ABET
Self-Study Report

for the

Mechanical Engineering Program

at

Alabama A&M University
College of Engineering, Technology, and Physical Sciences
Normal, AL 35762

July 1, 2018

CONFIDENTIAL

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BACKGROUND INFORMATION

A. Contact Information

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The Dean of the College of Engineering, Technology, and Physical Sciences is:

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B. Program History

The Mechanical Engineering Program started in fall 1997 and achieved ABET EAC accreditation in fall 2001.The last general review was done in fall 2012. The Mechanical Engineering Program has earned continuation of its ABET EAC accreditation to September 30, 2019 as per official notification from ABET's Chair of the Engineering Accreditation Commission in its letter of July 31, 2013, to the Dean of the College of Engineering, Technology, and Physical Sciences.

The Mechanical Engineering Program employs 8 teaching and research faculty members and has enrolled approximately 296 students for the academic year 2017-2018. The ME Program has graduated 35 students during the academic year 2017-2018.

Since the last general review, major program changes could be summarized in the following:

- Curriculum Improvement with the addition of the following courses:
    - ME 441 - Renewable Energy
    - ME 442 - Solar Thermal Engineering
- Laboratory enhancement:
    - Update the following Labs:
        - Experimental Mechanics Lab
        - Manufacturing Lab
        - Fluid Mechanics Lab
        - Heat Transfer Lab
        - Instrumentation Systems Lab

C. Options

The Mechanical Engineering Program at Alabama A&M University offers courses leading to the degree of Bachelor of Science in Mechanical Engineering. The curriculum offered is the General Program with two concentrations: Manufacturing Systems and Propulsion Systems. The title of the awarded degree as shown on the formal transcript and diploma is **"Bachelor of Science in Mechanical Engineering".**

D. Program Delivery Modes

The program is delivered primarily in a traditional lecture/laboratory mode Monday through Friday. There is great interest by the faculty and administration in development of online capability for some of the more common courses; however, as of this writing, they have not been implemented.

E. Program Locations

The Program in Mechanical Engineering is offered at the campus of Alabama A&M University at Normal, Alabama only.

F. Public Disclosure

The Program Education Objectives (PEOs), Student Outcomes (SOs), annual student enrollment and graduation data is posted and made accessible to the public at the university Web. Please see the following URL.

http://www.aamu.edu/academics/engineering-technology/cme/mecheng/pages/default.aspx

G. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

The Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET) conducted its last evaluation of the Mechanical Engineering Program at Alabama A&M University (AAMU) during the 2012 academic year. Excerpts from the last final statement showing ***remaining concerns*** are given below followed by actions taken.

Program Concerns

1. ***Criterion 5. Curriculum***
   This criterion requires that the curriculum culminates in a major design experience incorporating appropriate engineering standards and multiple realistic constraints. The program culminates in a two-semester major design experience in the senior year. Review of the senior design project materials shows a large variation in the incorporation of realistic constraints into the student projects. While some projects were found to be satisfactory, many projects did not include realistic constraints in the major design experience. Therefore, the program lacks the strength of compliance with this criterion.

   - ***Due-process response:*** *The EAC acknowledges receipt of materials that address the aspects of the cited shortcoming. The program implemented changes to the major design experience to include a modified syllabus and the addition of a report, as added in the spring 2013 semester, that requires all students to discuss design constraints used in their projects. The program provided two design project reports as preliminary evidence to demonstrate that the major design experience now appropriately incorporates design constraints.*

   - ***The weakness is now cited as a concern.***

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ACTIONS TAKEN

The department have adopted the following changes to strengthen its compliance with this criterion. The following steps have been developed and enforced:

- Students have to submit a "Design Constraint Focused Report" showing the use of design requirements/constraints to develop a design solution by evaluating alternative designs.
- The students are given detailed instructions on what they are supposed to report and how the report will be graded using grading rubrics.
- Every capstone project is mentored by a faculty member in the same area of expertise.
- The Industry Advisory Board members are involved in evaluating and grading (20% of the grade) these projects.
- The syllabus has been modified to include the following addition:
  - Course Objectives: item 3 has been added: "3. They should be able to identify the design parameters and constraints that characterize the system, and analyze them"
  - Weekly Schedule: Week No. 5: "Submit Design Constraint Focused Report showing use of design requirements/ constraints to develop a design solution by evaluating alternative designs"
  - Course Learning Outcomes:
    - "Develop a problem statement and design requirements/constraints for a design problem of interest to a client"
    - "Use design requirements/constraints to develop a design solution by evaluating a number of alternative designs"
  - Evaluation and grading policy: "Design Constraint Focused Report: 10%."

2. Criterion 8. Institutional Support

This criterion requires that the resources available to the program be sufficient to attract, retain, and provide for the continued professional development of a qualified faculty. Faculty members continue to have high teaching, research and service loads, receive lower than median salaries for comparable positions, and are not provided with adequate levels of resources for their professional development. Further, the faculty members receive minimal travel support, no opportunity for course releases, and there are no start-up packages for new faculty. While new faculty members have been hired at competitive salaries, the salaries of long-term faculty are compressed. As a result, the program may not be able to retain qualified faculty, nor will the faculty have the resources to support professional development. The potential exists for the program to fall out of compliance with this criterion in the future.

- ***Due-process response:*** *The EAC acknowledges receipt of documentation demonstrating that the university administration is working to increase institutional support including faculty salaries.*
- ***The concern remains unresolved.***

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ACTIONS TAKEN

The university administration is working on increasing institutional support including faculty salaries that will address this concern.

GENERAL CRITERIA

CRITERION 1. STUDENTS

A. Student Admissions

University admission is designed to accommodate students with diverse educational backgrounds and educational goals. The Admission Medical Record is a part of the Admission Application and must be completed, including required immunizations, before admission is granted and class registration is permitted. The physical examination on the reverse side of the Admission Medical Record is not part of the admission process; however, it is required in order to occupy residence halls.

A.1 Admission Categories

Individuals seeking admission to the University usually fall into one of the following categories.

High School Graduates/Freshman Students: Students request that their high school principal or guidance counselor forward an official copy of their high school transcript to the Office of Admissions. For unconditional admission high school graduates must have earned a score of 18 ACT/equivalent SAT and maintained a grade point average of "C" in the following subjects: English, mathematics, science, history, and political science. Upon notification of admission to AAMU, the applicant will receive a letter and card of acceptance. No student should report to AAMU for registration without having received the card of acceptance. Alabama students must have passed all three parts of the high school graduation examination. Students 26 years or older are exempt from college entrance examinations.

High School Equivalency (GED): For unconditional admission the applicant must have earned an average score of 48. Transcripts of last attendance in high school will be required. Students must have a score of at least 18 on the ACT/Equivalent SAT.

Accelerated Program for High School Students: Students must have completed their sophomore or junior year of high school in order to be admitted to the high school accelerated program. AAMU offers two programs for outstanding high school student who wish to earn college credit:

1. Qualified students who have completed their junior year of high school may take a course or courses during the summer preceding their senior year.
2. Qualified students who have completed their sophomore or junior year of high school may take a course or courses during the academic year while simultaneously enrolled in high school.

The qualifications to be considered include:

1. Minimum GPA of 3.0 on a 4.0 scale
2. Recommendation of guidance counselor
3. ACT/SAT or pre-ACT/SAT scores.

The following steps should be taken when applying to the Accelerated Program for High School Students:

1. Complete a University application form for accelerated students. Return the completed application form to the Office of Admissions, AAMU, Normal, AL, 35762.
    a. Enclose with the application the required $30.00 non-refundable application fee. Make check or money order payable to Alabama A&M University.
    b. Request that the principal or guidance counselor enclose a letter of recommendation to the Office of Admissions, AAMU.
2. Request that an official copy of your high school transcript be forwarded to the Office of Admissions, AAMU.

Credit earned for such course work will be awarded toward a degree upon the student's graduation from high school and enrollment at AAMU.

Under-prepared Students with Potential: AAMU has established a plan to ensure that a limited number of underprepared students with potential, who apply for admission, are accepted and included in the student body. These students will be admitted on a conditional basis.

Conditional Admission: Individuals who do not completely fit into one of the categories described above may be eligible for "conditional admission" and should make inquiries to the Office of Admissions. Credit is awarded to students who have earned grades on "conditional admission." Conditional admission, transfer and special students who are admitted to the University on a "conditional" basis will have one semester to remove the "conditional" status. If the "conditional" status is not removed, the student will be notified of his ineligibility to register for the next semester.

Transfer Students from Alabama Two-Year Colleges: The STARS Transfer Guide is to be honored for a period of four years from the date printed off the web site by all other public institutions of higher education within the state that offer programs in the specified discipline. Students should keep a copy of this guide for verification purposes. The STARS Transfer Guide remains valid and is guaranteed only if the student continues in the major specified on his/her transfer agreement. Changes made by accrediting and/or other regulatory agencies could result in specific requirements being added to the Transfer Agreement (i.e., No Child Left Behind Mandates). Any changes made by an institution in its degree programs will affect the transfer student in the same manner as the students native to the University.

Bulletin Year Issue - The students who use transfer guides will be graduated under the Bulletin in effect on date that the guide is printed unless they choose to go under the Bulletin in effect at time of transfer. This issue is covered in item #1 on the actual transfer agreement that prints out at the end of the transfer guide.

The STARS program governs the transfer of credits from Alabama public two-year institutions to Alabama four-year institutions. Students at the public two-year institutions who have a STARS Guide, can transfer all courses listed on that Guide from public two- year institution to any public four-year institution, including Alabama A&M University. There is a STARS Guide for almost every program offered at AAMU. Courses on the Guide will transfer and count toward half (50 percent) of the courses required for a specific degree program. The courses on the Guide are accepted under the same standards as courses taken at AAMU. If a "D" grade is acceptable for an AAMU course, then with the STARS Guide, the student can transfer the course from the public two-year institution with a "D."

Students intending to transfer to AAMU are encouraged to consult with their advisors and obtain a STARS guide from the AGSC/STARS Website, http://stars.troy.edu.

Transfer Students: Request that the registrar of each institution which you have attended forward an official copy of your transcript to the Office of Admissions. Students transferring from other postsecondary institutions must have maintained a cumulative GPA of 2.0 ("C") at the institutions from which credit is being transferred. Students who have 12 transferable credit hours or equivalent quarter hours of acceptable academic credit at the college or university level may be admitted to AAMU as transfer students. Students with fewer than 12 transferable credit hours will be admitted as a high school graduate and must request high school transcript and ACT/SAT scores; however, appropriate hours will count toward the AAMU degree.

Since AAMU awards credit for course work based on semester hours, credit hours awarded for course work completed at institutions which use a quarter system must be converted to semester hours upon transfer. In some instances, such conversion may result in the student receiving an insufficient number of credit hours to fulfill the required number of semester hours for a course at AAMU. If this happens, missing credit hour(s) must be made up in the course subject.

Transfer/Readmit: Alabama A&M University students who have attended another institution(s) after leaving the university must apply to return. Students must request that the registrar of each institution attended forward an official copy of your transcript to the Office of Admissions. An official copy of your transcript(s) must be in the Office of Admissions by the deadline date stated for the application, except from those school(s) in which applicant is currently enrolled. Transfer/Readmit students are considered for admission only when they have been in good standing with the institution from which they are transferring. This means that the student must have a cumulative grade point average of 2.0, and cannot be on probation or suspension. Students must provide official transcripts from all institution(s) attended and list each school on their application for readmission to the university. Colleges or universities attended will be reviewed based on the last institution attended first. Students must comply with all university guidelines governing re-entry and transfer student status.

Students who are re-admitted to the University after a two-year absence will be governed by the Bulletin under which they are re- admitted.

Readmission to the University: A student who has not attended AAMU for two or more regular terms should consult with the Office of Admissions to determine enrollment status and to apply for readmission. Students who are readmitted to the University after a two-year absence will be governed by the Bulletin under which they re-enter.

International students: In order to ensure that required long distance coordination may be completed in time to accommodate admission for the desired term, admission applications must be received by the following deadline dates: Fall, May 15; Spring, October 1; Summer, March 15.
Entering international students must provide an affidavit of financial support. Students must have maintained a grade point average of "C" in core courses; must have earned five passes on a national or a local examination; and must have attained a minimum score of 500 (paper-based test) or 61 (internet-based test) on the TOEFL (Test of English as a Foreign Language) or a 5.5 on the International English Testing Systems (ELS) Certification Examination. A letter of recommendation

from an applicant's principal or college advisor is also required. International students who receive a certificate of eligibility (the I-20) from the University are eligible to transfer to other institutions after two semesters of attendance.

International Baccalaureate Credit: AAMU will award credit for courses taken toward the International Baccalaureate (IB) diploma. Students who receive the IB diploma will be granted college credit for scores of four (4) or higher on both higher level and standard level examinations. Students who do not receive the IB diploma will be granted college credits for scores of five (5) or above on IB higher level examinations only. IB score reports should be sent to the Office of Admissions for evaluation. The academic unit responsible for the student's program of study will determine the application of credits toward specific degree requirements. If awarded, credits will be recorded without grades or quality points, and will not, therefore, be included in the calculation of the grade point average.

Special (Non-degree) Students: Persons who wish to pursue certain courses without reference to a degree may apply for admission as special students. Applications for such persons will be considered by the Director of Admissions. A student may take a maximum of twelve (12) hours as a special student except persons seeking teacher certification as directed by the Alabama State Department of Education. Before permission is given to enter a degree program, applicants must meet all requirements for being admitted as a regular degree student. At that time, credit earned as a special student can be counted toward the degree, unless the statute of limitations has expired. All applicants who apply for "special student" status must apply for admission at least two weeks prior to the beginning of the semester or session for which he/she wishes to enroll in the University. Special students must reapply for admission at the beginning of each semester or session.

Transient Students: Students enrolled at another institution who wish to pursue courses at AAMU, to be transferred back to their institution, may apply for admission as transient students. A letter of approval/good standing from the home institution is required. Transient students must apply for admission to AAMU at the beginning of each semester or session.

Transfer of Students on Suspension from Another Institution:

1. Temporary, Indefinite or Permanent Academic Suspension: A student who has been suspended from another college is eligible to apply for admission to the university after 12 months have elapsed.
2. Disciplinary Suspension: Students on disciplinary suspension from another institution must be eligible to return to that institution before being considered for admission to Alabama A&M University.

Second Bachelor's Degree: Students desiring a second bachelor's degree must complete another application for admission to AAMU.

For more details, see the Admission Policies and Procedures section in the Undergraduate Bulletin 2017-2018 published at the university web site:
http://www.aamu.edu/administrativeoffices/academicaffairs/Pages/Undergraduate-Bulletins.aspx

A.2 Application Procedures and Deadlines

The following steps should be followed when applying for admission to AAMU:

1. Complete an AAMU Undergraduate Application Form. Return the completed form to the Office of Admissions, Alabama A&M University, Post Office Box 908, Normal, Alabama 35762 or apply online by accessing AAMU's website at www.aamu.edu.
2. Enclose with the application the required $30.00 non-refundable application fee. Only a cashier's check, certified check, or money order made payable to Alabama A&M University will be accepted.
3. Request that an official copy of the high school transcript or General Education Development (GED) test results be forwarded to the Office of Admissions.
4. Request that official test results for American College Test (ACT) or Scholastic Aptitude Test (SAT) be sent directly to the Director of Admissions by the testing agency.
5. Request that the principal or a guidance counselor at the student's high school send a letter of recommendation to the Office of Admissions.
6. A transcript of the applicant's high school record or General Education Development (GED) Test results must be received by the Office of Admissions before an application for admission can be considered complete. All transcripts must be official and must be received directly from the issuing institutions.
7. Deadlines for receipt of applications for admissions are listed below:

Semester Session	Application
Fall	June 15th
Spring	November 1st
Summer	April 15th

8. Residence hall spaces will be assigned in the following order: citizens of the State of Alabama, citizens of the United States, and citizens of other countries.
9. For additional information, contact the Office of Admissions, Alabama A&M University, Post Office Box 908, Normal, Alabama 35762, (256) 372-5245 or (800) 553-0816.

NOTE: When a student's attendance is interrupted in excess of two regular semesters, for any reason, an application for re-admission, accompanied by the $30.00 application fee, must be filed with the Office of Admissions.

B. Evaluating Student Performance

Grading System:

AAMU uses a letter system of grading which follows: A=excellent performance; B=good performance; C=satisfactory performance; D=barely acceptable performance; F=failed performance; I=incomplete work; IP=in progress; P=satisfactory completion; X=audit; W=withdrew; WB=withdrew bankrupt; WM=withdrew military.

The grade "X" will be assigned for auditing a course; however, no credit will be allowed.

Credit for any course in which a student has received a grade of "F" can be obtained only by repeating the course at AAMU and earning a passing grade. The passing grade earned at AAMU replaces the "F" in the GPA calculation but the "F" remains on the transcript.

Grade Point Average (GPA):
AAMU's grading system is based on a 4.00 point scale; quality points are assigned as follows:
A = 4.00 B = 3.00 C = 2.00 D = 1.00 F = 0.00

The following grades are not included in the calculation of the GPA: W, I, P, X, WB (withdrew bankrupt), IP (in-progress [projects, thesis, dissertation, research]), WM (withdrew military).

Grades earned at another institution (except those designated as "Visiting") are not computed in the grade point average. Grades earned at another university (except those designated as "Visiting") cannot be used to improve a grade point average or eliminate a quality point deficiency.

Example of Calculation of Grade Point Averages					
Grade	Grade Points	Credit Hrs of Course	Quality Points	Hours Attempted	GPA
A	4	3	12	3	
W	0	3	0	0	
C	2	2	4	2	
B	3	4	12	4	
F	0	2	0	2	
D	1	3	3	3	
I	0	2	0	0	
Totals			31	14	2.21

Grade points **x** Course credit hours = Quality points earned.
Quality points earned Total ÷ Hours attempted Total = 2.21 Grade Point Average (GPA)

Missing Grades:
A missing grade must be received in the Registrar's Office within forty-five (45) days immediately following the grading period (semester or summer session) in which the grade was given. All missing grades must be reported on a Missing Grade Form. All forms should be submitted by the instructor of the registered course(s) with proper documentation and justification.

Grade Changes:
All course grades except "I" grades are intended to be final and permanent. It is expected that faculty will arrive at and report final grades as accurately and precisely as the nature of the evaluation of student achievement and the grading system will permit. It is the faculty's direct and personal responsibility to ensure that grades are fair and reported correctly the first time. **Final grades cannot be improved by "make-up" work, after the end of the term.**

If an error occurs in the calculation or recording of a grade, it can be corrected using the following procedures:

1. The faculty of record will complete the Change of Grade Form, which must include:

a. The student's name, student number, course designation by title and number, semester, and change desired.
b. A statement unequivocally identifying the person who made the error, and explaining the nature of the error.
c. An explanation of how the new grade was computed.

2. The form must bear the endorsement of the department chairperson and dean, and must be addressed to the Provost and Vice President for Academic Affairs.
3. Removal of an "I" must be made by instructor of record for the course and submitted directly to the Office of the Registrar on forms provided for that purpose. In cases where the instructor of record is no longer employed at the University during the period when the grade of "I" can be changed, the department chair will act in the stead of the instructor of record.
4. Requests for grade corrections must be submitted to the Office of the Registrar by the end of the semester after the incorrect grade was submitted.

Undergraduate students must maintain a minimum CGPA of 2.00 each semester they are enrolled. Students falling below this minimum CGPA are subject to academic probation or dismissal in accordance with the "Academic Policies and Procedures" section of the Undergraduate Bulletin 2017-2018 published at the university web site:
http://www.aamu.edu/administrativeoffices/academicaffairs/Pages/Undergraduate-Bulletins.aspx

Dismissal occurs if a student remains on academic probation for two consecutive semesters.

Student progress is monitored by the academic advisor. Each student is required to meet with his or her advisor at least once per semester to discuss past performance and to develop a course plan for the next semester. Additionally, faculty members are encouraged to monitor a student's progress in an individual course by using an early alert system and midterm grades. Identifying a student in the early alert system initiates a process that identifies resources to assist the student to improve performance that is below the minimal standard or attendance that is not as expected.

To ensure that prerequisites are satisfied, the online registration system automatically checks for prerequisites. A student who has not met a prerequisite is blocked from registering for the course and must then obtain a waiver from his or her academic advisor, the chairperson, and the college Dean before registering for the course. Waivers are not granted unless the student satisfies all the following conditions:

1. The student is a graduating senior and his graduation will be delayed by one year
2. The student has the potential for being successful in the course.
3. This prerequisite situation is resulted because an error in the implementation of the computerized system.

The Delay in his/her graduation is most often a result of the University offering all engineering courses only once per year. With the increased number of students, the University will be able to populate multiple offerings of the same course.

Recently, the university is implementing the Degree Works computerized software. It is a comprehensive academic advising, transfer articulation and degree audit solution that aligns students, advisors and institutions to a common goal: helping students graduate on time. Hence, it helps students and advisors monitor progress toward degree completion.

C. Transfer Students and Transfer Courses

The Office of Admissions accepts transfer credits for the University for purposes of student classification (i.e., freshman, sophomore, etc.). The deans of colleges or department chairpersons approve transfer credits for degree programs.

No credits will be accepted for developmental (remedial) courses, orientation, or religion courses in a specific religion. Exploratory/overview/survey courses that discuss more than one religion are acceptable.

Acceptance of Transfer Credit: Students who transfer from another four-year institution or two year college must submit in advance for acceptance transcripts of all previous work done on the college level. Such transcripts must be sent directly from the institution at which the work was completed. Academic work completed at other schools not listed on the Admission Application will not be accepted for transfer purposes.

Students transferring from colleges and universities must have maintained a "C" average and be in good standing with the institution from which they are transferring. Students on academic probation or suspension are not in good standing, and, therefore, will not be accepted by Alabama A&M University.

Courses may transfer from accredited colleges and universities if the grade for that course earned at the offering institution meets the requirement of the program offering the degree being pursued at Alabama A&M University. For example: Only courses with grades of C or better may transfer for ENG 101/102 because a C or better is required in ENG 101/102 for all programs at Alabama A&M University. Only a grade of C or better is accepted for transfer of MTH 112 for all business programs, but a D or better is accepted for transfer of MTH 112 for social science programs. Students should check the grade requirements for specific programs to determine if the grade earned at the offering institution is transferable to Alabama A&M University.

A student who has been suspended from an institution because of poor academic performance is not eligible to enter Alabama A&M University immediately following academic suspension.

Statewide Transfer and Articulation Reporting System (STARS): The STARS Transfer Guide is to be honored for a period of four years from the date printed off the web site by all other public institutions of higher education within the state that offer programs in the specified discipline. Students should keep a copy of this guide for verification purposes. The STARS Transfer Guide remains valid and is guaranteed only if the student continues in the major specified on his/her transfer agreement. Changes made by accrediting and/or other regulatory agencies could result in specific requirements being added to the Transfer Agreement (i.e., No Child Left Behind Mandates). Any changes made by an institution in its degree programs will affect the transfer student in the same manner as the students native to the University.

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The STARS program governs the transfer of credits from Alabama public two-year institutions to Alabama four-year institutions. Students at the public two-year institutions who have a STARS Guide, can transfer all courses listed on that Guide from public two-year institution to any public four-year institution, including Alabama A&M University. There is a STARS Guide for every program offered at AAMU. Courses on the Guide will transfer and count toward half (50 percent) of the courses required for a specific degree program. The courses on the Guide are accepted under the same standards as courses taken at AAMU. If a "D" grade is acceptable for an AAMU course, then with the STARS Guide, the student can transfer the course from the public two-year institution with a "D."

Students intending to transfer to AAMU are encouraged to consult with their advisors and obtain a STARS guide from the AGSC/STARS Website, http://stars.troy.edu.

International Institutions: Postsecondary credits earned from international institutions, which are patterned after the British or other Non-American systems of grading, must be evaluated by an accredited evaluator of foreign education credits (for example, the World Education Services, Inc.). Applications for the evaluation may be secured from the Office of Admissions. Courses recommended by the World Education Services, Inc., will be accepted by Alabama A&M University. It is the responsibility of the student to execute, request, and pay the cost of such evaluations.

Since AAMU awards credit for course work based on semester hours, credit hours awarded for course work completed at institutions which use a quarter system must be converted to semester hours upon transfer. In some instances, such conversion may result in the student receiving an insufficient number of credit hours to fulfill the required number of semester hours for a course at AAMU. If this happens, missing credit hour(s) must be made up in the course subject.

Advanced Standing: In order for transfer credits to be accepted for advanced standing, all prior college work must be declared on the official application and be supported by official transcripts. No credit for advanced standing will be accepted after the end of the first semester of the student's enrollment. All grades must be "C" or above.

Continuing Students: AAMU students who desire credits taken at other collegiate institutions to be applied toward their degrees at AAMU must receive approval before enrolling at the other institution. Criteria for approval include current enrollment at AAMU and a cumulative GPA of at least 2.0. The completed Transient Student Form must be signed by the student's advisor and submitted to the Office of the Registrar. Students who receive such approval must submit official transcripts documenting the work as soon as it is completed, whether they still desire credit for the work or not. The official transcript must be sent by the institution attended. The total number of hours taken at another institution or the sum of credits taken at AAMU and another institution

during the same term cannot exceed the maximum allowed during the same enrollment term at AAMU: 19 credit hours for fall and spring semesters; 10 SCHs for an eight or nine-week summer session. Policies regulating grades for transient students are the same as those for other transfer credits.

