths for undergraduate students. (Department Chair, Undergraduate Associate Chairs, Timeframe: Analysis 2012-2013, implement annually, follow-up analysis 2014-2016)

Action Item C.2: Monitor and continuously evaluate student GPA performance
Formally examine and annually report on average student GPA and attempt to institute reasonable uniformity in terms of student performance/learning across sections. Develop process to identify and, if necessary, mitigate grade inflation/compression within the Department. (Department Chairman, Timeframe: Starting 2012, implement analysis and process annually)

Action Item C.3: Reassess and, as deemed necessary, revamp curriculum in order to reflect major changes in engineering sciences and industry/professional requirements
Require technical committees to formally assess relevant curriculum and courses at periodic intervals, via reports to the Department Chair, in order to assure that the curriculum is uniformly preparing students for the technical work environment/graduate environment they will encounter. Formally structure a process such that Academy representatives can advise on curriculum as well. (Department Chair, Associate Chairs, Technical Committee Chairs, Academy, Timeframe: Initiate in 2013, implement annually)

Action Item C.4: Improve type and quality of undergraduate advising
Hire staff member for undergraduate advising (routine advisement) and appropriately restructure Departmental advising process. This staff member will handle all routine advisement needs (Departmental and Freshman Engineering). Set up a centralized career advising resource for undergraduates (data base of recent graduates who have entered the profession with courses taken, type of employment, etc.). Develop a process linked with academic advising that targets qualified undergraduate students for undergraduate research (preferential selection). (Department Chair, Associate Chairs, Advising Staff, Timeframe: 2013, implement processes annually)

Action Item C.5: Establish rigorous and meaningful requirements for senior exit assessment examination
Develop, recommend, and implement procedures that will produce meaningful senior exit assessment scores and analysis (i.e., minimum score requirement to graduate or pass/fail notation on transcript). (Department Chair, Associate Undergraduate Chairs, Program Assessment Committee, Timeframe: 2013-2014, implement annually)
Thematic Actions Items

*Theme D: Improve the department instructional laboratories*

**Relevance to Campus Plan:**
Theme D of the MAE Plan focuses on transforming the instructional laboratories. This theme was the genesis of the Campus Plan action item 3.3.1. Hence in addition to supporting the development of Lever 3.3 of the Campus Plan, Theme D of the MAE Plan also addresses actions under:

**Lever 4.2 – Enhance instructional labs and methods of developing lab experiences.**

**Key customer groups impacted:** Research based graduate students, undergraduate students.

**2011 status:** Currently the instructional laboratories in the Department of Mechanical and Aerospace Engineering consist of a series of prescribed experiments, conducted for students, in a two-or-three course sequence over the undergraduate curriculum. Most experiments aim at making a connection between concepts taught in lecture courses and actual engineering hardware as well as having the students encounter some level of hands-on experience. Most experiments were designed many years ago with the objective of demonstrating a single principle or concept for use in only one lab course. As a result, most experiment stations are only used by a student one time in their undergraduate education. Often this one time experience is not in parallel with the teaching of the engineering principle in the lecture; hence, a critical teaching moment is lost.

**2020 target:** The laboratory environment in the Department will provide curriculum-integrated lab experimental stations and associated systems integration equipment and hardware that can serve all aspects of our program and curriculum (undergraduate and graduate instructional purposes, and potentially some related research activities). This laboratory environment will be continuously and proactively supported (i.e., funded and maintained) and kept relevant to the curriculum and needs of the Department.
Action Item D.1: Develop and implement plan for producing/developing/purchasing innovative and significant upgrades in current instructional laboratory equipment and experiments. This plan should be focused on the production, development, and/or purchase of a suitable mix of integrated laboratory experimental stations and flexible systems integration modules that can serve the curriculum. (Department Chair, Laboratory Committee Chair, Technical Committee Chairs, Development, Academy, Timeframe: Starting 2012, $100K per year)

Action Item D.2: Obtain external funding for instructional laboratory development and operation and maintenance. (Department Chair, Academy, Development, Timeframe: Starting 2013-2017, build $2M endowment)

Action Item D.3: Provide continuous staff/faculty support for laboratory development, maintenance and improvement. Find funding in order to hire a suitable staff member for the specific purpose of overseeing laboratory development, operation, and maintenance. (Department Chair, Academy, Timeframe: 2015)
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Themes/Actions Items

**Theme E: Establish and improve ties with alumni**

**Relevance to Campus Plan:**

Theme E of the MAE Plan was developed in conjunction with a sub-committee of the AMAE and is included to ensure attention is paid to fostering the connection between the department and its alumni. With the Academy, the department efforts here support the Campus Plan efforts under:

**Lever 3.2** – Centralize corporate relations to improve service to corporate partners and identify and establish new partnerships…
**Lever 3.5** – Create and implement a student and alumni lifetime engagement strategy.

**Key customer groups impacted:** Employers, donors.

A primary interface between the department and the alumni is through the Academy of Mechanical and Aerospace Engineering. Based upon the AMAE mission, the following three primary roles for the Academy were identified by the AMAE. Each of these roles will be taken as ongoing action items:

**Action Item E.1** Consultancy: To provide advisory guidance and counsel at the call of the Mechanical and Aerospace Engineering chair, faculty or students. This committee will provide guidance and counsel to the MAE Department. This includes supporting the creation of the Vision 2020 Strategic Plan, the annual assessment of the realization of the plan, and the updates to the plan.

**Action Item E.2** Ambassadorship: To strengthen the dedication to and understanding of students to mechanical and aerospace engineering through personal and professional example. The Academy will support the MAE Strategic Plan by defining the skills and characteristics that are required of MAE graduates to be successful in commercial business. The Academy will work with the MAE faculty to translate the skills and characteristics into actionable strategies for attracting the required caliber of students, and developing the MAE products to transform these students into capable engineers.

