GOVERNMENTAL CODE

of the

DEPARTMENT OF MECHANICAL ENGINEERING

The University of Kansas

Approved by the Mechanical Engineering Assembly on January 27, 2014.
I. **OBJECTIVES.** This code describes a governmental structure for effective coordination of decision making, and the conduct of the affairs of the Department.

II. **GOVERNANCE STRUCTURE.** The governance structure consists of (a) the Department Chair and (b) the Mechanical Engineering Assembly (MEA), which consists of all faculty members who are budgeted at least half time in the Department at the rank of Assistant Professor or above.

   a. **Department Chair.** The Chair is the Department’s chief administrative officer, deriving authority through the administrative channels of the Dean of the School of Engineering, the Provost and Vice Chancellor for Academic Affairs, the Chancellor, and the Board of Regents. The Chair shall:

      1. Engage in long-range planning, and propose departmental goals and policies.
      2. Establish procedures to achieve departmental goals and implement policies.
      3. Seek and negotiate for the fiscal resources necessary to carry out the activities of the department and achieve departmental goals.
      4. Administer departmental policies by:
         - serving as the presiding officer at meetings of the MEA.
         - forming non-elective committees as needed and appointing members to the non-elective committees. The current committee structure is included in the attached document entitled *KUME Committees*.
         - eliminating committees with the advice of the MEA.
         - allocating financial resources with the advice of the MEA.
         - reporting the state of the department to the MEA in matters such as budgetary decisions, enrollments, academic policies, staff issues, including pertinent information obtained from various sources within the University.
         - appointing an Associate Chair and Scheduling Officer.
      5. Promote and seek resources for the department by:
         - Encouraging development of research and funding.
         - representing the Department to industry, alumni, and the public.
         - appointing and convening meetings of an Advisory Board as described in the attached *Bylaws of the Mechanical Engineering Advisory Board*.
         - working with the Kansas University Endowment Association in fundraising efforts.
         - representing the Department in its relations with other departments of the School of Engineering and across the University.
         - overseeing the development and dissemination of departmental promotional materials.
         - negotiating for the hiring of new faculty members with the advice of the MEA.
         - negotiating for the hiring of new staff members with the advice of the MEA.
      6. Administer the allocation of fiscal resources with the advice of the MEA.
7. Evaluate and promote faculty and staff success by:
   • reviewing the performance of faculty members as described in the attached *Department of Mechanical Engineering Faculty Evaluation Plan*.
   • reviewing faculty candidates for promotion and/or tenure as described in the attached *Policies and Procedures for Promotion and Tenure Evaluations*.
   • providing oversight of departmental staff members, and evaluating those staff members who report directly to the Department Chair.

The Department Chair has the authority to render final decisions regarding the administrative affairs of the Department within limits established by the Dean of the School of Engineering, the Engineering Senate, the Provost and Vice Chancellor of Academic Affairs, the Chancellor, and the University Senate. The Chair may delegate authority, but not responsibility, as is deemed desirable to effectively and efficiently promote the growth and vitality of the Department.

b. **Mechanical Engineering Assembly (MEA).** The MEA has the responsibility to develop and implement various policies of the department. The MEA will establish its own organization and rules for the conduct of its business as described herein. More specifically, the MEA will:
   1. Develop the academic policies of the Department including but not limited to:
      • undergraduate curricula and degree requirements as in the attached *Undergraduate Student Handbook*.
      • graduate curricula and degree requirements as in the attached *Graduate Student Handbook*.
      • general course content and catalog descriptions of the courses.
      • standards of scholastic or professional attainment for special awards.
   2. Establish the MEA organization and rules for conducting MEA business including:
      • developing and modifying this document including the attachments.
      • establishing committees. The current committee structure is included in the attached document entitled *KUME Committees*. All committee memberships are appointive except for the Faculty Rights, Privileges and Responsibilities (FRPR) committee, which is elective.
      • serving on committees. Appointive committee members shall be selected by the Department Chair with concurrence of the faculty (or staff) members involved. Committee assignments for the upcoming academic year will be presented to the MEA by the Department Chair no later than the start of the fall semester. If required, three elective members of the FRPR committee shall serve for one year. If FRPR committee action is required, the Department Chair shall mail an election ballot to each MEA member to determine the three members of the FRPR. Ballots shall be tallied by a Teller Committee appointed by the MEA, which shall file a written or e-mail report of the election results to the members of the MEA. Ten days will be allowed for the return of the ballots. The Department Chair is ineligible to serve on the FRPR committee.
      • recommending elimination and consolidation of committees.
   3. Provide guidance to the Department Chair regarding allocation of resources.
   4. MEA business is conducted as follows.
- At least two meetings, called by the Department Chair, will be held each semester. Special meetings must convene within two weeks if requested by a majority of the MEA members. Fifty percent of MEA membership shall constitute a quorum.

- The order of business in MEA meetings is:
  i. Consideration of minutes of the previous meeting.
  ii. Announcements by the Chair and unfinished business.
  iii. Committee reports.
  iv. New business.
  v. Adjournment.

Suspension of the preceding order of business shall occur at any meeting by an affirmative two-thirds vote of the members present.

- Voting shall occur as follows:
  i. Business is transacted by majority affirmative vote of MEA members present unless noted otherwise herein. A quorum is required.
  ii. Any MEA member may request and obtain a roll call vote upon majority affirmative vote of the members present.
  iii. Secret written balloting may be obtained by majority affirmative vote of members present.
  iv. Special voting procedures are included in the attached *Policies and Procedures for Promotion and Tenure Evaluations*.

- Minutes will be prepared by a staff person attending the faculty meetings. Draft minutes will be distributed to members of the MEA within two weeks after the meeting. Meeting agendas will be prepared by the Department Chair who will also solicit input for the agendas from the MEA members. The minutes and pertinent correspondence will be maintained in the permanent records of the ME office.

- A parliamentarian shall have full power to render decisions and interpretations of the Rules of Order when so requested, referencing *Roberts Rules of Order*. The parliamentarian shall be elected by the MEA.

5. Consider and act on such matters as may be placed before it by the Chancellor, the Provost and Vice Chancellor for Academic Affairs, the Dean of the School of Engineering, the Department Chair, faculty committees and members of the faculty.

III. **AMENDMENTS TO THE GOVERNANCE CODE.** This code may be extended, amended, or repealed at any regular or special meeting of the MEA by two-thirds affirmative vote of the members present, providing that written notice of the proposed change(s) shall have been sent to each MEA member at least 10 days prior to the meeting date on which the change is to be considered, and provided that a quorum is present. Amendments of this code that are inconsistent or incompatible with the rules of the Engineering Senate, or the University Senate, shall not be adopted.

IV. **PROMULGATION OF THE GOVERNANCE CODE.** This code shall become effective immediately upon approval of the majority affirmative vote of the MEA at any regular or special meeting of the MEA. Each new member of the MEA shall receive a copy of this code. A copy of this Code shall be maintained on file in the Mechanical Engineering office and be available upon request.

This concludes the Governance Code.
APPENDIX A

KU Mechanical Engineering

Current Committees and Committee Structure
**KUME COMMITTEES**

**Academic Year 2013 -2014**

**THREE PRIMARY COMMITTEES**

1. **Undergraduate Affairs (Members are Lorin Maletsky, Ted Bergman, Ken Fischer, Lisa Friis, Sarah Kieweg, Carl Luchies, Peter TenPas)**
   
   **Primary Committee Coordinator: Associate Chair, Lorin Maletsky**
   
   - Curriculum and Academic Standards (Lorin Maletsky* + Carl Luchies1 + Lisa Friis2 + Peter TenPas3)
   - Objectives/Outcomes/ABET/CTE (Ted Bergman + Lorin Maletsky* + Ken Fischer1 + Lisa Friis2)
   - Undergraduate Student Awards (Ted Bergman + Ken Fischer*2 + Sarah Kieweg3)
   - Recruitment (Sarah Kieweg2 + Lin Liu3x + Doug Kieweg)

   **Notes:** Physics/Math/Chemistry Liaison is Peter TenPas. *Guest Member of the Undergraduate Affairs Committee. (1)→term expires 6/30/2014 (2) →term expires 6/30/2015 (3) →term expires 6/30/2016.

2. **Graduate Affairs (Members are Robb Sorem, Karan Surana, Candan Tamerler, Bedru Yimer)**
   
   **Primary Coordinator: Graduate Director, Robb Sorem**
   
   - Recruiting and Offer Letters (Robb Sorem + Chris Depcik1x + Candan Tamerler2)
   - Qualifying Exam Coordinator (Robb Sorem)
   - Academic Standards (Karan Surana1 + Bedru Yimer2) **
   - Graduate Student Awards (Robb Sorem + Karan Surana1 + Candan Tamerler2)
   - Student Travel Opportunities (Robb Sorem)
   - Executive Council for Graduate Faculty (Robb Sorem)
   - KU/KUT Joint Graduate Program (Ted Bergman + Robb Sorem)

   **Note:** **Coordinates with current ME representative on SoE curriculum committee. *Guest Member of the Graduate Affairs Committee. (1)→term expires 6/30/2014 (2) →term expires 6/30/2015 (3) →term expires 6/30/2016.**

3. **Faculty Affairs (Ron Dougherty, Terry Faddis, Paulette Spencer, Bedru Yimer)**
   
   - Promotion and Tenure Coordination (Bedru Yimer1, Ron Dougherty2*, Terry Faddis3, Paulette Spencer4)
   - FRPR (membership on this committee will be as required)
   - Sabbatical Leave (Bedru Yimer1* + Terry Faddis2, rotates among the 4 faculty members on the committee)

   **Note:** (1)→term expires 6/30/2014 (2) →term expires 6/30/2015 (3) →term expires 6/30/2016 (4) →term expires 6/30/2017.

* KUME representative at the School or University level.
Committee structure approved by MEA, August 20, 2013

THREE SUPPORTING COMMITTEES

4. Facilities (Ron Dougherty, Karan Surana, Xinmai Yang)
   o Laboratories, Space and Computers (Ron Dougherty\textsuperscript{1} + Karan Surana\textsuperscript{2} + Xinmai Yang\textsuperscript{3} + Doug Kieweg)

   \textit{Note: (1)→term expires 6/30/2014 (2)→term expires 6/30/2015 (3)→term expires 6/30/2016}

5. ME Representation on School of Engineering Committees (Terry Faddis + Peter TenPas + Sara Wilson)
   o FRPR (Sara Wilson\textsuperscript{2})
   o Engineering Senate Executive Committee (Terry Faddis\textsuperscript{1})
   o Library (Peter TenPas\textsuperscript{2})
   o Graduate Studies and Research Committee (Peter TenPas\textsuperscript{2})**
   o Computer Committee (Karan Sarana\textsuperscript{1})

   \textit{Notes: **Coordinates with the Graduate Director. (1)→term expires 6/30/2014 (2)→term expires 6/30/2015 (3)→term expires 6/30/2016}

6. Other Committees
   o Faculty Awards (Ted Bergman + current Kipp Awardee\textsuperscript{1} + current Cramer Awardee\textsuperscript{1} + one faculty member from another SoE department)
   o Seminar Coordinator (Lin Liu...note: bioengineering seminars handled by Assoc. Director of Bioengineering Program)
   o Student Organizations and Activities including EXPO [ASME (Peter TenPas), BMES (currently filled by CPE faculty member), Pi Tau Sigma (Carl Luchies), SAE (Robb Sorem)]
   o Undergraduate Scholarships and Graduate Scholarships/Fellowships (Ted Bergman, Robb Sorem\textsuperscript{1} + Sara Wilson\textsuperscript{2} + Xinmai Yang\textsuperscript{3})
   o Teaching Collaboration Chairs (Lorin Maletsky, Peter TenPas, Sara Wilson, Xinmai Yang)
   o Bioengineering
      i. BERC Director (Paulette Spencer)
      ii. Academic Director (Sara Wilson)/Associate Directors (Ken Fischer)
      iii. Tracks (Lorin Maletsky, Lisa Friis co-lead with Sara Wilson)
   o Faculty Search Committee (Chris Depcik (chair), Ron Dougherty, Sarah Kieweg, Carl Luchies)

   \textit{Notes: (1)→term expires 6/30/2014 (2)→term expires 6/30/2015 (3)→term expires 6/30/2016. Term durations are not specified for variable-load committee responsibilities.}

   This concludes the list of committees.

* KUME representative at the School or University level.
APPENDIX B

KU Mechanical Engineering

ByLaws of the Mechanical Engineering Advisory Board
The KU Mechanical Engineering Advisory Board serves as a catalyst to encourage and enable continuous improvement of: (i) the value of engineering degrees conferred by the University of Kansas and (ii) the national and international stature and reputation of the KU Mechanical Engineering Department.

Expectations and Objectives

Each member of the Advisory Board is expected to:

1. Be a staunch advocate for the Department’s students, faculty and alumni, promoting the Department as appropriate.
2. Provide independent advice regarding current and emerging trends, challenges, and opportunities in industry and business, as well as in government and academia.
3. Provide independent advice on matters important to the Department.
4. Actively participate in Board functions and Board meetings.
5. Be available to provide pertinent advice to the Department Chair on an individual, as-needed basis.
6. Encourage alumni and corporate friends of the Mechanical Engineering Department to support the Department financially in order to provide the means to attract and retain students and faculty.

The following sections of the Bylaws are not meant to be a rigid set of firm rules. Rather, the Board structure and activities (meetings) will adhere to the following general guidelines.

Board Structure

The Board will consist of alumni and friends of the Department who are respected members of their professional communities. They will be (or have been) leaders (or potential leaders) in business, industry, government, or academia. The typical term for Board membership is three years, renewable upon mutual agreement between the Board member, the Chair of the Board, and the Department Chair. Current Board members and the Department Chair may nominate prospective Board members. The Department Chair and the Chair of the Advisory Board will jointly invite selected nominees to join the Board. Board members will be formally appointed by, and serve at the pleasure of the Department Chair.

The Chair of the Advisory Board will be appointed by the Department Chair, and will typically serve for two years, renewable upon mutual agreement between the Department Chair and Chair of the Board. New Advisory Board Chairs will be appointed at the end of the academic year (that is, toward the end of the Spring semester).

Board Meetings

The Advisory Board will hold two one-day meetings on the KU campus, one in the Spring and one in the Fall. Additional meetings may be called if circumstances warrant. The duration of the meetings (one-day for each meeting) may be modified by advance vote of the Board. The Chair of the Advisory Board will preside at the meetings.
APPENDIX C

KU Mechanical Engineering

Faculty Evaluation Plan
Department of Mechanical Engineering  
Faculty Evaluation Plan

Approved by the Faculty on November 11, 2013

Approved by Dean Michael Branicky on (date)

Approved by Provost Jeffrey Vitter on (date)

Introduction

1. Unit Expectations: The departmental expectations in teaching and advisement, scholarly or creative activity, and service are that the typical faculty member will dedicate 40% of his/her effort to teaching and advisement, 40% of his/her time to scholarly or creative activity, and 20% of his/her time to service.

2. Standards for Acceptable Performance for Faculty Members: The Department of Mechanical Engineering is dedicated to excellence in teaching, research, and service. Here, teaching includes both undergraduate and graduate teaching, as well as the mentoring of graduate students and/or post-doctoral scholars. Satisfactory overall departmental performance in undergraduate teaching is evidenced by the accreditation of the undergraduate mechanical engineering program by the Accreditation Board for Engineering and Technology (ABET). Assessment of Departmental research performance is consistent with, but not limited to current Membership Indicators established by the American Association of Universities (Appendix B). In the department of Mechanical Engineering, service is primarily that which is applicable to (1) the Department and School of Engineering, and the University, (2) the global mechanical and bioengineering communities and (3) the global scientific and engineering community. Service to the local non-academic (non K-post doc), non-business community is included, but is of secondary importance.

Service and teaching loads for tenure-track faculty members are generally lower than for tenured faculty members in order for the tenure-track faculty members to develop externally-funded research programs.

For satisfactory performance in the basic areas of teaching, research, and service, the expectation is that a faculty member should be doing many of the items listed in Section I of Appendix C in a high quality manner. Those items listed in Section II of Appendix C are considered special activities and can be used as differential allocation activities.

Faculty members are required to submit electronic reports of activities to the Chairperson of the Department early in each Spring semester.

3. Differential Allocation of Effort: The Department of Mechanical Engineering recognizes that the specific contributions of individual faculty members to the Department’s portfolio of activities will vary somewhat depending on individual strengths, the stage of one’s career, one’s administrative responsibilities, special assignments to the University and/or the Nation, and Department needs. Nonetheless, the Department’s expectation is that each faculty member will engage in continuous scholarly growth throughout their entire career in order to make sustained contributions to the teaching and research enterprise at KU, and to ensure that our undergraduate and graduate students are
exposed to current engineering practices, pertinent and timely scientific knowledge, and contemporary tools used in the engineering profession.

Because the Department’s research performance is aligned with current AAU Membership Indicators (Appendix B) and since a main indicator is research funding, a word regarding external research funding is appropriate here. Specifically, the Mechanical Engineering Department recognizes that many aspects of external funding for academic research (e.g., expanding or contracting budgets of federal funding agencies, or shifting priorities of non-profit foundations that fund research) are largely beyond the control of individual faculty members and can impact an individual faculty member’s research funding either positively or negatively. Hence, a multi-year window is necessary to assess individual faculty members’ external research funding record.

The metrics of Appendix C are used to weigh and adjust allocations of faculty effort.

**Annual Evaluation System**

1. **Overview:** Faculty members are required to submit electronic reports of activities to the Chairperson of the Department early in each Spring semester. Faculty members should also submit an updated Curriculum Vitae, in electronic form, to the Chairperson. Summary teaching evaluations (including student summary evaluations – a single instrument having numerically-based assessment, as well as written student comments...see Appendix A) are also submitted electronically or in hard copy form to the Chairperson. The Chairperson meets with the individual faculty members and discusses their activities. A written report is generated regarding each faculty member’s activities as described below in Item 4. The Chairperson and the faculty member sign the report, which is filed in the Department archives.

2. **Portfolio or Annual Report Preparation:** Every year, an electronic report that covers teaching, research and service activities is to be completed by each faculty member. The format of the report is developed by the School of Engineering, and a copy is included in Appendix D. The period of time covered is one year. To be included with this report are summary teaching evaluations (including student summary evaluations).

Because of the rapid pace at which engineering education and research is evolving, faculty members are encouraged to make use of the “Other Comments” categories contained within the electronic report of Appendix D, and as listed in Appendix C, for their teaching, research, and service activities.

3. **Portfolio or Annual Report Review and Evaluation:** The Chairperson evaluates faculty activity reports and curriculum vitae with the general guideline that for satisfactory performance in the basic areas of teaching, research, and service; the expectation is that a faculty member would be doing many of the listed items of Section I of Appendix C in a high quality manner. The items listed in Section II of Appendix C are considered special activities that can be used as differential allocation activities. Plans for differential allocation of effort are established in the meeting between the faculty member and the Department Chairperson described in Item 1.