Advisors with the approval of the department chair will assess whether or not the courses for which the student intends to enroll will transfer back to AAMU based on a comparison of course descriptions in the AAMU Bulletin and the bulletin of the institution the student wants to attend. Approval of transient credit is contingent upon whether the intended course is equivalent to a course at AAMU and whether or not it will be accepted by the major department for fulfillment of degree program course requirements.

Students are reminded that they should carefully review the number of credit hours that will be awarded for courses taken at another institution. AAMU can only transfer the amount of credit awarded by the institution offering the course. Since AAMU awards credit for course work based on semester hours, credit hours awarded for course work completed at institutions which use a quarter system must be converted to semester hours upon transfer. In some instances, such conversion may result in the student receiving an insufficient number of credit hours to fulfill the required number of semester hours for a course.

Credit by Examination:

ADVANCED PLACEMENT (AP) PROGRAM

Several A&M University departments award credit to students who have earned designated scores on Advanced Placement (AP) Program examinations of the College Entrance Examination Board. Advanced Placement examinations are taken at the end of an AP designed course of study in high school. The applicant must apply for advanced placement credit and provide results of said examination to the Office of Admissions. Students may contact their major departments to determine specific areas where AP credits will be accepted.

Credit, if awarded, will be recorded without grades or quality points and will not be included in calculation of the grade point average.

The University awards three (3) semester credit hours to students who score three (3) on the Advanced Placement Examination in the areas of Biology, Chemistry, English, Foreign Languages, History, Mathematics, Physics, Art and Music. Students scoring 4 or 5 may be awarded additional credit upon the recommendation of the appropriate department chairperson.

COLLEGE LEVEL EXAMINATION PROGRAM (CLEP)

CLEP, a nationwide system of credit-by-examination, is administered at many colleges and universities to award college credit to those who earn the designated minimum acceptable score. There are five general examinations and 30 specific subject examinations. The general examinations measure college-level achievement in five basic areas of the liberal arts: English composition, humanities, mathematics, natural sciences, and social sciences/history. The subject examinations measure achievement in specific college courses and are used to grant exemption from and credit for these classes. Students must check with the Testing Services Center to determine the availability of and their eligibility for subject examination.

The Testing Services Center at AAMU is an open center for CLEP administrations. Examinations are scheduled on an individual basis and are available year-round, with the exception of the English Composition with Essay Examination. This test is only offered in January, April, June, and October.

Enrolled students who want to take CLEP examinations to substitute for specific courses or who want to obtain additional information about the CLEP, should contact the Testing Services Center. Credit awarded through the CLEP must be recorded on a student's transcript no later than the end of the semester in which the examination is taken.

Military Education/Training Evaluation: The Office of Distance Education and Extended Studies evaluates military transfer credits for AAMU. For evaluation, appropriate official copies of certificates, diplomas, or transcripts should be forwarded to that office. The Guide of the Evaluation of Educational Experiences in the Armed Services as sanctioned by the American Council on Education (ACE) is the standard reference work used by AAMU for awarding credit for learning acquired through the military.

Experiential Learning: Non-Traditional/Prior Learning Credits: The University recognizes and awards non-traditional credit for prior learning. Universally accepted evaluation and prior learning assessment techniques are used to evaluate this type of credit resulting from professional training, work-related learning, certifications, and military training. Experiential learning credits may not be used to meet requirements for general education courses. They may be used for elective credit or major credit with the approval of the department. Credits received through experiential learning do not count towards the minimum 25% credit residency requirement or satisfy the graduation requirement that one half of the major requirements must be taken at Alabama A&M University. Any student applying for experiential learning credit must be accepted to AAMU and enroll in at least one (1) credit hour. Experiential learning credit will be awarded for a maximum of 18 credit hours.

Other Non-Collegiate Sponsored Instruction: AAMU considers for college credit non-collegiate sponsored instruction approved and sanctioned by the American Council of Education and listed in the National Guide to Educational Credit for Training Programs. Appropriate official copies of certificates, diplomas or transcripts should be forwarded to the Office of Distance Education and Extended Studies for evaluation.

Visiting Student Program: A cooperative arrangement exists with the University of Alabama in Huntsville, Athens State University, Oakwood College and Alabama A&M University, whereby a student at any of the participating institutions may request permission to attend a class at one of the other schools. Conditions governing the granting of permission include the following:

1. The student must be enrolled full-time during the time he/she is participating in the Visiting Student Program.
2. His or her total load must not exceed the established maximum number of hours established at the home school.
3. The student must have an overall GPA of "C" or better.
4. The course must be unavailable at the student's home institution during that term.

5. The student's request must be approved by his/her advisor and other appropriate personnel.
6. Permission of appropriate personnel at the visiting institution is required and will be dependent upon availability of space for the visitor after the school's own students are accommodated.
7. Enrollment must be completed prior to the initial meeting of the class at the visiting institution.
9. Grades earned as a visiting student are calculated into the GPA at the home institution.
10. Courses taken under the Visiting Student Program can be counted in the GPA as a repeated course at AAMU.

In order to participate in this program, students must complete the Inter-Campus Visiting Student Form, which may be secured from the Office of the Registrar or online at Registrar's Office Forms.

Transient Students: AAMU students who desire credits taken at other institutions to be applied toward their degrees at AAMU must receive approval before enrolling at the other institution. Criteria for approval includes current enrollment at AAMU and a cumulative GPA of at least 2.0. The completed Transient Student Form must be completely filled out, signed and submitted to the Office of the Registrar. Students who receive such approval must have submitted official transcripts documenting the work as soon as it is completed, whether they still desire credit for the work or not. The official transcript must be sent by the institution attended. Send official transcripts to: Office of the Registrar, AAMU, PO Box 848, Normal, AL, 35762.

The total number of hours taken at another institution or the sum of credits taken at AAMU and another institution during the same term cannot exceed the maximum allowed during the same enrollment term at AAMU: 19 credit hours for fall and spring semesters; 10 credit hours for an eight or nine week summer session.

If the transient course is accepted back to AAMU, only the credit hours for the transient course is applied to the student's program here at AAMU. The grade for the transient course is not calculated into the GPA.

Advisors will evaluate whether or not the courses for which the student intends to enroll will transfer back to AAMU based on a comparison of course descriptions in the AAMU Bulletin and the bulletin of the institution the student wants to attend. Approval of transient credit is contingent upon whether the intended course is equivalent to a course at AAMU and whether or not it will be accepted by the major department for fulfilling of degree program course requirements.

Since AAMU awards credit for course work based on semester hours, credit hours awarded for course work completed at institutions which use a quarter system must be converted to semester hours upon transfer. In some instances, such conversion may result in the student receiving an insufficient number of credit hours to fulfill the required number of semester hours for a course at AAMU. If this happens, missing credit hour(s) must be made up in the course subject.

Note:

AAMU has a published policy for accepting and evaluating transfer students. The policy on the transfer of credits can be found in the 2017-18 University Undergraduate Bulletin: http://www.aamu.edu/administrativeoffices/academicaffairs/Pages/Undergraduate-Bulletins.aspx

All students are admitted to the University through the Office of Admissions. This office is responsible for examining the transcripts of transfer students to determine which courses can be accepted by the University. Students entering from International institutions must have their transcript evaluated by an independent organization such as World Education Services. All new transfer students are interviewed by the Department Chairman who assigns an academic advisor to the students. The advisor determines which courses can be accepted by the mechanical engineering program. To determine which courses can be accepted by the program curriculum, the student is asked to provide a catalog of the university from which courses are being accepted or the advisor will check the web site of the institution from the student is transferring. If the institution has ABET accredited engineering programs, the advisor makes sure that these courses are listed in that engineering curriculum. If the institution does not have an engineering program, no engineering named courses will be accepted. The advisor checks the course description (and science curricula if the course being considered is a science or mathematics course) to make sure that the course is equivalent to one of the required courses in the mechanical engineering program. Appropriate credit is given for courses being transferred from institutions on calendars other than semester calendars. Once these courses are approved, the advisor completes a standard university substitution form to have the courses substituted for required courses in the mechanical engineering curriculum through channels. **Grades below "C" are not transferable.**

D. Advising and Career Guidance

AAMU has a two-tiered approach for advising students. The first tier is the responsibility of the University College. The University College (UC) serves as the portal of entry for all freshmen and new students; provides academic and support services to help students succeed in their educational pursuits; and certifies lower division students' completion of requirements for entrance into their major departments. The general objectives are (a) to assist pre-college and currently enrolled students in acquiring the skills and competencies necessary for success in college; (b) to assist freshmen, and other students who have not officially declared majors, in a systematic progression through the freshman core curriculum by providing a comprehensive and effective advising system; (c) to ensure students complete the university-designated program of study and established exit criteria prior to release from University College; (d) to provide instructional programs to meet the varied intellectual needs of students; and (e) to provide a caring, nurturing and communing environment, where relevant skills and competencies, collegiate adjustments, career goals, and education plans-commensurate with students' abilities and interest are actualized.

Academic support services provided by the University College include the Academic Advising Center, the Academic Support Services, New Student Orientation Program (SOAR, BULLDOG WEEK, and OPERATION TRANSITION), TRIO/Special Programs, Testing Services, the Computer Instruction Assistance Laboratory, and the North Alabama Center for Educational

Excellence (NACEE) Satellite Program. These support services are described in the University's Undergraduate Bulletin.

Prospective students must qualify for admission to the University and must satisfy the following requirements prior to transfer from University College to the Mechanical Engineering Department:

- Demonstrate competence in the basic areas of reading, writing, logical reasoning, and mathematics as measured by standardized assessment instruments;
- Complete a minimum of 23 credit hours from the freshman core curriculum and university requirements; and
- Meet all requirements for admission to the mechanical engineering program.
- The University requires that all students take two courses one credit hour each in university orientation (ORI 101 - First Year Experience and ORI 102 - First Year Experience) and two credit hours in an approved health course.
- Mechanical engineering majors are required to report to the department office and schedule an interview with the chairperson as soon as possible. The interview provides an opportunity for appropriate documentation to be placed in the student's file.
- Transfer credits from other institutions are accepted conditionally, subject to departmental approval and approval by the Vice President for Academic Affairs. The department may require the completion of class projects through independent study. Transfer students must complete at least one-half of the ME courses and earn the final 25% of required credit hours of work towards their degree at AAMU.

The second tier of the advising system is based on the individual interaction between a student and his/her major academic advisor. Students are advised at least once per semester prior to registering for the next semester's courses. The advising session is mandatory as the student is prevented from registering for the next semester until the advisor removes the registration block (issue a PIN # for registration). As soon as the student is prepared to take engineering courses (usually Statics), an advisor is assigned from the program faculty. Career guidance is provided through these main sources: (1) the student's faculty advisor during the normal advising session, (2) the Dean's office, (3) the interaction with the ME Industry Advisory board members in the senior design course, and (4) the University's Career Services Center, which provides job search and interviewing skills training, as well as working with employers to arrange interviews.

Responsibility Statement: Each student is held responsible for reading, understanding, and meeting the requirements for graduation as set forth in AAMU Undergraduate Bulletin. Such requirements include the general education requirements as well as those specified by each degree-granting program.

Graduation Clearance Protocols

Junior Audits

1. Faculty advisors are required to sit with all advisees, who have earned 64 or more semester credit hours and review the degree audit presented in Degree Works. The Office of the Registrar will send each department a list of majors in their respective departments, who have earned at least 64 semester credit hours.

2. A "HOLD" will be placed on the student's BANNER account until the Office of the Registrar receives the properly approved Degree Works audit.
3. The advisor will print the Degree Works audit to be signed and dated by both student and advisor, and each should retain a copy for their files.
4. A fully signed copy must be sent to the Office of the Registrar. The Office of the Registrar will then review and confirm the audit for accuracy.
5. Upon approval, the student's BANNER account "HOLD" will be lifted. If there are inaccuracies, the needed corrections will be noted, and the revised audit will be sent back to the advisor and student for their signature.
6. A copy of the signed, revised audit will be sent back to the Office of the Registrar for the Registrar's signature and filing. The Office of the Registrar will send a copy of the revised audit to the student and the advisor.
7. From this review, the Degree Works audit lists the remaining courses and semester(s) in which each course will be taken. The result of the Degree Works Audit will indicate when the student should anticipate graduation from the university with the desired degree.

Senior Record Checks

1. Faculty advisors are required to sit with all advisees, who have earned 95 or more semester credit hours and review the degree audit presented in Degree Works. The degree audit will be on file with the advisor and in the Office of the Registrar. The Office of the Registrar will send each department a list of majors in their respective departments who have earned at least 95 semester credit hours.
2. A "HOLD" will be placed on the student's BANNER account until the Office of the Registrar receives the properly approved Degree Works audit.
3. From this review, if necessary, a revised Degree Works Audit lists the remaining courses and semester(s) in which each course will be taken. This audit should be signed and dated by the advisor and the advisee, and each should keep a copy for their files.
4. A copy must be sent to the Office of the Registrar. The student's BANNER account "HOLD" will not be lifted until the Office of the Registrar receives the properly approved Degree Works audit.
5. A copy of the signed, revised audit will be sent back to the Office of the Registrar for the Registrar's signature and filing. The Office of the Registrar will send a copy of the revised audit to the student and the advisor.
6. The result of this review will indicate when the student should anticipate graduation from the university with the desired degree.

Application for the Diploma and Graduation

Students who anticipate graduation must make a formal application the semester of their expected date of graduation. The application must be approved by the student's advisor, chair, and dean before being submitted to the Office of the Registrar (see the University Calendar and Class Schedule for deadline dates.) The graduation fee will be assessed in the semester that the graduation occurs.

Note:

For more details, see the 2017-18 University Undergraduate Bulletin at the following URL:
http://www.aamu.edu/administrativeoffices/academicaffairs/Pages/Undergraduate-Bulletins.aspx

E. Work in Lieu of Courses

Credit in lieu of courses may be given for Advanced Placement (AP), College Level Examination Program (CLEP), and International Baccalaureate (IB) examinations. Dual enrollment credit from another university is treated as transfer credit from another university. **No credit is given for life or military experience**.
The details of all of these programs have been discussed in section C (**Transfer Students and Transfer Courses)** and would be found at the 2017-18 University Undergraduate Bulletin: http://www.aamu.edu/Academics/academicresources/Documents/Bulletin_2011-2012.pdf

F. Graduation Requirements

Undergraduate degree candidates in the Department of Mechanical Engineering must satisfy each of the following requirements:

1. Complete the University General Education Curriculum requirements.
2. Complete the Department and Major Curriculum requirements
3. Complete the minimum number of semester credit hours required for graduation (130 credit hours).
4. Maintain a cumulative grade point average of 2.0 or above for all courses attempted at AAMU.
5. Maintain a cumulative grade point average of 2.0 or above for all courses in major attempted at AAMU.
6. A grade of "C" or better is required in all ME courses.
7. Prerequisites are required for approval of any subsequent courses. Students are required to earn a grade of C or better in all prerequisites before proceeding to any advanced courses.

University policy requires that students get their records checked with a program advisor within a designated time-period prior to graduation followed by a final check by the Academic Advisor of the College. Both advisors verify all program requirements have been met through review of the student's records. The Mechanical Engineering baccalaureate degree checklist is provided in Figures 1.1 – 1.3. More recently, the university has adopted Degree Works audit procedure as explained in section D under "**Graduation Clearance Protocols".** Figure 1.4 shows a screen shot of the graduation requirements using Degree Works.

The title of the awarded degree as shown on the formal transcript and diploma is Bachelor of Science in Mechanical Engineering.

G. Transcripts of Recent Graduates

The program is designated at the beginning of the transcript as: "BACHELOR OF SCIENCE IN Mechanical Engineering." If the student chooses to follow one of the two concentrations (Manufacturing Systems or Propulsion Systems), then, the concentration is also listed in the transcript.

SCHOOL OF ENGINEERING, TECHNOLOGY, AND COMPUTER SCIENCE GRADUATION CHECK-SHEET

Degree: **CATALOG: 2008 – 2011**

Student Number **Graduation Date: Spring ( ) Summer ( ) Fall ( ) Year:** **Year Enrolled:**

Name: **Advisor:**

Major: Mechanical Engineering

General Program

GENERAL EDUCATION Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
ENG 101 Communication Skills		3				
ENG 102 Communication Skills	ENG 101	3				
Physical Ed/Health/Military Sci or Food Sci.		2				
HIS 101 World History		3				
HIS 102 World History	HIS 101	3				
Fine Arts Elective		3				
ECO 200 Basic Economics		3				
CHE 101 General Chemistry		3				
CHE 101 General Chemistry Lab		1				
PHY 105 Physics I	MTH 125	4				
PHY 106 Physics II	MTH 126, PHY 105	4				
ENG 203 World Literature I	E NG 102	3				
ENG 204 World Literature	ENG 203	3				
MTH 125 Calculus I		4				
MTH 126 Calculus II	MTH 125 or 145	4				
Social Science		3				
ORI 101 First Year Experience		1				
ORI 102 First Year Experience		1				
General Ed Totals:		51	0	0		
General Ed GPA:						

ELECTIVE Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
ELECTIVES TOTAL:		0	0	0	0	0

Total AAMU Hours: Total Transfer Hours:

Total Quality Points: Overall GPA:

Total Hours Required for Degree:

Telephone: _____

MAJOR Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
ME 103 Computer Aided Design I		3				
ME 104 Engineering Analysis & Comp		3				
ME 101 Intro. to Mechanical Engineering	Co-req: ME 101L	1				
ME 101L Intro. to Mech. Engr Lab	Co-req: ME 101	1				
MTH 227 Calculus III	MTH 126	4				
EE 201 Linear Circuit Analysis I		3				
EE 201L Linear Circuit Analysis I Lab	Co-req EE 201	1				
ME 205 Statics	MTH 126, Coreq: PHY 106	3				
MTH 238 Differential Equations	MTH 126 or MTH146	3				
ME 210 Material Science	CHE 101, PHY 105	3				
ME 206 Dynamics	ME205	3				
ME 231 Strength of Materials	ME 205, ME210, consult advisor	3				
ME 300 Math. Methods in Mech Engr	MTH 227, ME 104	3				
ME 310 Thermodynamics	PHY 105	3				
ME 360 Fluid Mechanics I	ME 206, MTH 227, Co-req ME360L	3				
ME 360L Fluid Mechanics I/Lab	Co-req ME 360	1				
ME 320 Kinematics/Dynamics of Mach.	ME 206	3				
ME 313L Experimental Mechanics Lab	Co-req ME 231	1				
ME 301/301L Anal. & Inst./Phys.Sys/Lab	EE201, ME205, MTH227, Co-req ME301L	3				
ME 3xx / ME4xx Elective		3				
ME 312 Heat and Mass Transfer	ME 310, ME 360, Co-req ME312L	3				
ME 312L Heat and Mass Transfer	Co-req ME 312	1				
ME 425 Design of Machine Element	ME 231	3				
ME 4XX Elective		4				
ME 451/451L Auto Control Systems	ME 301, Co-req ME 451L	3				
ME 470 Mech Engr Design Project	Senior standing & consult of Instructor	2				
ME 4XX Elective		3				
ME 475 Mech Engr Design Proj Continu	ME 470	3				
ME 4XX Elective		3				
ME 4XX Elective		3				
MAJOR REQUIREMENTS TOTAL:		79	0	0	0	0
MAJOR GPA:						

Total AAMU Hours: Total Transfer Hours:

Total Quality Points: 0 Overall GPA:

MINOR/ELECTIVES Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
MINOR/ELECTIVE TOTALS		0	0	0	0	0
MINOR/ELECTIVE GPA						

Advisor _____

Coordinator _____

Student _____

Print your name as you want it on your degree and Sign also.

Figure 1.1 Mechanical Engineering Graduation Check-Sheet, General Program

SCHOOL OF ENGINEERING, TECHNOLOGY, AND COMPUTER SCIENCE GRADUATION CHECK-SHEET

Degree: **CATALOG: 2008 – 2011**

Student Number **Graduation Date: Spring ( ) Summer ( ) Fall ( ) Year:** **Year Enrolled:**

Name: **Advisor:**

Major: Mechanical Engineering

Concentration: Manufacturing Systems

GENERAL EDUCATION Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
ENG 101 Communication Skills		3				
ENG 102 Communication Skills	ENG 101	3				
Physical Ed/Health/Military Sci or Food Sci.		2				
HIS 101 World History		3				
HIS 102 World History	HIS 101	3				
Fine Arts Elective		3				
ECO 231 or 232		3				
CHE 101 General Chemistry		3				
CHE 101 General Chemistry Lab		1				
PHY 105 Physics I	MTH 125	4				
PHY 106 Physics II	MTH 126, PHY 105	4				
ENG 203 World Literature I	E NG 102	3				
ENG 204 World Literature	ENG 203	3				
MTH 125 Calculus I		4				
MTH 126 Calculus II	MTH 125 or 145	4				
Social Science		3				
ORI 101 First Year Experience		1				
ORI 102 First Year Experience		1				
	General Ed Totals:	51	0	0		
				General Ed GPA:		

ELECTIVE Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
	ELECTIVES TOTAL:	0	0	0	0	0

MAJOR Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
ME 103 Computer Aided Design I		3				
ME 104 Engineering Analysis & Comp		3				
ME 101 Intro. to Mechanical Engineering	Co-req: ME 101L	1				
ME 101L Intro. to Mech. Engr Lab	Co-req: ME 101	1				
MTH 227 Calculus III	MTH 126	4				
EE 201 Linear Circuit Analysis I		3				
EE 201L Linear Circuit Analysis I Lab	Co-req EE 201	1				
ME 205 Statics	MTH 126, Coreq: PHY 106	3				
MTH 238 Differential Equations	MTH 126 or MTH146	3				
ME 210 Material Science	CHE 101, PHY 105	3				
ME 206 Dynamics	ME205	3				
ME 231 Strength of Materials	ME 205, ME210, consult advisor	3				
ME 300 Math. Methods in Mech Engr	MTH 227, ME 104	3				
ME 310 Thermodynamics	PHY 105	3				
ME 360 Fluid Mechanics I	ME 206, MTH 227, Co-req ME360L	3				
ME 360L Fluid Mechanics I/Lab	Co-req ME 360	1				
ME 320 Kinematics/Dynamics of Mach	ME 206	3				
ME 313L Experimental Mechanics Lab	Co-req ME 231	1				
ME 301/301L Anal. & Inst./Phys.Sys/Lab	EE201, ME205, MTH227, Co-req ME301L	3				
ME 380 Computer Aided Design II	ME 103, ME 231	3				
ME 312 Heat and Mass Transfer	ME 310, ME 360, Co-req ME312L	3				
ME 312L Heat and Mass Transfer	Co-req ME 312	1				
ME 425 Design of Machine Element	ME 231	3				
ME 432/432L Design for Manuf. Rel	ME 103, Co-req ME 432L	4				
ME 451/451L Auto Control Systems	ME 301, Co-req ME 451L	3				
ME 470 Mech Engr Design Project	Senior standing & ME425	2				
ME 481 Qual. Reliability Assurance	MTH 227	3				
ME 475 Mech Engr Design Proj Contin	ME 470	3				
ME 472 Economic Eval of Design Proj	ECO 231 or 232, ME231	3				
ME 482 Operations Planning & Schedu	MTH 227	3				
	MAJOR REQUIREMENTS TOTAL:	79	0	0	0	0
					MAJOR GPA:	

MINOR/ELECTIVES Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
	MINOR/ELECTIVE TOTALS	0	0	0	0	0
					MINOR/ELECTIVE GPA	

Total AAMU Hours: Total Transfer Hours:

Total Quality Points: 0 Overall GPA:

Total AAMU Hours: Total Transfer Hours:

Total Quality Points: Overall GPA:

Total Hours Required for Degree:

Advisor

Coordinator

Student

Telephone: _____

Print your name as you want it on your degree and Sign also.