**Action Item E.3** Sponsorship: To advance the objectives of the development program by identifying, securing, and providing financial support for the Mechanical and Aerospace Engineering program. Specifically, the Academy will support the MAE department by helping to develop and promote the strategic plan with stakeholders that can provide financial support necessary to execute the Department’s vision.
Theme F: Create a Department environment that acknowledges and rewards staff contribution and performance

Relevance to Campus Plan:

Theme F of the MAE Plan focuses on developing and recognizing the staff contributions to the department and to assist them in their continuing efforts to meet the needs of the many customers and constituents they serve. These actions support the Campus Plan through:

Lever 1.2 – Foster innovation and creativity for faculty, staff and students.
Lever 3.4 – Promote inclusion and increase diversity of faculty, staff and students to remain relevant and competitive in a global environment.

Key customer groups impacted: Undergraduate students, research based graduate students, distance and online students, research investors, employers, donors.

Action Item F.1: Promote interaction between faculty, staff and students.
F.1.a Upgrade the faculty/staff lounge. (Staff Committee, Administrative Associate, Shop Supervisor, Department Chair, Timeframe: Starting AY 2013, completed)
F.1.b Provide more social activities for faculty and staff interaction. (Staff Committee, Shop Supervisor, Administrative Associate, Faculty, Department Chair, Timeframe: Starting 2012, three per year)
F.1.c Create an information sheet for the website for use by faculty and students which lists the capabilities and protocols for working with the technical and electronic shop. (Staff Committee, Shop Supervisor, Administrative Associate, Department Chair, Timeframe: Starting 2013, ready 2014)

Action Item F.2: Create a welcoming environment for students, prospective students, and alumni
F.2.a Review and update department website and media. (Staff Committee, Administrative Associate, Department Chair, Timeframe: Starting 2012, website complete 2014)
F.2.b Provide opportunities for showing department support of campus activities. (Staff Committee, Administrative Associate, Department Chair, Timeframe: Starting 2012, annually)
F.2.c Develop and implement a plan for improving furniture/aesthetics in Toomey Hall. (Staff Committee, Shop Supervisor, Administrative Associate, Faculty Committee, Department Chair, Timeframe: Plan 2014, implement annually)
Themes/Actions Items

**Action Item F3:** Review infrastructure and functions for staff efficiency.

- F3.a Develop and implement a plan for reorganization of the administrative suite. (Secretarial Committee, Administrative Associate, Department Chair, Timeframe: Starting 2012, completed)
- F3.b Develop and implement a plan for replacing old office and shop equipment. (Staff Committee, Shop Supervisor, Administrative Associate, Department Chair, Timeframe: Plan 2014, implement annually)
- F3.c Benchmark department positions with similar positions in the other engineering departments. (Staff Committee, Shop Supervisor, Administrative Associate, Department Chair, Timeframe: Starting 2013)
- F3.d Review/restructure secretarial staff assignments. (Secretarial Committee, Administrative Associate, Department Chair, Timeframe: Starting 2012, implement 2013, complete 2015)
- F3.e Research the procedures for reclassifying positions. (Administrative Associate, Department Chair, Timeframe: Starting 2012, completed)
- F3.f Identify funding sources and reclassify identified staff positions. (Administrative Associate, Department Chair, Timeframe: Starting 2013, complete 2016)
- F3.g Review/restructure the work order system in order to track time spent on each project. (Staff Committee, Shop Supervisor, Department Chair, Timeframe: Starting 2013, implement 2014)

**Action Item F4:** Establish a recognition program to recognize high performing staff teams.

- F4.a Benchmark department recognition with similar departments on campus/other universities. (Staff Committee, Shop Supervisor, Administrative Associate, Department Chair, Timeframe: 2014)
- F4.b Develop the criteria to recognize high performing staff and teams. (Staff Committee, Shop Supervisor, Administrative Associate, Department Chair, Timeframe: 2014)
- F4.c Implement the recognition program. (Administrative Associate, Department Chair, Timeframe: Starting 2015)
- F4.d Provide team development activities. (Staff Committee, Administrative Associate, Department Chair, Timeframe: Starting 2014)
Implementation and Assessment Process for Strategic Plan:

Progress toward reaching the goals and objectives developed in this Strategic Plan will be regularly assessed by the Department and representatives of the Academy. In addition, the individual priority goals and objectives and associated specific action items that are outlined in this document will also be regularly scrutinized and reassessed as part of this same process. If deemed necessary or appropriate, and approved by the faculty and staff, items within this Plan can be modified or changed based on current conditions or new developments. These required reassessments and potential updates will therefore focus on the degree of satisfactory progress in achieving the objectives set forth in the Strategic Plan, as well as the continuing suitability of priority goals and action items themselves.

Therefore, in order to provide such assessment, the Department Chair will make an annual report to the faculty in the fall semester during an annual Faculty Retreat and to the staff at the first fall staff meeting. This report will focus on the various performance measures associated with each specific theme, review policies and progress related to each specific theme and its associated action items, and suggest possible changes or refinements to the Plan. The faculty and staff will provide suitable modifications to the written document. The written Strategic Plan will then be reissued in the fall semester of each year to the Department faculty and staff and to the Mechanical and Aerospace Engineering Academy.

Additionally, the department will prepare an annual tactical plan at the conclusion of the faculty retreat. This tactical plan will delineate specific actions or components of actions to be completed that academic year to support the expected incremental changes in the strategic measures. This tactical plan will include as part of the analysis the impact of changes in anticipated resources and expectations for the department. The Department Chair will also continually seek and obtain specific input from the faculty through the Departmental Advisory Committee, from the Academy via discussions and meetings with MAE Academy representatives, and from the Staff.