4. **Annual Evaluation Feedback Process:** A written summary of the evaluation will be provided to the faculty member, including descriptions of the performance in each of the three areas. The written summary also informs the faculty member of the opportunity to discuss the evaluation with the
Chairperson. The faculty member and Chairperson sign the written summary. Copies of the written summaries are retained by the Mechanical Engineering Department.

5. Outcomes of the Annual Performance Evaluation: Discussions between the faculty member and the Chairperson will include topics such as achievement of departmental and individual professional goals, differential allocation of effort, personnel decisions (progress toward promotion and tenure, non-reappointment, etc.) and merit salary adjustments. In the main, the discussions between the faculty member and the Chairperson are opportunities to provide:

- Feedback and assistance to any faculty member whose (1) productivity (i.e., quantity) and (2) impact (i.e., quality) significantly exceeds that of Mechanical (or Bioengineering) faculty members at peer institutions nationwide, as documented by the faculty member and assessed by the Chairperson. It is likely that a small fraction of the Department faculty members will fit this category.

- Constructive feedback to any faculty member whose productivity is significantly below Departmental expectations in terms of achieving many of the items listed in Appendix C. It is the goal of the Department that no faculty members will perform significantly below expectations. See Section 5.1.

- A basis for recommending merit salary increases using a holistic assessment of the individual faculty member’s contributions to the teaching, research, and service missions of the department. See Section 5.2.

5.1. If the Chairperson ascertains that a faculty member’s performance does not meet academic responsibilities as evidenced by a rating of unsatisfactory in any area of the department’s basic performance expectations (Section I of Appendix C) taking into account any differential allocation of effort assignments, and/or the faculty member does not meet the responsibilities specified in the Faculty Code of Conduct, the Chairperson will first meet with the ME Faculty Rights, Privileges, and Responsibilities Committee (FRPR) for advisory consultation and corroboration of the unsatisfactory rating, before meeting with and providing a written summary of the assessment to the faculty member concerned. The Chairperson will then meet with the faculty member to discuss and develop a written plan to address the area or areas of difficulty.

Demonstration of failure to meet academic responsibilities for a period of three of five years may result in a recommendation for dismissal from the Chairperson to the Dean of Engineering.

5.2. After review and analysis of faculty activity reports, the Chairperson provides a summary of the evaluation conclusions and the merit salary recommendation, along with all the faculty written information, to the Dean of Engineering for his/her review and action. After reviewing each faculty activity with the Dean, the Chairperson provides a written summary of the merit salary raise recommendation to the faculty member.

Merit salary earnings are distributed in the following manner. The Chairperson has up to 20% of the merit increase for discretionary distribution. The remaining 80% is divided equally into two parts. The first part is a merit allocation for satisfactory performance in the basic areas of teaching, research, and service (Section I of Appendix C). The second part is merit allocation for special activities, examples of which are listed in Section II of Appendix C).
6. Faculty Development Initiatives:

The following policies and initiatives are in place to promote faculty development.

New faculty members have reduced teaching and service loads to develop their research laboratories and research programs. New faculty members are provided with significant startup funds to, for example, hire research assistants and undergraduate researchers, and equip their research laboratories.

Currently (2013), travel funds of approximately $1750 ($3000) are provided annually to all Associate and Full Professors (Assistant Professors) to attend conferences and/or visit funding agencies.

Initiated in 2012, faculty members who serve as technical advisors for capstone design projects that are industrially-sponsored receive approximately $950 per year per project that can be used for business travel, as well as the purchase of supplies, books, and other (non-salary) expenses. Most department faculty members are currently advising industrially-sponsored capstone projects.

The Department of Mechanical Engineering has two endowed faculty awards that are conferred annually to recognize faculty achievement and to enable faculty development. The Harold L. Kipp Distinguished Teaching Award provides a $5000 cash stipend plus $5000 for discretionary use including faculty development. The Wesley G. Cramer Mechanical Engineering Faculty Award provides a $7000 stipend.

Currently (2013), five of the 18 tenured and tenure-track Mechanical Engineering faculty members hold endowed faculty titles, providing additional funds for discretionary support of teaching and/or research activities as well as faculty development. This is an increase from two faculty members holding endowed positions in 2011.

New faculty members are informally mentored by all members of the department, including the Chairperson. Associate Professors are mentored on an “as requested” basis by the Full Professors and Chairperson. Faculty members in the Mechanical Engineering Department continually participate in seminars and workshops provided not only by the Department but also by the School of Engineering and the University regarding teaching methodologies and effectiveness, as well as research.

7. Modifying the Plan:

The faculty of the Mechanical Engineering Department will place discussion of this document on the agenda of the first faculty meeting in the fall semester every year. At that time, if any changes are made to the document, they must be approved by a vote of the faculty. The revised document will then be submitted to the Provost’s office. If no changes are approved, the document on file in the Provost’s office will serve as the governing plan for that academic year unless the faculty chooses to modify it during the year.
APPENDIX A

The instrument used for the student evaluation of teaching is attached.
APPENDIX B

Membership Indicators established by the American Association of Universities are the following (See “AAU Membership Principles” adopted January 12, 1999 and revised April 20, 2010, available online).

Current membership indicators are separated into Phase I and Phase II categories:

Phase I:

1. Competitively funded federal research support.
2. Membership of faculty in the National Academies.
3. Faculty awards, fellowships, and memberships.

Phase II:

1. USDA, state, and industrial research funding.
2. Doctoral education.
3. Number of postdoctoral appointees.
4. Undergraduate education (i.e., an AAU university must educate undergraduates).
APPENDIX C

Section I: Basic Performance

A. Teaching

• 2 – 5 courses per year.
• Participation in normal on-campus advising (undergraduates) and advising of graduate students and/or postdoctoral scholars as well as visiting scholars.
• Conducting summary teaching evaluations
• Continual improvement of class and/or teaching laboratory content
• Participation in professional activities related to teaching
• Other

B. Research

• Conducting externally funded research
• Authoring or co-authoring refereed publications
• Making national and international technical presentations
• Participation in professional activities related to research
• Other

C. Service

• Provide service to the Department
• Serve on Departmental, School and/or University committees
• Participate in local and national technical and professional society activities
• Provide service to the community
• Other

Section II: Special Activities

• Teaching an extra course or courses
• Teaching an unusually large class (or classes) without adequate student assistance
• Teaching a laboratory course(s)
• Creation and funding of a new research laboratory or laboratories
• Supporting a high number of graduate students
• High rate of publication
• Writing a textbook(s)
• Taking on special administrative or committee assignment(s)
• Receiving special award(s)
• Serving on important national/regional committees
• Special involvement on behalf of students
• Other
APPENDIX D

School of Engineering Electronic Faculty Activity Form.

Need to include a copy here.
Mechanical Engineering Department Course & Instruction Evaluation

Please fill in your instructor name, class, and semester where it says SURVEY NAME on scantron
Fill in the bubbles for the COURSE NUMBER in SPECIAL CODES area

**Evaluation of Course:**
1. Course is required in my major:
2. My level of motivation:
3. Overall, course goals & objectives are met
4. Grade expected in this course:
5. I learned a lot in this class:
6. My approximate overall GPA:
7. Number of classes missed:

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**Evaluation of Instructor**
8. Command of the Subject
9. Clarity and organization
10. Fairness in grading
11. Pertinence of assignments
12. Availability outside class
13. Overall effectiveness

PLEASE WRITE ADDITIONAL COMMENTS ON THE ‘COMMENTS’ PORTION OF THE SCANTRON

Revised 4-13-2011
Student evaluations are made available to the instructor after semester grades are turned in and to the Chairperson and the Dean. These evaluations are considered in the allocation of merit salary increases and during promotion, tenure and sabbatical decisions.

Mechanical Engineering Department Course & Instruction Evaluation

Please fill in your instructor name, class, and semester where it says SURVEY NAME on scantron
Fill in the bubbles for the COURSE NUMBER in SPECIAL CODES area

**Evaluation of Course:**
1. Course is required in my major:
2. My level of motivation:
3. Overall, course goals & objectives are met
4. Grade expected in this course:
5. I learned a lot in this class:
6. My approximate overall GPA:
7. Number of classes missed:

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<td>Somewhat Low</td>
<td>Very Low</td>
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</tr>
<tr>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neutral</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
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<tr>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neutral</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
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<tr>
<td>&lt; 2.0</td>
<td>2.0-2.49</td>
<td>2.5-2.99</td>
<td>3.0-3.49</td>
<td>3.5-4.0</td>
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<td>&gt; 6</td>
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Please use this key for questions 8-13:

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<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>AB</th>
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</thead>
<tbody>
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<td>Above Avg.</td>
<td>Average</td>
<td>Below Avg.</td>
<td>Unsatisfactory</td>
<td>N/A</td>
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**PLEASE ANSWER THE FOLLOWING QUESTIONS ON THE COMMENTS PORTION OF THE SCANTRON**

Revised 4-13-2011
Student evaluations are made available to the instructor after semester grades are turned in and to the Chairperson and the Dean. These evaluations are considered in the allocation of merit salary increases and during promotion, tenure and sabbatical decisions.
APPENDIX D

KU Mechanical Engineering

Policies and Procedures for Promotion and Tenure Evaluations
Policies and Procedures for Promotion and Tenure Evaluations
Department of Mechanical Engineering

This document provides the procedures for promotion and tenure (P&T) evaluations with details on the timeline, evaluation procedures, and evaluation criteria. The Section 1 provides a chronological order of events for planning and executing the P&T evaluations. Section 2 includes standard position descriptions, criteria for promotion in rank and/or tenure (with regard to research, teaching and service), and standard descriptions of procedures for a) obtaining external evaluations, b) evaluating teaching, c) evaluating research, and d) evaluating service. This document makes reference to several university and school documents that are included for reference as attachments.

Recommendations concerning promotion and tenure must be made carefully, based upon a thorough examination of the candidate’s record and the impartial application of these criteria and procedures, established in compliance with the Faculty Senate Rules and Regulations (FSRR) Article VI.

These written procedures and criteria have been adopted by vote of the full Mechanical Engineering Assembly (all tenure-track faculty in the Mechanical Engineering Department) at a regularly scheduled meeting of this body.

The Mechanical Engineering Promotion and Tenure Committee will consist of all tenured faculty members at the rank of Associate Professor and above. Because the Mechanical Engineering P&T committee is a committee of the whole (i.e. all tenured faculty in the department), concurrence of a separate departmental committee of the whole is not applicable. For promotion cases from Assistant Professor to Associate Professor with Tenure, the full committee is eligible to participate in the evaluation and to vote on the evaluation levels and the overall recommendations for promotion and tenure. For promotion cases from Associate Professor to Full Professor, only tenured faculty at the Full Professor rank are eligible to participate in the evaluation and to vote on the evaluation levels and overall recommendation for promotion. The department chair may participate in the evaluations, but serves as a non-voting member of the Committee.

Confidentiality and Conflicts of Interest.
Consideration and evaluation of a faculty member’s record is a confidential personnel matter. Only those persons eligible to vote on promotion and tenure and the department chair may participate in or observe deliberations or have access to the personnel file (except that clerical staff may assist in the preparation of documents under conditions that assure confidentiality).

No person shall participate in any aspect of the promotion and tenure process concerning a candidate when participation would create a clear conflict of interest or compromise the impartiality of an evaluation or recommendation.

If a candidate believes that there is a conflict of interest, the candidate may petition to have that person recuse him/herself. If a committee member does not recuse him/herself, a decision about whether that person has a conflict of interest shall be made by a majority of
the other committee members. A quorum of at least 60% of eligible faculty members must be present to hold a vote on conflict of interest.

Section 1: Timeline of events

The review for promotion and/or tenure may be initiated by notification from the Provost for mandatory review. The review for promotion and/or tenure may also be initiated by the candidate prior to the mandatory review. All reviews for promotion to Full Professor are initiated by the candidate.

Note that this timeline directly addresses mandatory review. The department will not initiate a review, except in the case of mandatory review. Recommendations and requirements regarding candidate initiated review for either level are also included below.

Mid-January: Chair of P&T committee requests a list of at most 6 possible external reviewers from each candidate to be received by March 31. Candidates may also identify up to 2 individuals that they would not wish to be included as external evaluators. Per university guidelines, reviewers must hold an academic rank equal to or greater than the rank for which the candidate is being considered. Care should be taken in their selection, as all reviews received must be included in the package. Note that at least 6 external reviews are recommended by the university, and 4 are absolutely required, even with an explanation of circumstances if fewer than 6 letters are provided. Also note that the final list should not include more than 3 evaluators suggested by the candidate, and exceptions to this standard must be explained and justified in the P&T file. Thus, it may be in the best interest of the candidate to submit names of only 3 possible external reviewers. Candidate Initiated Review: January is the preferred time for a candidate to inform the P&T chair that he or she is initiating review for promotion and/or tenure. Even if the candidate is not certain, it is preferred to initiate the review at this time for planning purposes and to assure preparations are not rushed. The request for candidate initiated review can be withdrawn at any time.

Mid-March: Chair of P&T committee outlines tasks and obtains volunteers to evaluate teaching, research/publications, external evaluations, and service. Note that peer evaluations of untenured faculty teaching should be made at least once per year.

Chair of P&T committee reminds candidates that the list of external reviewers is due March 31. If March 31 is not a business day, the list will be due the next business day.

Early April: Chair of the P&T committee requests from the candidate copies of his/her current Candidate CV, and all publications by May 1 or the next business day. These documents or a subset thereof will be supplied to external reviewers. Candidates will be allowed to suggest a set of papers to be sent to the external reviewers, and the Candidate CV sent to external reviewers may be the official Candidate P&T
CV (formatted to current university requirements) or may be the candidate’s professional curriculum vitae formatted/organized differently according to the candidate’s preference.

Mid-April: P&T evaluation assignments are confirmed, and P&T committee approval is required for each external reviewer of each candidate.

Candidate Initiated Review: Note that candidate initiated review MUST be requested by April 15 (or the next business day), in order to be considered for evaluation in the next academic year.

Early May: Requests for external reviews are sent to potential reviewers. Include a summary of the candidate’s research area in the initial request letter. Note that external reviews are confidential to the extent permitted by law and university guidelines require that reviewers be made aware of this fact in the initial letter. Allow two weeks for a decision, and follow-up with phone calls if necessary.

Mid-May: Additional requests for reviewers may be sent out to account for non-responders or those who have declined to review.

Early June: Candidate CV for external evaluators, selected publications (4-7), and other relevant information will be sent to external reviewers. These documents will be prepared by the candidate in coordination with and approved by the department P&T chair. Request completed reviews by August 1.

P&T chair request names for possible support letters (internal) from each candidate.

Early August: P&T chair follows-up with late reviews to assure that a minimum of 6 reviews are received by September 1.

Mid-August: Candidates are notified/reminded that their complete P&T package (all promotion and tenure information (in current university format), publications, teaching evaluations, etc.) are due in the ME office on September 15 or the next business day. This allows time for the department to complete evaluations and forward the package on to the School of Engineering for further consideration. The candidate is responsible for completing and providing necessary documents and information, in accordance with the Provost’s guidelines, with assistance from the department.

September: P&T committee begins compiling evaluations based on currently submitted materials. This compilation continues into October, when evaluations should be completed for each candidate.

Early October: P&T committee develops draft official wording of candidate evaluations, summary statements, position descriptions, and so forth. Review of candidate
materials may continue, and candidates will be informed of typographical errors and other corrections they should make in their dossier.

Mid-October: P&T committee meets to finalize all sections of the evaluation and to vote on final disposition for each candidate. A quorum of at least 60% of the eligible faculty is required to vote on candidate ratings in each category of evaluation and on overall recommendation for promotion and/or tenure. A majority of affirmative votes (counting abstentions, though not recusals nor failures to vote, as non-affirmative votes) will result in a recommendation for tenure and promotion by the committee. The chair of Mechanical Engineering shall indicate separately in writing whether she or he concurs or disagrees with the recommendations of the committee. For candidates with a favorable evaluation and all candidates undergoing mandatory review, materials and department evaluations are sent to the School of Engineering for continued review, and a summary of the department evaluations and the chair’s disposition and comments is simultaneously provided to the candidate, along with a letter explaining the rationale for ratings in each category of teaching, research and service. Once the candidate’s P&T package is forwarded to the School of Engineering no further changes (additions or deletions) to the P&T package are allowed unless there is a request for additional information/materials from the school and/or university level committees.

Candidates will be provided with a summary of department evaluations and the chair’s disposition and comments. Each candidate undergoing non-mandatory evaluation and who receives an unfavorable evaluation will be asked if he/she wishes their package to be sent on to the School of Engineering for further review (as this is not automatic unless the review is mandatory). The department and candidate retain a copy of the signed Receipt of Evaluation Summary form.

Candidates with an unfavorable evaluation are given one week to respond to the departmental evaluations, using the official response form and supporting documentation. The response form must be submitted to the School of Engineering Promotion and Tenure Committee. If a response is provided by the candidate, both the department and the candidate retain copies of the signed Receipt of Candidate Response form.

November: The School of Engineering reviews the P&T package for each candidate. The school P&T committee may present a request for additional materials to the department. If a request for additional materials occurs, then the chair of Mechanical Engineering and the chair of the P&T committee will assist the candidate in responding to the request. The School of Engineering P&T Committee finalizes its ratings and recommendation(s).

December: The Dean of Engineering reviews each candidate’s P&T package, including ratings and recommendations at each level, and provides comments/disposition on each applicant prior to the P&T package being forwarded to the university level. The School of Engineering will provide a summary of the school-level
evaluations to the candidate. Candidates with unfavorable non-mandatory reviews will be asked whether or not they wish the package to be sent to the university level for review.

Candidates receiving a negative evaluation from the School of Engineering P&T Committee and/or the Dean of Engineering (as defined by university policy) will be allowed one week to provide a written response using the School of Engineering candidate response form. The response form must be submitted by the Candidate to the University Committee on Promotion and Tenure. If a response is provided, both the School of Engineering and the candidate shall retain copies of the Receipt of Response form.

January: The University Committee on Promotion and Tenure (UCPT) begins evaluation of P&T packages for candidates that are forwarded to the university level for final evaluations. The university committee may present a request for additional materials to the department. If a request for additional materials is received, then the chair of Mechanical Engineering and the chair of the P&T committee will assist the candidate in responding to the request. Once the candidate responds to the request for information from the UCPT, he/she should immediately consider preparing an appropriate response to a possible negative final recommendation by UCPT and/or the Provost to the Chancellor. If the candidate believes there are grounds for appeal, the candidate should immediately begin preparing to make an appeal. Information and guidance on appropriate grounds can be obtained from the chair of the Faculty Rights Board.

March: Candidate receives a summary of the final recommendation of the UCPT and the Provost. If UCPT and/or the Provost have given a negative evaluation or recommendation (per university policies), the candidate may, within the time allowed by university rules and regulations, file either a written response to be included in the record forwarded to the Chancellor, or may appeal the case to the Faculty Rights Board (based on established grounds for appeal), or both, as may be allowed in the university rules and regulations.

May: Candidate receives final decision of the Chancellor.