Figures 1.2 Mechanical Engineering Graduation Check-Sheet, Manufacturing Systems

SCHOOL OF ENGINEERING, TECHNOLOGY, AND COMPUTER SCIENCE GRADUATION CHECK-SHEET

Degree: **CATALOG: 2008 - 2011**

Student Number **Graduation Date: Spring ( ) Summer ( ) Fall ( ) Year:** **Year Enrolled:**

Name: **Advisor:**

Major: Mechanical Engineering

Concentration: Propulsion Systems

GENERAL EDUCATION Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
ENG 101 Communication Skills		3				
ENG 102 Communication Skills	ENG 101	3				
Physical Ed/Health/Military Sci or Food Sci.		2				
HIS 101 World History		3				
HIS 102 World History	HIS 101	3				
Fine Arts Elective		3				
ECO 231 or 232		3				
CHE 101 General Chemistry		3				
CHE 101 General Chemistry Lab		1				
PHY 105 Physics I	MTH 125	4				
PHY 106 Physics II	MTH 126, PHY 10	4				
ENG 203 World Literature I	ENG 102	3				
ENG 204 World Literature	ENG 203	3				
MTH 125 Calculus I		4				
MTH 126 Calculus II	MTH 125 or 145	4				
Social Science		3				
ORI 101 First Year Experience		1				
ORI 102 First Year Experience		1				
	General Ed Totals:	51	0	0		
					General Ed GPA:	

ELECTIVE Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
	ELECTIVES TOTAL:	0	0	0	0	0

Total AAMU Hours: Total Transfer Hours:

Total Quality Points: Overall GPA:

Total Hours Required for Degree:

Telephone: _____

MAJOR Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
ME 103 Computer Aided Design I		3				
ME 104 Engineering Analysis & Comp		3				
ME 101 Intro. to Mechanical Engineering	Co-req ME 101L	1				
ME 101L Intro. to Mech. Engr Lab	Co-req ME 101	1				
MTH 227 Calculus III	MTH 126 or MTH 146	4				
EE 201 Linear Circuit Analysis I		3				
EE 201L Linear Circuit Analysis I Lab		1				
ME 205 Statics	MTH 126, Co-req: PHY 106	3				
MTH 238 Differential Equations	MTH 126 or MTH 146	3				
ME 210 Material Science	CHE 101, PHY 105	3				
ME 206 Dynamics	ME205	3				
ME 231 Strength of Materials	ME 205, ME210, consult advisor	3				
ME 300 Math. Methods in Mech Engr	MTH 227, ME 104	3				
ME 310 Thermodynamics	PHY 105	3				
ME 360 Fluid Mechanics I	ME 206, MTH 227, Co-req ME360L	3				
ME 360L Fluid Mechanics I/Lab	Co-req ME 360	1				
ME 320 Kinematics/Dynamics of Mach.	ME 206	3				
ME 313L Experimental Mechanics Lab	Co-req ME 231	1				
ME 301/301L Anal. & Inst./Phys.Sys/Lab	EE201, ME205, MTH227, co-req ME301L	3				
ME 311 Power Systems Integration	ME 310, ME 360	3				
ME 312 Heat and Mass Transfer	ME 310, ME 360, Co-req ME 312L	3				
ME 312L Heat and Mass Transfer	Co-req ME 312	1				
ME 425 Design of Machine Element	ME 231	3				
ME 417 Power Systems Integ. & Performa	ME 310, ME360	3				
412/412L Anal/Synthesis Gas Turb & Com	ME310, Co-req 412L	4				
ME 451/451L Auto Control Systems	ME 301, Co-req ME 451L	3				
ME 470 Mech Engr Design Project	Senior standing & ME425	2				
ME 413 Rocket Propulsion	ME 310	3				
ME 416 Gas Dynamics	ME 310, ME 360	3				
ME 475 Mech Engr Design Proj Continua	ME 470	3				
	MAJOR REQUIREMENTS TOTAL:	79	0	0	0	0
					MAJOR GPA:	

Total AAMU Hours: Total Transfer Hours:

Total Quality Points: 0 Overall GPA:

MINOR/ELECTIVES Requirements	PREREQ	HRS REQ	HOURS EARNED AAMU	HOURS EARNED TRANS	GR	QPS
	MINOR/ELECTIVE TOTALS	0	0	0	0	0
					MINOR/ELECTIVE GPA	

_____ Advisor

_____ Coordinator

_____ Student

Print your name as you want it on your degree and Sign also.

Figures 1.3 Mechanical Engineering Graduation Check-Sheet, Propulsion Systems

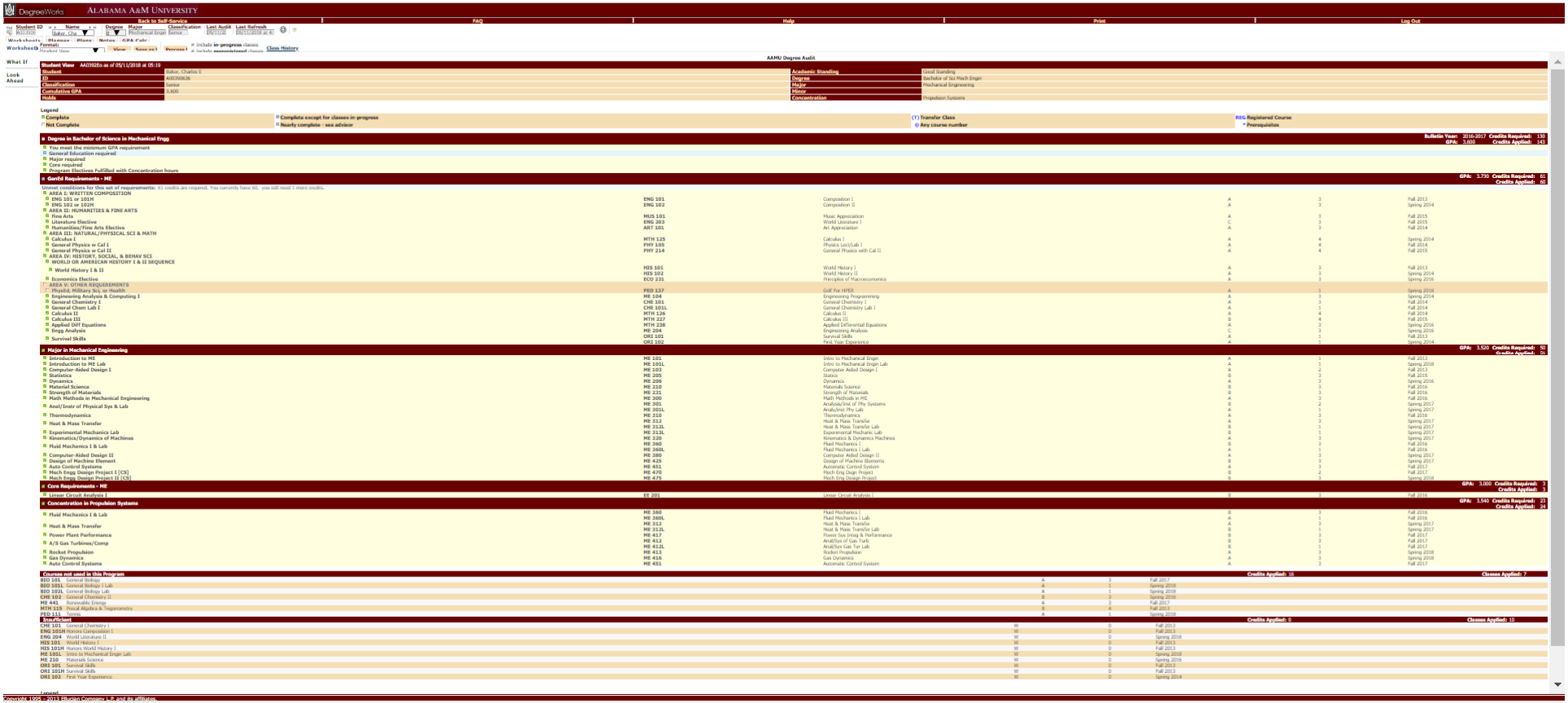


Figure 1.4 Screen Shot of Mechanical Engineering BS Degree Checklist on "Banner - Degree Works"

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

Institutional Mission Statement

Alabama Agricultural and Mechanical University reflects the uniqueness of the traditional land-grant institution combining teaching, research, service, liberal arts, and vocational fields. The University offers baccalaureate, masters, and doctoral level degrees (that are compatible with the times) to all qualified and capable individuals who are interested in further developing their technical, scientific, professional, and scholastic skills and competencies. The University operates in the three-fold function of teaching, research, extension and other public service. Alabama A&M University, a center for excellence, provides an educational environment for the emergence of scholars, scientists, leaders, critical thinkers, and other contributors to a global society. In cooperation with business, industry, governmental agencies, and other private and community-based institutions, Alabama A&M University provides a laboratory where theory is put into practice globally. Further, the University is committed to:

1. Excellence in education and a scholarly environment in which inquiring and discriminating minds may be nourished;
2. Education of students for effective participation in local, state, regional, national, and international societies;
3. Search for new knowledge through research and its applications;
4. Provision of a comprehensive outreach program designed to meet the changing needs of the larger community;
5. Programs necessary to address adequately the major needs and problems of capable students who have experienced limited access to education, and
6. Integration of state-of-the-art technology into all aspects of University functions.

In cooperation with businesses, industry, governmental agencies, and other private and community-based institutions, Alabama A&M University provides a laboratory where theory is put into practice, in a productive environment.

http://www.aamu.edu/aboutaamu/pages/default.aspx

B. Program Educational Objectives

The current Program Educational Objectives (PEOs) of the Mechanical Engineering program at Alabama A&M University are to produce graduates who, within the first few years of their graduation:

1. Are successfully employed in ME related fields or have transitioned into nontraditional career paths.

2. Advance professionally as a result of his/her ability to solve complex technical problems and demonstrate professional engineering competence via promotions and/or positions of increasing responsibility.
3. Continue life-long learning via progress toward, or successful completion of an advanced degree, professional development and/or industrial training course(s), and/or engineering certification.
4. Demonstrate service and sovereignty through involvement with community and/or professional organizations and/or make contributions towards society's greater good and prosperity.

Original program educational objectives (PEOs) were developed in 1999 by the ME program faculty in consultation with the program constituencies. They have been revised periodically in response to assessment findings, and to incorporate feedback from alumni, employers, and the ME Industry Advisory Board. Major modifications to the program educational objectives were made in response to concerns expressed during the 2008 ABET accreditation process, which received feedback and was approved by the Program faculty and the ME Industry Advisory Board. During the process of the recent assessment and evaluation cycle, and preparation of this self-study, the 2012 PEOs have been rewritten to describe what graduates are expected to attain within the first few years of their graduation. This re-writing has also received feedback and been approved by the Program faculty and the ME Industry Advisory Board. However, re-writing of the PEOs has also started an assessment process where PEOs are being reevaluated as well as the tools that are used to assess them. Since the 2012 ABET visit, the PEOs have not been changed.

The program objectives are communicated to the public through the internet at the Mechanical Engineering web page of the AAMU web site:
http://www.aamu.edu/Academics/engineering-technology/CME/MechEng/Pages/default.aspx

Moreover, the objectives are published in the Mechanical Engineering section of the 2017 – 2018 Undergraduate Catalog, see page 170 of the 2017-18 University Undergraduate Bulletin:
http://www.aamu.edu/administrativeoffices/academicaffairs/Pages/Undergraduate-Bulletins.aspx

C. Consistency of the Program Educational Objectives with the Mission of the Institution

The Mechanical Engineering program objectives are consistent with and directly supportive of the mission of the institution, Table 2.1. The objectives are consistent with serving as resources for the intellectual, social, economic, and technological advancement of the diverse constituency in Alabama and the region. The field of mechanical engineering is a primary driver in any technological advancement. The mechanical engineering program at Alabama A&M University is committed to providing graduates who are capable of working in wide variety of industrial and governmental settings. Stated succinctly, PEO #1: Are successfully employed in ME related fields or have transitioned into nontraditional career paths support the AAMU Mission elements 1-6 (Excellence in education, Effective participation in societies, research and its applications, meeting the changing needs of the community, addressing adequately the major needs and problems of students, integration of state–of-the-art technology in addition to training to students who previously had limited access to education)

Objectives 2 - 4 reinforce the mission because they support the six elements of the AAMU Mission. These additional objectives increase the overall technological infrastructure of Alabama and the region leading to enhanced economic and intellectual growth.

Table 2.1 Map of ME Program Educational Objectives and the Mission of the Institution.

AAMU Mission	ME PEOs			
	PEO #1: Are successfully employed in ME related fields or have transitioned into nontraditional career paths.	PEO #2: Advance professionally as a result of his/her ability to solve complex technical problems and demonstrate professional engineering competence via promotions and/or positions of increasing responsibility.	PEO #3: Continue life-long learning via progress toward, or successful completion of an advanced degree, professional development and/or industrial training course(s), and/or engineering certification.	PEO #4: Demonstrate service and sovereignty through involvement with community and/or professional organizations and/or make contributions towards society's greater good and prosperity.
1. Excellence in education and a scholarly environment in which inquiring and discriminating minds may be nourished;	X	X	X	X
2. Education of students for effective participation in local, state, regional, national, and international societies;	X	X	X	X
3. Search for new knowledge through research and its applications;	X	X	X	X

4. Provision of a comprehensive outreach program designed to meet the changing needs of the larger community;	X	X	X	X
5. Programs necessary to address adequately the major needs and problems of capable students who have experienced limited access to education; and	X	X	X	X
6. Integration of state–of-the-art technology into all aspects of University functions.	X	X	X	X

D. Program Constituencies

The ME Program identified that the most important constituencies to our program are:

- the **Students** of the program
- the **Faculty** of the program
- the **Alumni** of the program
- the **Employers** of the program's graduates
- the **Industry Advisory Board** members of the program
- the **Community** in general.

Details about these constituents and the means by which they provide input to the program are shown below.

Students are the immediate beneficiaries of the program and subsequently have expectations to receive an education that will prepare them for a professional career in mechanical engineering or enable them to undertake graduate studies, or contribute to society in other ways. As such, undergraduate mechanical engineering students are constituents of the program. Their parents and families also have an obvious interest in the program, although they are not considered direct constituents. Students participate in the assessment process through individual course assessment surveys, institutional course evaluations, and the senior exit survey.

The ***faculty*** has the academic responsibility for the curriculum and for education of the students. Faculty members develop and deliver the educational program that provides for a professional career in mechanical engineering and interact with each of the other constituents.

The program and curricula they administer is a major means of accomplishing all of the program's objectives. They have a strong vested interest in the program and the upholding of standards of quality. Faculty members participate in the assessment process through individual course assessment, department faculty meetings and interaction with the industry advisory board.

Alumni have a vested interest in the educational program through their alumni status, financial support, as employers of future graduates, and as family members that become students. They are the "products" and strong supporters of the academic program. Their careers demonstrate the accomplishment of the PEOs. Alumni participate in the assessment process through the alumni survey and participation on the professional advisory board.

Considering the high percentage of our graduates who enter the workforce, ***employers*** of our graduates are also an important constituency. The employers of our graduates need young engineers who are technically capable good problem solvers committed to self-improvement and advancement in their careers. Our educational objectives are consistent with all of these key competencies. Graduates of the BSME program are well prepared to pursue careers in research and development, design, manufacturing and management in a diverse array of industries including power engineering and energy systems, aerospace, automotive, robotics, etc. They are also well prepared to pursue graduate and professional degrees. Employers participate in the assessment process through the industry advisory board, the alumni survey, and through participation in the senior design process.

The **Mechanical Engineering Industry Advisory Board** for the mechanical engineering program is primarily established to represent our employer constituents. However, it is common for an employer to be an alumnus. In fact we find that alumni who are employers of our students are often our best advisors based on their strong desire to serve the mechanical engineering program. The Board is made up of very active professionals representing a balanced cross section of various mechanical engineering disciplines. The current Board members are listed in Table 2.2 along with their professional affiliation. Our board members are volunteers and provide their own resources to attend meetings usually conducted at least once every semester. They perform the exit interviews of our graduating seniors. Moreover, they involve in the two-semester capstone design projects by:

- Mentoring the senior design projects
- Evaluating the senior project progress at the end of the first semester and provide directions for improvement.
- Evaluating the final capstone project and provide directions for improvements for next year projects

Table 2.2 - Mechanical Engineering Industry Advisory Board Membership

Last	First	E-mail Address	Company	Comments
Randall	Christopher	chris.randall-1@nasa.gov	NASA, MSFC	Alumni
Edwards	Eugene	eugene.edwards.civ@mail.mil	U S Army RDECOM/AMRDEC	Alumni
Lassiter	John	John.O.Lassiter@nasa.gov	NASA, MSFC	
Maguire	Kenneth	kenneth.maguire@ngc.com	Northrup Grumman	
Marino	Ronald	ronald.a.marino@boeing.com	The Boeing Company	
Kmiec	Thomas	thomas.kmiec@pwr.utc.com	Pratt & Whitney Rocketdyne	
Flowers	Theromiles	Theromiles.Flowers-1@nasa.gov	NASA/MSFC	Alumni
Roberts	J Keith	john.k.roberts48.civ@mail.mil	U. S. Army RDECOM, AMSRD-AMR-PS-AM	
Dillard	Gary	gary.dillard@pwr.utc.com	Pratt & Whitney Rocketdyne	
McDonald	Emmett	emcdonald@dynamic-concepts.com	Dynamic Concepts, Inc.	
Randall	Christopher	chris.randall-1@nasa.gov	NASA	Alumni
Hudson	Dale	dalehudson@knology.net	Hudson Professional Services	
Soliman	Ahmed	ahmed.soliman@bench.com	Benchmark Electronics	
Miller	Andre	Andre.E.Miller@nasa.gov	NASA, MSFC	
Parsons	James A.	Jim.Parsons@dynetics.com	Dynetics	
Hogan	Javiheir	javiheir.q.hogan@nasa.gov	NASA, MSFC	Alumni

All Objectives also serve the needs of the **community in general** as they all contribute to the development of human resources that enhance the economic, intellectual, and technological infrastructure of the community.

In summary, each of these constituencies has vested interest in the success and continued improvement of the Mechanical Engineering program at AAMU and the proper direction of the program through its educational objectives. The role of each of these constituencies in the establishment and continuous assessment of the PEOs is described below in Table 2-3, which also provides a description of how the PEOs meet the needs of these constituencies

Table 2.3 Linkage between PEOs and Constituencies

Program Educational Objective	Constituencies served
1. Are successfully employed in ME related fields or have transitioned into nontraditional career paths.	**Current Students**: providing fundamental and applied engineering skills, students will be prepared for employment. **Employers**: providing well-qualified work force **Alumni**: ability to find employment **Community:** contributing to the development of human resources that enhance the economic, intellectual, and technological infrastructure of the community
2. Advance professionally as a result of his/her ability to solve complex technical problems and demonstrate professional engineering competence via promotions and/or positions of increasing responsibility.	**Current Students**: reinforcing the fundamental and applied engineering skills, students will be prepared for employment **Employers :** ability of graduates to function in a dynamic environment with changing regulations **Alumni**: ability to compete in a dynamic environment with changing regulations **Community:** contributing to the development of human resources that enhance the economic, intellectual, and technological infrastructure of the community
3. Continue life-long learning via progress toward, or successful completion of an advanced degree, professional development and/or industrial training course(s), and/or engineering certification.	**Current Students**: enhancing the fundamental and applied engineering skills, students will be prepared for advancement in their careers. **Employers :** ability of graduates to function in a dynamic environment with changing regulations **Alumni**: ability to compete in a dynamic environment with changing regulations **Community:** contributing to the development of human resources that enhance the economic, intellectual, and technological infrastructure of the community
4. Demonstrate service and sovereignty through involvement with community and/or professional organizations and/or make contributions towards society's greater good and prosperity.	**Current Students**: providing fundamental and applied engineering skills, students will be prepared for serving the community and the nation. **Employers :** ability of graduates to function in a dynamic environment with changing regulations **Alumni**: ability to compete and prosper in a dynamic environment with changing regulations **Community:** contributing to the development of human wellbeing towards society's greater good and prosperity

E. Process for Revision of the Program Educational Objectives

The Mechanical Engineering program has established a long-term relationship with alumni and their respective employers. The program has received adequate feedback from the alumni through graduate surveys that have been conducted regularly by the department. The program's educational objectives have been developed to be consistent with the mission of AAMU and in conjunction with the survey results from the graduates and employers. The revised draft was distributed to faculty members for comments and suggestions. Since the last 2012 general EAC review, the Program Educational Objectives have been changed to the current objectives. A timeline depicting the processes and actions taken to assess and revise our program educational objectives is shown in Table 2.4.

Table 2.4 Timeline for assessment and revision of educational objectives

Date	**Modification**	Constituency Surveyed
Fall 2012	ABET review identified program educational objectives as a weakness.	
Spring 2013	The PEOs modified to be more measurable and achievable and submitted in the response to ABET Draft Statement of Accreditation. The weakness is resolved in the final statement.	Faculty, Alumni, Employers, Industry Advisory Board

As mentioned in the above table, the department has started its new cycle of assessment of the current educational objectives. Based on these assessment results, the department will start its reevaluation and discussion in the fall 2018 semester. Table 2.5 summarizes the changes in the objectives.

Table 2.5 Revision of the Program Educational Objectives

Date	Program Educational Objectives
Fall 2011	The objectives of the Mechanical Engineering program at Alabama A&M University are to produce graduates who, within the first few years of their graduation, have successfully demonstrated: 1. The necessary competencies in fundamental engineering technologies in areas of mechanical engineering, such as thermal and mechanical systems design. 2. Competencies in experimental testing, error analysis, laboratory safety, data acquisition, instrumentation and laboratory report writing. 3. Computer competency and an intelligent use of computers as a tool for developing solutions to engineering problems.

Spring 2013	The current Program Educational Objectives (PEOs) of the Mechanical Engineering program at Alabama A&M University are to produce graduates who, within the first few years of their graduation: 1. Are successfully employed in ME related fields or have transitioned into nontraditional career paths. 2. Advance professionally as a result of his/her ability to solve complex technical problems and demonstrate professional engineering competence via promotions and/or positions of increasing responsibility. 3. Continue life-long learning via progress toward, or successful completion of an advanced degree, professional development and/or industrial training course(s), and/or engineering certification. 4. Demonstrate service and sovereignty through involvement with community and/or professional organizations and/or make contributions towards society's greater good and prosperity.

The process to establish and review the programs educational objectives involves various constituencies which consist of students, faculty, alumni, employers and members of the Advisory Board. To ensure the program is meeting its educational objectives, the Department has adopted several assessment tools and evaluation forms. These forms are:

- Constituent Survey for Mechanical Engineering Program Objectives (Faculty, Alumni, Industry Advisory Board, Employer)
- Graduating Senior Survey
- Alumni Survey Form
- Employer Survey Form

Copies of these Forms are provided in Appendix E, pages E1-E5. This assessment process involves the graduating senior students, faculty, alumni, employers, and Industry Advisory Board. These data are analyzed and used for the improvement of the program. In addition, suggestions from the Advisory Board and faculty members are great resources for future enhancements to the program.

The processes used by the Mechanical Engineering Department to assure achievement of program educational objectives are guided by an **overall** process diagram entitled "The Assessment Process" (Figure 2.1) and by an enhanced more specific program quality control diagram (Figure 2.2: Continuous Quality Improvement Feedback Diagram). These diagrams show how each constituent is involved in developing and improving the educational objectives and assessing the program outcomes at the scheduled times. Constituent involvement in the assessment process is also included in the diagram. This diagram serves the dual purpose of providing the processes used to monitor the overall program quality as well as processes used to assure achievement of program objectives. The diagram shows how the Department uses **Assessment Tools** such as **Student Feedback** form, graduating senior **Exit Interview** form, **Graduate Survey** form, **Course Evaluation** form and **Employer Survey** form to collect data and comments from **Constituencie**s such as **Students**, **Alumni** and **Employers**. Additional data are also obtained through evaluation of **Student Course Performance** each semester and **Student Extra-Curricular Activities** each

year. Furthermore, suggestions from the **Advisory Board** and **Faculty** members are resources for future enhancements to the program. These data are analyzed by the faculty and used for the assessment of the program achievement. Final action for any program improvement is taken at the **ME Faculty Meeting** as shown in the diagram, as guided by the **Governing Elements** such as **University Mission & Goal, ABET Criteria** and **Professional Development**.