Section 2: Details of the Evaluation Process

Description of Position within the University
Per the university initial review evaluation documents, the Position Description is to be completed by the Department Chair and signed by both candidate and chair early in the mandatory review process. No specific timeline is given, but this should typically be completed by early September, as it is relevant to the evaluation of teaching, research and service.
Part A. The percentage appointment in the department must be entered, and is typically 100%, unless the candidate holds a joint appointment.

Part B. While the position description may vary somewhat with specific individuals, it will be essentially the same for most faculty. Percentage effort in each category is typically 40% teaching, 40% research and 20% service, but the distribution of percentages must always add to 100% (regardless of joint appointments requiring multiple unit evaluations).

Part C. The standard position description is as follows:

Dr. ____, Assistant/Associate Professor, is expected to teach and guide undergraduates and graduate students in courses and individually. The typical teaching load for tenure track assistant professors is two courses per year for the first year and three courses per year thereafter. However, this may be modified to compensate for substantial service and/or research loads, or for a significant laboratory course load.

Establishment of a research program is required, which must include all of these elements: peer-reviewed publications; competitive, externally funded research; and supervision of graduate students and/or post-doctoral trainees/students. While emphasis is placed on teaching and research, service on Departmental committees is expected, and service at the national level (e.g., committees, conference sessions, and paper/proposal reviews) is strongly encouraged.

Part D. Unique expectations for the candidate’s position will be described in detail, as necessary. For individuals with unique expectations, the distribution of effort and the standard position description may need to be altered, as well. Generally, “None” will be entered under unique expectations.

Part E. The department criteria for promotion in rank or tenure must be included in promotion and tenure documentation. The information provided by the candidate to demonstrate achievement of the criteria must cover all areas of teaching, research, and service.
Criteria for Promotion and Tenure:

The enumerated criteria used for candidate evaluation are not to be construed as a set of inflexible rules. Reasonable flexibility should be exercised in the evaluation of a candidate’s accomplishments. These criteria are included on the Initial Review Evaluations form as part of the evaluation procedures. The standard Department of Mechanical Engineering criteria for promotion to associate professor with tenure are as follows:

**Teaching:** Teaching is evaluated on the basis of the combination of student teaching evaluations, peer teaching evaluations, participation in undergraduate and graduate advising, and candidate efforts to improve teaching. New assistant professors in Mechanical Engineering are typically given an initially lower than average teaching load of one course per semester, to assist them in building their research program. After one year, research active faculty members in Mechanical Engineering are typically expected to teach 3 courses per year.

Peer evaluations and efforts for improvement are generally qualitative. Peer evaluators are typically assigned by the department P&T chair. While the student evaluations may include qualitative comments, they also provide quantitative ratings (0-5, from worst to best) categorized as follows:

<table>
<thead>
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<th>Scale</th>
<th>Rating</th>
</tr>
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<tbody>
<tr>
<td>Exceptional</td>
<td>4.20-5.00</td>
</tr>
<tr>
<td>Very Good</td>
<td>3.51-4.19</td>
</tr>
<tr>
<td>Good</td>
<td>3.01-3.50</td>
</tr>
<tr>
<td>Adequate</td>
<td>2.50-3.00</td>
</tr>
<tr>
<td>Poor</td>
<td>0.00-2.49</td>
</tr>
</tbody>
</table>

Because of the known effect of expected grade on the level of student evaluations, peer evaluations are generally of higher weight, though trends (consistently increasing or decreasing values) in student evaluations are also considered.

It is expected that directing graduate students in research activities will be a major component of graduate advising. This involves serving as a major advisor and chair of masters and/or doctoral level thesis committees. Participation as a member of graduate thesis committees of other faculty is also expected.

Faculty members are expected to participate in symposia, workshops, and similar opportunities to gain skills and ideas for improving their teaching. Educational or pedagogical research is considered for teaching with regard to professional development, but is primarily evaluated under research. Overall “good” levels of teaching (e.g., student evaluations above 3.00, and positive peer evaluation) are expected.

**Research:** It is required that research and publication will be a substantial component of the total professional activity. This must include advising and directing students and improving and establishing a funded research program. Candidates are expected to produce high-impact scholarly work that may take various forms such as refereed journal articles, refereed conference papers, books and book chapters, and patents. The impact of the scholarly work will be gauged by the P&T Committee and will be based on aspects such as: (a) the assessment of the research provided by external reviewers and (b) citations of the scholarly work using appropriate citation tools, (c) the quality of the journals, (d) the quality of the research as judged by the P&T committee itself, and (e) the external funding support for the research. Candidates must demonstrate ability to support and maintain their research program, as demonstrated by a major role in
attracting and acquiring a reasonable level of funded external grants. Candidates must serve as a major advisor and chair of masters and/or doctoral level thesis committees.

Service: The Mechanical Engineering Department prefers to limit the amount of service involvement at the school and university level for untenured faculty members in order to provide more opportunities for research development. Regular service at the department level and some service at the national level (such as professional organization service, conference session chair, peer review of manuscripts, and research proposal review) are expected.

The standard Department of Mechanical Engineering criteria for promotion to Full Professor are as follows:

Teaching: The criteria for promotion to associate professor with tenure must also be met in the time period since that promotion. In addition, faculty are expected to have a consistent record of good quality teaching and regular participation in symposia, workshops, and similar opportunities to gain new skills and approaches to demonstrate continued effectiveness and growth of their teaching. In other words, the candidate should have clearly demonstrated competence as a teacher. Further, the candidate should be a positive contributor to faculty and student morale and spirit and have shown leadership in the development of an atmosphere which promotes the pursuit of creative and intellectual learning.

Research: The criteria for promotion to associate professor with tenure must also be met in the time period since that promotion. In addition, it is expected that faculty will have demonstrated mastery of a specialty in his or her program of research and clearly demonstrated an ability to support and maintain his or her research. A candidate for the rank of Professor should have been engaged in significant research and publication or other scholarly activities which further the knowledge of the profession, and/or have engaged in significant professional activities which have clearly established their scholarly career and their position as a leader in the profession.

Service: The criteria for promotion to associate professor with tenure must also be met in the time period since that promotion. In addition, the candidate should also have demonstrated a continued contribution by way of substantial service to the Department, School, University, his or her profession, and/or the community at large. Substantial service may include (but is not limited to) participation in university faculty governance, national or international technical committees, associate and/or chief editor of a journal, conference organization.

Composite Evaluations and Recommendations

Note that these and all subsequent evaluation procedures are included on the Initial Review Evaluation form as part of the documentation of evaluation procedures.

Note also that this part of the evaluation is normally completed last, after evaluation of the individual areas of effort (teaching, research, and service). The department committee must agree on the overall evaluation level for each of the three areas of teaching, research and service (Excellent, Very Good, Good, Marginal or Poor; or other ratings as specified by university policy and/or forms). For evaluation level in each category, the candidate will be assigned the
highest level that receives a majority vote of those present and/or who communicated their vote early or via proxy. Based on the distribution of votes, votes at each level will be added votes from levels above, until a majority is achieved. The committee will determine the recommendations regarding promotion and tenure (Recommended, Not Recommended, or Not Applicable). Vote distribution must be reported for promotion and/or whether or not to grant tenure. A positive recommendation will be arrived at by a majority of affirmative votes (counting abstentions, though not recusals nor failures to vote, as non-affirmative votes).

The overall evaluation and recommendations must be supported by documentation addressing reasons for evaluation in each of the areas of effort evaluated and all types of data considered. These rationale shall be provided to the candidate with the overall recommendations reported on the Initial Review Evaluation Summary for Candidates or similar form, as required by the university.

The department chair must indicate concurrence or lack thereof with the recommendations of the department P&T committee. The chair must also document the reasons for concurrence (or lack thereof) on the Initial Review Evaluation Summary for Candidates form or in an attached letter.

**Evaluation of Teaching**

The evaluation of teaching is normally led by a subcommittee of 3-4 tenured faculty members, but in no case shall fewer than two (2) tenured faculty members perform primary evaluation of the teaching. Based on the procedures below and the departmental criteria for promotion and/or tenure, the subcommittee will draft an evaluation of the candidate’s teaching to be reviewed and approved by the P&T committee.

Multiple sources of information will be used as the basis for the evaluation of classroom teaching. The candidate's written statements describing course objectives and course content for each course from course syllabi and/or other documentation will be reviewed. Reports by evaluators, who had observed classroom teaching over a period of several years, will be examined to evaluate the candidate’s instructional methods and command of the subject matter, and commitment to student learning. Student performance in assigned homework, projects, and examinations as well as their preparation to succeed in upper level courses will provide the basis for assessing evidence of student learning. Student classroom evaluations will provide additional data on command of the subject matter, the ability to communicate effectively in the classroom, and support of undergraduate students outside the classroom. The candidate’s participation in classroom teaching improvement activities such as workshops and seminars, and comments from peer evaluators, trends in student evaluation score, and teaching awards will be examined for evidence of development as a teacher. Peer letters evaluating classroom performance will be included in the P&T dossier for each candidate.

The candidate’s stated undergraduate advising record will also be used to evaluate participation in undergraduate advising. In addition, the candidate’s statement and record of graduate student advising and mentoring will be evaluated. Though post-doctoral mentoring is not a requirement, any documented experience in this area will also be considered within the teaching evaluations.

Overall, the quality and quantity of teaching achievements will be evaluated in the context of the percent effort stated for teaching and the department, school and university criteria and standards. The overall evaluation of teaching will rank the teaching in the standard categories. The distribution of the vote will be provided, if needed, per university requirements and forms.
To generate a summary level ranking to be reported to the candidate, votes at each level will be added to votes from all the higher levels, until a majority of votes is reached (the highest level of performance with a majority of votes at or above that level). The overall results will be reported as part of the initial evaluation and on the Department Evaluation Summary for the Candidate form.

Evaluation of Professional Performance

This evaluation is generally only applicable to librarians and is not applicable for Mechanical Engineering faculty.

Evaluation of Research

The evaluation of research is normally led by a subcommittee of three (3) or more tenured faculty members. In no case shall fewer than two (2) tenured faculty members perform primary evaluation of the research. Generally research should be evaluated by those tenured faculty members who have an interest and knowledge in the same or related research area, when available. Based on the procedures below and the departmental criteria for promotion and/or tenure, the subcommittee will draft an evaluation of the candidate’s research to be reviewed and approved by the P&T committee.

Research will be evaluated with respect to the cumulative impact, quality and quantity of publications, patents, pending grant applications, and funded external grants. A sustainable program of research will require both publications/patents and external funding. Cumulatively, all publications at the University of Kansas since the candidate’s last appointment will be reviewed and rated (excellent, very good, good, fair, poor) by members of the subcommittee. Based on external letters and citations, the professional (regional, national, and/or international) reputation will be evaluated. External evaluations will also be used as objective evidence of quality and impact of the research. The program of research will be evaluated for progress beyond that completed for the terminal degree or a prior appointment level at the University of Kansas, and the promise of continued productivity. The quality and quantity of research achievements will be evaluated to determine impact in the context of the percent effort stated for research and the department, school and university criteria and standards.

The overall evaluation of research will rank the research in the standard categories. The distribution of the vote will be provided, if needed, per university requirements and forms. To generate a summary level ranking to be reported to the candidate, the highest level of performance with a majority of votes at or above that level will be reported. The overall results will be reported as part of the initial evaluation and on the Department Evaluation Summary for the Candidate form.

External Evaluations

The P&T committee shall obtain external reviewers from a cross section of the candidate’s technical area. The process of obtaining external evaluations will follow the current university “Guidelines on Requirements for External Evaluations – Promotion and Tenure Review.” From the candidate list, and from others recommended by the committee, 7-8 persons will be asked to evaluate the candidate. If less than seven agreed to serve as evaluators, then additional evaluators will be identified and recruited. Agreement from at least 7 evaluators will be sought by mid-May. A response by all evaluators will be requested by the beginning of August. Reminder letters and phone calls will be used to help assure that evaluations are received in a
timely manner (by at least September 1). The evaluation letters, CV’s of evaluators, etc. will be compiled and included in the P&T dossier for each candidate per university requirements.

Because the evaluations are to be given as confidential and are to remain confidential to extent possible under the law, the following statement is required to be in the letters to external evaluators:

“As a part of the promotion and/or tenure review process, we are soliciting assessments of Professor_______’s research contributions from academic colleagues and distinguished professionals. These letters will become part of the candidate’s promotion and tenure dossier and are treated as confidential by the University to the extent we are permitted to do so by law.”

In addition, the letter to external evaluators will request that they address the areas required by the current university “Guidelines on Requirements for External Evaluations – Promotion and Tenure Review.” The materials sent to the external evaluators will include the Candidate CV, selected publications (4-7), and other relevant information deemed pertinent by the departmental P&T committee.

In cases where the candidate has extended the timeline for their mandatory review year (per University policies), or other special circumstances occurring during the time period between appointment as Associate Professor to consideration for promotion to Full Professor, the Candidate and P&T Chair will discuss the option of apprising external evaluators of the special circumstances in the timing. The candidate may choose to disclose this information in the letter to external evaluators or in his/her CV, or the candidate may choose not to disclose this information to external evaluators.

**Evaluation of Service**

The evaluation of service is normally led by a subcommittee of 3-4 tenured faculty members, but in no case shall fewer than two tenured faculty members perform primary evaluation of the service. Based on the procedures below and the departmental criteria for promotion and/or tenure, the subcommittee will draft an evaluation of the candidate’s service to be reviewed and approved by the P&T committee.

The subcommittee will review the number and type of departmental, school-level, and university projects and committees served by the candidate. In addition, the relative activity (workload) of the committee will be considered. The subcommittee will also evaluate the number, type, and activity of regional and national service activities by the candidate, as these are important for bringing recognition to the university.

The overall evaluation of service will rank the service in the standard categories. The distribution of the vote will be provided, if needed, per university requirements and forms. To generate a summary level ranking to be reported to the candidate, the highest level of performance with a majority of votes at or above that level will be reported. The overall results will be reported as part of the initial evaluation and on the Department Evaluation Summary for the Candidate form.

See also University of Kansas Rules and Regulations, Article VI, and documents/forms provide by the Office of the Provost and the School of Engineering.
APPENDIX E

KU Mechanical Engineering

Undergraduate Student Handbook
DEPARTMENT OF MECHANICAL ENGINEERING
MISSION STATEMENT

The three-fold mission of the Department of Mechanical Engineering is to provide its students with an education of high quality, generate and apply knowledge, and serve both society and the engineering profession. In support of this mission, there are one primary and three secondary objectives.

**Primary Objective**

The primary objective is to produce technical competence in the contemporary theory, principles, and practices of mechanical engineering. It is expected that graduates can (a) apply knowledge of mathematics, science, and engineering; (b) use the techniques, skills, and tools of modern mechanical engineering practice; (c) design a system, components, or process to meet a specified need; (d) identify, formulate, and solve mechanical engineering problems; and (e) design and conduct experiments and analyze and interpret data obtained there from.

**Secondary Objectives Are to:**

1. produce broad understanding in the humanities and in social science areas. It is expected that graduate can (a) function as responsible members of society and as members of teams; (b) uphold professional and ethical standards; (c) communicate effectively; (d) understand the impact of engineering solutions in both global and societal contexts; and (e) have knowledge of contemporary issues.
2. produce recognition of the need for and an ability to engage in life-long learning.
3. stimulate the aspirations among graduates for career growth to positions of leadership.
Mechanical Engineering Faculty & Staff
The Mechanical Engineering Department currently consists of 16 faculty members who have a variety of interests, knowledge and expertise.

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Karan S. Surana, Deane E. Ackers Distinguished Professor (Ph.D., Wisconsin)
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School of Engineering

There are 13 undergraduate degree programs in the school: aerospace engineering, architectural engineering, chemical engineering, civil engineering, computer engineering computer science, electrical engineering, engineering physics, engineering management, environmental engineering, mechanical engineering and petroleum engineering. All engineering degrees are accredited by the Accreditation Board for Engineering and Technology (ABET).

From communications systems to bridges, from satellites to manufacturing; our society depends on engineers. An engineering education from the University of Kansas provides students with an understanding of technical principles and prepares them for the changes that lie ahead.

The School of Engineering undergraduate degree programs teach students to apply fundamental mathematics and science principles to problem solving. Students also learn the social and human impact of their technology. Outstanding faculty and facilities offer students a challenging learning environment.

What is Mechanical Engineering?

Mechanical engineering involves the science and technology basic to industrial activity. Mechanical engineers design, analyze, invent, build, and control mechanical devices and systems. They also analyze and work with natural phenomena, with industrial activities, and with research and development.

Mechanical engineers work within two broad areas: thermal and mechanical systems. To name a few applications, within these areas they can work with heat transfer, energy management, computer-aided manufacturing, computational mechanics, machine design and biomedical engineering.

Admission Requirements

Students may enter the School of Engineering as freshmen, but all admissions, both in state and out-of-state, are on a selective basis. General requirements for admission to the university of included under Admission in the General Information chapter of the Undergraduate Catalog.

Preparation for an engineering career begins in high school with basic mathematics and science courses. Perspective engineering students should take mathematics through trigonometry and at least one year of both chemistry and physics. A well-rounded background in English, history, economics, and social studies, preferably with some computer operations and programming and advanced mathematics, affords flexibility in choosing a field of concentration. In general, a strong college preparatory program provides a good background for the student who plans to major in engineering.

Application is through the University of Kansas, Office of Admissions and Scholarships, Kansas University Visitor Center, 1502 Iowa Street, Lawrence, Kansas 66045. The application form should request admission to the School of Engineering, with a major in Mechanical Engineering (major code 0444). Math ACT scores or college level math course grades demonstrating this preparation are required.

Applications for admission are judged on several factors, including but not limited to, high school record, scores on national tests, academic records at college or university levels, and trend of grades. High school transcripts and enhanced ACT scores are required. (Equivalent SAT scores may be substituted).
Minimum Academic Standards for Admission

To be considered for admission to the School of Engineering, beginning freshman year, you must meet or exceed the following minimum standards:

- MUST be a graduate of an accredited high school or equivalent.
- MUST be in the top 50% of the high school’s graduating class, or equivalent.
- MUST meet eligibility requirements for MATH 104 (Math ACT score of 22), or equivalent.

Admission Deadlines

For entering freshmen students are:

- Fall Semester: April 1st
- Spring Semester: December 1st
- Summer Semester: April 1st

For transfer students are:

- Fall Semester: June 1st
- Spring Semester: December 1st
- Summer Semester: June 1st

Transfer Admission Standards

Students wishing to transfer to the School of Engineering from other units of the University of Kansas who are in good academic standing and who met the requirements for admission to the School of Engineering when first admitted to the university are admitted to the School of Engineering. Students wishing to transfer to the School of Engineering who are in good academic standing but did not meet admission requirements when first admitted are reviewed on a case-by-case basis. Transfers between engineering departments, including changing from “Undecided,” are allowed if the student is in good academic standing.

Applications from transfer students from other institutions are evaluated on a case-by-case basis. The strength of the institution, accreditation status, and the history of other transfer students from this institution are factors in admission. In some cases, a grade-point average higher than that required for continuing School of Engineering students may be required for admission. In general, students with grade-point averages under 2.5 are not considered for admission.

No upper-level engineering credits from non-ABET-accredited engineering programs are acceptable as transfer credit for engineering programs.
Undergraduate Scholarships

School of Engineering

The School of Engineering offers a variety of scholarships, most of which are awarded on a competitive basis according to academic ability, without regard to financial need. Scholarship renewals are based upon satisfactory progress and performance by the student. To be eligible to apply, a student must be enrolled for at least 12 hours per semester. Applications are available in the Dean’s Office after February 1st each year and are due by the Friday before Spring Break. Contact the Academic Services Director in the Dean’s Office, 1 Eaton Hall, for information on these scholarships.

The School of Engineering also has a scholarship program for entering freshmen and transfer students, as well as special scholarships for minority students. To be considered for a first-year scholarship, students should submit the Application for Freshman Scholarships to the Office of Admissions and Scholarships, Kansas University, Visitor Center, 1502 Iowa Street, Lawrence, Kansas 66045. To be considered for transfer scholarships, students should request an Engineering Transfer Scholarship Application from the School of Engineering, 1 Eaton Hall. For information about scholarships for minority students, contact the Director of Minority Engineering in the Dean’s Office, 1 Eaton Hall.

Students with financial need should also file the standard application with the Office of Student Financial Aid, 50 Strong Hall. For more information see Tuition, Fees, and Financial Aid in the Undergraduate Catalog.

Departmental

Undergraduate merit scholarships are available through the Department of Mechanical Engineering. Scholarship applications are accepted at any time, however, the first consideration for the fall semester is the previous February 1st. Awards are announced by April 2nd.

Inquiries and/or applications should be addressed to: Scholarship Committee Chair, Department of Mechanical Engineering, 1530 W. 15th St., 3138 Learned Hall, The University of Kansas, Lawrence, Kansas 66045. Applications should include: transcript of college coursework or Degree Progress Report (DPR), a letter from the applicant directed to the career objectives, a minimum of three letters recommendation regarding academic potential and achievement and character, and a current resume.

See departmental web site for additional information.
Departmental Academic Policies

This section details departmental policies and procedures concerning completion of the curricula. Each student is responsible for seeking out and complying with policies of the School of Engineering and the University. These are contained in the current Undergraduate Catalog of the University, or in sources referred to therein.

Departmental Advising

General department advising is held once a semester, fall and spring, approximately one-week prior to enrollment. Students are mailed a flyer on when general advising will be held, times and location (generally held in the M.E. Conference Room). A student may see his assigned career advisor or any faculty member that is available. Students are strongly encouraged to sign up for an advising time. Mechanical Engineering faculty members are assigned to students to act as career advisors. Advisors are available to help students with career choices, academic advising or just to talk.

Student Workload

A minimum of 128 credit hours is needed to earn a degree in Mechanical Engineering. Most students average about 16 credits, or four to five courses a semester. Each student takes 101 hours of required courses, and 27 hours of restricted electives. During the first two years of your studies, prerequisites in English, math, social sciences, and science are taken as preparation for later engineering studies.

Your degree requires careful planning if you want to graduate within four years. Some upper-division courses are offered only once per year, and some are prerequisites for courses that you must take later. You should work closely with your mechanical engineering advisor to ensure that you take the courses you need in the necessary order.

Transfer Credits

The University accepts and will place on the student’s permanent KU record credits for all academic courses taken at an accredited college or university. Vocational and technical institute courses are excluded. Not all courses accepted by the University will apply toward a degree in engineering. A student will not receive engineering degree transfer credit for:

1. Courses in which the grade was lower than C, or which were graded credit/no-credit or pass/fail.
2. More than 64 hours from community or junior colleges.
3. Courses in advanced engineering sciences or engineering design unless they were taken in an engineering program accredited by ABET.
Academic Requirements

Bachelor of Science Degree

The mechanical engineering curriculum builds on the basic foundation of mathematics and physical sciences with the study of engineering applications in two primary areas:

1. Thermal-fluid sciences and design of energy systems.
2. Mechanical system design and analysis (mechanical structures, motion and manufacturing).

Engineering science and design are integrated into the curriculum, with heavier emphasis on engineering fundamentals and analysis in the earlier semesters and increased emphasis on creative design in subsequent semesters, culminating in capstone design courses in each of the two primary areas.

Combined Mechanical Engineering and Business Degree

A student who wants to combine business with engineering may enroll in a program leading to B.S. degrees in both mechanical engineering and business. Full-time enrollment enables the student to earn the two degrees in five years. During the first two years, the student enrolls in the School of Engineering. After that, the student enrolls simultaneously in the School of Business and the School of Engineering. A semester-by-semester listing of the required courses for this plan of study is available on page 18 of this handbook.

Biomechanics Concentration

A Mechanical Engineering Undergraduate student at the University of Kansas can elect to take the required classes to complete a Biomechanics Option. While it will not appear on the transcript or diploma, potential employers will identify this option with students who have focused chosen electives in the fast growing field of Biomechanics.

The Biomechanics Option does not require any additional credit hours in the Mechanical Engineering Curriculum. The requirements include two List 1 Electives, one List 2 elective, and a senior design project in the area of biomechanics.

Premedical Concentration

A Premedical concentration in Mechanical Engineering can be accomplished by completing thirteen additional credit hours beyond the normal curriculum. Most medical schools require a minimum of one academic year of biology (BIOL 150 and BIOL 152), one academic year of chemistry (CHEM 184 and CHEM 188), one academic year of organic chemistry (CHEN 624, CHEM 625, CHEM 626, CHEM 627), one academic year of English (ENGL 101 and ENGL 102), and one academic year of physics (PHSX 211 and PHSX 212). A few medical schools require biochemistry, genetics, additional biology courses, and one or two calculus courses.

Several of these required classes are counted as Mechanical Engineering required credits as shown below:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 150</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 184</td>
<td></td>
</tr>
<tr>
<td>CHEM 188</td>
<td>5</td>
</tr>
<tr>
<td>ENGL 101 and ENGL 102</td>
<td>required in the ME curriculum</td>
</tr>
<tr>
<td>PHSX 211 and PHSX 212</td>
<td>required in the ME curriculum</td>
</tr>
<tr>
<td>MATH 121 and MATH 122</td>
<td>required in the ME curriculum</td>
</tr>
</tbody>
</table>

The additional classes that are required for completion of minimal medical school requirements that cannot be counted in the ME curriculum include:
BIOL 152 (3 credit hours), CHEM 624 (3 credit hours), CHEM 625 (2 credit hours) and CHEM 626 (3 credit hours) and CHEM 627 (2 credit hours). These additional requirements can be fulfilled in four years if the student takes courses during summers. Other classes that may be desirable are BIOL 646 and 647 (Mammalian Physiology lecture and lab, 5 credit hours), BIOL 416 (Cell Structure and Function, 3 credit hours), and BIOL 404 (Intro to Genetics, 3 credit hours). If these extra classes are taken, at least one additional semester of coursework with summers or one additional year without summers would be required.

**Professional Opportunities**

Job opportunities and salaries are excellent for mechanical engineers. The school’s graduates have job opportunities after graduation at salaries above $40,000. Your B.S. degree is all you need for entry-level jobs in your field. Your experience and abilities will enable you to advance later into engineering management and consulting if you wish.

Mechanical engineering is among the broadest of the engineering fields. Graduates find work in areas such as mechanical design, robotics and computer-integrated manufacturing, management, and energy systems design. Because mechanical engineers focus on machinery and systems of all types, they often work in other engineering fields such as aerospace, electrical, environmental, and petroleum engineering.

**Job Search Assistance**

The School of Engineering Career Service Center offers a comprehensive array of services to graduating students seeking permanent employment and to undergraduates seeking career-related summer or co-op employment. These services include the on-campus interviewing program, a career fair each September, individual counseling and group workshops or resumes, interviews and job search strategies, resume-writing software, job postings from many employers not interviewing on campus, a library of employer and career literature, and mailing of student resumes.

**Co-op Educational Program**

The University of Kansas School of Engineering Cooperative Education Program is a three-way partnership between students, employers and the university. Cooperative education is classroom theory mixed with practical experience. Students in the co-op program spend one or more separate times working for their employer partners during the study of mechanical engineering.

During these periods, the student is away from the KU campus, typically for a semester plus summer. The student is on professional assignment with the company but remains a student at KU. During the assignment, the company provides industrial experience and professional pay consistent with the student’s academic background. Assuming continued success, the student may continue with the company on subsequent co-op assignments. Enrollment in one hour of ENGR 300 under the supervision of the co-op advisor during each co-op period is required.

The Co-op program is very flexible and can be tailored to meet a student’s needs, the industrial assignments and the student’s goals. The student should note that the co-op program requires, typically at least one additional semester for graduation. The primary function of the program is education, so it is principally an educational program controlled by the school. For more information on the Co-op Educational Program, contact the Career Services Center in the Dean’s Office, 1001 Eaton Hall.
Engineering Career Center

Contact Information:

Phone: (785) 864-3891
Email: ecc@ku.edu

Visit our Web site:

http://www.engr.ku.edu/career_center/

Engineering & Computer Science Career Fair

A Career Fair specifically targeting Engineering & Computer Science students is held each September and February. Past Career Fairs have included over 40 companies participating. This is an excellent opportunity to meet recruiters from various companies.

Campus Recruiting Dates (on campus interviews):

- **Fall Recruiting:**
  Dates for Fall: October 1 – November 16

- **Spring Recruiting:**
  Dates for Spring: February 1 – approx. March 31

- **Information Sessions:**
  Many companies host evening presentations or information sessions on campus for students the night before their on-campus interviews. This is a good way for students to meet with recruiters in an informal setting and learn any necessary information about the company.
Engineering Career Center Information
Services Offered to Students

**Corporate Library**
We offer students a corporate library featuring binders, literature, and videotapes from companies. This is where you can research companies to find out exactly what they do and whether this is a place you would be interested in working.

**Resource Library**
The resource library hosts a variety of books on resume writing, interviewing skills, industry research, career development, and more.

**Resume Writing / Career Development Assistance**
We offer workshops, career counseling, resume review and general career development assistance for students. Students are given feedback on their resumes and cover letters and are assisted in making a more professional resume.

**Web Resume Book & Resume Searches from our database**
When you are registered with career services, your resume is entered into a database. This database is available to employers via the web. Recruiters or company representatives can view student resumes by accessing our database via [www.resumeexpert.com](http://www.resumeexpert.com). In a search from our database, we do the search based on an employer’s given criteria and then send the resumes for review.

**Web Job Listings**
Employers may post a job opportunity on our Web Job Listings site, available specifically for KU students. Internship positions, part-time and full-time opportunities may be posted. This is linked from our web site under “Resume Expert.” This is available exclusively to KU students and requires a password that changes monthly. Contact the Career Services Center for the password.

**Internships & Co-ops**
Students have the opportunity to work in the industry setting of their discipline to gain real-world work experience. The Career Services staff assists in advertising openings, setting up interviews for these positions, and connecting students with contact information.
Expanded Professional Opportunities

Additional employment opportunities are possible by becoming registered professional engineer. Many industries require this certification in order to practice as an engineer.

Professional Registration

Registration is a process that ultimately identifies an individual as an engineer who has achieved professional excellence and is recognized among his/her peers. It is the legal certification of the ability to practice engineering in the public arena. Professional registration is a prerequisite for such things as expert testimony, federal and state reporting, and engineering design certification.

Professional registration requires passing the “Fundamentals of Engineering Examination,” a period of four years experience as a practicing engineer, followed by passing the “Principles and Practice of Engineering Examination.” The Fundamentals of Engineering Examination is offered two times each year, in the fall and the spring. Students are encouraged to take the examination during their senior year at KU while the materials covered are still fresh. Juniors are eligible to take the examination in the spring semester. The morning examination consists of 120 questions covering a broad range of engineering topics. The afternoon examination has 60 questions and is discipline specific for mechanical engineers.
Student Organizations

**Pi Tau Sigma (Mechanical Engineering Honor Society)**  
*Faculty Advisor: Carl W. Luchies*

Pi Tau Sigma is the national honorary mechanical engineering fraternity. Membership is one of the ways that our students can be recognized for their scholastic achievement. Members are selected from the junior and senior classes on the basis of sound engineering ability, scholarship and personal character. A student must rank in the top 35 percent of his/her class scholastically to be eligible.

**ASME (The American Society of Mechanical Engineers)**  
*Faculty Advisor: Lisa Friis*

The American Society of Mechanical Engineers (ASME) promotes and enhances the technical competency and professional well being of its membership and strives, through quality programs and activities in mechanical engineering, to better enable its practitioners to contribute to the well being of humankind. Student activities include participation in the ASME Student Leadership Conference, the Human-Powered Vehicle competition and the annual Engineering Expo.

**SAE (The Society of Automotive Engineers)**  
*Faculty Advisor: Robert M. Sorem*

The Society of Automotive Engineers (SAE) is an engineering society of over 60,000 members from all engineering and scientific disciplines who are dedicated to advancing mobility. Through SAE, these engineers and scientists work together to further the research, development, design, manufacture and utilization of land, sea, air and space vehicles.

The KU SAE chapter has participated in several of the SAE collegiate design competitions including the Formula SAE competition, Mini-Baja competition, Heavy-lifter competition, and the Supermileage competition.

**BMES (The Biomedical Engineering Society)**  
*Faculty Advisor: Sara E. Wilson*

The Biomedical Engineering Society is an engineering society dedicated to the application of engineering principles to medicine and biology. The society strives to encourage professional growth of its members through annual conferences, publications and career services, and to promote the biomedical engineering field. Past student activities have included tours of regional medical and industrial workplaces, career planning sessions, and seminars with practicing biomedical engineers.

**Contact the appropriate Faculty Advisor for additional information**
Mechanical Engineering Course Descriptions
[*Indicates required course]*

*ME 211 Statics & Introduction Mechanics (3)
The principles of statics, with particular attention to engineering applications and an introduction to mechanics of materials. This course is a combination of material covered in ME 201 and ME 210. *Prerequisite: PHSX 211.*

**ME 208 Introduction to Digital Computing Methods in Mechanical Engineering (3)**
This course teaches the use of basic computing tools including MATLAB, C++ and Labview to solve engineering problems. Students learn basic programming skills, are introduced to a number of programming environments and use these tools to solve mechanical engineering problems ranging from thermodynamics to automotive testing. *Prerequisites: MATH 121*

**ME 306 Science of Materials (3)**
An introductory course on materials. Emphasis is placed on structure and the relation of structure to the behavior and properties of engineering materials. This course may not be used to satisfy ME requirements. *Prerequisites: CHEM 125 or 184, or consent of instructor.*

*ME 307 Engineering Materials Lab (1)*
Laboratory to supplement lecture on engineering materials properties and selection, manufacturing processes, and design for manufacturing. *Prerequisite: CHEM 150 or CHEM 130 or 184. Corequisite: ME 306 and ME 311.*

*ME 311 Mechanics of Materials (4)*
A basic treatment of stress and deformation in elastic bodies. *Prerequisites: ME 211 and MATH 220*

*ME 312 Basic Engineering Thermodynamics (3)*
An introduction to the concepts of heat, work, the first and second laws of thermodynamics and equations of state. These concepts are applied to flow and nonflow systems including power and refrigeration cycles. *Prerequisites: PHSX 211. Corequisite: MATH 122*

**ME 320/321 Dynamics with Lab (3+1)**
Kinetic design and analysis of mechanisms; with modeling to demonstrate concepts. *Prerequisites: ME 211, MATH 220 & 290*

*ME 328 Computer Graphics (3)*
Introduction to graphics programs, introduction to computer aided design, familiarization with computer graphics hardware and software.

**ME 360 Mechanical Engineering Problems (1-3)**
An analytical or experimental study of problems or subjects of immediate interest to a student and faculty member and which is intended to develop student capability for independent research or application of engineering science and technology. After completion of the project, a report is required. Maximum credit is three hours. *Prerequisite: Approval of an outline of the proposed project by the instructor and department chair.*

**ME 390 Special Topics (1-5)**
Course on special topics of current interest in mechanical engineering, given as the need arises. *Prerequisite: Approval of instructor.*
*ME 412 Thermal System Design (3)
Application of the principles of thermodynamics to the analysis and design of thermal systems.
Prerequisite: ME 312.

*ME 455 Mechanical Engineering Measurements & Experimentation (4)
Weekly lectures and experiments designed to introduce the student to the basics of measurement theory, experimental design, instrumentation, sensors, data acquisitions and analysis, error analysis, and report writing. Emphasis on measurement theory, instrumentation, data acquisition, and data analysis. Lab gives experience with these concepts.
Prerequisite: ME 208, ME 311. Co-requisite: EECS 318, ME 510, ME 520, ME 612, and Statistics.

ME 501 Mechanical Engineering Design Process (3)
The design process of a mechanical or thermal system. Establishment of specifications and consideration of realistic constraints such as safety, codes, economic factors, reliability, oral and written communications, and other factors as they impact the design process.
Prerequisites: ME 228, ME 307, ME 311 and ME 312.

*ME 508 Numerical Analysis of Mechanical Engineering Problems (3)
Introduction to numerical methods for solution of mechanical engineering problems by use of digital computers.
Prerequisites: ME 208, MATH 220 and MATH 290.

*ME 510 Fluid Mechanics (3)
An introduction to the mechanics of fluid flow. The principles of conservation of mass, momentum and energy are developed in differential and integral forms. Laws of dimensional analysis and similitude are presented as the basis for empirical correlations. Engineering applications include: calculation of hydrostatic forces on submerged objects, analysis of flow and pressure loss in piping systems, estimation of aerodynamic lift and drag, and performance characteristics of pumps and fans.
Prerequisites: ME 211 and ME 312.

ME 590 Special Topics (1-5)
Course on special topics of current interest in mechanical engineering, given as the need arises.
Prerequisite: Approval of instructor.

*ME 612 Heat Transfer (3)
An applied study of conductive and radiative heat transfer mechanisms in solid and fluid system. Engineering applications include solid conduction, free and forced convection in fluids, thermal radiation and heat exchangers, evaporators and furnaces.
Prerequisite: ME 312 and MATH 220. Corequisite: ME 510.

ME 627 Automotive Design (3)
Basic concepts of automotive design and manufacture. Primary focus of course on vehicle design and performance. Design is subdivided into vehicle components of frame, suspension, front and rear axle, steering power train, front and rear wheel drive, and braking. Integration of these ideas into a vehicle design with analysis of its performance and manufacture culminates the course. Prerequisite: Permission of instructor.

*ME 628 Mechanical Design II (3)
Design of mechanical components and systems.
Prerequisite: ME 311.
ME 633 Basic Biomechanics (3)
Provides an overview of musculoskeletal anatomy. Linear and angular dynamics of human movement, energy expenditure, and power required to perform a given activity. Two-dimensional joint forces and torques from kinematic data for body segments and force plate data. Tissue properties, appropriate constitutive models and determination of stresses and strains in tissues and structures under normal loading conditions. Students will select and work on biomechanics design projects or independent study projects.
Prerequisites: ME 311 and ME 320/321.