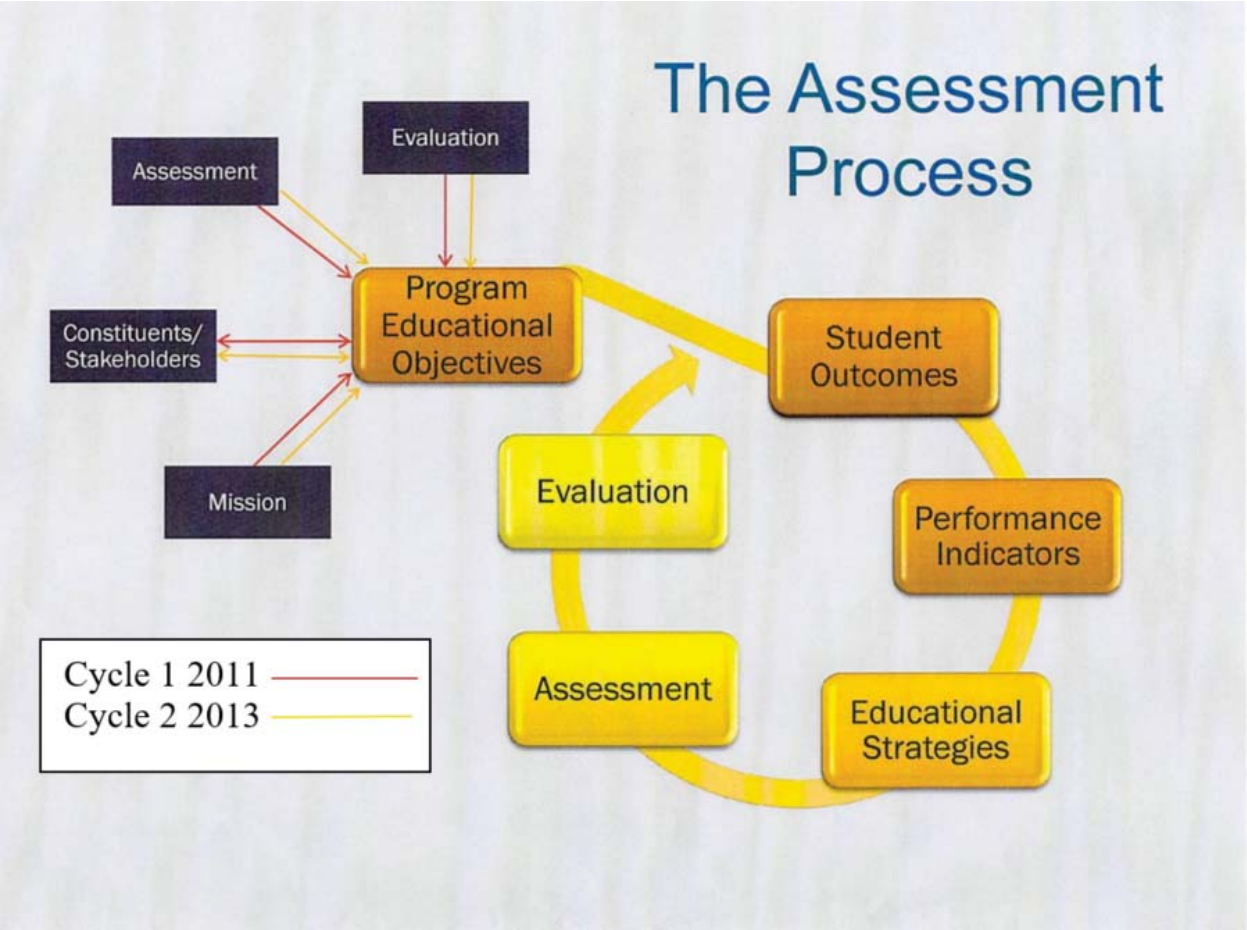
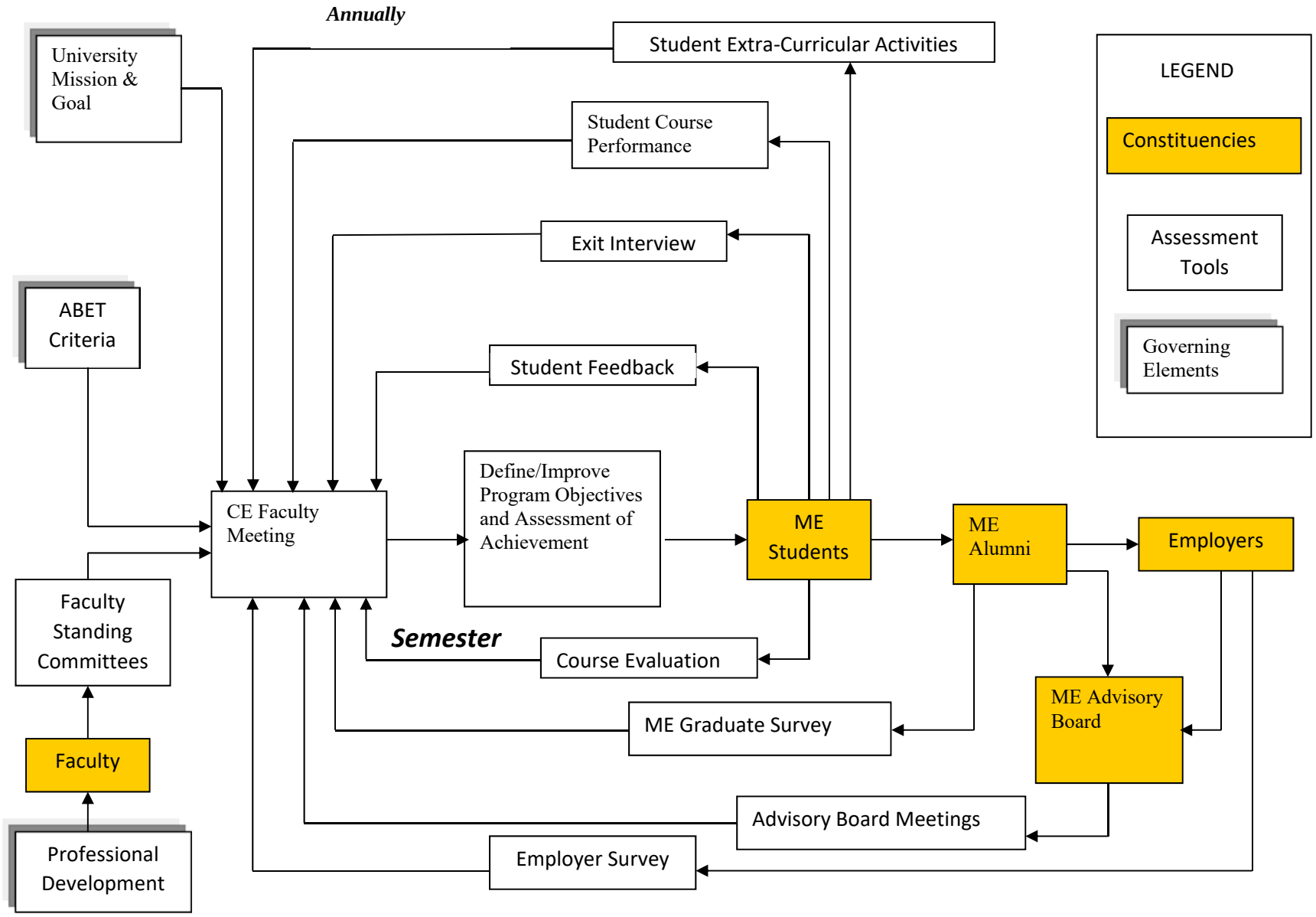


Figure 2.1 The Assessment Process

Several improvements to the program have been made as a result of these assessment tools. Additional documents that outline the various Continuous Improvement Processes will be provided to the Evaluation Team during their visit.

Figure 2.2 Continuous Quality Improvement Feedback Diagram



The ***Program Educational Objectives*** are subject to change and modification as part of the continuous improvement process. Although the program objectives are evaluated by the constituencies every 4 years, any modification or change can only be considered for implementation at a two year interval when the new University Undergraduate Bulletin is published. The primary method of assessment is Survey of the constituents. The Spring 2013 survey results of the Faculty (seven faculty members) and Industry Advisory Board members (10 members responded) are shown in Figure 2.3. The department decided to continue with the current PEOs till the coming ABET visit in Fall 2018.

The ***Program Educational Objectives*** recommendations will be discussed by the faculty members in Fall 2018. Then the recommendations will be discussed with ME Industry Advisory Board (ME – IAB) during the Fall semester meeting. To show *that constituents have participated in the development of program objectives and that they have been included in the assessment process,* complete documentation will be made available during the ABET visit in Fall 2018.

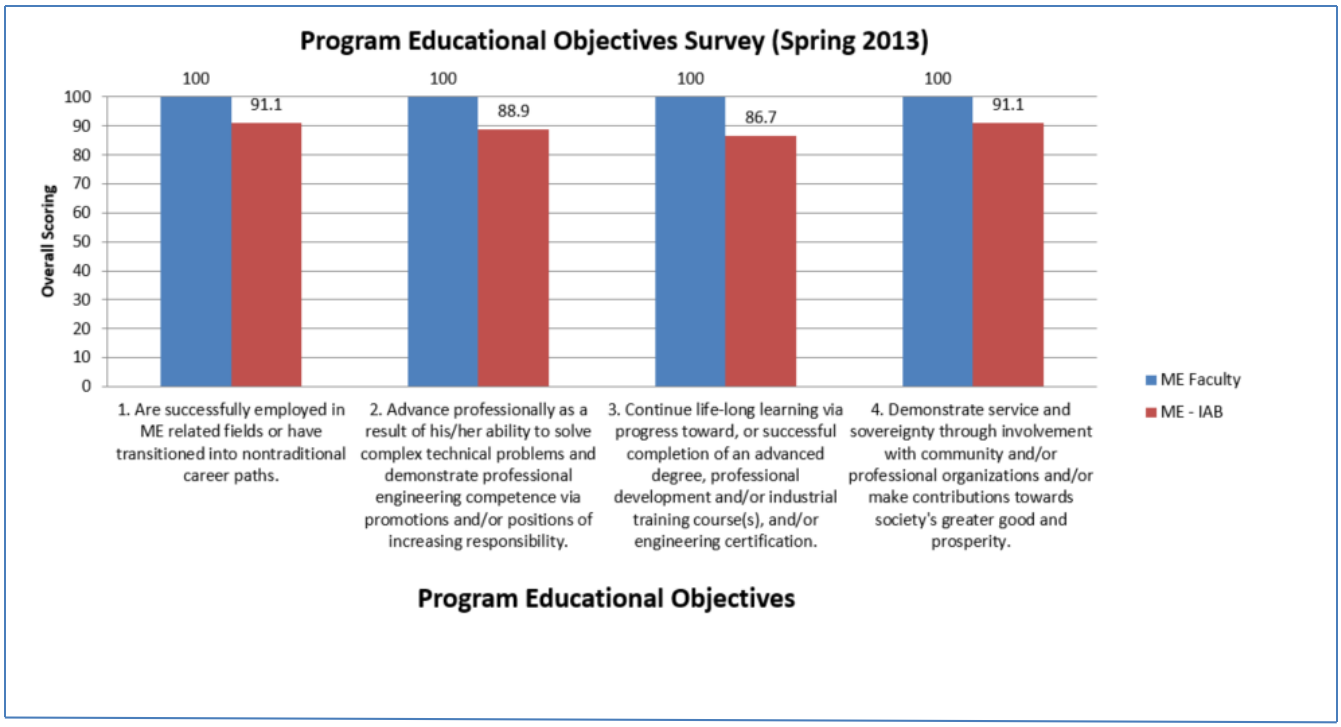


Figure 2.3 Program Educational Objectives Survey Results

Assessment of Program Educational Objectives

The process used to evaluate and revise the program educational objectives is described in section **E** of **CRITERION 2**, above. Data from alumni, employer and ME Industry Advisory Board surveys are used to assess the attainment of the educational objectives. The alumni survey takes place on a cycle of approximately three years. The following criterion has been established to assess whether or not program educational objectives have been attained:

A program educational objective will be considered to have been attained if 75% or more of respondents indicate a rating of >3.75 on a scale of 1-5 (5 being Strongly Agree) as the level of attainment for that objective.

The ME Industry Advisory Board (ME-IAB) also plays an important role in the assessment process. The results of the surveys are discussed with the Board, who make recommendations to the faculty on both the attainment of the objectives and possible revisions. The results of the assessment process are documented in spreadsheets, minutes of faculty meetings, and reports of ME Industry Advisory Board meetings. Electronic files are kept on an administrative disk space accessible to the Program Coordinator and program staff members.

Summary and Analysis of Assessment Data for Program Educational Objectives

In the period since the last ABET accreditation general review of 2012, the Mechanical Engineering Program has modified the Program Educational Objectives to be more measurable and achievable. On Spring 2013, a new set of PEOs has been developed by the ME faculty and approved by the Industry Advisory Board. The program also developed the Alumni survey form for the assessment of the performance of the graduates. Although the form does not directly assess the PEOs, the performance indicators used in this form have direct support of the PEOs, Table 2.6.

Table 2.6 Map of Mechanical Engineering Program Educational Objectives and the Alumni Survey

Alumni Survey Performance Indicators	ME PEOs			
	PEO #1: Are successfully employed in ME related fields or have transitioned into nontraditional career paths	PEO #2: Advance professionally and demonstrate professional engineering competence via promotions and/or positions of increasing responsibility	PEO #3: Continue lifelong learning via progress toward, or successful completion of an advanced degree, professional development and/or industrial training course(s), and/or engineering certification	PEO #4: Demonstrate service and sovereignty through involvement with community and/or professional organizations and/or make contributions towards society's greater good and prosperity
1. I have the technical skills required for my job assignments.	X	X	X	X
2. I have the ability to use the techniques and tools necessary for successful professional practice.	X	X	X	X
3. I have the ability to communicate effectively both verbally and in writing.	X	X	X	X
4. I have the ability to function on multi-disciplinary teams.	X	X	X	X

5. I have an understanding of professional and ethical responsibility in professional practice.	X	X	X	X
6. I have a recognition of the need for, and an ability to engage in lifelong learning.	X	X	X	
7. I am competitive with other young professionals hired by my company.	X	X	X	
8. I would recommend Alabama A&M University to my family and friends.	X	X	X	X

The first survey of the modified PEOs was administered to alumni and employers by the Mechanical Engineering Department in Spring 2013. Alumni participation in the survey was solicited by e-mails from the Department Head, which went out to all alumni for whom we had e-mail addresses. Employer participation in the survey was solicited by asking the alumni to forward the survey instrument and a solicitation letter from the coordinator to their direct supervisors. Results are calculated by using Priority rating obtained by giving a weight of 5 to strongly agree, 3 to neutral and 1 to strongly disagree. Number of respondents in each rating category was multiplied by the corresponding weight to obtain total PEO success which is divided by the number of respondents and the maximum possible success of 50, yielding the "Success Score" expressed as a percentage.

On Fall 2012, the ME Faculty modified the PEOs to respond to the ABET finding in 2012 visit. The modification was presented to the ME Industry Advisory Board for approval. This initiate a discussion for revisiting the current PEOs and the board recommends the following(see the minutes of the ME-IAB meeting on February 21, 2013 in Appendix E, pages E7-E8):

- Approve the modification
- More time needed to carefully revisit the PEOs and look at other institutions for comparison.
- Use the current Constituent Survey for Mechanical Engineering Program Objectives Form to obtain feedback and suggestions from all members.
- Revisit the alumni and employer surveys to address the lake of response from both constituencies.

In the following faculty meeting, the faculty provided their input to the Constituent Survey for Mechanical Engineering Program Objectives Form and re-evaluated the PEOs. The form was emailed to the ME Industry Advisory Board for evaluation and suggestions. The survey results of the Faculty (six faculty members) and Industry Advisory Board members (10 members responded) are shown in Figure 2.3.

The second survey was administered to alumni and employers by the Mechanical Engineering Department in Spring 2013. As with the previous survey, alumni and employers were contacted by e-mail. Table 2.6 and Figure 2.4 summarize the alumni survey results for 2013 and 20116.

Table 2.6 Alumni Survey Results.

Alumni Survey Results	2013	2016
Number of Respondents	12	21
1. I have the technical skills required for my job assignments.	86.67%	88.57%
2. I have the ability to use the techniques and tools necessary for successful professional practice.	90.00%	91.43%
3. I have the ability to communicate effectively both verbally and in writing.	80.00%	92.38%
4. I have the ability to function on multi-disciplinary teams.	96.67%	95.24%
5. I have an understanding of professional and ethical responsibility in professional practice.	96.67%	94.29%
6. I have a recognition of the need for, and an ability to engage in lifelong learning.	96.67%	96.19%
7. I am competitive with other young professionals hired by my company.	96.67%	94.00%
8. I would recommend Alabama A&M University to my family and friends.	86.67%	89.52%

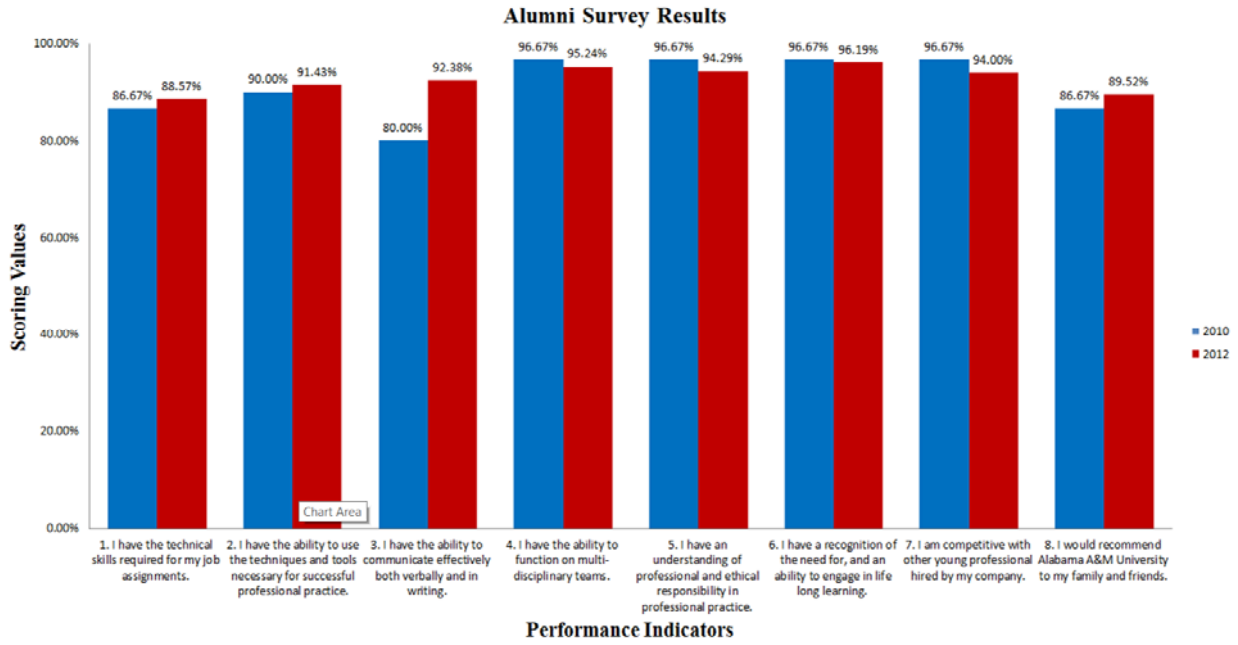


Figure 2.4 Alumni Survey Results

The results revealed that AAMU graduates have the technical skills and techniques necessary for successful professional practice. Additionally the results also provided evidence of professional

development activities, ethical responsibility, ability to communicate and competitiveness. Using the 75% attainment criterion, it may be concluded that all program educational objectives were attained by our recent mechanical engineering graduates. A disappointment of the Survey results was the low response rate among employers. Some alumni may have been reluctant to forward the survey to their employers for one reason or another. In discussing the low response rate with the Advisory Board, we learned that many firms prohibit their staff from responding to such surveys. In talking to Chairs at other departments, this seems to be a common problem elsewhere as well. While direct survey input from employers would be useful, the Industry Advisory Board represents our employer constituency effectively in the assessment process.

CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes

The student outcomes for the mechanical engineering program are the same as those found in Criterion 3 of ABET's *Criteria for Accrediting Engineering Programs, 2016 – 2017.* The Student outcomes are outcomes (a) through (k):

a. an ability to apply knowledge of mathematics, science, and engineering,

b. an ability to design and conduct experiments, as well as to analyze and interpret data,

c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,

d. an ability to function on multidisciplinary teams,

e. an ability to identify, formulate, and solve engineering problems,

f. an understanding of professional and ethical responsibility,

g. an ability to communicate effectively,

h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,

i. a recognition of the need for, and an ability to engage in life-long learning,

j. a knowledge of contemporary issues, and

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The student outcomes for the Mechanical Engineering program can be easily reached by the public through the department's web page. The direct link is:

http://www.aamu.edu/Academics/engineering-technology/CME/MechEng/Pages/default.aspx

B. Relationship of Student Outcomes to Program Educational Objectives

The following Outcomes – Objectives Matrix shows how the Student Outcomes lead to the achievement of the Program Educational Objectives. An "X" in a cell indicates a specific Student Outcome that prepares graduates to attain a specific Program Educational Objective. The matrix shows that each Outcome contributes to the attainment of an Educational Objective. Furthermore, there is good redundancy in the contribution of the Outcomes; that is, each Educational Objective has several Outcomes contributing to its attainment.

Table 3.1 Mapping of ME Program Outcomes to ME Educational Objectives

Outcomes – Objectives Matrix												
	Student Outcome	a. Apply math, science, and engineering	b. Design and conduct expts., analyze and interpret data	c. Design to meet realistic constraints	d. Function on multidisciplinary teams	e. Identify, formulate, and solve engineering problems	f. Understand professional and ethical responsibility	g. Communicate effectively	h. Broad education to understand impact of engr. solns.	i. Recognize need and be able to engage in life-long learning	j. Knowledge of contemporary issues	k. Use techniques, skills, modern tools for engr. practice
Program Educational Objective												
1. Are successfully employed in ME related fields or have transitioned into nontraditional career paths		X	X	X	X	X	X	X	X	X	X	X
2. Advance professionally as a result of his/her ability to solve complex technical problems and demonstrate professional engineering competence via promotions and/or positions of increasing responsibility		X	X	X	X	X	X	X	X	X	X	X
3. Continue life-long learning via progress toward, or successful completion of an advanced degree, professional development and/or industrial training course(s), and/or engineering certification.		X	X	X	X	X		X	X	X	X	X
4. Demonstrate service and sovereignty through involvement with community and/or professional organizations and/or make contributions towards society's greater good and prosperity				X	X		X	X		X	X	

The mapping of the student outcomes to the PEOs is shown in Table 3.1. Both the PEOs and student outcomes are accomplished through the sound and rigorous curriculum of the BSME degree program. This curriculum encompasses the specific knowledge and skills requirements identified in the ABET criteria. More details of these discussions can be found in Section ”PROGRAM CRITERION”.

Each of the student outcomes mentioned above have been defined by a few high level performance Indicator so that they can be communicated to students, integrated into the curriculum and measured in a consistent and reliable manner. Table 3.3 shows performance criterion for each outcome for the Mechanical Engineering program. It should be noted that the assessment process has led to changes to the performance indicators. Table 3.3 shows the performance indicators developed on 2011 and the modified ones that have been developed during the Spring 2013. Since engineering faculty members only have a direct influence on the courses taught within our program, the integration of student outcomes is guaranteed in the engineering courses alone. Student study in math and basic sciences enhances achievement of outcomes, but engineering faculty members have no consistent ability to influence change in courses taught outside of our program.

Table 3.3 Student outcomes and performance criteria

Student Outcome	Performance Indicators 2011		Performance Indicators 2013	
a. an ability to apply knowledge of mathematics, science and engineering	a1	Ability to plot functions and read graphs	a1	Ability to plot functions and read graphs
	a2	Ability to formulate a set of equations and solve them	a2	Ability to formulate a set of equations and solve them
	a3	Ability to apply/solve DE	a3	Ability to apply calculus and DE for solving engineering problems
	a4	Ability to apply calculus methods	a4	Ability to apply dimensional analysis and unit conversion
	a5	Ability to apply dimensional analysis and unit conversion		
b. an ability to design and conduct experiments, as well as to analyze and interpret data	b1	Ability to understand the experiment objective	b1	Ability to set up and conduct the experiment
	b2	Ability to set up and conduct the experiment	b2	Ability to collect and present data
	b3	Ability to collect and present data	b3	Ability to analyze and interpret data
	b4	Ability to analyze and interpret data	b4	Ability to perform error analysis
	b5	Ability to perform error analysis		
c. an ability to design a system, component, or process to meet desired needs	c1	An ability to understand design specifications	c1	An ability to understand design/process specifications
	c2	Ability to model and prototype	c2	Ability to model and prototype
	c3	Ability to iterate design cycles	c3	Ability to implement design and fabricate
	c4	Ability to implement design and fabricate	c4	Ability to test, evaluate, and qualify design
	c5	Ability to test, evaluate, and qualify design		
d. an ability to function in multidisciplinary teams	d1	Demonstrate ability to work & plan together	d1	Demonstrate ability to work & plan together
	d2	Demonstrate ability to divide up complex tasks	d2	Demonstrate ability to divide up complex tasks
	d3	Demonstrate ability to integrate individual work	d3	Demonstrate ability to integrate individual work
	d4	Demonstrate ability to report team efforts and outputs	d4	Demonstrate ability to report team efforts and outputs
e. an ability to identify, formulate and solve engineering problems	e1	Ability to formulate a set of equations and solve them	e1	Ability to formulate a set of equations and solve them
	e2	Ability to model and solve engineering problems	e2	Ability to model and solve engineering problems
	e3	Ability to apply differential and integral calculus to engineering problems	e3	Ability to apply differential and integral calculus to engineering problems

	e4	Ability to simulate and model engineering problems	e4	Ability to simulate and model engineering problems
f. an understanding of professional and ethical responsibility	f1	Demonstrated performance in classroom	f1	Demonstrated ability to reason through ethical dilemmas
	f2	Membership in professional societies	f2	Demonstrated knowledge of NSPE Code of Ethics
	f3	Service to community	f3	Graduates exhibit professional and ethical behavior in the workplace.
	f4	Demonstrated academic honesty in classroom		
	f5	Demonstrated ability to reason through ethical dilemmas		
	f6	Demonstrated knowledge of NSPE Code of Ethics		
	f7	Demonstrated knowledge of ABET role in Engineering Education, and procedures for Professional Licensure		
	f8	Graduates exhibit professional and ethical behavior in the workplace.		
g. an ability to communicate effectively	g1	Ability to make formal presentation	g1	Ability to make formal presentation
	g2	Ability to write effectively	g2	Ability to write effectively
	g3	Participation in classroom discussion	g3	Participation in classroom discussion
h. the broad education necessary to understand the impact of engineering solutions in a global and societal context	h1	Graduate from an Accredited Program	h1	Understand the impact of engineering solutions in society
	h2	Gain non-engineering perspective	h2	Relate engineering solutions to real life problems
	h3	Relate engineering solutions to real life problems		
i. a recognition of the need for and an ability to engage in life-long learning	i1	Awareness of modern developments in engineering	i1	Awareness of modern developments in engineering
	i2	Continuing education courses	i2	Seeking graduate degree/professional development
	i3	Demonstrated eligibility for graduate school		
j. a knowledge of contemporary issues	j1	Demonstrated knowledge of state of the art technology	j1	Demonstrated knowledge of state of the art technology
	j2	Integration of engineering science to practical problems of contemporary interest	j2	Integration of engineering science to practical problems of contemporary interest
	j3	Demonstrated attendance at professional seminars, lectures and desire to gain knowledge from them		

k. an ability to use the techniques, skills and modern engineering tools necessary for engineering practice	k1	Ability to write computer programs	k1	Ability to utilize advanced Engineering software design tools
	k2	Ability to analyze data and plot graphs	k2	Ability to use advanced computational tools
	k3	Ability to use computer software	k3	Ability to design and simulate experiment using advanced Data acquisition tools
	k4	Ability to use Matlab and Simulink computational tools		
	k5	Ability to use Data acquisition tools		

CRITERION 4. CONTINUOUS IMPROVEMENT

The philosophy of continuous improvement of academic programs using outcomes-based assessment began at Alabama A&M University in 1999. Since then, the Mechanical Engineering Program (then a Department) has adopted a variety of assessment tools to evaluate course outcomes, program objectives, and student outcomes:

- Alumni surveys
- Employer surveys
- Graduating Senior surveys
- Student Satisfaction with ME Department surveys
- Program Educational Objectives surveys
- Regular consultation with the ME Industry Advisory Board

The sections that follow review the processes by which program educational objectives and student outcomes are assessed and evaluated. The results of those processes are described and analyzed. Furthermore, the results of these processes are being utilized to effect continuous improvement of the program.