ME 636 Internal Combustion Engines (3)
Study and analysis of internal combustion engine physical phenomena, dynamic function, components and system design. Emphasis on spark ignition and compression ignition engine analysis. Performance, current technology, thermodynamics, fluid mechanics, combustion products and pollution, fuels and lubrication, and mechanical design.
Prerequisite: ME 412.

ME 641 Design Project Option A (3)
Design and development of a mechanical or thermal/fluid system. An individual or group report that includes designs, analysis/testing, drawings, and/or schematics is required. Establishment of specifications and consideration of realistic constraints such as safety, economic factors, design impact, aesthetics, and reliability are required.
Prerequisites: ME 501, ME 455 and ME 628.

ME 642 Design Project Option B (3)
Manufacturing and testing of a mechanical system designed and developed in ME 627—Vehicle Design. A group report with individual assignments which details the manufacturing procedures and testing procedures and results is required. A completed, working project with a design file documenting all aspects of the project must be submitted.
Prerequisite: ME 501, ME 627 and ME 628. Corequisite: ME 412 and ME 455.

ME 643 Design Project Option C (3)
Design and development of a mechanical system related to biomechanics that has been investigated in ME 633—Basic Tissue mechanics and Biodynamics. An individual or group report that includes designs, analysis/testing, and drawings and/or schematics is required. Establishment of specifications and consideration of realistic constraints such as safety, economic factors, design impact, aesthetics, and reliability are required. Demonstration of the design feasibility through a working prototype or full implementation is required.
Prerequisite: ME 501, ME 628, and ME 633. Corequisite: ME 455.

*ME 661 The Finite Element Method (3)
An introduction to the underlying theory of the finite element (FE) method and its application to linear solid and structural mechanics. FE formulations are derived for bars, beams, 2D formulations such as: plane stress, plane strain, and 3D solids. Basic issues are treated such as assembly and generation of FE equations, computation, post-processing, and interpretation of FE solutions (e.g. stresses and strains analysis). Prerequisite: CE 310 and ME 508.

*ME 682 Control Systems (2-3)
An introduction to the modeling, analysis and design of linear control systems. Topics include mathematical models, feedback concepts, state-space methods, time response, system stability in the time and transform domains, design using PID control and series compensation, and digital controller implementation.
Prerequisites: ME 320.

ME 701 Finite Element Method for Stress Analysis (3)
Introduction to the finite element method solid mechanics. Finite element formulations for plane stress, plane strain, beams, spars, axisymmetric solids, shells and three-dimensional solids. Assembly and solutions of finite element equations, computations of stresses and strains and post processing of results for further use in the design process. Finite element modeling techniques and laboratory sessions for solving actual problems.
Prerequisites: ME 508.
ME 702 Mechanical Engineering Analysis (3)
A study of advanced methods for engineering analysis of practical problems utilizing fundamental principles from engineering disciplines. The emphasis is on the solution of these problems and the interpretation and generalization of the results.
Prerequisite: A course in differential equations.

ME 708 Microcomputer Applications in Mechanical Engineering (3)
Design and implementation of interfaces of microcomputers to mechanical equipment. Includes laboratory experiments presenting selected industrial applications. Emphasis on human factors, functional design parameters and microprocessor interfaces. Includes instruction concerning specifications of practical hardware configurations and writing of programs necessary to accomplish mechanical systems applications.
Prerequisite: Permission of instructor.

ME 710 Advanced Fluid Mechanics (3)
Topics include kinematic and dynamic behavior of fluids, derivation of Navier-Stokes equations, flow classification, solutions of viscous and inviscid flows for simple geometries, potential flow theory and laminar and turbulent boundary layer theory.
Prerequisites: ME 510 or equivalent.

ME 711 Bearings and Bearing Lubrication (3)
Theoretical aspects of lubrication, determination of pressure distribution in bearings from viscous flow theory, application of hydrodynamic and hydrostatic bearing theories to the design of bearings, high speed bearing design problems, properties of lubricants, methods of testing.
Prerequisites: ME 510 and a course in differential equations.

ME 712 Advanced Engineering Thermodynamics (3)
An advanced course in thermodynamics, mathematical in nature with emphasis on a critical re-evaluation of the laws of thermodynamics, thermodynamics of one-dimensional gas flow, development of the classical thermodynamic relations and their application to engineering problems.
Prerequisites: ME 508 and ME 412.

ME 720 Advanced Dynamics of Machinery (3)
Dynamics of particles and of rigid bodies with advanced engineering applications, generalized coordinates, Hamilton’s principles, Lagrange’s equations, and Hamilton-Jacobi theory.
Prerequisite: ME 320.

ME 731 Convective Heat and Momentum Transfer (3)
The formulation and solution of steady and unsteady convective heat, mass and momentum transfer problems. Topics include boundary layers duct flows, natural convection with and without phase change, development of analogies, transport properties, numerical methods.
Prerequisite: ME 612 or equivalent.

ME 732 Computational Fluid Dynamics and Heat Transfer (3)
The fundamentals of the finite-difference method are presented and applied to the formulation of numerical models for heat and momentum transfer. The accuracy, stability, and computational efficiency of different algorithms are analyzed. Computer programs are developed for classical benchmark problems.
Prerequisites: ME 508, ME 510, and ME 612 or equivalents.

ME 733 Gas Dynamics (3)
A study of the thermodynamics and fluid dynamics of gaseous media. Emphasis is placed on the rigorous application of conservation laws to represent physical processes. Classical and statistical models for the thermodynamic and transport properties are examined. Applications include determination of gas properties, wave propagation, and high-speed flow.
Prerequisites: ME 412 and ME 510, or equivalents.
ME 740 Mechanical Vibrations (3)
Linear vibration theory. Lumped parameter approximations and distributed systems. Generalized properties and numerical solutions.
Prerequisites: ME 320.

ME 750 Biomechanics of Human Motion (3)
Fundamental concepts of anatomy and physiology are introduced but the focus is on the biomechanics of human motion. Human body segment kinematics and joint kinematics are analyzed. An introduction to muscle mechanics is provided. Applications in balance and gait are covered.
Corequisite: ME 320.

ME 751 Experimental Methods in Biomechanics (3)
This course will focus on methods of experimental measurement and computational modeling used in biomechanics. Instrumentation used to measure three-dimensional motion, ground reaction forces, center of pressure and EMG measures are considered. Methods used for inverse dynamics, direct dynamics and simulation are introduced.
Corequisite: ME 320.

ME 753 Bone Biomechanics (3)
Provides an in-depth knowledge of bone as a living mechanical system. Topics include the microstructure, biology, mechanical properties, mechanical modeling, adaptation of bone to the mechanical environment, and its simulation.
Prerequisites: ME 311 or equivalent.

ME 754 Continuum Mechanics for Soft Tissues (3)
An introductory course in the analysis of the mechanical behavior of materials modeled on the continuum assumption. The course will provide background on soft tissue properties and will focus on the tools necessary to model soft tissues, including the essential mathematics, stress principles, kinematics of deformation and motion, and viscoelasticity.
Prerequisites: ME 311 or equivalent.

ME 757 Biomechanical Systems (3)
A course on the dynamics and motor control of human and animal motion. The course will focus on applying mechanical principles of dynamics, lumped parameter systems and control theory to problems in biomechanics. Topics include muscle mechanics and dynamics, reflex and voluntary control, proprioception, anatomy of the muscular and nervous systems, and system dynamics in locomotion and other movements.
Prerequisites: ME 320

ME 761 Theory of the Finite Element Method (3)
Finite element method for solid mechanics, heat transfer, fluid mechanics and dynamics. Modeling techniques, software implementation and solution of problems.
Prerequisite: ME 508 or equivalent.

ME 763 Introduction to Composite Materials (3)
A basic treatment of the analysis, design, and manufacture of fibrous composite materials. Laminated fiber reinforced composite materials are examined in detail. Properties of the constitutive materials are studied. Laminated plate and shell theories are discussed as well as computer applications. Laboratory works consists of the fabrication and testing of various laminated composite specimens.

ME 765 Biomaterials (3)
Fundamental concepts on the properties and response of synthetic and natural materials used biomedical products are covered. Regulatory and design issues involved in using these biomaterials are discussed. Details of biomaterials concerns in some specific applications are also addressed.
Prerequisites: ME 306 or consent of instructor.
ME 770 Conductive Heat Transfer (3)
The formulation of steady- and unsteady-state conduction heat transfer problems and their solution by analytical and numerical methods.
Prerequisite: ME 612 or equivalent.

ME 774 Radiative Heat Transfer (3)
The formulation of steady and unsteady radiation heat transfer problems and their solutions by analytical and numerical methods.
Prerequisite: ME 612 or equivalent.

ME 780 Kinematic Synthesis of Mechanisms (2-3)
A study of methods of synthesis of mechanisms from kinematic specifications.
Prerequisite: ME 320.

ME 790 Special Topics (1-5)
Advanced courses on special topics of current interest in mechanical engineering, given as the need arises.
Prerequisite: Approval of instructor.

ME 796 System Design and Analysis (3-5)
Design and analysis of systems and components, using both individual and team projects. Engineering experience in planning, execution and reporting on selected practical engineering situation.
Prerequisite: ME 628 or equivalent.
Additional Notes

Informational Websites for New Students

- **KU on Wheels**  [http://www.kuonwheels.ku.edu/](http://www.kuonwheels.ku.edu/)
  Provides information regarding KU’s campus transportation, bus passes, and schedules.

- **Apartments in Lawrence**  [http://apartments.Lawrence.com/viewer](http://apartments.Lawrence.com/viewer)
  Allows you to find the apartment you’re looking for if you want off-campus housing.

- **On-Campus Housing**  [http://housing.ku.edu/](http://housing.ku.edu/)
  If you want to live in on-campus housing, this site tells you everything you need to know.

- **About Lawrence**  [http://www.visitlawrence.com/](http://www.visitlawrence.com/)
  Gives information about dining, hotels, events, shopping and attractions in Lawrence.

- **Want a Campus Job?**  [http://employment.ku.edu/](http://employment.ku.edu/)
  Search through all the open student positions on campus, both work-study and hourly.

- **Getting Involved**  [http://www.ku.edu/students/organizations/](http://www.ku.edu/students/organizations/)
  Want to get involved at KU? Check out this website for Organizations and Leadership opportunities.

- **KU History**  [http://kuhistory.com/](http://kuhistory.com/)
  Learn all about the University of Kansas and its impressive history.
KU Traditions

By Tim Richardson
The Capital-Journal

LAWRENCE - Long before an isolated swath of prairie in the heart of a mostly unexplored land became known as Kansas, Jayhawks were roaming the countryside.

Pioneers crossing present-day Nebraska took the name from the hawk and the blue jay -- two birds that had become familiar in the West. With the self-imposed title "the Jayhawkers of '49," the group journeyed from the heartland to California.

Jayhawks trudged over the barren land five decades before the crimson and blue became a part of the University of Kansas. In the early 1890s, the university adopted Harvard's crimson in honor of the Ivy-League man who donated money for an athletic field, abandoning Michigan's maize and sky blue.

"There was a great debate among the faculty that we owe Harvard nothing," said Jim Carothers, KU professor of English.

But the decision sidelined Yale faculty members, who demanded blue be included in the school's colors. The KU Athletic Board later adopted crimson and blue as the official team colors for the university in 1896.

Although KU established the tint and tone that would carry its athletics into the next century, it was undecided on a mascot. KU adopted the mythical Jayhawk in 1866, and several different representations of the bird were used for the next half-century.

A KU student in 1912 created a cartooned, large-billed bird with crossed legs. The mascot sported shoes that would allow it to kick the Missouri Hound Dog, echoing the sentiment of a popular song at the time.

A somber Jayhawk perched on a KU monogram replaced the first version, but was short-lived. In 1923, two students created a bird that resembled today's Jayhawk. After scrapping three other versions of the mythical bird -- the "fighting" Jayhawk, the "depression" Jayhawk and the "perky" Jayhawk -- KU settled on the smiling logo that continues to get stomped on the floor of Allen Fieldhouse.

Carothers said the logo's tenure at the university would make changing the Jayhawk nearly impossible.

"I think Hal Sandy's smiling Jayhawk is so thoroughly used and adopted," he said. "It would be a surprise to me if it underwent anymore evolution."

Despite the smiling logo's presence throughout Kansas, another university tradition usually resonates from the rafters of Allen Fieldhouse.

The Rock Chalk Chant has become ingrained in KU athletics. Before the rapid staccato and thrice-repeated "Rock Chalk, Jayhawk, KU" was adopted in 1897, members of the University Science Club were chanting "Rah, Rah, Jayhawk, KU."

Carothers said a geology professor had invited several students to his farm south of Lawrence, where he displayed a chalky limestone rock to his students. He asked his pupils to guess the rock's composition, when one student responded "rock chalk."

The student's response gave birth to what Teddy Roosevelt called the greatest cheer in college sports. Kansas troops used the cheer while fighting in the Philippines in 1899 and the Boxer Rebellion in China. In addition to elevating the spirits of troops abroad, the distinctive, drawn-out cadence continues to inspire KU on the playing field.

"I think it's very haunting," he said. "There's nothing close to it. Everybody has a fight song, but not everyone has a chant."
APPENDIX F

KU Mechanical Engineering

Graduate Student Handbook
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Mechanical Engineering Faculty

The Mechanical Engineering Department currently consists of 18 faculty members who have a variety of interests, knowledge and expertise.

Theodore Bergman, Charles E. & Mary Jane Spahr Professor, Department Chair (Ph.D., Purdue)
Heat Transfer, Energy Thermal Manufacturing
(785) 864-3181 tlbergman@ku.edu

Christopher Depcik, Assistant Professor
Automotive Engineering, Internal Combustion Engines, Alternative Fuels and Energy
(785) 864-4151 depcik@ku.edu

Ronald L. Dougherty, Professor
(Ph.D., P.E., Missouri-Rolla)
Radiative Heat Transfer, Two-Phase Heat Transfer, Thermal Fluid Sciences, Laser Scattering, Dynamic Light Scattering
(785) 864-2981 doughrty@ku.edu

Terry Faddis, Professor (D.E., Kansas)
Mechanical Design, Computer Integrated Manufacturing
(785) 864-2976 faddis@ku.edu

Ken Fischer, Assistant Professor (Ph.D., Stanford)
Biomechanics, Dynamics, Statics, Mechanics of Materials, Computational Mechanics
(785) 864-2994 fischer@ku.edu

Elizabeth Friis, Assistant Professor (Ph.D, Wichita)
Biomechanics, Biomaterials, Mechanical Testing, Biomedical Product Development
(785) 864-2104 lfriis@ku.edu

Sarah Kieweg, Assistant Professor (Ph.D. Duke University)
Biofluids, Drug Delivery, Transport Phenomena
(785) 864-3354 kieweg@ku.edu

Lin Liu, Assistant Professor (Ph.D. Iowa State University)
(785) 864-3181 linliu@ku.edu

Carl W. Luchies, Associate Professor (Ph.D., Michigan)
Mechanical Measurements, Mechanical Engineering Experimentation, Biomechanics of Human Motion, Experimental Methods in Biomechanics, Advanced Dynamics, Statics
(785) 864-2993 luchies@ku.edu

Lorin Maletsky, Assistant Professor (Ph.D., Purdue)
(785) 864-2985 maletsky@ku.edu
Robert M. Sorem, Associate Professor (Ph.D., Kansas)
Mechanical Design, Computational Mechanics, Finite Element Formation and Application,
Mechanics of Materials, Composite Material Mechanics
(785) 864-2983 sorem@ku.edu

Paulette Spencer, Ackers Distinguished Professor and Director of Bioengineering Research Center
Biomaterials, Structure/Property Characterization of Material/Tissue Interface
(785) 864-8140 pspencer@ku.edu

Karan S. Surana, Deane E. Ackers Distinguished Professor (Ph.D., Wisconsin)
Solid Mechanics, Finite Element Methods and Software, Computational Mechanics,
Computational Fluid Dynamics
(785) 864-2988 kssurana@ku.edu

Candan Tamerler, Wesley G. Cramer Associate Professor (Ph.D., Bogazici University)
Molecular Biomimetics, Bio-nanotechnology, and Bio-enabled Materials Science
(785) 564-2964 ctamerler@ku.edu

Peter W. TenPas, Associate Professor (Ph.D., Iowa State)
Computational Fluid Dynamics, Computer Aided Thermal Design
(785) 864-2986 tenpas@ku.edu

Sara Wilson, Assistant Professor (Ph.D., MIT)
Biomechanics, Human Motor Control, Control Systems, Biodynamics, Digital Methods
(785) 864-2103 sewilson@ku.edu

Xinmai Yang, Assistant Professor (Ph.D., Boston University)
Photoacoustic Imaging, Biomedical Ultrasound
(785) 864-1753 xmyang@ku.edu

Bedru Yimer, Professor (Ph.D., Dayton)
Heat Transfer, Fluid Mechanics, Thermodynamic
(785) 864-2982 yimer@ku.edu
Mechanical Engineering Department Graduate Programs

The University of Kansas Department of Mechanical Engineering offers the Master of Science in Mechanical Engineering degree, the Doctor of Philosophy and the Doctor of Engineering degrees. Areas of study in Mechanical Engineering include:

1. **Biomechanics and Biomaterials**: biomechanics of human motion, biomaterials, orthopedic biomechanics and biomedical product design, transport phenomena, and drug delivery.
2. **Computational Mechanics and Mathematics of Computations**: computational mechanics, finite element analysis, finite element methods and software.
3. **Thermal-Fluid Systems and Heat Transfer**: energy and thermal-power system design, heat transfer and computational fluid dynamics.
4. **Mechanical Design, Manufacturing, and Microprocessor Applications**: computer-aided mechanical design, continuum mechanics, computer-integrated manufacturing, computational mechanics, finite element analysis, machine stress analysis, microcomputer applications, and automatic control systems.

**Admission Requirements**

To qualify for graduate study in any of the graduate programs in the Department of Mechanical Engineering, a student generally must have earned a baccalaureate degree from an accredited mechanical engineering program. However, a student with good preparation in some other engineering discipline or a related program, such as physics, may qualify by taking appropriate undergraduate courses specified by the Mechanical Engineering Department Graduate Admissions Committee.

**Regular Status**

For admission to regular status in the masters program, the student must have an undergraduate grade point average of at least B (3.0/4.0). For masters applicants whose undergraduate GPA is below 3.0/4.0, but no lower than 2.75/4.0, admission on probation status will be considered on a case-by-case basis.

For admission to regular status in the PhD program, the student must have an undergraduate grade point average of at least 3.75/4.0 for direct admission into the PhD program or 3.5/4.0 for admission with an MS degree.

Graduate Record Examination (GRE) scores are required and are used in the evaluation process.

**Provisional Status**

For masters applicants whose undergraduate GPA is below 3.0/4.0, but no lower than 2.75/4.0, admission on provisional status will be considered on a case-by-case basis.

For students whose MS GPA is below 3.5/4.0, admission on provisional status will be considered on a case-by-case basis.

After the equivalent of one semester of full-time study as a provisional graduate student, the performance of the student is reviewed and will be (1) transferred to regular status, (2) dropped from the Graduate School or (3) allowed to continue the equivalent of another semester as a provisional student. It is ordinarily expected that provisional status will not exceed two semesters.

**Minimum English Proficiency Requirements**

Following are the acceptable means of verifying English proficiency for purposes of admitting international students to the Graduate School. These guidelines also apply to U.S. citizens and permanent residents who are not native speakers of English; these guidelines are subject to change by official action of the appropriate Graduate School governance bodies.

Visit the full English Proficiency Requirements for International Students policy, [https://documents.ku.edu/policies/Graduate_Studies/EnglishProficiencyIntlStudents.htm](https://documents.ku.edu/policies/Graduate_Studies/EnglishProficiencyIntlStudents.htm)
Admission:
The following are acceptable means for verifying English proficiency for purposes of admission for non-native speakers of English and/or international students to graduate programs at KU:

Graduation with a baccalaureate degree (or higher) earned in residence from an accredited U.S. institution of higher education, or from such an institution whose medium of instruction is English. This does not apply to degrees earned online.

Receipt of official copy (not student’s copy) of applicant’s proficiency scores achieved not more than two years prior to the semester of admission.

All international students are required to check-in at the Applied English Center (AEC) upon arrival to campus. At that time, the AEC will confirm the student’s level of English proficiency and determine if additional English courses are required.

GTA and GRA eligibility:
Graduate teaching and research assistant eligibility requirements are distinct from admission requirements. Additional information on eligibility for graduate teaching assistants and graduate research assistants may be found in the GTA/GRA Eligibility Guidelines.

The Board of Regents policy on spoken English competency for graduate teaching assistants requires that non-native speakers of English demonstrate English proficiency by obtaining a minimum score of 50 on the SPEAK or TSE, a 22 on the speaking portion of the iBT, or an 8 on the IELTS and that the student must be interviewed by three institutional representatives to determine sufficient English proficiency. More information may be found in the Kansas Board of Regents Policy on Spoken English Language Competency of Faculty and Graduate Teaching Assistants.

The Graduate School English Proficiency Score requirements for admission and GTA/GRA eligibility are listed in the following chart.
Note: All students whose first language is not English must be cleared by the Applied English Center before enrolling.

Enrollment
KU defines full-time graduate enrollment as 9 credit hours and half-time as 5 hours. For summer session, full-time enrollment is 6 credit hours, while half-time enrollment is 3 credit hours. If a student is enrolled in fewer hours than half-time, then that student is considered to be enrolled part-time. Graduate students are not normally permitted to enroll for more than 16 hours a semester or more than 8 hours in summer session

While these are KU’s definitions of full-, part-, and half-time enrollment, financial aid providers may have different definitions. Be sure to consult with your financial aid provider before making enrollment decisions. Students with GTA appointments, GRA appointments, GI Bill funding, or dissertation hours are subject to different definitions of full-time and half-time enrollment.

Failure to enroll or delays in enrollment directly impact the student’s enrollment status and can cause the student to incur additional expense. Students not enrolled by the first day of classes will be assessed a $150 late fee to enroll. Students who wish to leave their graduate program should inform the department of such plans in writing so that a Voluntary Discontinue form may be filed on his or her behalf. Students not enrolled by the 20th of classes will be automatically discontinued in Enroll & Pay.
Students who wish to apply for a temporary leave from the graduate program should contact the department to petition for a Leave of Absence. Leaves of one to three semesters, including summer session, may be requested. A Leave of Absence allows the student to temporarily suspend enrollment without discontinuing his or her place in the graduate program.

Special enrollment requirements apply to post-comprehensive doctoral students.

**Enrollment Status**

Enrollment status is defined by the Graduate School. The policy can be found at [https://documents.ku.edu/policies/Graduate_Studies/full-time_enrollment_graduate_students.htm](https://documents.ku.edu/policies/Graduate_Studies/full-time_enrollment_graduate_students.htm) and is defined as:

This policy defines the categories of full-time and part-time enrollment. For other policies related to enrollment and employment, please see the list below under related documents.

**Full-time enrollment for Fall and Spring semesters:**
- Enrollment in 9 credit hours;
- Enrollment in 6 credit hours plus a GTA, GRA, or GA appointment, regardless of percentage of appointment;
- Enrollment in 6 credit hours for graduate students using the Montgomery GI Bill – Active Duty (MGIB-AD) and Post-9/11 GI Bill – Active Duty;
- Doctoral candidates enrolled in dissertation hour(s). *See Doctoral post-comprehensive enrollment.

**Full-time enrollment for Summer semesters:**
- Enrollment in 6 credit hours;
- Enrollment in 3 credit hours plus a GTA, GRA, or GA appointment, regardless of percentage of appointment;
- Enrollment in 3 credit hours for graduate students using the Montgomery GI Bill – Active Duty (MGIB-AD) and Post-9/11 GI Bill – Active Duty;
- Doctoral candidates enrolled in dissertation hour(s).

**Half-time enrollment for Fall and Spring semesters:**
- Enrollment in 5 credit hours;
- Enrollment in 3 credit hours plus a GTA, GRA, or GA appointment, regardless of percentage of appointment;
- Enrollment in 3 credit hours for graduate students using the Montgomery GI Bill – Active Duty (MGIB-AD) and Post-9/11 GI Bill – Active Duty.

**Half-time enrollment for Summer semesters:**
- Enrollment in 3 credit hours;
- Enrollment in 1 credit hour plus a GTA, GRA, or GA appointment, regardless of percentage of appointment;
- Enrollment in 1 credit hour for graduate students using the Montgomery GI Bill – Active Duty (MGIB-AD) and Post-9/11 GI Bill – Active Duty.

Students enrolled in fewer hours than defined by half-time enrollment are considered part-time.

All students should check with their graduate degree programs and Graduate Studies’ policies to determine if additional enrollment requirements or summer enrollment requirements exist.

**Seniors and Graduate Study (Co-enrollment)**

A Mechanical Engineering senior at the University of Kansas who has a strong academic record may apply for contingent admission to the Graduate School and request permission of the Graduate Division.
to co-enroll in the Graduate School for the semester in which all requirements for the BSME degree will be completed. At least a 3.0 GPA is required.

**Grading**
The basic system in the Graduate School is an A, B, C, D, F system, where A designates above-average graduate work, B, average graduate work, C, passing but not average graduate work. D and F work does not count toward a degree.

The letter P is used in this system only to indicate participation in thesis, dissertation, and research enrollments (related to thesis or dissertation), and in the first semester enrollment of a two-semester sequence course. P grades for enrollments in research or dissertation leading to one of the doctorates may remain unchanged, but a letter grade (A, B, C, D or F) will be assigned in the last semester of enrollment to characterize the quality of the final product. The I grade is not appropriate for enrollment in thesis, dissertation, or research, and will not be accepted.

For enrollments other than thesis, dissertation, or research, the letter I is used to indicate course work that has been of passing quality, some part of which is, for good reason, unfinished. The grade of I for graduate courses shall remain unchanged on the student’s record except that should the student subsequently complete the course work, the instructor would then change the I to a letter grade, i.e., A, B, C, D or F. At least a B average is required on course work counted towards a Masters’ and only courses graded A, B or C may be so counted. Courses graded P, S, U or I are excluded from the computation of the average.

**Probation**
Upon falling below a cumulative graduate grade point average of 3.0, computed with the inclusion of grades earned at the University of Kansas for all courses including undergraduate courses taken to make up background deficiencies, the student shall be placed on probation by the Graduate Division of the School of Engineering. If the student's overall graduate average has been raised to B by the end of the next semester of enrollment after being placed on probation, the student may be returned to regular status; if not, the student will not be permitted to re-enroll in the Graduate School unless the Graduate Division acts favorably on a recommendation from the Department for the student to continue in graduate study.

If admitted on probation, a student must earn an overall graduate average of at least a 3.0 during the first semester of enrollment (in which case the student is considered to have achieved regular status). A student admitted on probation who fails to earn a 3.0 average in the first semester will normally not be permitted to re-enroll. When the particular circumstances may be deemed to justify continuation, and upon the recommendation of the Department, such a student may be continued on probation by the Graduate Division for one additional semester equivalent of full-time graduate study.

**Scholarships and Fellowships**
Graduate students may apply for financial aid in the form of scholarships, fellowships, research assistantships, and teaching assistantships. Fellowships and scholarships are available for outstanding students. Information on financial support for the current year is available in the Departmental office. Applications for scholarships, fellowships or assistantships should be submitted to the Department prior to the academic year for which the appointment is desired. Applications for teaching assistantships should be submitted prior to May 15 for the Fall semester and October 15 for the Spring semester. In general, these awards are offered to 1st year graduate students.

Most scholarships, fellowships and other forms of financial support require the student to maintain a minimum cumulative grade point average. This grade point average is always computed only with plan-of-study course grades, and excludes independent study credit.
KU pays the tuition and 3 hours of campus fees of graduate students who receive appointments as graduate teaching assistants (GTAs). The percentage paid by KU depends on the level of appointment.

<table>
<thead>
<tr>
<th>Percentage of Appointment</th>
<th>Percentage of Tuition</th>
<th>Percentage of 3 Hours of Campus Fees</th>
</tr>
</thead>
<tbody>
<tr>
<td>40% or more appointment</td>
<td>100% of tuition</td>
<td>100% of 3 hours of campus fees</td>
</tr>
<tr>
<td>30% - 39% appointment</td>
<td>75% of tuition</td>
<td>75% of 3 hours of campus fees</td>
</tr>
<tr>
<td>20% - 29% appointment</td>
<td>50% of tuition</td>
<td>50% of 3 hours of campus fees</td>
</tr>
<tr>
<td>10% - 19% appointment</td>
<td>25% of tuition</td>
<td>25% of 3 hours of campus fees</td>
</tr>
</tbody>
</table>

Where applicable, staff (resident) rates are assessed before tuition is paid. Only graduate students involved in direct classroom or laboratory instruction are eligible for appointments as graduate teaching assistants and for the tuition payment program. Eligibility is limited to the term during which students have instructional appointments. The tuition payment program covers only tuition, including any differential tuition assessed, and 3 hours of campus fees. It is not applicable to the remaining hours of campus fees; KU Edwards Campus construction fee, union fee, and required fees; mediated and Continuing Education course fees; optional fees; housing costs; or other specialized fees.

Further information about tuition and fees is available from the Office of the University Registrar.

**Master Degrees**

**Master of Science (MS) Degree**

The Department of Mechanical Engineering offers both a thesis option and a non-thesis option leading to the M.S. degree. Both options require a minimum of 30 credit hours of graduate work. The thesis option must include a thesis for at least six hours of credit. The non-thesis option must include at least three-credit hours of independent investigation. A degree progress chart is shown on the following pages.

A maximum of 6 hours of mechanical engineering courses numbered between 500 and 699 may be included in the program. Courses either required or used for the B.S. degree may not be used to fulfill M.S. degree requirements.

**Major**

The major will be selected from the energy and thermal-fluids category, the mechanical design category, the computational mechanics category or the biomechanics category (course groups listed on page 19). A maximum of six hours of Mechanical Engineering courses numbered between 500 and 699 may be included in the program of study. Courses either required or used for the B.S. degree may not be used to fulfill M.S. degree requirements. At least half of the graduate level coursework must be taught by graduate faculty employed full-time by the Department of Mechanical Engineering.

**Plan of Study**

The M.S. degree student selects an adviser in the first semester of graduate study. The student and the student’s advisory committee determine a program of study during the first semester of enrollment. The program of study must include (1) a minimum of 12 credit hours in a major selected from Mechanical Engineering courses (excluding credit for mathematics and the independent investigation or thesis) and (2) no fewer than three credit hours dealing with advanced mathematics. The complete plan of study must be approved by the Advisory Committee and the Graduate Director before the beginning of the second semester of graduate enrollment and filed electronically with the Department and the Graduate
Division of the School of Engineering. The online Plan of Study can be found at
https://gradplan.enr.ku.edu/accounts/login/.

Thesis Option
The program of study for the thesis option includes the requirements above plus a minimum of six credit hours of thesis.

A thesis-option student is expected to do original work that would be the basis of a paper suitable for publication in a refereed journal. After the final oral examination has been passed, and after any changes required by the examination committee have been made in the theses, the thesis should be submitted electronically in PDF Format to ProQuest/UMI on or before the date specified by the Graduate School. Supplementary materials may be added in other formats. (See Section 4, Publication Requirement.) You are responsible for submitting any bound copies that may be required by your department and/or advisor. Recommended binding services for personal or departmental copies may be found at http://www.graduate.ku.edu/etd/sub Submitting.

Non-Thesis Option
The program of study for the non-thesis option includes the requirements above plus a minimum of three credit hours of independent investigation.

A non-thesis-option student must do an analytical or experimental study acceptable to the advisory committee. An oral presentation of the results of the independent investigation before Mechanical Engineering graduate students and faculty is required. A typed unbound project report must also be provided to the advisory committee.

Final Examination
Each Masters’ degree candidate must pass a final examination that may be oral, or both written and oral, as determined by the advisory committee. The examination must be publicized at least one week before the date of the examination. The examination will cover the field of mechanical engineering for both the thesis and non-thesis options and emphasize the thesis for the thesis option.

The thesis presentation portion of the examination shall be open. The written portion of the examination, if required, will be composed and evaluated by the examination committee. The examination committee, which is normally the advisory committee, must consist of at least three members of the Graduate Faculty and at least two must be Mechanical Engineering Faculty.

The request to schedule the examination must be submitted to the Mechanical Engineering Department at least two weeks prior to the examination date. Unbound thesis copies are to be submitted to the examination committee two weeks before the examination.

Note: Masters Candidates must be enrolled for at least one credit hour during the semester in which the Masters’ final examination is taken.

Only two attempts to pass the Masters’ examination are allowed. If the examination is not passed in two attempts, the student will be terminated from the program and will not receive the degree. Only the thesis option is eligible for “Honors” designation and then only in exceptionally meritorious cases.

Note: see the online KU Electronic Thesis and Dissertation Page (http://www.graduate.ku.edu/ETD).

Program Time Constraints
Masters’ degree students are allowed seven years for completion of all requirements for the degree. In cases in which compelling reasons or circumstances recommend a one-year extension, the Graduate Division, on recommendation of the department/committee, has authority to grant the extension. In cases where more then eight years are requested, the appropriate appeals body of the school or division
considers petitions for further extensions and, where evidence of continuous progress, currency of knowledge, and other reasons are compelling, may grant them.

**Credit by Transfer**
Six hours of graduate credit taken at a regionally accredited graduate school may be transferred and applied to the Masters’ degree, provided that the transfer has the approval of the Department and of the Dean of Engineering. Eight hours may be approved for transfer if the student holds a baccalaureate degree from the University of Kansas. Transfer credit may not be the last hours required for the degree. Only work graded A or B may be transferred. The University of Kansas does not accept the transfer of credit from other institutions for graduate-level courses completed in institutes and workshops or given for life/work experience.
Doctoral Degrees

Doctor of Philosophy (Ph.D.) Degree

A minimum of three full academic years, or the equivalent, beyond the baccalaureate degree must be spent in graduate study at the University of Kansas or some other approved university to complete requirements for the Ph.D. degree.

A minimum grade point average of 3.5/4.0 in Masters’ degree work is normally required for admission to a doctoral program.

A progress chart is given on the following pages showing the approximate time for each milestone in the program.

Doctoral Qualifying Examination

For a student with a master’s degree, a qualifying examination will normally be taken in the first semester of participation in the doctoral program on regular status. It may not be taken later than the end of the second semester. For a direct admit with a bachelor’s degree, a qualifying examination will typically be taken after completion of 30 hours of graduate course work. The Doctoral Qualifying Examination is defined below.

The Qualifying Examination Committee consists of three or more members of the graduate faculty within the area of emphasis and are normally expected to be members of the Research and Graduate Studies Committee of the Department of Mechanical Engineering. A grade of pass or fail will be assigned and be kept in the departmental records.

Three evaluation criteria for the Qualifying Examination were established by the faculty on August 15, 2008.

CRITERION #1: The student must demonstrate an understanding in a core set of fundamental undergraduate mechanical engineering knowledge.

CRITERION #2: The student must demonstrate an understanding in a subset of core advanced mechanical engineering knowledge.

CRITERION #3: The student must demonstrate the ability to communicate effectively through writing, oral presentation, and open questioning.

The faculty from the four areas of study in Mechanical Engineering, as defined by the Graduate Student Handbook, are responsible for developing separate methods to evaluate the criteria. The areas of study are: Biomechanics and Biomaterials; Computational Mechanics and Mathematics of Computations; Thermal-Fluid Systems and Heat Transfer; and Mechanical Design, Manufacturing, and Microprocessor Applications. The methods for the four areas to assess the three criteria area listed below.

Criterion #1

ASSESSMENT #1 (all four groups the same): This criterion will be assessed and satisfied with the current policies for entrance to the KUME graduate program. This includes the current requirements for satisfying deficiencies in the undergraduate mechanical engineering curriculum. At the time of the Ph.D. qualifying exam, the student must have satisfied and completed all requirements and conditions specified by the Department of Mechanical Engineering and the SOE to address deficiencies.

Criterion #2

BIOMECHANICS AND BIOMATERIALS CRITERION #2: The student will select three 3 credit mechanical engineering courses numbered 700-990 (excluding ME 702, ME 860, ME 899, ME 901, and ME 999) with the approval of his/her advisor and the qualifying committee chair. The chosen
courses should reflect the student’s interest in the area(s) of biomechanics and biomaterials. To satisfy this criterion, the student must complete the three qualifying courses with an average GPA of 3.5 or above.

**Computational Mechanics and Mathematics of Computations Criterion #2:** The student is required to demonstrate an understanding of 1) the fundamentals of mechanics, 2) the theory of finite-element methods and 3) applied mathematics, by passing written exams in each of these areas. The series of three written exams will be scheduled during one week each spring semester. Each exam will be graded separately. A student must pass all three exams to pass the qualifying requirement. A CONDITIONAL PASS may be awarded in the case of a student passing in two areas and failing in just one area. Additional conditions that must be satisfied may include extra coursework and/or a repeat of the exam in the area failed. A student failing to pass in at least two areas must repeat the entire exam sequence the following year.

**Thermal-Fluid Systems and Heat Transfer Criterion #2:** A student must demonstrate that they have an understanding in a core advanced thermal-fluid systems and heat transfer knowledge by completing a graduate level course with grade “A” in the following areas: Fluids, Heat Transfer, Applied Thermodynamics and Advanced Mathematics. A course from each area may be selected from the following.

<table>
<thead>
<tr>
<th>Fluids</th>
<th>Heat Transfer</th>
<th>Applied Thermodynamics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 711</td>
<td>ME 770</td>
<td>ME 636</td>
</tr>
<tr>
<td>ME 810</td>
<td>ME 774</td>
<td>ME 637</td>
</tr>
<tr>
<td>*ME 733</td>
<td>*ME 831 or C&amp;PE 731</td>
<td>ME 712</td>
</tr>
<tr>
<td>*ME 831 or C&amp;PE 731</td>
<td></td>
<td>*ME 733</td>
</tr>
</tbody>
</table>

*Course will count in one area only

**Advanced Mathematics**
Courses selected from approved list

Equivalent graduate courses that are completed at other institutions may be used to satisfy the requirements. For a conditional pass, a student must complete with an “A” grade courses in at least two areas and obtain a “B” grade in each of the remaining areas. The student will be required to pass courses with “A” grades in the areas in which he/she obtained “B” grades, within a year or before taking the Ph.D. comprehensive examination.