A. Student Outcomes

Student Outcome Assessment Methods

The principal tools that have been used to assess the attainment of student outcomes are:

- Senior exit surveys
- end-of-semester student feedback
- outcome rubrics
- ME-IAB evaluation of the Senior Design Project

The program assessment methods to achieve the student outcomes are listed below:

1. Conduct exit interviews with graduating students.
2. Conduct ME Advisory boards meetings
3. Conduct ME faculty meetings
4. Conduct peer institution surveys through web site search
5. Request feedback from the student body
6. Maintain records of ABET accreditation reviews and reports
7. Maintain records of academic advising
8. Conduct strategic planning to assess future directions
9. Conduct and analyze student course evaluations

As can be seen from the list, qualitative assessment tools are also used to address specific issues raised by all of the constituencies (e.g. advisory board, professional feedback, alumni, etc.). Consequently, these procedures are intended to methodically evaluate the performance of current students and recent graduates. The complete details of the assessment tools and their use in the evaluation of student outcomes are presented below.

1. Conduct exit interviews with graduating students

   The ME Advisory Board conducts a collective interview with the graduating seniors. In addition a Student Exit Interview form is also filled by each graduating senior, which is used to assess graduating seniors' perception of the program and to solicit comments about possible improvements and modifications. The ME –IAB summarizes the interview and sends the report to the Program Coordinator. They also conduct the Graduating Senior and Student Satisfaction with ME Department Survey Forms, Appendix E, page E2and E6. The results for the last 5 years are summarized in Tables 4.1-4.2. Although we do not use these data in our attainment criteria, they are a valuable supplement.

2. Conduct ME Advisory board meetings

   The Mechanical Engineering Advisory Board is comprised of sixteen mechanical engineering professionals, Table 2.2. Among them, five are AAMU alumni. The Board helps the Program in identifying the current and changing needs of the profession, and gives suggestions on how to improve the program to effectively achieve the program outcomes. The ME faculty meet with the ME-IAB two times per year. During these meetings, the Advisory Board members and the faculty exchange ideas to improve the program, such as adding ME380 Computer Aided Design II. The board members evaluate the ME 470/475 Senior Design Project presentation using the Senior Design Evaluation Form (Appendix E, E9) and administer the Exit Interview. It should be noted that, Senior Design Evaluation Form contains outcomes rubrics that are used in student outcomes assessment. They have suggested practical project topics that were adopted by seniors. They have also provided guest lectures to help student retention. They have participated in the recent faculty recruitment process. The Board evaluates our program based on their individual and collective assessments. The ME-IAB Board Senior Student's Design Project Critique and Suggestions for the Spring 2013 is included in Appendix E, pages E10-E12. The minutes of Advisory Board meeting will be available at the time of ABET visit.

Table 4.1 Graduating Senior Survey Results

Perceptions and Assessment of Education	2013	2015	2016	2017	2018
1. The advice given me by the engineering faculty advisors was accurate and of high quality	94	77.3	94	100	89.3
2. The computing and simulation tools I needed to get my work done were readily available in my department.	83	68.2	56	68	92.9
3. Engineering faculty members encouraged students to study in group environments.	78	63.7	100	84	92.9
4. Lab courses were beneficial in helping to understand concepts taught in the lectures	83	61.9	100	100	96
5. Courses taken in my department required that I analyze and interpret data.	89	90.5	100	100	96
6. I was taught to design a system, component or process to meet a specific need.	100	65	94	100	96
7. I was taught to function on multi-disciplinary teams.	89	57.2	88	95	96

8. Ethical social and global economic and environmental issues in engineering were discussed in my undergraduate courses.	89	68.2	94	79	82
9. My assignments required that I apply math, science and technology principles.	100	95.3	100	100	96
10. My engineering assignments required that I solve realistic problems with multiple constraints.	100	90.5	88	95	96
11. Oral and written communication skills were required in my courses.	94	86.4	94	89	96
12. I made use of library and internet resources in solving problems.	94	81.9	94	84	93
13. My instructors encouraged me to further my education beyond the undergraduate level.	94	71.5	88	84	86
14. I plan to take the Fundamentals of Engineering examination.	78	54.6	63	63	57
15. I plan to enhance my education by attending workshops and enrolling in graduate school.	89	61.9	75	74	79
16. Engineering professors, department chairmen and the Dean's office were helpful in obtaining intern and co-op positions and other technical employment.	78	33.3	63	68	82
17. Overall, I feel that I have obtained a quality education here at the University.	94	81.9	94	95	96
18. I would recommend AAMU to my family and friends.	83	76.2	100	84	89

Table 4.2 Students Satisfaction with ME Department

ME Department Assessment	2013	2015	2016	2017	2018
1. I feel comfortable in seeking help from my (major) department office.	100	82	94	95	100
2. My advisor is available and helpful in planning my course of study.	88	73	81	79	91
3. I am encouraged to use the library resources and materials.	71	61	88	84	86
4. I have adequate access to computing facilities.	88	77	77	74	62
5. Laboratories are beneficial in helping to understand theoretical concepts presented in lectures.	88	67	92	89	95
6. Laboratories are well equipped to support experiment objectives.	88	59	87	79	82
7. Senior projects were well designed and supported by faculty	88	50	80	100	73

3. Conduct ME faculty meetings

   Mechanical Engineering faculty meetings are held several times during the academic year. These meetings are in addition to the ME Advisory Board meetings mentioned above. The Program Coordinator in collaboration with faculty members prepares annual objectives and plans to achieve the program goals. The Program Coordinator develops agendas and presides at all faculty meetings. In these meetings, the reports from the Coordinator and program standing committees are addressed and discussed. In addition, faculty members bring up their suggestions for program and curriculum improvement, based on their classroom experience and other information gained from students' feedback, graduate survey, employer survey, and developments in peer institutions. The minutes of faculty meetings will be available at the time of ABET visit.

4. Conduct peer institution surveys through web site search (annual).

   The faculty takes every chance to learn about the programs in peer institutions, a major source being the web site of these institutions. This survey gives valuable information about the developments nationwide. New ideas as are in keeping with our program mission and goals are incorporated into our program.

5. Request feedback from the student body

   Students are one of the most important constituencies to our program. In the past, the program depended on the individual interactions to obtain the feedback from the students. Although the results of the University student course evaluations at the end of each semester provides some of the information needed to improve our course instructions, an additional instrument is needed to gather students' feedback more effectively.

   The current Student Feedback form can be found in Appendix E, E6. ME graduating seniors are required to answer the form. The purposes of this survey are: (1) to insure that stated program goals and objectives are being met, (2) to identify the strengths and weaknesses of this program, and (3) to obtain student suggestions. The raw data are analyzed and documented for the improvement of the program. Results are shown in Table 4.4.

6. Maintain records of ABET accreditation reviews and reports.

   The program maintains records of current and previous ABET accreditation reviews and reports for the future reference and the program improvements. The removal of the shortcomings that were identified by the EAC during the previous reviews has been used as our goal in the Institutional effectiveness process. The actions to correct previous shortcomings are stated in the Section G of BACKGROUND.

7. Maintain records of academic advising

   The program office maintains an active file for each student, which includes student enrollment information, transfer credits, and substitution records. The advisor works each semester with students to keep track of their progress toward obtaining the degree.

8. Conduct strategic planning to assess future directions.

   The Department has conducted an annual planning and assessment every year as required by the University. This is a part of the University's institutional effectiveness self-study, which was recommended by the Southern Association of Colleges and Schools (SACS). This provides the continuous measurements of institutional effectiveness of the program and the University.

   This annual cycled evaluation process consists of two phases: planning phase and the assessment phase. The planning phase is to create department goals and includes specific student learning outcomes. It also includes the description of the methods that will be used to assess the accomplishments of the objectives. Furthermore, projected use of the assessment results to refine the program is also included. This phase is initiated during the early part of the fall semester as part of the continuous improvement of programs and continued until its completion at the end of the academic year (May). The assessment phase involves a collection of the results of the assessments. This process must be completed at the end of the academic year (May), so that the results can be collected and evaluated by the method that was set in the planning phase of the previous year. The department maintains the documents of the assessment process. The program has synchronized the SACS outcome evaluation process with ABET requirements and process.

9. Conduct and analyze student work.

   The department is using students work as another tool for assessing the student outcomes. Student work could be senior design project reports, senior design presentations, Laboratory reports, exams, and other project reports.

Course Outcomes Rubrics

Pursuant to 2008 ABET review, the ME faculty formulated measurable performance criteria, specifically student outcome rubrics in Fall 2009 and modified them in Spring 2011 with more appropriate performance criteria for each program outcome. Use of the rubrics allows for the evaluation of the student outcomes. A planning matrix was developed for assessment of each student outcome using the related rubrics (Performance Indicator) by selecting certain courses each semester. Each course syllabus included Course Outcomes and Assessment Rubrics. The performance criterion for each student outcome and corresponding rubrics have been further re-defined in Spring 2013 in order to synchronize with the newly implemented SACS Assessment tools leading to a reduced number of criterion. The re-formulated performance criterion for each student outcome is shown in Table 3.3 of Criterion 3.

The rubrics have been designed to quantify the student outcomes. A planning matrix has been developed for assessment of each program outcome using the related performance criteria by selecting certain courses each semester. These matrices are given in Appendix E, pages E13-E18. A summary of all planned courses for assessment throughout the academic year is shown on these pages. The planning matrix also identifies who will be involved in the assessment of each rubric. Moreover each course syllabus includes Course objectives and outcomes. We want to re-

emphasize that the mapping of each major course to the Program Outcomes is a continually evolving process. Each faculty member who is teaching a class evaluates students' performance with respect to performance indicators and determines the number of the students who received 75% (meets expectations) or greater. Faculty may choose one or a combination of homework assignments, exams, quizzes, and projects for an acceptable representation of the class performance. These rubric scores along with class enrollment and actions suggested are reported using the "**Course Assessment Data Sheet (Excel Speadsheet)**" and "Action Plan Form." Subsequently, all the classes contributing to each performance criterion/ outcome are grouped and an average score (percent student= total number of the students who received 75% (meets expectations) or greater divided by total enrollment in all contributing classes) is assigned to each of the student outcomes performance indicator.

Assessment Planning

Once the performance indicators are developed to assess student outcomes, the assessment plan is to gather such assessment data every academic year. Then, every three years a cycle of evaluation and action will be performed and recommendations will be given. Since, data is collected every year; there is a possibility for early identification of a problem before waiting to the end of the three year cycle.

All the ME faculty members are involved in the various Assessment and Evaluation Activities. The assessment and evaluation activities include but not limited to the following:

- Review of performance criteria that define the outcome
- Map educational strategies related to performance criteria
- Review mapping and identify where data will be collected
- Develop and/or review assessment methods used to assess performance criteria
- Collect data
- Evaluate assessment data including processes
- Report findings
- Take action where necessary

Achievement of Student Outcomes

Results for each student outcome are reported separately in the following tables and all supporting documentation will be available in the ABET resource room at the time of the visit. Each table represents the activity for the last five years. Each outcome table includes performance indicators, courses and/or co-curricular activities (educational strategies) that provide students an opportunity to demonstrate the indicator, where summative data are collected, timetable, method of assessment and the performance target. Each table is followed by a graph showing the results of these assessment years. It should be noted the following:

- For surveys and ME-IAB evaluations: results are calculated by using Priority rating obtained by giving a weight of 5 to strongly agree, 3 to neutral and 1 to strongly disagree. Number of respondents in each rating category was multiplied by the corresponding weight

to obtain total performance success which is divided by the number of respondents and the maximum possible success of 5, yielding the “Success Score” expressed as a percentage.

- For exams, lab reports and project: results are obtained by dividing the number of students scoring above 75% by the total number of students.
- Results for 2013, 2015, 2016, 2017 and 2018 represent results for the academic years of 2012-13, 2014-15, 2015-16, 2016-17, and 1017-18 respectively.

Student Outcome a: an ability to apply knowledge of math, science and engineering

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
1. Ability to plot functions and read graphs	Table 5.3(b)	Exams	ME101, ME104	5 years	2013-2018	75%
2. Ability to formulate a set of equations and solve them	Table 5.3(b)	Exams	ME204, ME205	5 years	2013-2018	75%
3. Ability to apply calculus and DE for solving engineering problem	Table 5.3(b)	Exams	ME205, ME312	5 years	2013-2018	75%
4. Ability to apply dimensional analysis and unit conversion	Table 5.3(b)	Exams	ME101, ME210	5 years	2013-2018	75%

Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME:210, 206, 206 and 210, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-83.3%; Indicator #2-77.8%; Indicator #3-77.8%, and Indicator #4-83.3%.

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 101, 205, 312 and 101, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-89%; Indicator #2-84%; Indicator #3-86.7%, and Indicator #4-71 %.

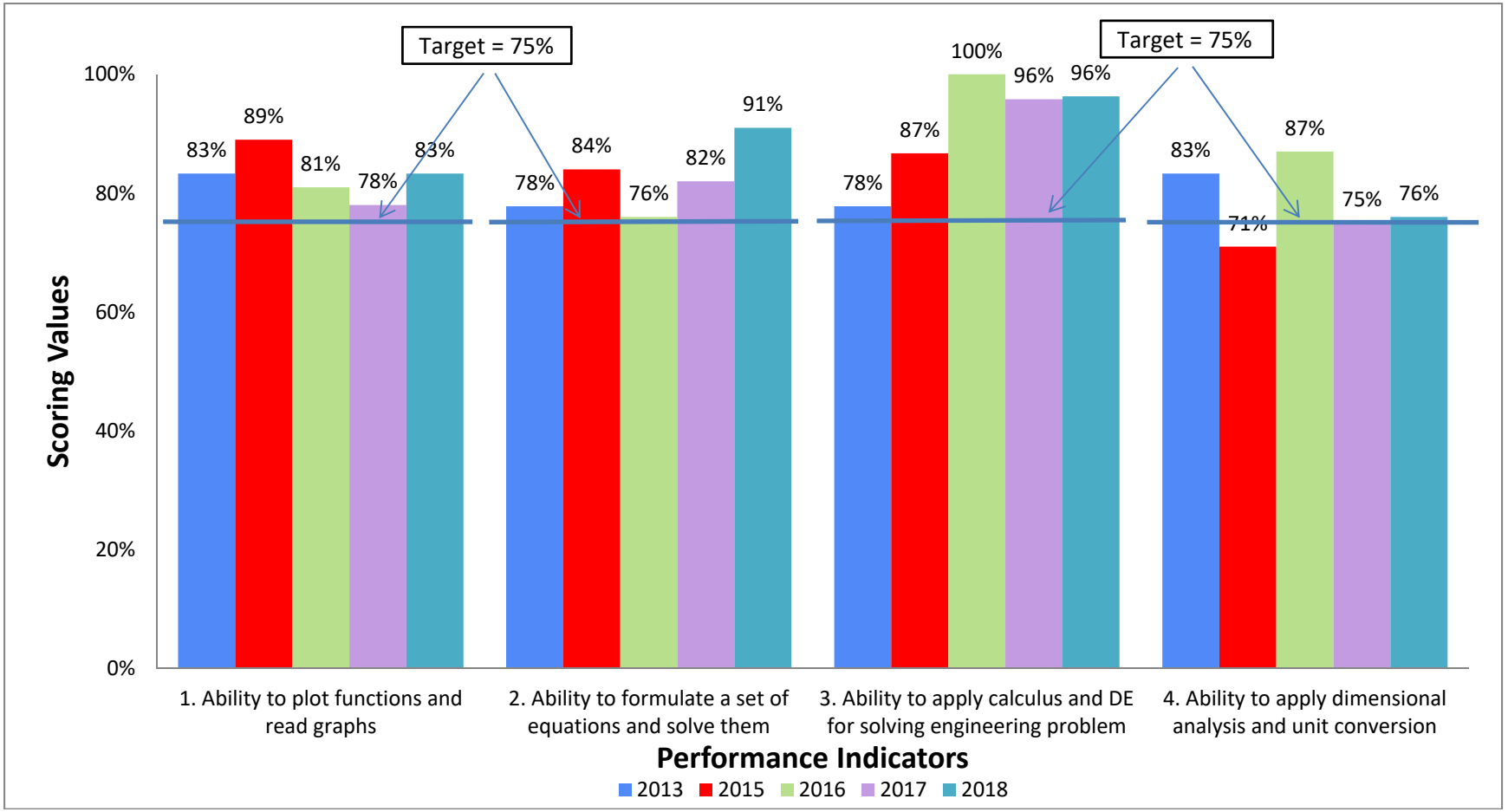
Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 101,204,312 and 101, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-81%; Indicator #2-76%; Indicator #3-100%, and Indicator #4-87%.

Evaluation and Actions 2016: Actions suggested by the faculty members of respective courses at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Recruit students with higher ACT scores
- Strengthen the students' foundation of math and science courses
- A condensed math review at the beginning of each semester

Assessment results (direct measures) 2017 & 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 101,204,312 and 101, respectively for 2017 and ME: 104, 204, 312, and 101, respectively for 2018. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were show in the following graph.

Student Outcome a: an ability to apply knowledge of math, science and engineering



Display materials available at visit:

- Rubric used for scoring Indicators
- Student work
- Exams
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome b: an ability to design and conduct experiments, as well as to analyze and interpret data

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
1. Ability to set up and conduct the experiment	Table 5.3(b)	Lab reports	ME301L, ME312L	4 years	2015-2018	75%
2. Ability to collect and present data	Table 5.3(b)	Lab reports	ME301L, ME360L	4 years	2015-2018	75%
3. Ability to analyze and interpret data	Table 5.3(b)	Lab reports	ME301L, ME451L	4 years	2015-2018	75%
4. Ability to perform error analysis	Table 5.3(b)	Lab reports, Exams	ME301L, ME482	4 years	2015-2018	75%

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 301L, 301L, 312L, and 301L, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-93%; Indicator #2-75%; Indicator #3-100%, and Indicator #4-74%.

Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 301L, 360L, 312L and 360L, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-92%; Indicator #2-75%; Indicator #3-90%, and Indicator #4-75%.

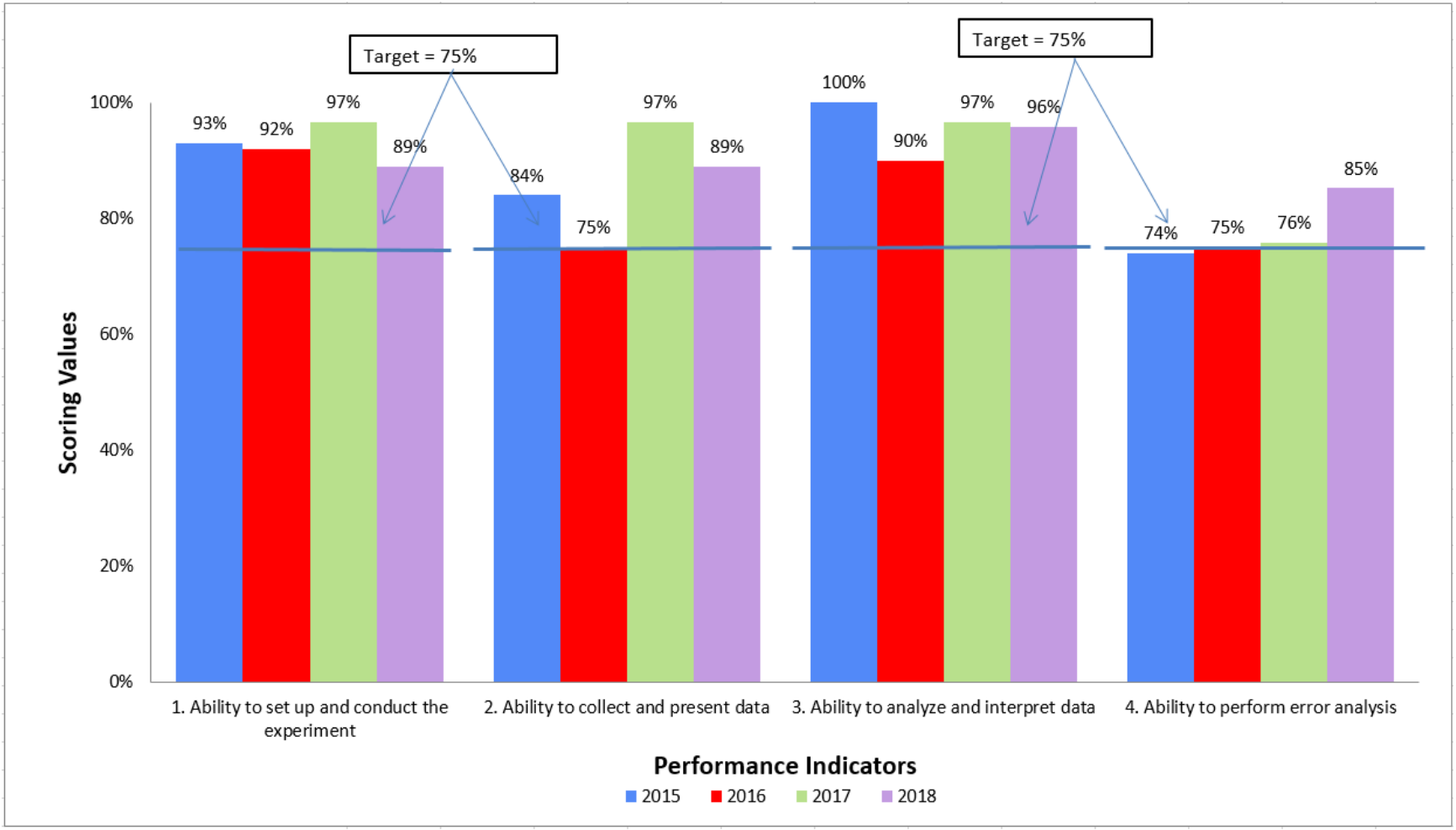
Assessment results (direct measures) 2017: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 360L, 360L, 312L and 360L, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-96.6%; Indicator #2-96.67%; Indicator #3-96.2%, and Indicator #4-75.9%.

Evaluation and Actions 2017: Actions suggested by the faculty members of respective courses at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- More attention on how to perform error analysis
- More lab equipment must be acquired to accommodate the increasing number of students
- Request to offer more lab sections
- Use teaching assistants in lab preparation and lab support.

Assessment results (direct measures) 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 360L, 360L, 312L and 360L, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-88.9%; Indicator #2-88.9%; Indicator #3-95.8%, and Indicator #4-85.2%.

Student Outcome b: an ability to design and conduct experiments, as well as to analyze and interpret data



Display materials available at visit:

- Rubric used for scoring Indicators
- Lab reports
- Exams
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome c: an ability to design a system, component, or process to meet desired needs

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
1. An ability to understand design/process specifications	Table 5.3(b)	ME-IAB	ME 475	5 years	2013-2018	75%
2. Ability to model and prototype	Table 5.3(b)	ME-IAB	ME 475	5 years	2013-2018	75%
3. Ability to implement design and fabricate	Table 5.3(b)	ME-IAB	ME 475	5 years	2013-2018	75%
4. Ability to test, evaluate, and qualify design	Table 5.3(b)	ME-IAB	ME 475	5 years	2013-2018	75%

Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty and ME-IAB for all indicators. Summative data for indicator #1 -4 were collected in ME: 475. The scoring rubrics to assess student performance were completed by the ME-IAB for Indicators # 1-4. The percent of the students that demonstrated each criterion were as follows: Indicator #1-94%; Indicator #2-94%; Indicator #3-100%, and Indicator #4-100%.

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB for all indicators. Summative data for indicator #1 - 4 were collected in ME: 475. The scoring rubrics to assess student performance were completed by the ME-IAB for Indicators # 1 - 4. The percent of the students that demonstrated each criterion were as follows: Indicator #1-100%; Indicator #2-100%; Indicator #3-92%, and Indicator #4-67%.

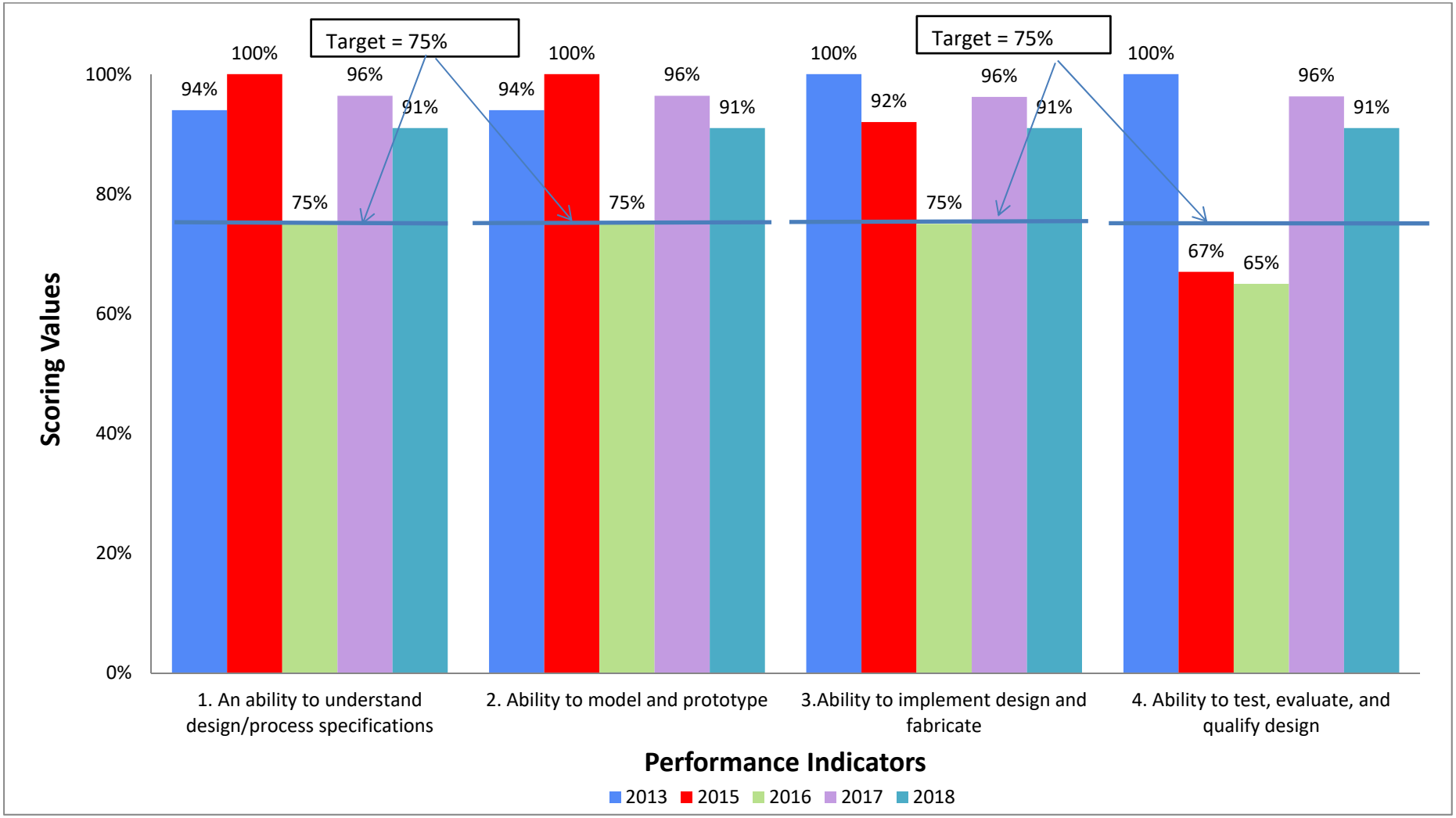
Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty and ME-IAB for all indicators. Summative data for indicator #1 -4 were collected in ME: 475. The scoring rubrics to assess student performance were completed by the ME-IAB for Indicators #1-4. The percent of the students that demonstrated each criterion were as follows: Indicator #1-75%; Indicator #2-75%; Indicator #3-75%, and Indicator #4-65%.

Evaluation and Actions 2016: Actions suggested by the faculty members of respective courses at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Continue implementing the ME-IAB inputs and recommendations.
- Increase the number of industry related projects
- Perform evaluation and recommendation by the ME-IAB at the beginning of the project

Assessment results (direct measures)2017 and 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty and ME-IAB for all indicators. Summative data for indicator #1 -4 were collected in ME 475. The scoring rubrics to assess student performance were completed by the ME-IAB. The percent of the students that demonstrated each criterion were as follows: Indicator #1-96.4%; Indicator #2-96.4%; Indicator #3-96.2%, and Indicator #4-96.3% for 2017; and Indicator #1-91%; Indicator #2-91%; Indicator #3-91%, and Indicator #4-91% for 2018

Student Outcome c: an ability to design a system, component, or process to meet desired needs



Display materials available at visit:

- Rubric used for scoring Indicators
- reports
- Senior Design ME-IAB evaluations
- projects
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome d: An ability to function on multi-disciplinary teams

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
1. Demonstrate ability to work & plan together	Table 5.3(b)	ME-IAB evaluations	ME475	5 years	2013-2018	75%
2. Demonstrate ability to divide up complex tasks	Table 5.3(b)	ME-IAB evaluations	ME 475	5 years	2013-2018	75%
3. Demonstrate ability to integrate individual work	Table 5.3(b)	ME-IAB evaluations	ME 475	5 years	2013-2018	75%
4. Demonstrate ability to report team efforts and outputs	Table 5.3(b)	ME-IAB evaluations	ME 475	5 years	2013-2018	75%

Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB for all indicators. Summative data for indicator #1 -4 were collected in ME475 (Senior Design Project). The scoring rubrics to assess student performance were completed by ME-IAB for Indicators #1-4. The percent of the students that demonstrated each criterion were as follows: Indicator #1-100%; Indicator #2-100%; Indicator #3-89%, and Indicator #4-100%.

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB for all indicators. Summative data for indicator #1 -4 were collected in ME475. The scoring rubrics to assess student performance were completed by ME-IAB for Indicators #1-4. The percent of the students that demonstrated each criterion were as follows: Indicator #1-100%; Indicator #2-100%; Indicator #3-100%, and Indicator #4-96%.

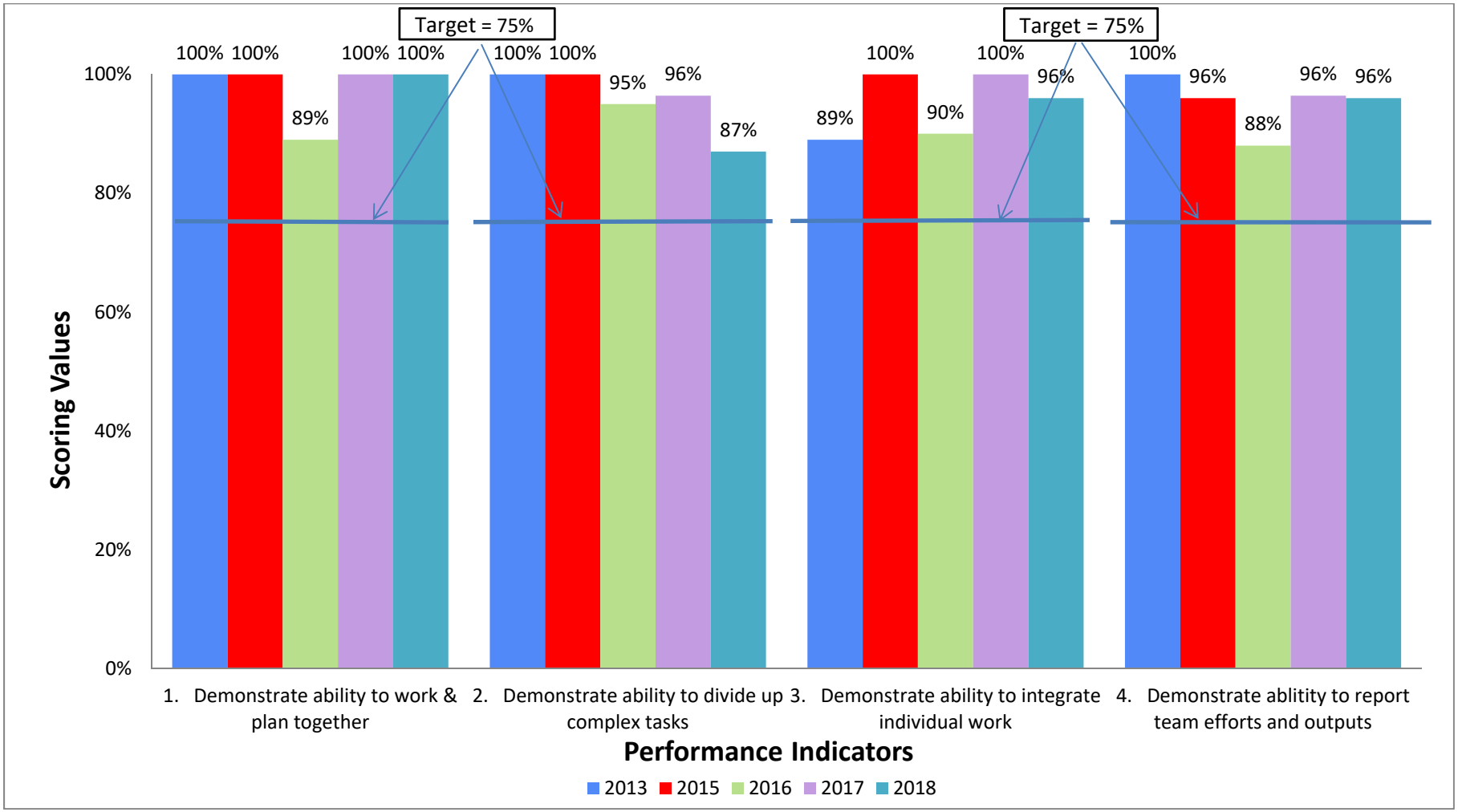
Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB for all indicators. Summative data for indicator #1 -4 were collected in ME475. The scoring rubrics to assess student performance were completed by ME-IAB for Indicators #1-4. The percent of the students that demonstrated each criterion were as follows: Indicator #1-89%; Indicator #2-95%; Indicator #3-90%, and Indicator #4-88%.

Evaluation and Actions 2016: Actions suggested by the faculty members at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Devise more capstone design projects with multidisciplinary nature (follow the rocket competition as a model)
- Cover project management

Assessment results (direct measures) 2017 and 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB for all indicators. Summative data for indicator #1 -4 were collected in ME475. The scoring rubrics to assess student performance were completed by ME-IAB for Indicators #1-4. The percent of the students that demonstrated each criterion were as follows: Indicator #1-100%; Indicator #2-96.4%; Indicator #3-100%, and Indicator #4-96.4% for 2017; and Indicator #1-100%; Indicator #2-87%; Indicator #3-96%, and Indicator #4-96% for 2018

Student Outcome d: An ability to function on multi-disciplinary teams



Display materials available at visit:

- Rubric used for scoring Indicators
- reports
- Senior Design ME-IAB evaluations
- projects
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome e: an ability to identify, formulate and solve engineering problems

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
1. Ability to formulate a set of equations and solve them	Table 5.3(b)	Exams	ME:101, 204, 205,	5 years	2013-2018	75%
2. Ability to model and solve engineering problems	Table 5.3(b)	Exams, Projects	ME: 482, 416, 310	5 years	2013-2018	75%
3. Ability to apply differential and integral calculus to engineering problems	Table 5.3(b)	Exams	ME: 416, 204,	5 years	2013-2018	75%
4. Ability to simulate and model engineering problems	Table 5.3(b)	Exams, Projects	ME: 205, 416, 206	5 years	2013-2018	75%

Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 101, 482, 416, and 205, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-79.6%; Indicator #2-91%; Indicator #3-100%, and Indicator #4-80%.

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 205, 416, 204, and 416, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-84%; Indicator #2-83.3%; Indicator #3-75%, and Indicator #4-77.8%.

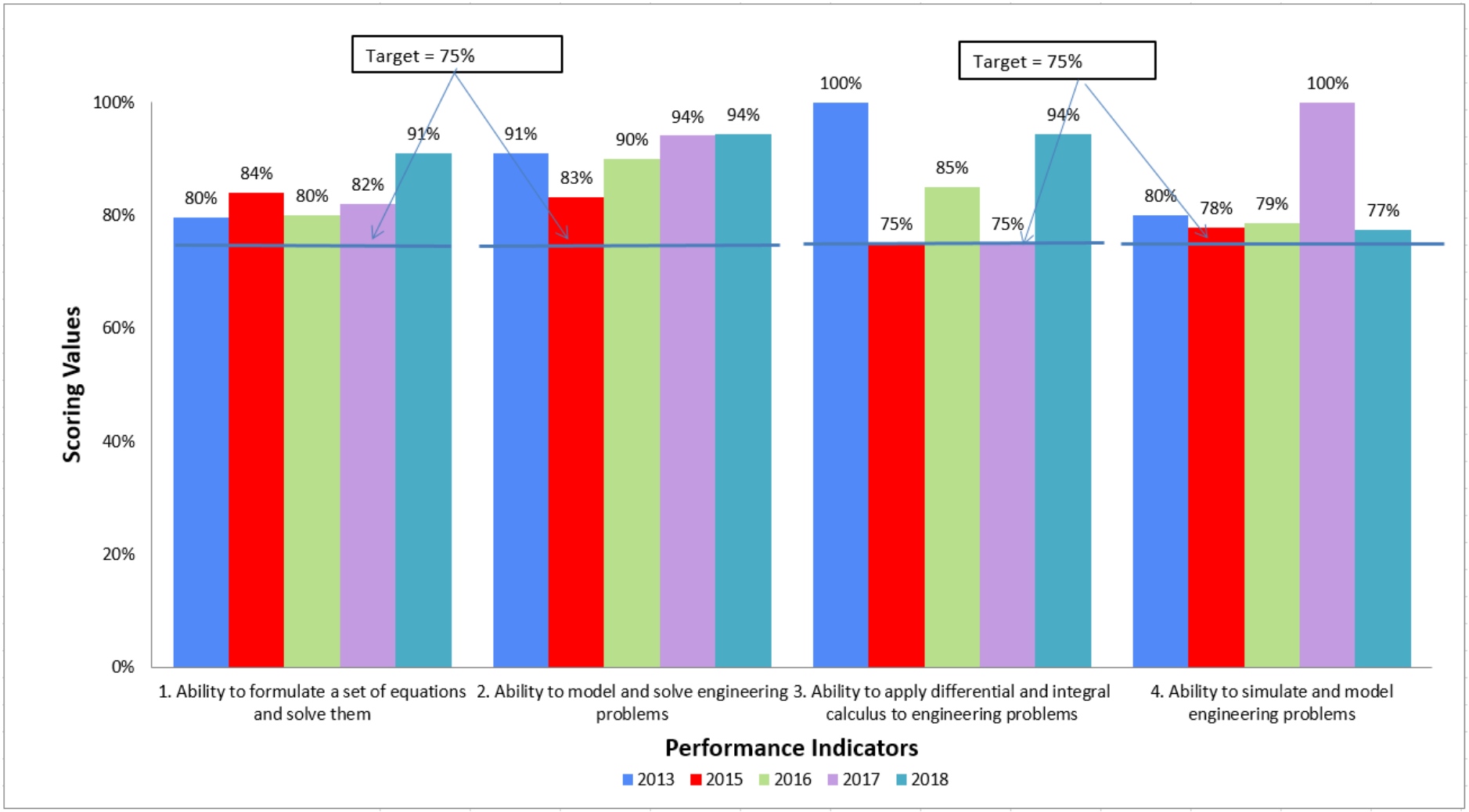
Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 204, 310, 204, and 206, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-80%; Indicator #2-90%; Indicator #3-85%, and Indicator #4-79%.

Evaluation and Actions 2016: Actions suggested by the faculty members of respective courses at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Recruit students with higher ACT scores
- Strengthen the students' foundation of math and science courses
- A condensed math review at the beginning of each semester

Assessment results (direct measures) 2017 and 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -4 were collected in ME: 204, 310, 204, and 416, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-82%; Indicator #2-94%; Indicator #3-75%, and Indicator #4-100% for the year 2017 and Indicator #1-91%; Indicator #2-94.4%; Indicator #3-94.4%, and Indicator #4-77.4% for the year 2018.

Student Outcome e: an ability to identify, formulate and solve engineering problems



Display materials available at visit:

- Rubric used for scoring Indicators
- Exams
- projects
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome f: an understanding of professional and ethical responsibility

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
Demonstrated ability to reason through ethical dilemmas	Table 5.3(b)	Lab exercise	ME 101, 475	5 years	2013-2018	75%
Demonstrated knowledge of NSPE Code of Ethics	Table 5.3(b)	Lab exercise	ME 101, 475	5 years	2013-2018	75%
Students exhibit professional and ethical behavior in the workplace.	Table 5.3(b)	Lab exercise	ME 101, 475	5 Years	2013-2018	75%

Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for Indicators using ME: 475. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-89.5.%; Indicator #2-89.5%, and Indicator #3-100%.

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all Indicators. Summative data were collected in ME: 101. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-71%; Indicator #2-71%; and Indicator #3-82%.

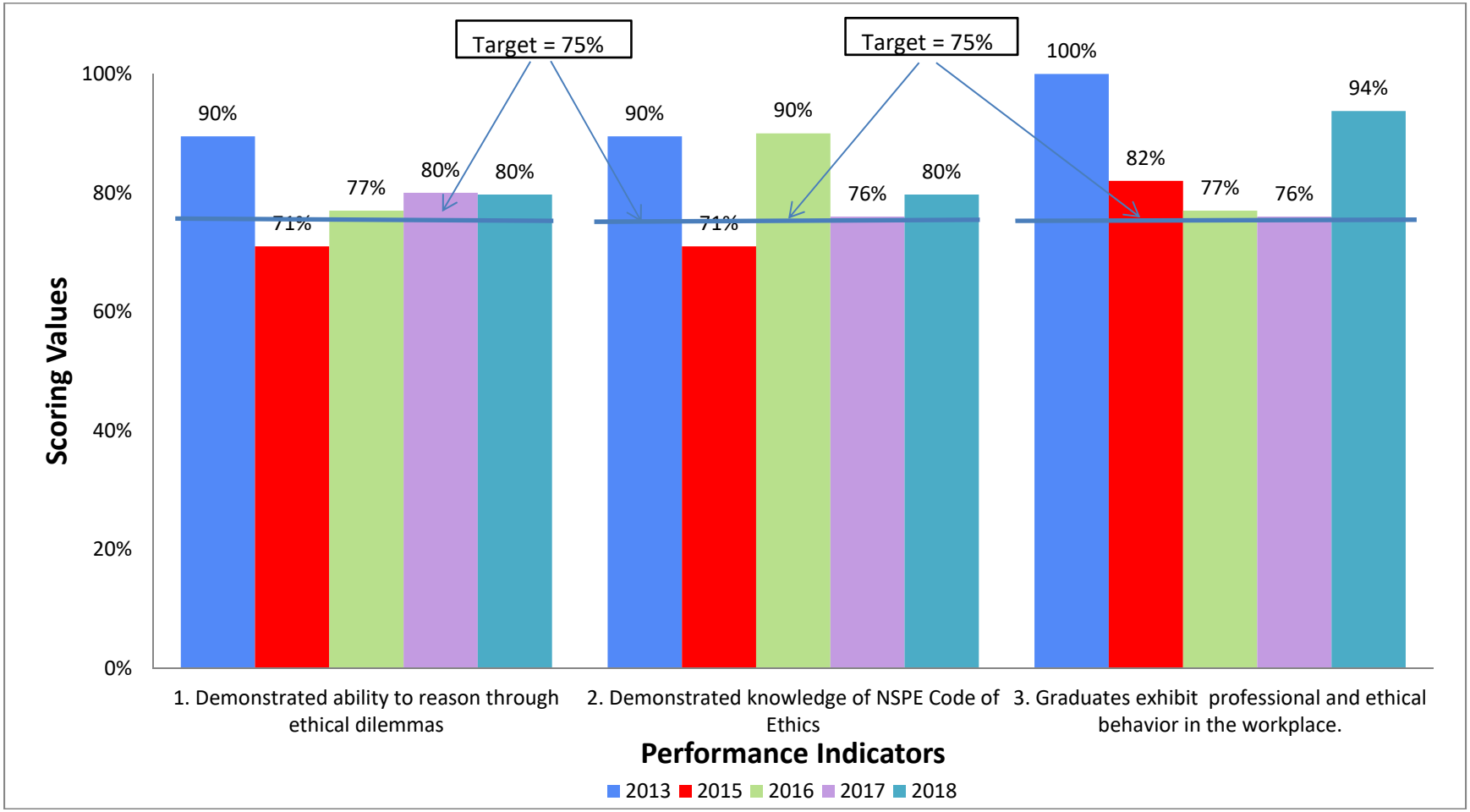
Assessment results (direct measures) 2016 For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all Indicators. Summative data were collected in ME: 101. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-77%; Indicator #2-90%; and Indicator #3-77%.

Evaluation and Actions 2016: Actions suggested by the faculty members of respective courses at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Develop and collect more materials and case studies for the senior design class

Assessment results (direct measures) 2017 and 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all Indicators. Summative data were collected in ME: 101. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-80%; Indicator #2-76%; and Indicator #3-76% for 2017 and: Indicator #1-79.7%; Indicator #2-79.7%; and Indicator #3-93.75% for 2018.

Student Outcome f: an understanding of professional and ethical responsibility



Display materials available at visit:

- Rubric used for scoring Indicators
- Lab exercise
- Alumni Survey
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome g: an ability to communicate effectively

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
Ability to make formal presentation	Table 5.3(b)	ME-IAB Evaluation	ME475	5 years	2013-2018	80%
Ability to write effectively	Table 5.3(b)	Survey	Alumni	5 years	2013-2018	80%

Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB for Indicator # 1. Summative data for indicator #1 were collected in ME: 475 and for Indicator #2, data were collected using Alumni Survey Form. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-89%; and Indicator #2-80%.

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB and Alumni Survey for all Indicators. Summative data for indicator #1 were collected in ME: 475 and for Indicator #2, data were not collected this year. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-100%

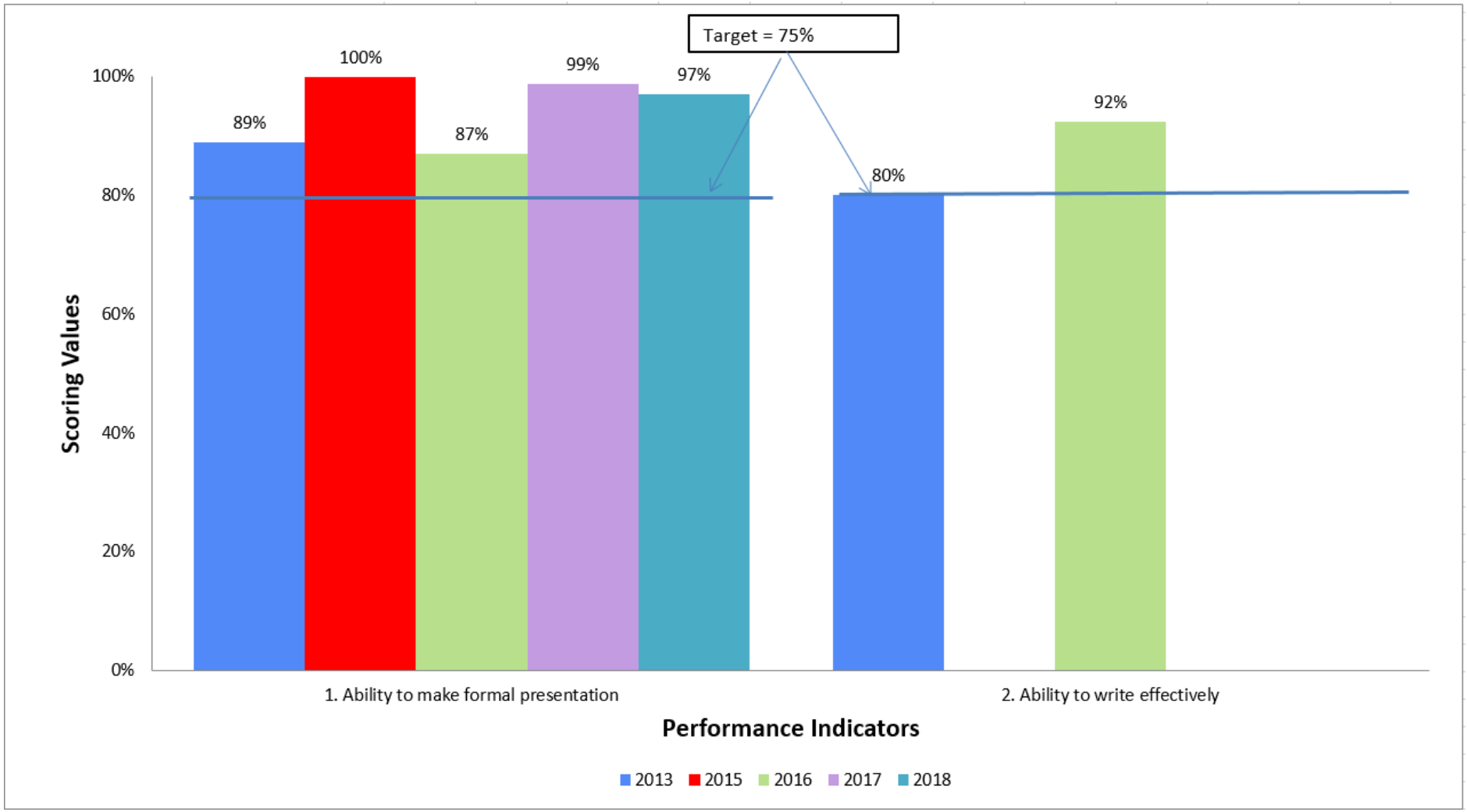
Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of Indicators # 1-2. Summative data for indicator #1 were collected in ME: 475 and for Indicator #2, data were collected using Alumni Survey Form. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-87%; and Indicator #2-92%.