**Mechanical Design, Manufacturing, and Microprocessor Applications Assessment #2:** The student will select three 3 credit mechanical engineering courses numbered 700-990 (excluding ME 702, ME 860, ME 899, ME 901, and ME 999) with the approval of his/her advisor and the qualifying committee chair. The chosen courses should reflect the student’s interest in the area(s) of design, manufacturing, and microprocessor applications. To satisfy this criterion, the student must complete the three qualifying courses with an average GPA of 3.5 or above.

**Criterion #3**
After further reflection by the different research groups, there has been some discussion as to whether this should be included as part of the evaluation criteria. This will be decided at the faculty meeting.

**Biomechanics and Biomaterials Criterion #3:** This assessment will be done over a three day period.
On the morning of the first day, the student will be provided three published manuscripts within his/her research area. The student will briefly review the articles and then select one for the examination. There are two steps to the examination.
Within the first three hours of the examination:

The student will write and submit a one page summary of the chosen manuscript. No outside help or resources are allowed. A computer with word processing will be provided. The written examination will last 3 hours or less.

Within the next three days of the examination:

The student will prepare a PowerPoint presentation to be presented to the qualifying examination committee. The presentation should include a discussion of the manuscript content and an evaluation of its strengths and weaknesses. No outside help will be allowed, although the student may utilize resources such as published manuscripts, textbooks, and references as needed to clarify the manuscript content. This is not an examination of research methods. It is also not an examination of the student’s ability to assimilate a broad research topic. This is an examination of the student’s ability to effectively communicate the information contained within the chosen manuscript. Therefore, no other manuscripts should be referred to during the presentation. The oral presentation will last 20 minutes or less. The presentation, including questions on the manuscript content, will last 60 minutes or less.

Note: A set of SAMPLE questions corresponding to a SAMPLE manuscript (i.e. not the manuscript selected by the student) will be provided prior to the exam to give the student insight into the types of questions he/she should expect on the manuscript content during the exam.

**Computational Mechanics and Mathematics of Computations Criterion #3:** Under development.

**Thermal-Fluid Systems and Heat Transfer Criterion #3:** The student will give a 20 minute oral presentation to the qualifying examination committee. The material for the presentation will be from one of the following: the results of the student’s MS thesis research, the manuscript of the student’s published paper, or the results of a special research project assigned by the student’s major advisor. The student must provide to the committee an abstract of the presentation ahead of the examination. To receive a grade of pass, the student must demonstrate to the committee his/her ability to effectively communicate the information. For a student that receives a grade of conditional pass, the committee will recommend appropriate remedies. If a student receives a grade of fail, a second and final attempt will be granted.

**Mechanical Design, Manufacturing, and Microprocessor Applications Criterion #3:** This assessment will be done over a three day period. On the morning of the first day, the student will be provided three published manuscripts within his/her research area. The student will briefly review the articles and then select one for the examination. There are two steps to the examination.

Within the first three hours of the examination:

The student will write and submit a one page summary of the chosen manuscript. No outside help or resources are allowed. A computer with word processing will be provided. The written examination will last 3 hours or less.

Within the next three days of the examination:

The student will prepare a PowerPoint presentation to be presented to the qualifying examination committee. The presentation should include a discussion of the manuscript content and an evaluation of its strengths and weaknesses. No outside help will be
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Note: A set of SAMPLE questions corresponding to a SAMPLE manuscript (i.e. not the manuscript selected by the student) will be provided prior to the exam to give the student insight into the types of questions he/she should expect on the manuscript content during the exam.

Plan of Study
On successful completion of the qualifying examination, the student selects a major professor from the Department to serve as the chairperson of the advisory committee and to direct the research. An advisory committee of at least five Graduate Faculty members from the School of Engineering with at least three from the Mechanical Engineering faculty is then selected by the student and his adviser to assist the student in preparing the plan of study (see following two pages), to conduct the comprehensive examination and to assist the student in planning research.

Courses completed without an approved program of study filed will not necessarily count toward the degree. The complete plan of study must be submitted before the end of the first semester and include the specific courses and all other requirements (research skills, research topic, etc.), and filed electronically with the Department and the Graduate Division of the School of Engineering.

A minimum of 72 credit hours of graduate credit beyond the bachelor’s degree is required for a Ph.D. For students with a 30-credit Masters’ degree in Mechanical Engineering, a minimum of an additional 18 credits of graduate course work and a 24-hour dissertation are required. If a Masters’ degree is not sought, 42 hours of graduate course work beyond the bachelor’s degree and a 30-hour dissertation are required. A minimum of 9 credit hours of the 18 (or 21 of the 42) must be mechanical engineering courses numbered 700-900 (excluding ME 702, ME 899, ME 901 and ME 999). A minimum of 9 credit hours of advanced mathematics beyond the bachelor’s degree is required.

Proficiency in Research Skill Area and Responsible Scholarship
The Ph.D. student must demonstrate proficiency in at least one research skill area. Since the needs of students differ, the research skills are determined with the advice and approval of the advisory committee. Possible areas may include:

1. **Foreign Language.** The aspirant may demonstrate a reading knowledge in a foreign language in either of two ways:
   a. Receive a score in the language on the Educational Testing Service Graduate School Foreign Language Test at, or above, the minimal level prescribed by the Graduate School
   b. Complete a language course approved by the advisory committee with a grade of B or better.

2. **Computer Science.** To establish competence in computer science, it is necessary to satisfy the advisory committee by demonstrating proficiency in a commonly used programming language and creating at least one original program.

The responsible scholarship requirement may be met by taking ME 801, in addition to all other course and credit requirements.
All research skill and responsible scholarship requirements must be satisfied prior to the comprehensive examination and reported to the Graduate Division.

**Doctoral Comprehensive Examination**

Following the completion of at least 18 credit hours of coursework beyond the master’s degree, a comprehensive or candidacy examination must be passed. The comprehensive examination shall consist of a presentation of the student’s proposal for research on a topic previously approved by the advisor, followed by a public oral examination based on the aspirant’s academic background. Through the Do-All form, the Department must request the School of Engineering Graduate Division to schedule the comprehensive oral examination in advance of the examination date by a minimum of two weeks. The committee (typically the advising committee) for the comprehensive oral examination must consist of at least five members, all of whom must be members of the Graduate Faculty and at least three of whom must be Mechanical Engineering Faculty. The Graduate Division of KU, on the basis of nominations submitted by the Department, will designate its members. At least one of the members must be from a department other than Mechanical Engineering. This member represents the Graduate School and must be a regular member of the Graduate Faculty. The examination may be scheduled provided that no less than five months have elapsed from the time of the aspirant's first enrollment at this university considering that the Qualifying Exam has been successfully completed. The schedule for the examination should be announced (by email, web, and posted notices) throughout the Department at least 7 days in advance.

For every scheduled examination, the department will report a grade of honors, satisfactory, or unsatisfactory. If the aspirant receives a grade of unsatisfactory on the comprehensive oral examination, it may be repeated upon the recommendation of the Department and the request of the aspirant. The examination may not be repeated until at least 90 days have elapsed since the last unsuccessful attempt and no later than one year from the date of the first attempt. Normally, the aspirant will be terminated from the doctoral program if the comprehensive examination is not passed after two attempts.

After passing the comprehensive oral examination for a doctoral degree, the candidate must be continuously enrolled, including summer sessions, until all requirements for the degree are completed, and each enrollment must reflect, as accurately as possible the candidate's demands on faculty time and university facilities. During this time, until all requirements for the degree are completed or until 18 post-comprehensive hours have been completed (whichever comes first), the candidate must enroll for a minimum of 6 hours a semester and 3 hours a summer session. Post-comprehensive enrollment may include enrollment during the semester or summer session in which the comprehensive oral examination has been passed. If after 18 hours of post-comprehensive enrollment, the degree is not completed, the candidate must continue to enroll each semester and each summer session until all requirements for the degree have been met. The number of hours of each enrollment must be determined by the candidate's dissertation advisor and must reflect as accurately as possible the candidate's demands on faculty time and university facilities.

**Dissertation**

A dissertation is required of each doctoral candidate. The Ph.D. dissertation presents the results of the student's research investigation. It is expected to make an original contribution to technical knowledge of sufficient quality to merit publication(s) in refereed journals. A candidate for a doctoral degree must satisfy all Graduate School requirements for the degree and must submit to the major professor a paper or papers, based on the dissertation, suitable for publication in a refereed journal.

When the student passes the comprehensive oral examination, the Graduate Division identifies the candidate's Dissertation Committee based on the recommendations of the Department. The Dissertation Committee must consist of at least three members and may include members from other
departments and divisions or, on occasion, members from outside the university. All members of the Committee must be chosen from the Graduate Faculty, and the chairperson must, in addition, be authorized to chair doctoral dissertations. A prospective member of the Committee from outside the university must have gained appointment as an ad hoc member of the Graduate Faculty prior to appointment to the Committee.

When the completed dissertation has been accepted by the Dissertation Committee, and all other degree requirements have been satisfied, the chairperson of the Dissertation Committee requests, three weeks in advance of the desired examination, the Graduate Division to schedule the final oral examination. The examination must be publicized at least 7 days prior to the date of the examination in the Department. At least five months must elapse between the successful completion of the comprehensive oral examination and the date of the final oral examination.

The committee for the final oral examination must consist of at least five members (the members of the Dissertation Committee plus at least two other members of the Graduate Faculty recommended by the chair of the dissertation committee and the Department and appointed by the Graduate Division). At least one of the members must be from an academic department other than the Department. This member represents the Graduate School and must be a regular member of the Graduate Faculty. The Department will report to the Graduate Division (by Do-All form) for every scheduled final oral examination a grade of honors, satisfactory, or unsatisfactory for the candidate's performance. If a grade of unsatisfactory is reported, the candidate may be allowed to repeat the examination upon the recommendation of the Department.

When the final oral examination has been passed and the dissertation has been signed by the members of the dissertation committee, a copy needs to be submitted electronically to the Graduate School, one bound copy to the major professor, and one bound copy to the Mechanical Engineering Department (with the funds needed to bind the two copies). In addition, the candidate must make arrangements for publication of the dissertation abstract in "Dissertation Abstracts International" Information on publication procedures may be secured from the Graduate Division. Recommended binding services for personal or departmental copies may be found at http://www.graduate.ku.edu/etd/submitting.

Program Time Constraints

**Residence Requirement**

Two semesters, which may include one summer session, must be spent in resident study at the University of Kansas. During this period of residence the student must be involved full-time in academic or professional pursuits, which may include appointments in this university for teaching or research if it is directed specifically toward the student's degree objectives. In this latter case, the student must be enrolled in a minimum of 6 hours per semester, and the increased research involvement must be fully supported and documented by the dissertation supervisor as being contributory to the student's dissertation or program objectives. The research work must be performed under the direct supervision of the major adviser if on campus, or with adequate liaison if off campus.

**Maximum Tenure**

The following time constraints apply for completion of doctoral programs:

a. A student who enters graduate studies at this University with a masters' degree from another university must complete all the work for the doctoral degree within eight years of the time of the initial enrollment in graduate work at this university.

b. A student who leaves after having received the masters' degree from this University, and later decides to pursue the doctorate, may apply through the Department and Graduate Division for readmission to the Graduate School. If readmission is granted, the student must complete all
the work for the doctoral degree within eight years of the time of the first enrollment after readmission.

Extension of the tenure periods specified above may be granted in exceptional circumstances for one year at a time by the Graduate Division upon receipt of a satisfactorily documented petition from the student concerned, supported by the Department.

A student in any of the categories listed above may petition the Graduate Division through the Department for a leave of absence during either the pre- or post-comprehensive period to pursue full-time professional activities related to the student’s doctoral program and long-range professional goals. Leaves of absence may also be granted because of illness or other emergency. Ordinarily a leave of absence is granted for one year, with the possibility of extension upon request. After an absence of five years, however, a doctoral aspirant or candidate loses status as such and, in order to continue, must apply for readmission to the Department and to the Graduate Division.

**Doctor of Engineering (D.E.) Degree**

The degree of Doctor of Engineering is granted upon completion of at least 90 credit hours of post-baccalaureate work. The minimum coursework requirement is 54 credit hours, which must include, as a minimum (see list of approved courses on page 25):

- Engineering Design 9 cr. hrs.
- Engineering Management 9 cr. hrs.
- Mathematics 9 cr. hrs.

The remaining 27 credit hours of coursework are selected to meet the student's interests and goals subject to the approval of the student's advisory committee. Coursework required for a masters’ degree may be included in this 54-credit hour total if approved by the advisory committee. A minimum of 21 credit hours of Mechanical Engineering courses numbered 700-990 (excluding 702, 899 and 901) must be included. In addition, the following research components are required for the degree:

- Internship 12 cr. hrs.
- Project 24 cr. hrs.

Each student will spend at least 12 consecutive months of approved internship in industry or government. No coursework will be completed during this time, except that one credit hour is given per month of approved internship experience, provided the student is enrolled in ME 901. During the internship, the student is supervised by a preceptor at the internship site in conjunction with the student's regular faculty adviser. The preceptor may be appointed as an adjunct faculty member at the University, and can become a member of the student's advisory committee. Monthly progress reports should be prepared by the student while on internship and submitted to the student’s regular faculty adviser.

The internship is intended to involve the student at a level that promotes experience in project management. Internship can be served in several ways:

a) on full-time grant for one year or more with a government laboratory or company, or
b) full-time employment for one year or more with a company in the U.S. or abroad.

The DE student must also demonstrate a proficiency in at least one research skill area and responsible scholarship (see Ph.D. degree requirements on page 14).

Students must pass a qualifying examination during the first semester of participation. The student must pass a comprehensive examination following the completion of the major portion of the course work.
When the student’s advisory committee has accepted the final project report, the student must pass a final oral examination (see Ph.D. requirements).

Courses

Numbering System

Courses that may give graduate credit are numbered according to the following scheme:

- Courses numbered 500-699 are designed primarily for juniors and seniors, but are also taken by some graduate students who have fewer than 30 hours of graduate credit.
- Courses numbered 700-799 are designed primarily for graduate students who have fewer than 30 hours of graduate credit, but they are also taken by some undergraduates.
- Courses numbered 800-899 are designed primarily for graduate students who have fewer than 30 hours of graduate courses.
- Courses numbered 900-999 are designed primarily for graduate students who have 30 or more hours of graduate credit.

No course, regardless of its number, can give graduate credit unless it has been approved for graduate credit by the Graduate Division or the Graduate School, and is taught by a person holding a current appointment to the Graduate Faculty.
## Categories for Major

### Approved Courses in Mechanical Engineering

#### Energy and Thermal-Fluids
- **ME 636**  Internal Combustion Engines
- **ME 637**  Steam Power Plants
- **ME 656**  Thermal System Design
- **ME 711**  Bearings and Bearing Lubrication
- **ME 712**  Advanced Engineering Thermodynamics
- **ME 733**  Gas Dynamics
- **ME 770**  Conductive Heat Transfer
- **ME 774**  Radiative Heat Transfer
- **ME 810**  Advanced Fluid Dynamics
- **ME 831**  Convective Heat and Momentum Transfer
- **ME 832**  Computational Fluid Mechanical and Heat Transfer
- **ME 963**  Finite Element Method in Fluid Dynamics
- **ME 964**  Advanced Topics in the Finite Element Method for Fluid Dynamics

#### Mechanical Design
- **ME 627**  Automotive Design
- **ME 661**  Finite Element Method for Stress Analysis
- **ME 696**  Design for Manufacturability
- **ME 720**  Adv. Dynamics of Machinery
- **ME 740**  Mechanical Vibrations
- **ME 763**  Intro. to Composite Materials
- **ME 780**  Kinematic Synthesis of Mechanisms
- **ME 796**  System Design and Analysis
- **ME 808**  Advanced Microprocessor Applications
- **ME 863**  Mechanics of Composite Materials
- **ME 882**  Advanced Control Systems
- **ME 961**  Finite Element Method for Nonlinear Problems in Solid Mechanics

#### Biomechanics
- **ME 633**  Basic Biomechanics
- **ME 661**  Finite Element Method for Stress Analysis
- **ME 696**  Design for Manufacturability
- **ME 720**  Adv. Dynamics of Machinery
- **ME 740**  Mechanical Vibrations
- **ME 750**  Biomechanics of Human Motion
- **ME 751**  Experimental Methods of Biomechanics
- **ME 753**  Bone Biomechanics
- **ME 757**  Biomechanical Systems
- **ME 760**  Biomedical Product Development
- **ME 763**  Intro. to Composite Materials
- **ME 765**  Biomaterials
- **ME 810**  Advanced Fluid Dynamics
- **ME 831**  Convective Heat and Momentum Transfer
ME 854  Continuum Mechanics for Soft Tissues

*Useable in any of the first three categories*
- ME 708  Microcomputer Applications in Mechanical Engineering
- ME 808  Advanced Microprocessor Applications
- ME 861  Theory of the Finite Element Method
- ME 862  Finite Element Method for Transient Analysis
- ME 962  Advanced Treatment of p-Approximation, Error Estimation and Other Advanced Topics in the Finite Element Method

**Approved Courses in Mathematics**

The following courses may be used to satisfy mathematics requirements for a Mechanical Engineering graduate degree:

- ME 702  Mechanical Engineering Analysis
- PHSX 718  Mathematical Physics
- MATH 590  Linear Algebra
- MATH 591  Applied Numerical Linear Algebra
- MATH 611  Fourier Analysis of Time Series
- MATH 624  Discrete Probability
- MATH 627  Probability
- MATH 628  Mathematical Theory of Statistics
- MATH 631  Operations Research
- MATH 646  Complex Variable and Applications
- MATH 647  Applied Partial Differential Equations
- MATH 648  Calculus of Variations and Integral Equations
- MATH 715  Sampling Techniques
- MATH 717  Nonparametric Statistics
- MATH 727  Probability Theory
- MATH 728  Statistical Theory
- MATH 735  Intro To Optimal Control Theory
- MATH 750  Stochastic Adaptive Control
- MATH 765  Intro to Theory of Functions I
- MATH 766  Intro to Theory of Functions II
- MATH 783  Applied Numerical Analysis for Partial Differential Equations
- MATH 790  Linear Algebra II
- MATH 791  Modern Algebra I
- MATH 792  Modern Algebra II
- MATH 865  Intro to Stochastic Processes
Approved courses in Design, Management and Mathematics for Doctor of Engineering Degree

**Engineering Design**
- ME 636 Internal Combustion Engines
- ME 637 Steam Power Plants
- ME 696 Design for Manufacturability
- ME 708 Microcomputer Applications in Mechanical Engineering
- ME 780 Kinematic Synthesis of Mechanisms
- ME 796 System Design and Analysis
- ME 808 Advanced Microprocessor Applications