Evaluation and Actions 2016: Actions suggested by the faculty members of respective courses at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Continue using IAB feedback for improvement
- Encourage students to get involved in STEM Day
- Involve students in conferences and professional societies meetings
- Invite professional speakers

Assessment results (direct measures) 2017 and 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB and Alumni Survey for all Indicators. Summative data for indicator #1 were collected in ME: 475 and for Indicator #2, data were collected using Alumni Survey Form. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were given in the following graph.

Student Outcome g: an ability to communicate effectively



Display materials available at visit:

- Rubric used for scoring Indicators
- ME-IAB Evaluation of graduating seniors
- Alumni Survey
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome h: the broad education necessary to understand the impact of engineering solutions in a global and societal context

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
Understand the impact of engineering solutions in society	Table 5.3(b)	Survey	Alumni	5 years	2013-2018	75%
Relate engineering solutions to real life problems	Table 5.3(b)	ME-IAB Evaluation	ME475	5 years	2013-2018	75%

Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of Alumni Survey and ME-IAB for all Indicators. Summative data for indicator #1 were collected using Alumni Survey Form and for Indicator #2, data were collected in ME: 475. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-90%; and Indicator #2-100%.

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB for Indicator # 2. Summative data for indicator #2 were collected in ME: 475. The scoring rubric to assess student performance was completed and the percent of the students that demonstrated this criterion was as follows: Indicator #2-88%.

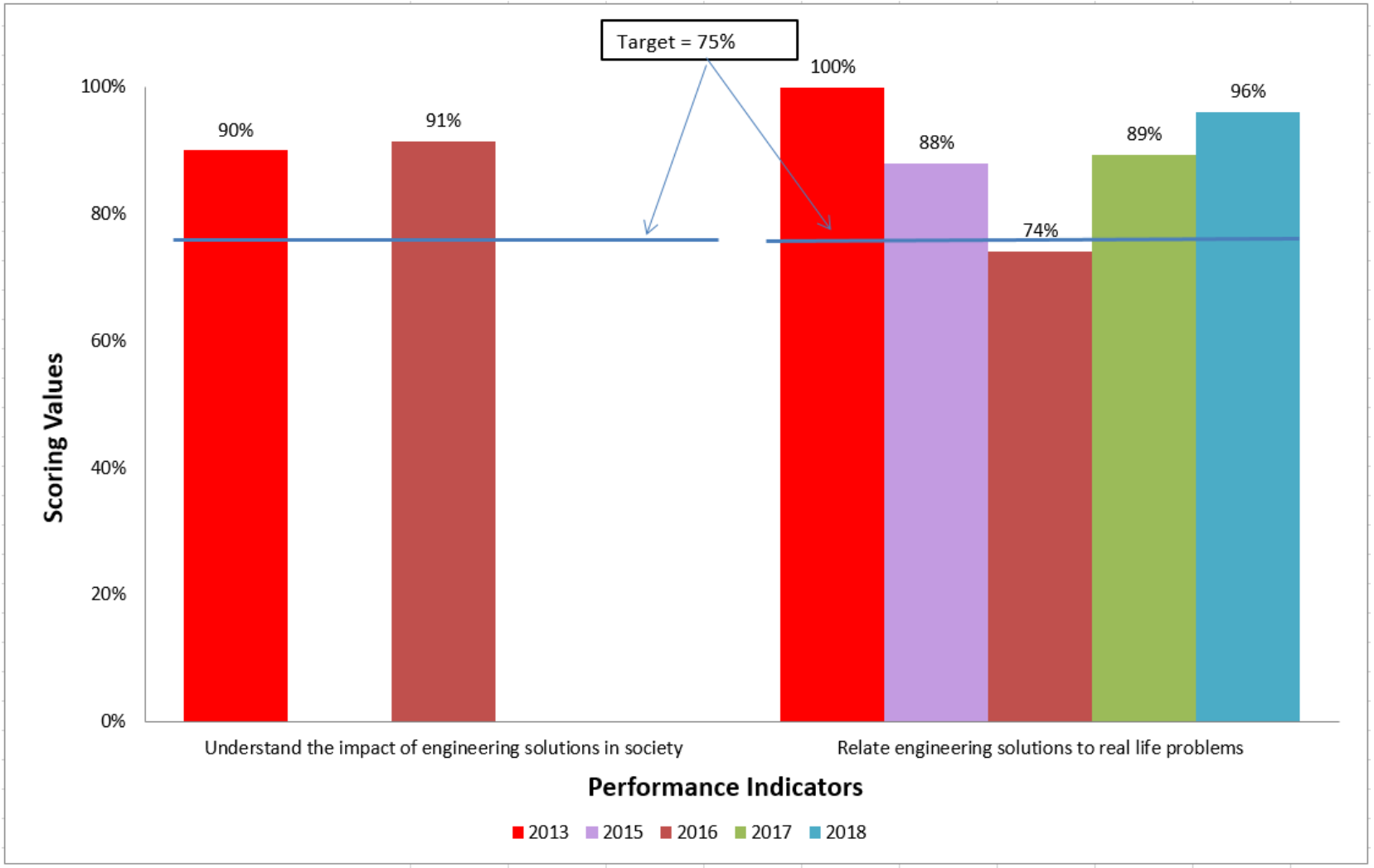
Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of Alumni Survey and ME-IAB for all Indicators. Summative data for indicator #1 were collected using Alumni Survey Form and for Indicator #2, data were collected in ME: 475. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-91%; and Indicator #2-74%.

Evaluation and Actions 2016: Actions suggested by the faculty members of respective courses at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Continue to invite speakers
- Involve students in professional societies meetings
- Encourage students to search related subjects to the class
- Industrial base senior design projects

Assessment results (direct measures) 2017 and 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB for Indicator # 2. Summative data for indicator #2 were collected in ME: 475. The scoring rubric to assess student performance was completed and the percent of the students that demonstrated this criterion was as follows: Indicator #2-89% for 2017 and 96 for 2018.

Student Outcome h: the broad education necessary to understand the impact of engineering solutions in a global and societal context



Display materials available at visit:

- Rubric used for scoring Indicators
- ME-IAB Evaluation of graduating seniors
- Alumni Survey
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome i: a recognition of the need for, and an ability to engage in life-long learning

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
Awareness of modern developments in engineering	Table 5.3(b)	Survey	Alumni	2 years	2013, 2016	75%
Seeking graduate degree/professional development	Table 5.3(b)	Survey	Alumni	2 years	2013, 2016	75%

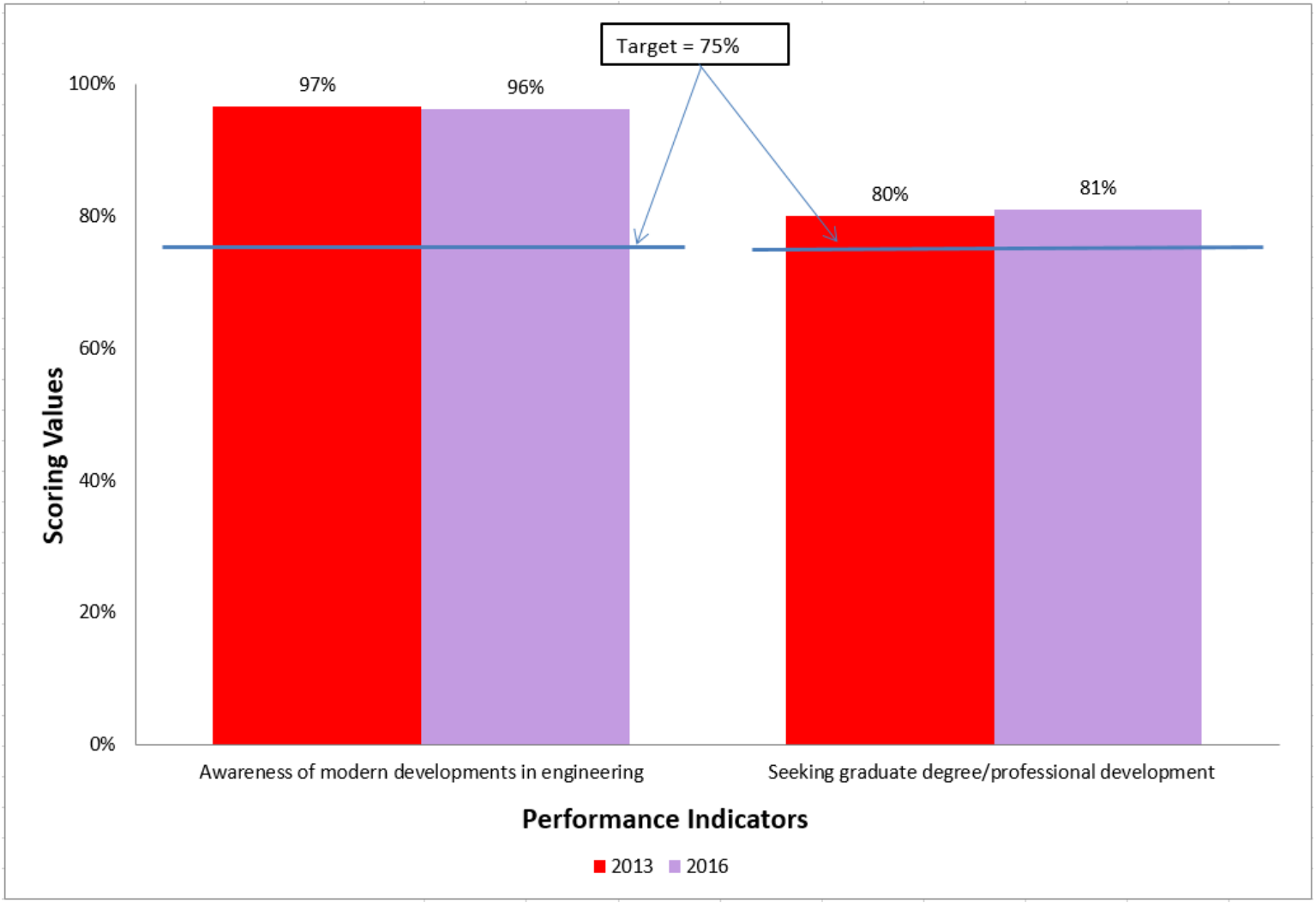
Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of Alumni Survey for all Indicators. Summative data were collected and the scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-96.67%; and Indicator #2-80%.

Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of Alumni Survey for all Indicators. Summative data were collected and the scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-96.19%; and Indicator #2-80.95%.

Evaluation and Actions 2016: Actions suggested by the faculty members of respective courses at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Continue to invite speakers and involve students in professional societies meetings
- Encourage the students to participate in professional development courses or seek graduate degrees after graduation.
- Educate the students with the concept of the Bloom's Taxonomy with emphasis on synthesis.

Student Outcome i: a recognition of the need for, and an ability to engage in life-long learning



Display materials available at visit:

- Rubric used for scoring Indicators
- Alumni Survey
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome j: a knowledge of contemporary issues

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
Demonstrated knowledge of state of the art technology	Table 5.3(b)	ME-IAB Evaluation	ME 475	5 years	2013-2018	75%
Integration of engineering science to practical problems of contemporary interest	Table 5.3(b)	ME-IAB Evaluation	ME 475	5 years	2013-2018	75%

Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of Indicators #1 and 2. Summative data for indicator #1 and 2 were collected in ME475. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-89%; and Indicator #2-89%.

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of Indicators #1 and 2. Summative data for indicator #1 and 2 were collected in ME475. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-100%; and Indicator #2-100%.

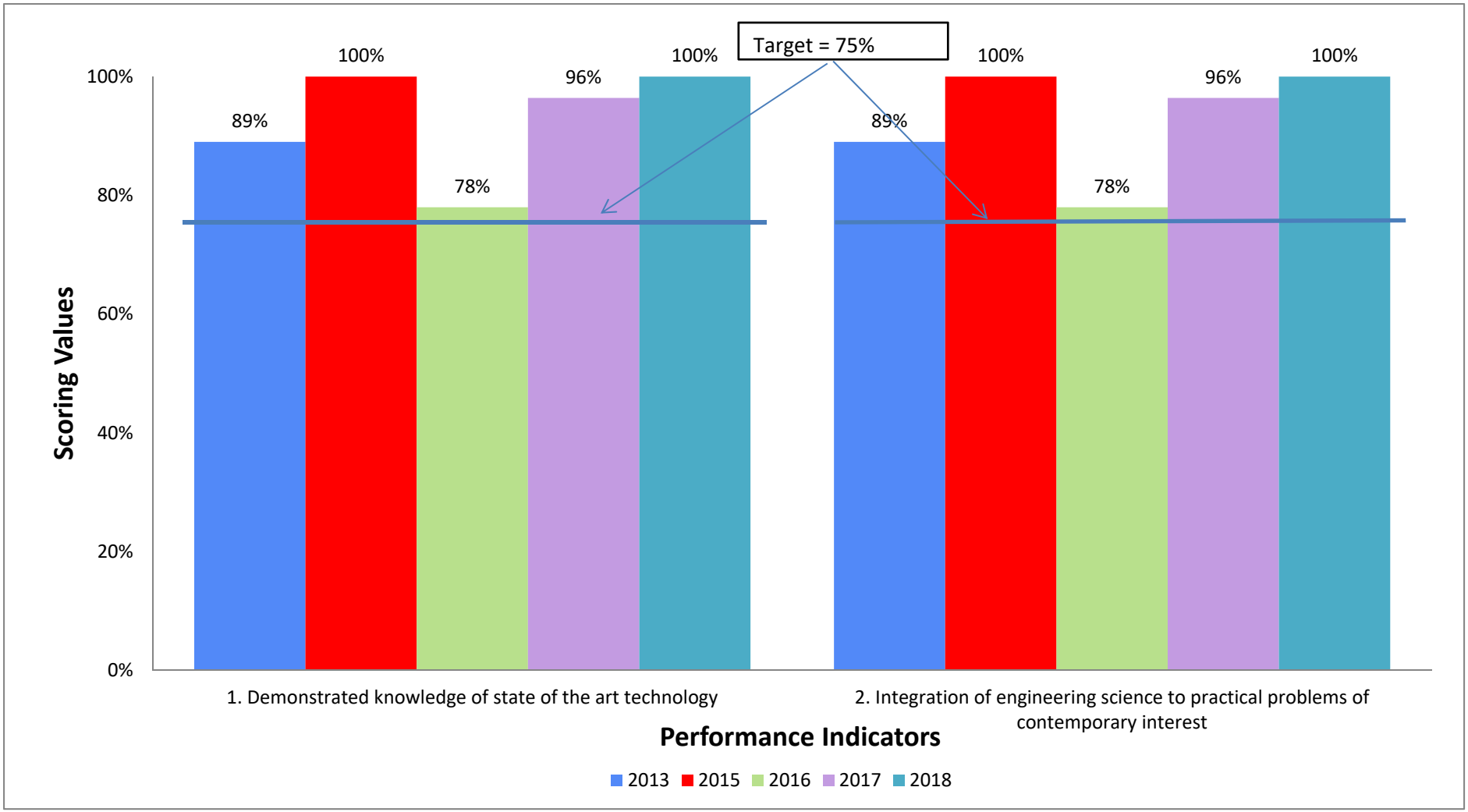
Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of Indicators #1 and 2. Summative data were collected in ME475. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-78%; and Indicator #2-78%.

Evaluation and Actions 2016: Actions suggested by the faculty members at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Encourage students to subscribe to engineering magazines
- Invite Speakers and guest lectures
- Schedule trips to local and nearby Industry

Assessment results (direct measures) 2017 and 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of ME-IAB for Indicators # 1 and 2. Summative data for indicator #1 and 2 were collected in ME475. The scoring rubrics to assess student performance were completed and the percent of the students that demonstrated each criterion were as follows: Indicator #1-96.4%; and Indicator #2-96.4%for 2017 and Indicator #1-100%; and Indicator #2-100%for 2018

Student Outcome j: a knowledge of contemporary issues



Display materials available at visit:

- Rubric used for scoring Indicators
- Exams and projects
- ME-IAB evaluation results
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

Student Outcome k: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Performance Indicators	Courses	Method(s) of Assessment	Target Courses summative data collection	Length of assessment cycle	Year(s)/semester of data collection	Target for Performance
Ability to utilize advanced Engineering software design tools	Table 5.3(b)	Projects	ME: 103, 380	5 years	2013-2018	75%
Ability to use advanced computational tools	Table 5.3(b)	Projects	ME: 300, 103, 104, 380	5 years	2013-2018	75%
Ability to design and simulate experiment using advanced Data acquisition tools	Table 5.3(b)	Lab Reports	ME: 312L, 301L	5 years	2013-2018	75%

Assessment results (direct measures) 2013: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -3 were collected in ME: 103, 380 and 301L, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-83.3%; Indicator #2-76.1%; and Indicator #3-85.2%.

Assessment results (direct measures) 2015: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -3 were collected in ME: 103, 380 and 301L, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-92%; Indicator #2-84.6%; and Indicator #3-78%.

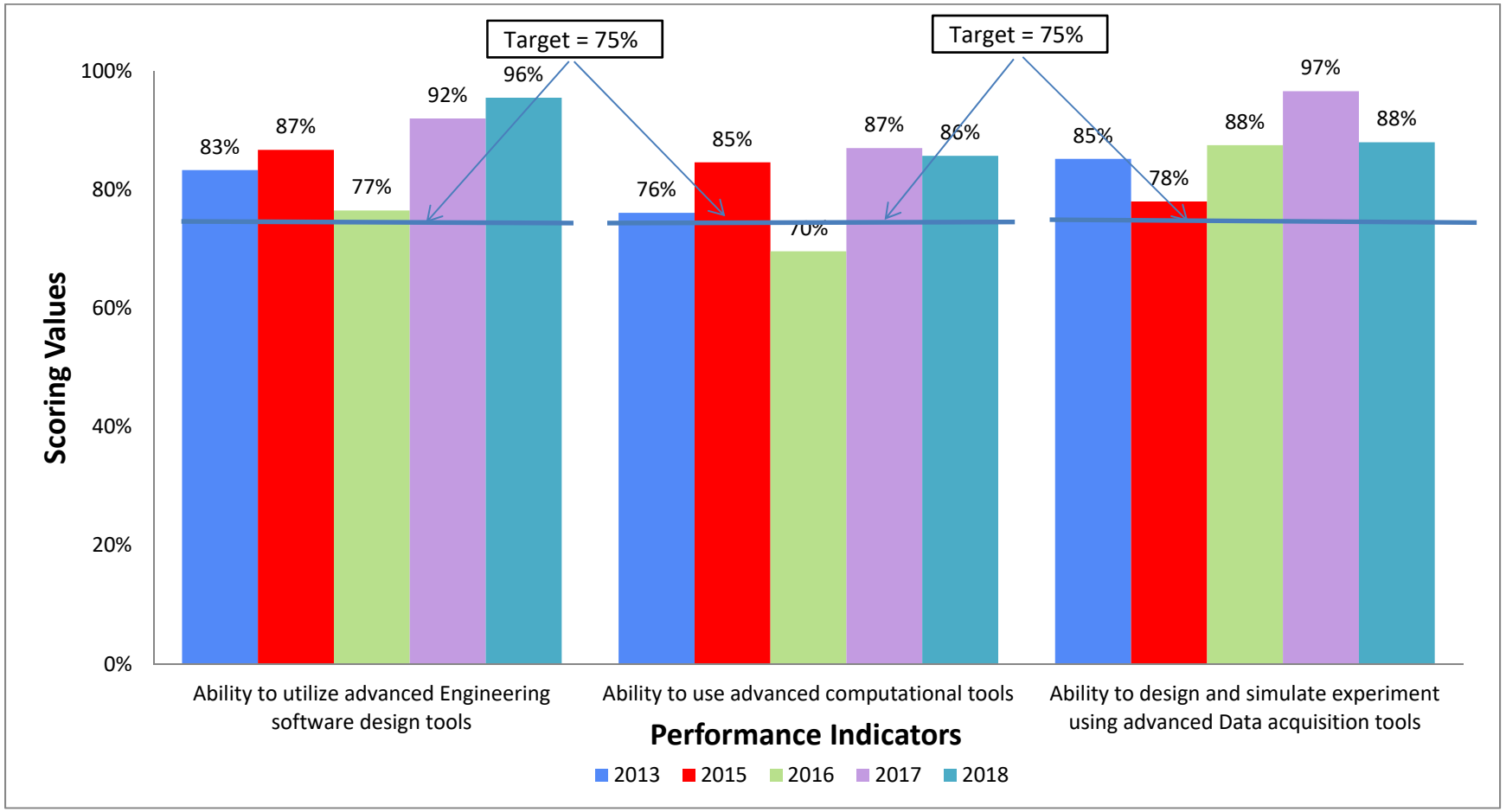
Assessment results (direct measures) 2016: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -3 were collected in ME: 103, 380 and 301L, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-76.5%; Indicator #2-69.6%; and Indicator #3-87.5%.

Evaluation and Actions 2016: Actions suggested by the faculty members of respective courses at the end of the semester were discussed in departmental faculty meetings that led to the following actions:

- Continue to acquire and upgrade engineering software and hardware
- Introduce Advanced Manufacturing in the classroom
- Include advanced sensors and testing to ME Laboratories

Assessment results (direct measures) 2017 and 2018: For the summative assessment (end of program), the decision was made to focus on the direct assessment of faculty for all indicators. Summative data for indicator #1 -3 were collected in ME: 103, 380 and 360L, respectively. The scoring rubrics to assess student performance were completed by the faculty. The percent of the students that demonstrated each criterion were as follows: Indicator #1-92%; Indicator #2-87%; and Indicator #3-96.6% for 2017 and Indicator #1-95.5%; Indicator #2-85.7%; and Indicator #3-88% for 2018.

Student Outcome k: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice



Display materials available at visit:

- Rubric used for scoring Indicators
- Projects
- Labs
- Minutes of Department meetings where recommendations were made
- Minutes of Department meetings where actions were taken

B. Continuous Improvement

This information is included in each outcome table and also discussed in section A above. Following is a list of the major changes in the ME program:

1. Curriculum Improvement with the addition of two new courses in the area of Renewable Energy to address the challenge of producing a quality pool of engineers with experience in this cutting edge field and meet the national demand.
    a. ME 441 – Renewable Energy was added based on:
        - New technology in the classroom
        - increase the design experience of the ME students in new areas
        - Recommendation by the ME-IAB
    b. ME 442 – Solar Thermal Engineering was added to address the following:
        - Improving the student experience in design analysis, simulation and optimization in new engineering area.
        - Giving our students an edge and making them competitive in this fast grewing technology
2. Laboratory Enhancement: based on the recommendation of the ME-IAB and the Alumni feedbacks:
        - ME 313L – Experimental Mechanics Lab: Three more experiments have been added to provide more hands-on testing and evaluation.
        - ME 432L – Manufacturing Lab: Sheet metal workstation, Surface roughness system, Coordinate Measurement Machine, and reverse engineering system have been added to the existing facility
        - ME 360L – Fluid Mechanics Lab: a water bed testing facility has been added to the fluid mechanics lab.

3. The requirement for graduation has been changed from "Students are encouraged to earn a grade of C or better in all prerequisites" to "Students are required to earn a grade of C or better in all prerequisites". This change was proposed by the faculty and approved by the ME-IAB to better prepare ME students before they start their mechanical engineering courses.
4. Student Outcome Performance Criterion and rubrics modified.
5. More simulation analysis software are available for the students

It should be noted that based on these assessment the department has developed a yearly Prioritized Continuous Improvement Plan that is part of the university quality Improvement Plan. The following pages describe the plans for 2015-2016, 2016-2017, and 2017-2018.