**Engineering Management**
- EMGT 802 Statistical Analysis and Prediction of Engineering Systems
- EMGT 803 Technological Forecasting and Assessment
- EMGT 804 Business Development and Marketing of Professional Services
- EMGT 805 Management of Innovation
- EMGT 806 Finance for Engineers
- EMGT 808 Quality Management
- EMGT 809 Personal Development for the Engineering Manager
- EMGT 810 Application of Quantitative Analysis in Decision Making
- EMGT 811 Engineering Systems Simulation
- EMGT 812 Law and the Design Professional
- EMGT 813 Design Project Management of Professional Practice
- EMGT 814 Financial and Managerial Accounting for the Engineer
- EMGT 821 Strategic Analysis of Technology Projects
- EMGT 823 Management of Internal Engineering Projects
- EMGT 824 Product Market for Engineering Managers
- EMGT 830 Case Studies in Engineering Management
- EMGT 840 Systems Approach to Engineering
- EMGT 844 Managing Software Development Projects
- EMGT 848 Information Technology for Management
- EMGT 850 Environmental Issues for Engineering Managers
- EMGT 854 Management of Business Intelligence and Security for Strategic Planning
- EMGT 862 Manufacturing Systems Integration
- EMGT 867 Advanced Operations Management

**Mathematics**
- See list for Ph.D. (page 20)
Mechanical Engineering Graduate Course Descriptions

**ME 612 Heat Transfer (3)**
An applied study of conductive, convective, and radiative heat transfer mechanisms in solid and fluid systems. Engineering applications include solid conduction, free and forced convection in fluids, thermal radiation and heat exchangers, evaporators, and furnaces. Prerequisite: MATH 220 and ME 312. Corequisite: ME 510. LEC

**ME 627 Automotive Design (3)**
Basic concepts of automotive design and manufacture. Primary focus of course on vehicle design and performance. Design is subdivided into vehicle components of frame, suspension, front and rear axle, steering power train, front and rear wheel drive, and braking. Integration of these ideas into a vehicle design project with analysis of its performance culminates the course. Prerequisite: Permission of instructor. LEC

**ME 628 Mechanical Design (3)**
Design of mechanical components and systems. Prerequisite: ME 311. LEC

**ME 633 Basic Biomechanics (3)**
Provides an overview of musculoskeletal anatomy. Biodynamics includes linear and angular dynamics of human movement, energy expenditure and power required to perform a given activity. Students will learn to determine joint forces and torques (in 2-D) from kinematic data for body segments and force plate data. The tissue mechanics section builds on mechanics of materials. Students will learn about tissue properties, appropriate constitutive models and determination of stresses and strains in tissues and structures under normal loading conditions. Prerequisite: ME 311 and ME 520 or equivalent. LEC

**ME 636 Internal Combustion Engines (3)**
Study and analysis of internal combustion engine physical phenomena dynamic function, components, and system design. Emphasis on spark ignition and compression ignition engine analysis. Performance, current technology, thermodynamics, fluid-mechanics, combustion products and pollution, fuels and lubrication, and mechanical design. Prerequisite: ME 412. LEC

**ME 637 Steam Power Plants (3)**
A study of steam power plant equipment including thermodynamic analysis, design and performance of modern steam generators, prime movers, and auxiliaries. Prerequisite: ME 412 or permission of instructor. LEC

**ME 661 The Finite Element Method (3)**
An introduction to the underlying theory of the finite element (FE) method and its application to linear solid and structural mechanics. FE formulations are derived for bars, beams, 2D formulations such as: plane stress, plane strain, and 3D solids. Basic issues are treated such as assembly and generation of FE equations, computation, post-processing, and interpretation of FE solutions (e.g. stresses and strains analysis). Prerequisite: ME 311, MATH 220, and MATH 290. LEC

**ME 682 System Dynamics and Control Systems (3)**
An introduction to the modeling and analysis of analog linear systems and the design of control systems. Topics include mathematical models of mechanical, electrical, fluid and thermal systems, feedback concepts, transient response, frequency response and vibration, system stability, and design of feedback control systems including PID. Prerequisite: ME 320. LEC

**ME 696 Design for Manufacturability (3)**
Tools to incorporate manufacturing and life-cycle concerns into the design of products. Prerequisite: ME 501 or equivalent. LEC
ME 702 Mechanical Engineering Analysis (3)
A study of advanced methods for engineering analysis of practical problems utilizing fundamental principles from engineering disciplines. The emphasis is on the solution of these problems and the interpretation and generalization of the results. Prerequisite: A course in differential equations. LEC

ME 708 Microcomputer Applications in Mechanical Engineering (3)
Design and implementation of interfaces of microcomputers to mechanical equipment. Includes laboratory experiments presenting selected industrial applications. Emphasis on human factors, functional design parameters and microprocessor interfaces. Includes instruction concerning specifications of practical hardware configurations and writing of programs necessary to accomplish mechanical systems applications. Prerequisite: Permission of instructor. LEC

ME 711 Bearings and Bearing Lubrication (3)
Theoretical aspects of lubrication, determination of pressure distribution in bearings from viscous flow theory, application of hydrodynamic and hydrostatic bearing theories to the design of bearings, high speed bearing design problems, properties of lubricants, methods of testing. Prerequisite: ME 510 and a course in differential equations. LEC

ME 712 Advanced Engineering Thermodynamics (3)
An advanced course in thermodynamics, mathematical in nature, with emphasis on a critical re-evaluation of the laws of thermodynamics, thermodynamics of one-dimensional gas flow, development of the classical thermodynamic relations and their application to engineering problems. Prerequisite: ME 508 and ME 412. LEC

ME 720 Advanced Dynamics of Machinery (3)
Dynamics of particles and of rigid bodies with advanced engineering applications; generalized coordinates; Hamilton's principles; Lagrange's equations; Hamilton-Jacobi theory. Prerequisite: ME 520. LEC

ME 733 Gas Dynamics (3)
A study of the thermodynamics and fluid dynamics of gaseous media. Emphasis is placed on the rigorous application of conservation laws to represent physical processes. Classical and statistical models for the thermodynamic and transport properties are examined. Applications include determination of gas properties, wave propagation, and high-speed flow. Prerequisite: ME 412 and ME 510 or equivalents. LEC

ME 736 Catalytic Exhaust Aftertreatment Modeling (3)
Fundamental concepts behind catalytic exhaust aftertreatment devices for automobiles including both monolithic catalysts and particulate filters. Studies of other catalytic devices intended for applications in the mechanical and chemical engineering fields. Topics covered are the development of governing equations based on conservation laws and their numerical solutions using finite difference methods. Studies will include a monolithic catalyst. Project assignments will be included. Prerequisite: ME 412 and ME 510 or permission of instructor. LEC

ME 740 Mechanical Vibrations (3)
Linear vibration theory. Lumped parameter approximations and distributed systems. Generalized properties and numerical solutions. Prerequisite: ME 520 and ME 528. LEC

ME 750 Biomechanics of Human Motion (3)
Fundamental concepts of anatomy and physiology are introduced but the focus is on the biomechanics of human motion. Human body segment kinematics and joint kinematics are analyzed. An introduction to muscle mechanics is provided. Applications in balance and gait are covered. Corequisite: ME 520. LEC
**ME 751 Experimental Methods in Biomechanics** (3)
This course will focus on methods of experimental measurement and computational modeling used in biomechanics. Instrumentation used to measure three-dimensional motion, ground reaction forces, center of pressure and EMG measures are considered. Methods used for inverse dynamics, direct dynamics and simulation are introduced. Corequisite: ME 520. LEC

**ME 752 Acoustics** (3)
This course will teach the production, propagation, and effects of sound waves. Detailed topics include plane wave, spherical wave, and cylindrical wave propagation in free space and waveguides, wave reflection and transmission on an interface, piston radiation, wave scattering and diffraction. Prerequisite: ME 520 or permission of instructor. LEC

**ME 753 Bone Biomechanics** (3)
Provides an in-depth knowledge of bone as a living mechanical system. Topics include the microstructure, biology, mechanical properties, mechanical modeling, adaptation of bone to the mechanical environment, and its simulation. Students assignments include homework, a poster presentation, basic finite element analysis laboratory, and bone remodeling simulations. Prerequisite: ME 311 or equivalent. LEC

**ME 754 Biomedical Optics** (3)
This course will cover the fundamentals of photon transport in biological tissues, including explanations of Rayleigh and Mie scattering, Monte Carlo simulations, the radiative transport equations and more. Also, the basic physics and engineering of various optical imaging techniques for biological tissues, including ballistic or quasi-ballistic imaging (such as confocal microscopy, and optical coherence tomography), diffuse imaging, photoacoustic imaging, will be introduced. Prerequisite: ME 508 or permission of instructor. LEC

**ME 755 Computer Simulation in Biomechanics** (3)
Provides an in-depth knowledge of 1) the process of developing a research question to be addressed with computer simulation, 2) various techniques for medical imaging to obtain model geometries (including hands-on experience with low-field MR imaging), 3) image segmentation techniques, 4) issues affecting geometric accuracy in model building, 5) the determination and specification of loading and/or kinematic boundary conditions, 6) the interpretation of model results in the context of the model limitations and the medical application. Knowledge and/or experience with finite elements is desirable, but not required. Prerequisite: ME 311 and ME 520 or equivalent. LEC

**ME 756 Biofluid Dynamics** (3)
An introduction to the fundamentals of biofluid dynamics, and the application of these principles to a variety of biological flows. Fluid flows in physiology, drug delivery, and biotechnology are investigated at a variety of scales, ranging from subcellular to organ groups. Topics include non-Newtonian constitutive equations, solution techniques, and principles of modeling and simulating. Prerequisite: ME 208 and ME 510 or equivalents. LEC

**ME 757 Biomechanical Systems** (3)
A course on the dynamics and motor control of human and animal motion. The course will focus on applying mechanical principles of dynamics, lumped parameter systems, and control theory to problems in biomechanics. Topics include muscle mechanics and dynamics, reflex and voluntary control, proprioception, anatomy of the muscular and nervous systems, and system dynamics in locomotion and other movements. Prerequisite: ME 520 or equivalent. Corequisite: ME 682 or permission of instructor.

LEC
**ME 758  Physiological System Dynamics (3)**
This course covers the use of engineering systems modeling approaches to understand the function of physiological systems. Systems covered include the cardiovascular system, the respiratory system, the renal system, the gastrointestinal system, and the musculoskeletal system. Prerequisite: ME 510, ME 520, Physics 212 or permission of instructor. **LEC**

**ME 760  Biomedical Product Development (3)**
Introduction to methods of taking medical product inventions from conception to initial stage production. Students work in cross-functional teams to investigate development potential of inventions. Topics covered include product development processes, regulatory issues with the FDA, quality system requirements, SBIR/STTR funding pathways, biomaterial and biomechanics issues in medical product design, and ethical considerations. Prerequisite: Senior or graduate student standing in engineering, business, industrial design, or an applicable life science field and permission of instructor. **LEC**

**ME 765  Biomaterials (3)**
An introductory course on biomaterials science and consideration of biomaterials in the design of biomedical implants. Topics including ethical considerations in biomaterials research and the role of the FDA in medical device design are also presented. Prerequisite: ME 306. **LEC**

**ME 770  Conductive Heat Transfer (3)**
The formulation of steady- and unsteady-state conduction heat transfer problems and their solution by analytical and numerical methods. Prerequisite: ME 612 or equivalent. **LEC**

**ME 774  Radiative Heat Transfer (3)**
The formulation of steady and unsteady radiation heat transfer problems and their solution by analytical and numerical methods. Prerequisite: ME 612 or equivalent. **LEC**

**ME 780  Kinematic Synthesis of Mechanisms (3)**
A study of methods of synthesis of mechanisms from kinematic specifications. Prerequisite: ME 520. **LEC**

**ME 790  Special Topics: _____ (1-5)**
Advanced courses on special topics of current interest in mechanical engineering, given as the need arises. Prerequisite: Approval of instructor. **LEC**

**ME 796  System Design and Analysis (3)**
Design and analysis of systems and components, using both individual and team projects. Engineering experience in planning, execution and reporting on selected practical engineering situations. Prerequisite: ME 628 or equivalent. **LEC**

**ME 801  Responsible Conduct of Research in Engineering (1)**
Lectures and discussion on ethical issues in the conduct of a scientific career, with emphasis on practical topics of special importance in bioengineering. Topics include the nature of ethics, the roles of the scientist as a reviewer, entrepreneur, employer and teacher, research ethics in the laboratory, social responsibility and research ethics regulation. (Same as BIOE 801.) Prerequisite: Permission of instructor. **LEC**

**ME 808  Advanced Microprocessor Applications (3)**
Advanced design and development of microprocessor based mechanical systems. Individual and team projects involving the development and integration of hardware and software into a "smart" system which includes the sensing, processing, and controlling functions are accomplished. Emphasis is on the use of the latest sensors and development tools. Prerequisite: Permission of instructor. **LEC**
**ME 810 Advanced Fluid Mechanics** (3)
Topics include kinematic and dynamic behavior of fluids, derivation of Navier-Stokes equations, flow classification, solutions of viscous and inviscid flows for simple geometries, potential flow theory and laminar and turbulent boundary layer theory. Prerequisite: ME 510 or equivalent. LEC

**ME 831 Convective Heat and Momentum Transfer** (3)
The formulation and solution of steady and unsteady convective heat, mass, and momentum transfer problems. Topics include boundary layers, duct flows, natural convection with and without phase change, development of analogies, transport properties, numerical methods. Prerequisite: ME 612 or equivalent. LEC

**ME 832 Computational Fluid Dynamics and Heat Transfer** (3)
The fundamentals of the finite-difference method are presented and applied to the formulation of numerical models for heat and momentum transfer. The accuracy, stability, and computational efficiency of different algorithms are analyzed. Computer programs are developed for classical benchmark problems. Prerequisite: ME 508, ME 510, and ME 612 or equivalents. LEC

**ME 840 Continuum Mechanics I** (3)
Principles of Continuum Mechanics for solids, fluids, and gases. Frames of references, measures of motion, deformation, strains, stresses, their rates, objectivity and invariance. Conservation laws, constitutive equations, equations of state and thermodynamic principles for developing mathematical models of continuum matter. Theoretical solutions of model problems. Corequisite: MATH 647 or ME 702; or permission of instructor. LEC

**ME 841 Continuum Mechanics II** (3)
Fundamental principles of Continuum Plasticity, measures of plastic strains, stresses and constitutive equations for flow theory of plasticity. Internal variable theory of thermo-mechanical behaviors and endochronic theory of plasticity and viscoplasticity. Anisotropic plasticity and advanced topics. Continuum mechanics principles for viscoelastic solids with emphasis on constitutive equations. Development of complete mathematical models and solutions of selected model problems. Prerequisite: ME 840 or equivalent. LEC

**ME 854 Continuum Mechanics for Soft Tissues** (3)
An introductory course in the analysis of the mechanical behavior of materials modeled on the continuum assumption. The course will provide background on soft tissue properties and will focus on the tools necessary to model soft tissues, including the essential mathematics, stress principles, kinematics of deformation and motion, and viscoelasticity. Prerequisite: ME 311 or equivalent. LEC

**ME 860 Advanced Mechanical Engineering Problems** (1-3)
An analytical or experimental study of problems or subjects of immediate interest to a student and faculty member and which is intended to develop students capability for independent research or application of engineering science and technology. Maximum credit toward any degree is three hours unless waived in writing by the departmental chairperson. Prerequisite: Approval of instructor. RSH

**ME 861 Theory of the Finite Element Method** (3)
Finite element method for solid mechanics, heat transfer, fluid mechanics, and dynamics. Modeling techniques, software implementation, and solution of problems. Prerequisite: ME 508 or equivalent. LEC

**ME 862 Finite Element Method for Transient Analysis** (3)
Advanced treatment of dynamic and transient response for linear and nonlinear problems in solid mechanics. Formulation and solution of time dependent linear and nonlinear field problems using finite element techniques. Prerequisite: ME 861 or equivalent. LEC
**ME 864** *Mesh Generation and Adaptivity for Finite Element Simulations in Engineering* (3)
The generation of Finite Element meshes in the analysis and simulation of engineering systems. Important topics are treated such as initial mesh generation and refinements (i.e. geometric modeling and mesh adaptivity or grading), choice of type of element, and assessment of solution accuracy (i.e. error estimation). Assignments include solving problems using FE software. Prerequisite: ME 661, ME 861, or equivalent. **LEC**

**ME 882** *Advanced Control Systems* (3)
Advanced methods in the modeling, analysis and design of linear and nonlinear control systems. Topics include but not limited to digital controls methods, energy-based modeling, and state-space methods. Prerequisite: ME 682. **LEC**

**ME 890** *Special Topics:_____* (1-5)
Advanced courses on special topics of current interest in mechanical engineering, given as the need arises. Prerequisite: Approval of instructor. **RSH**

**ME 899** *Independent Investigation* (1-6)
An analytical or experimental investigation of an engineering problem requiring independent research. If the thesis option is selected six credit hours are required for the degree. If the project option is selected three credit hours are required for the degree. (See requirements for the Master of Science degree for additional details.) **THE**

**ME 901** *Doctor of Engineering Internship* (1-12)
A twelve month internship in industry or government for doctor of engineering candidates. The student is supervised by a preceptor at the internship site. Bimonthly progress reports are to be filed with the student’s advisory committee. One credit hour per month of internship. **FLD**

**ME 961** *Finite Element Method for Nonlinear Problems in Solid Mechanics* (3)
Advanced treatment of finite element techniques for structural analysis including material and geometric non-linearity as well as large strain deformation. Prerequisite: ME 861 or equivalent. **LEC**

**ME 962** *p-Approximation, Error Estimation, and Other Adv. Topics in the Finite Element Method* (3)
Advanced treatment of p-Approximation, error estimation, and other advanced topics in the finite element method. Prerequisite: ME 861 or equivalent. **LEC**

**ME 965** *Mathematical Modeling and Computational Method in Multi-Scale Processes* (3)
An overview of classical averaging and homogenization methods, as well as current multi-scale modeling techniques for the analysis of the micro- and nano-mechanics of materials. Models and numerical techniques are introduced based on continuum as well as particle descriptions. Assignments include the simulation of micro- and nano-mechanics problems by using existing finite element software and molecular dynamics packages. Prerequisite: ME 861 and ME 840. **LEC**

**ME 990** *Special Topics* (1-5)
Advanced courses on special topics of current interest in mechanical engineering, given as the need arises. Prerequisite: Approval of instructor.

**ME 999** *Independent Investigation* (1-16)
An analytical or experimental investigation of an engineering problem requiring independent research. Twenty four hours as a minimum are awarded for the Ph.D. dissertation. An original contribution suitable for publication in a refereed journal is required of Ph.D. candidates. Twenty four credit hours as a minimum are awarded for the D.E. project. The D.E. candidate will have technical and supervisory responsibility for a multiperson project and a formal final project report suitable for publication is required. **THE**