Prioritized Continuous Improvement Plan

Mechanical Engineering Department

Academic Year 2015-2016

Criteria	Actions	Expected Results	Anticipated Cost	Implementation (Target Date)	Person Responsible	Use of Results
Students Prerequisites	Implement Banner module	Courses will be taken in sequences	$ 0.00	Fall 2015	Registrar's Office	Enhance strength of curriculum
	Update the prerequisites	Students will have the right sequences of courses	$ 0.00	Spring 2016	Chair	Enhance strength of curriculum
Program Outcomes	Strengthen the design contents of the propulsion concentration	Re-structure the propulsion concentration to include CAD experience	$ 0.00	Spring 2016	Chair / ME Faculty	Enhance the students experience in Computer Aided Design
	Laboratories Enhancements	Buy new equipments for: 1. Fluid Mechanics Lab 2. Heat Transfer Lab 3. Automatic Control Lab	$ 55,330	Spring 2016	Dean /Provost	Enhance students experience by adding new experiments to: 1. Fluid Mechanics Lab 2. Heat Transfer Lab 3. Automatic Control Lab
Program Objectives	Involve the ME Industry Advisory Board in the Capstone Design Class	Recommendations for Capstone Design project improvement	$ 0.00	Spring 2016	Chair	Enhance the capstone project experience
	Involve the ME Industry Advisory Board in the graduating seniors exit interview	Program assessment	$ 0.00	Spring 2016	Chair	Enhance the strength of the ME Program
Professional Development	Faculty will attend workshops and conferences	- Enhance the faculty teaching and research performance - More exposure to the scientific and engineering communities.	$ 14,000	Spring 2016	- Title III - ME Travel Budget	- Update courses and Labs. - Develop new research capabilities - Advance the faculty publications
Faculty Retention	Adjust the faculty salary to the National norm	- Maintain good and productive faculty - Attract high caliber faculty	$ 89,066	Fall 2016	Provost	Enhance the strength of the ME program

Prioritized Continuous Improvement Plan
Mechanical Engineering Department
Academic Year 2016-2017

Criteria	Actions	Expected Results	Anticipated Cost	Implementation (Target Date)	Person Responsible	Use of Results
Students Prerequisites	Enforce the prerequisites	Students will have the right sequences of courses	$ 0.00	Fall 2016	Chair	Enhance strength of curriculum
Program Outcomes	Strengthen the design contents and the CAD/CAE experience	- Re-structure the curriculum to include CAD experience - Software Update	$ 4,800.00	Fall 2016	Chair / ME Faculty	Enhance the students experience in Computer Aided Design across the curriculum
	Laboratories Enhancements	Buy new equipments for: 1. Fluid Mechanics Lab 2. Heat Transfer Lab 3. Automatic Control Lab 4. Experimental Mechanics	$ 76,330	Fall 2017	Dean /Provost	Enhance students experience by adding new experiments to: 1. Fluid Mechanics Lab 2. Heat Transfer Lab 3. Automatic Control Lab 4. Experimental Mechanics Lab
Program Objectives	Involve the ME Industry Advisory Board in the Capstone Design Class	Recommendations for Capstone Design project improvement	$ 0.00	Fall 2016	Chair	Enhance the capstone project experience
	Involve the ME Industry Advisory Board in the graduating seniors exit interview	Program assessment	$ 0.00	Spring 2017	Chair	Enhance the strength of the ME Program
Professional Development	Faculty will attend workshops and conferences	- Enhance the faculty teaching and research performance - More exposure to the scientific and engineering communities.	$ 14,000	Spring 2017	- Title III - ME Travel Budget	- Update courses and Labs. - Develop new research capabilities - Advance the faculty publications
Faculty Retention	Adjust the faculty salary to the National norm	- Maintain good and productive faculty - Attract high caliber faculty	$ 89,066	Fall 2017	Provost	Enhance the strength of the ME program

Prioritized Continuous Improvement Plan

Mechanical Engineering Program

Academic Year 2017-2018

Criteria	Actions	Expected Results	Anticipated Cost	Implementation (Target Date)	Person Responsible	Use of Results
Students	Involve students in more professional development activities including field trips	- Students will be better prepared for professional career	$ 3,000.00	Fall 2017 and Spring 2018	ME Faculty	Prepare competitive professionals
Program Outcomes	Strengthen the design contents and the CAD/CAE experience	- Software Update - Hardware Upgrade	$ 34,800.00	Fall 2017	Dean /Provost	Enhance the students experience in Computer Aided Design across the curriculum
	Laboratories Enhancements	Buy new equipments for: 1. Fluid Mechanics Lab 2. Heat Transfer Lab 3. Automatic Control Lab 4. Experimental Mechanics Lab 5. Advanced Manufacturing Lab 6. Instrumentation Lab 7. Machine shop	$ 142,330	Fall 2018	Dean/Provost	Enhance students experience by adding new experiments and supporting facility to: 1. Fluid Mechanics Lab 2. Heat Transfer Lab 3. Automatic Control Lab 4. Experimental Mechanics Lab 5. Advanced Manufacturing Lab 6. Instrumentation Lab 7. Machine shop
Program Objectives	Extend the involvement of the ME Industry Advisory Board in the Capstone Design Class	Recommendations for Capstone Design project improvement	$ 0.00	Fall 2017	Chair	Enhance the capstone project experience
	Increase industry-based projects	Exposure to real world engineering issues	$ 2000.00	Fall 2017	Chair	Better preparation of ME graduates for their engineering careers
Professional Development	Faculty will continue to attend workshops and conferences	- Enhance the faculty teaching and research performance - More exposure to the scientific and engineering communities.	$ 14,000	Fall 2017 and Spring 2018	- Title III - ME Travel Budget	- Update courses and Labs. - Develop new research capabilities - Advance the faculty publications
Faculty Retention	Adjust the faculty salary and teaching load to the National norm	- Maintain good and productive faculty - Attract high caliber faculty	$ 89,066	Fall 2018	Dean /Provost	Enhance the strength of the ME program and address the ABET concern.

The Future program improvement plans include the updating of the following Labs:

- Instrumentation Systems Lab
- Fluid Mechanics Lab
- Heat Transfer Lab
- Manufacturing Lab
- Machine shop

C. Additional Information

Documentary evidence that will be available for review during the visit to demonstrate achievement of the program outcomes and assessment will include:

1. Course descriptions and outlines
2. Samples of student work in analysis, laboratory reports, and design projects
3. Course materials that illustrate evaluation of student performance
4. Student Satisfaction with ME Department survey
5. Continuous Improvement of Mechanical Engineering Program Forms
6. Senior Design Evaluation Form
7. Feedback from current students
8. Interviews with graduating seniors (Exit Interview)
9. Alumni survey
10. Employer survey
11. Minutes of Advisory Board meetings
12. Minutes of faculty meetings
13. Minutes from meetings where the assessment results were evaluated and where recommendations for action were made

CRITERION 5. CURRICULUM

A. Program Curriculum

The Mechanical Engineering Program at AAMU is set to be a broad-based program that allows students to have an emphasis within their program during their senior year. The program has been designed by the faculty to produce a graduate broadly acquainted with tools and principles that would be used in the mechanical engineering field. While designed to develop the essential knowledge, skills, and abilities needed for professional practice or graduate study, the curricular structure of the program, coupled with the integrated influence of liberal arts studies equips our students with a holistic educational experience that is designed to prepare students to succeed in a world characterized by rapidly developing technology, growing complexity, and globalization.

A.1 Program Curriculum Description

The program offers courses in the different areas of mechanical engineering. The curriculum offered is the General Program with two concentrations: Manufacturing Systems and Propulsion Systems. The general program permits students to elect additional electives to satisfy their interests in any particular area. On the other hand, the two concentrations are available for those who want to concentrate on manufacturing or propulsion systems. The students are introduced to basic and generic design concepts and problems as early as their freshmen year in Computer Aided Design (ME 103), and Introduction to Mechanical Engineering (ME 101/ ME101L). Students are frequently taken on field trips to manufacturing sites to listen to professionals and share their practical experience, professionalism, and ethics. The students are guided through required basic engineering science courses, such as Statics, Dynamics, Strength of Materials, Fluid Mechanics, Thermodynamics, and Materials Science, with appropriate mathematics, physics and chemistry prerequisites. The students are trained on the design aspects of analysis, simulation, verification, and iteration on their junior and senior years. The design of Machine Elements (ME425), Computer Aided Design II (ME380), and the senior design project (ME470 and ME 475) provide a comprehensive exposure to the design of complex systems, components, and/or processes. This ability to design includes not only analysis of specific problem situations, but also the synthesis of appropriate data into a systematic approach for designing a solution.

Tables 5-1, 5-1(a), and 5-1 (b) given at the end of this Criterion describe the plans of study for the general, manufacturing systems concentration, and propulsion systems concentration of the mechanical engineering program, respectively. The tables list the courses in the recommended sequence. Alabama A&M University is on a semester system. Moreover, Tables 5-1 (c-e) summarizes the curricula for the general, manufacturing systems concentration, and propulsion systems concentration, respectively.

A.2 Curriculum Alignment with Program Educational Objectives

Table 5-2 illustrates the alignment of the curriculum with the program educational objectives (PEO's). Courses common to both concentrations are cross-listed in the table against the PEO's.

An "X" in a cell indicates a course that has a direct contribution to the achievement of an objective. It should be noted that, all courses align with the Program Educational Objectives.

A.3 Curriculum and Student Outcomes

Tables 5-3(a) and 5-3(b) illustrates how the curriculum supports the attainment of student outcomes. An "X" in a cell indicates a course that has a contribution to the attainment of an outcome. The associated prerequisite structure allows some entry-level courses to serve primarily to attain entry into more advanced courses, which serve to attain an outcome. For example, Calculus I allows students to take Statics, etc. As shown in these tables, each student outcome is addressed in more than one course in the curriculum. This provides students with the opportunity to develop and enhance the knowledge and skills represented by the student outcomes in multiple situations and engineering applications. Individual course syllabi also includes course related mapping.

A.4 Prerequisite Structure of the Program

The prerequisite structure for the curriculum is shown in the set of charts in Figures 5-4 (a and b) for manufacturing systems concentration and propulsion system concentration, respectively.

A.5 Meeting the Requirements

For mechanical engineering programs, the professional component must include:

a. One year of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline. Tables 5-1, 5-1(a), and 5-1(b) give the full curriculum requirements of the program. Twenty-one credits of college-level mathematics are required and twelve credits of college-level basic science for a total of 37 credits. This constitutes slightly more than one-year combination of mathematics and basic sciences. Also, three of the basic sciences courses (CHE 101-101L, PHY213, PHY214) are laboratory courses that give the required experimental experience.
b. One and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. Tables 5-1, 5-1(a), and 5-1(b) show 62 credits of engineering topics for the general and the two concentrations, exceeding the requirement. Of the 62 credits, 28 (or 45%) contain significant design content.
c. A general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives. Tables 5-1, 5-1(a), and 5-1(b) show that there are 27 general education credits, or 20.8% of the total curriculum.

A.6 Design Experience

The culminating major design experience is carried out in a two-course sequence beginning in the fall semester (ME470 Mechanical Engin8eering Design Project) and finishing in the spring semester (ME475 Mechanical Engineering Design Project). In this sequence, students choose a

product to design and then carry out its detail design. Design project ideas come from one of four sources: (1) industrial partners who need a new product or process designed, (2) student engineering competitions such as the NASA- Moon buggy and NASA-USLI competitions (3) ideas from the faculty to support research, and (4) ideas from the students. The first semester of the senior design project stresses design methodology and practice. It includes the topics of customer needs, product specifications, concept generation, and concept selection. Customer needs are developed that address multiple realistic constraints such as cost, operating environment, environmental impact, health and safety, product size, manufacturability and various performance criteria. The course ends with written and oral reports. In this course students must use knowledge and skills learned in communications courses (written, oral, graphical), and engineering design courses to do feasibility studies when ranking competing concepts. Students must also use appropriate engineering standards to keep costs down, satisfying the customer need to minimize cost. By the end of the first semester, the industry advisory board members evaluate the projects and provide feedback and ways for improvement.

The second semester of the senior design project stresses the detail design of the product. The course work produces a comprehensive design report and an oral presentation that is open to the public and evaluated by the industry advisory board members. Students must use knowledge and skills learned in communications courses to prepare the written report and deliver the oral presentation. Depending on the product, students will use a variety of engineering courses to complete the design. The most commonly relied on courses are ME425 Design of Machine Elements, ME 380 Computer Aided Design II, ME 232 Strength of Materials, ME310 Thermodynamics, ME 312 Heat and Mass Transfer, ME360 Fluid Mechanics, ME 432 Design for Manufacturing and Reliability, ME 472 Economic Evaluation of Design Project, and ME412 Analysis and Synthesis of Gas Turbines and Compressors.

A.7 Cooperative Education

At the present time there is no cooperative employment program for the mechanical engineering program.

A.8 Materials for Review during the Visit

Course syllabi, textbooks, and sample student work will be available during the ABET visit as display material. Each course in the curriculum has a binder with the above material included. Student project reports from the Senior Design and Computer-Aided Mechanical Design courses will also be available.

B. Course Syllabi

Appendix A has a syllabus for each course used to satisfy the mathematics, science, and discipline-specific requirements of Criterion 5 and the mechanical engineering program criteria.

Table 5-1 Curriculum

Mechanical Engineering – General

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Freshman I							
ORI 101 First Year Experience I	R				1	Fall 2017/Spring 2018	38
ENG 101 Composition I [1]	R			3		Fall 2017/Spring 2018	26
MTH 125 Calculus I	R	4				Fall 2017/Spring 2018	30
CHE 101 General Chemistry I	R	3				Fall 2017/Spring 2018	51
CHE 101L General Chemistry I Lab	R	1				Fall 2017/Spring 2018	28
PED/MSC/HED Elective	E				2	Fall 2017/Spring 2018	Unknown
ME 101 Intro. to ME	R		1			Fall 2017/Spring 2018	30
ME 101 Intro. to ME lab	R		1(√)			Fall 2017/Spring 2018	30
Freshman II							
ME 104 Engineering Programming	R	3				Fall 2017/Spring 2018	34
ENG 102 Composition II [1]	R			3		Fall 2017/Spring 2018	27
MTH 126 Calculus II	R	4				Fall 2017/Spring 2018	26
PHY 213 Genera Physics with Cal. I	R	4				Fall 2017/Spring 2018	21
ME 103 Computer Aided Design I	R		2(√)			Fall 2017/Spring 2018	33
ORI 102 First Year Experience II	R				1	Fall 2017/Spring 2018	37
Continued on the next page							

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Sophomore I							
History Sequence I [3]	R			3		Fall 2017/Spring 2018	80
MTH 227 Calculus III	R	4				Fall 2017/Spring 2018	26
PHY 214 Genera Physics with Cal. II	R	4				Fall 2017/Spring 2018	26
ME 205 Statics	R		3			Fall 2017/Spring 2018	30
EE 201 Linear Circuit Analysis I	R		3			Fall 2017/Spring 2018	39
Sophomore II							
History Sequence II [3]	R			3		Fall 2017/Spring 2018	80
MTH 238 Applied Diff. Equations	R	3				Fall 2017/Spring 2018	17
ME 204 Engineering Analysis	R	3				Fall 2017/Spring 2018	26
ME 206 Dynamics	R		3			Fall 2017/Spring 2018	35/45
ME 210 Materials Science	R	1	2			Fall 2017/Spring 2018	35/35
Junior I							
ECO 231 or 232				3		Fall 2017/Spring 2018	30/32
ME 231 Strength of Materials	R		3			Fall 2017/Spring 2018	33
ME 300 Math Methods in M.E.	R	3				Fall 2016/Fall 2017	24
ME 310 Thermodynamics	R		3			Fall 2017/Spring 2018	35
ME 360 Fluid Mechanics I	R		3			Fall 2016/Fall 2017	30
ME 360L Fluid Mechanics I/Lab	R		1			Fall 2016/Fall 2017	30
Continued on the next page							

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Junior II							
ME 320 Kinematics/Dyncs of Machines	R		3(√)			Spring 2017/Sp'18	27
ME 313L Experimental Mechanics Lab	R		1			Spring 2017/Sp'18	24
ME 301 Ana & Instrmnt of P.Sys	R		2			Spring 2017/Sp'18	27
ME 301L Ana&Instrmnt of P.Sys Lab	R		1			Spring 2017/Sp'18	27
ME 380 Computer Aided Design II	R		3(√)			Spring 2017/Sp'18	21
ME 312 Heat and Mass Transfer	R		3			Spring 2017/Sp'18	27
ME 312L Heat and Mass Transfer/ Lab	R		1			Spring 2017/Sp'18	27
ME 425 Design of Machine Elements	R		3(√)			Spring 2017/Sp'18	24
Senior I							
ENG 203 World Literature I	R			3		Fall 2017/Spring 2018	41
ME 432 Design for Manuf & Reliab	R		3(√)			Fall 2016/Fall 2017	16
ME 432L Design for Manuf & Rel Lab	R		1			Fall 2016/Fall 2017	16
ME 451 Auto Control Systems	R		3			Fall 2016/Fall 2017	26
ME 470 Mech. Engineering Des. Project	R		2(√)			Fall 2016/Fall 2017	30
ME 4xx Elective	SE		3			Fall 2017/Spring 2018	
Senior II							
ENG 204 World Literature II	R			3		Fall 2017/Spring 2018	41
ART 101 or 220 or 221 or MUS 101	R			3		Fall 2017/Spring 2018	35
ME 4xx Elective	SE		3			Spring 2017/Sp'18	
ME 4xx Elective	SE		3			Spring 2017/Sp'18	
ME 475 Mech. Engineering Des. Project	R		2(√)			Spring 2017/Sp'18	30
ME 4xx Elective	SE		3			Fall 2017/Spring 2018	
Continued on the next page							

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
ME Senior Elective							
ME 481 Qual. Reliability Assurance	SE		3			Fall 2016/Fall 2017	31
ME 412 Anal./Syn. of Gas Turb./Com	SE		3(√)			Fall 2016/Fall 2017	10
ME 417 Power Sys. Integ & Performance	SE		3(√)			Fall 2016/Fall 2017	9
ME 472 Economic Eval. of Design Prj.	SE		3(√)			Spring 2017/Sp'18	18
ME 482 Operations Planning & Sched.	SE		3			Spring 2017/Sp'18	18
ME 413 Rocket Propulsion	SE		3			Spring 2017/Sp'18	8
ME 416 Gas Dynamics	SE		3			Spring 2017/Sp'18	12
ME 441 Renewable Energy	SE		3			Fall 2016/Fall 2017	10
ME 442 Solar Thermal Engineering	SE		3			Spring 2017/Sp'18	12
Add rows as needed to show all courses in the curriculum.							
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		37	62	27	4		
OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM	130						
PERCENT OF TOTAL		28.5%	47.7%	20.8%	3.08%		
Total must satisfy either credit hours or percentage — Minimum Semester Credit Hours		32 Hours	48 Hours				
Total must satisfy either credit hours or percentage — Minimum Percentage		25%	37.5 %				

1. **Required** courses are required of all students in the program, **elective** courses (often referred to as open or free electives) are optional for students, and **selected elective** courses are those for which students must take one or more courses from a specified group.
2. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the maximum enrollment in each element. For selected elective courses, indicate the maximum enrollment for each option.

Instructional materials and student work verifying compliance with ABET criteria for the categories indicated above will be required during the campus visit.

Table 5-1 (a) Curriculum

Mechanical Engineering – Manufacturing Systems Concentration

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Freshman I							
ORI 101 First Year Experience I	R				1	Fall 2017/Spring 2018	38
ENG 101 Composition I [1]	R			3		Fall 2017/Spring 2018	26
MTH 125 Calculus I	R	4				Fall 2017/Spring 2018	30
CHE 101 General Chemistry I	R	3				Fall 2017/Spring 2018	51
CHE 101L General Chemistry I Lab	R	1				Fall 2017/Spring 2018	28
PED/MSC/HED Elective	E				2	Fall 2017/Spring 2018	Unknown
ME 101 Intro. to ME	R		1			Fall 2017/Spring 2018	30
ME 101 Intro. to ME lab	R		1(√)			Fall 2017/Spring 2018	30
Freshman II							
ME 104 Engineering Programming	R	3				Fall 2017/Spring 2018	34
ENG 102 Composition II [1]	R			3		Fall 2017/Spring 2018	27
MTH 126 Calculus II	R	4				Fall 2017/Spring 2018	26
PHY 213 Genera Physics with Cal. I	R	4				Fall 2017/Spring 2018	21
ME 103 Computer Aided Design I	R		2(√)			Fall 2017/Spring 2018	33
ORI 102 First Year Experience II	R				1	Fall 2017/Spring 2018	37
Continued on the next page							

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Sophomore I							
History Sequence I [3]	R			3		Fall 2017/Spring 2018	80
MTH 227 Calculus III	R	4				Fall 2017/Spring 2018	26
PHY 214 Genera Physics with Cal. II	R	4				Fall 2017/Spring 2018	26
ME 205 Statics	R		3			Fall 2017/Spring 2018	30
EE 201 Linear Circuit Analysis I	R		3			Fall 2017/Spring 2018	39
Sophomore II							
History Sequence II [3]	R			3		Fall 2017/Spring 2018	80
MTH 238 Applied Diff. Equations	R	3				Fall 2017/Spring 2018	17
ME 204 Engineering Analysis	R	3				Fall 2017/Spring 2018	26
ME 206 Dynamics	R		3			Fall 2017/Spring 2018	35/45
ME 210 Materials Science	R	1	2			Fall 2017/Spring 2018	35/35
Junior I							
ECO 231 or 232				3		Fall 2017/Spring 2018	30/32
ME 231 Strength of Materials	R		3			Fall 2017/Spring 2018	33
ME 300 Math Methods in M.E.	R	3				Fall 2016/Fall 2017	24
ME 310 Thermodynamics	R		3			Fall 2017/Spring 2018	35
ME 360 Fluid Mechanics I	R		3			Fall 2016/Fall 2017	30
ME 360L Fluid Mechanics I/Lab	R		1			Fall 2016/Fall 2017	30
Continued on the next page							

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Junior II							
ME 320 Kinematics/Dyncs of Machines	R		3(√)			Spring 2017/Sp'18	27
ME 313L Experimental Mechanics Lab	R		1			Spring 2017/Sp'18	24
ME 301 Ana & Instrmnt of P.Sys	R		2			Spring 2017/Sp'18	27
ME 301L Ana&Instrmnt of P.Sys Lab	R		1			Spring 2017/Sp'18	27
ME 380 Computer Aided Design II	R		3(√)			Spring 2017/Sp'18	21
ME 312 Heat and Mass Transfer	R		3			Spring 2017/Sp'18	27
ME 312L Heat and Mass Transfer/ Lab	R		1			Spring 2017/Sp'18	27
ME 425 Design of Machine Elements	R		3(√)			Spring 2017/Sp'18	24
Senior I							
ENG 203 World Literature I	R			3		Fall 2017/Spring 2018	41
ME 432 Design for Manuf & Reliab	R		3(√)			Fall 2016/Fall 2017	16
ME 432L Design for Manuf & Rel Lab	R		1			Fall 2016/Fall 2017	16
ME 451 Auto Control Systems	R		3			Fall 2016/Fall 2017	26
ME 470 Mech. Engineering Des. Project	R		2(√)			Fall 2016/Fall 2017	30
ME 481 Qual. Reliability Assurance	R		3			Fall 2016/Fall 2017	31
Senior II							
ENG 204 World Literature II	R			3		Fall 2017/Spring 2018	41
ART 101 or 220 or 221 or MUS 101	R			3		Fall 2017/Spring 2018	35
ME 482 Operations Planning & Sched.	SE		3			Spring 2017/Sp'18	22
ME 472 Economic Eval. of Design Prj.	SE		3(√)			Spring 2017/Sp'18	18
ME 4xx Elective	SE		3			Spring 2017/Sp'18	
ME 475 Mech. Engineering Des. Project	R		2(√)			Spring 2017/Sp'18	30
Continued on the next page							

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
ME Senior Elective							
ME 412 Anal./Syn. of Gas Turb./Com	SE		3(√)			Fall 2016/Fall 2017	20
ME 417 Power Sys. Integ & Performance	SE		3(√)			Fall 2016/Fall 2017	19
ME 413 Rocket Propulsion	SE		3			Spring 2017/Sp'18	19
ME 416 Gas Dynamics	SE		3			Spring 2017/Sp'18	21
ME 441 Renewable Energy	SE		3			Fall 2016/Fall 2017	15
ME 442 Solar Thermal Engineering	SE		3			Spring 2017/Sp'18	14
Add rows as needed to show all courses in the curriculum.							
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		37	62	27	4		
OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM	130						
PERCENT OF TOTAL		28.5%	47.7%	20.8%	3.08%		
Total must satisfy either credit hours or percentage — Minimum Semester Credit Hours		32 Hours	48 Hours				
Total must satisfy either credit hours or percentage — Minimum Percentage		25%	37.5 %				

1. **Required** courses are required of all students in the program, **elective** courses (often referred to as open or free electives) are optional for students, and **selected elective** courses are those for which students must take one or more courses from a specified group.
2. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the maximum enrollment in each element. For selected elective courses, indicate the maximum enrollment for each option.

Instructional materials and student work verifying compliance with ABET criteria for the categories indicated above will be required during the campus visit.

Table 5-1 (b) Curriculum

Mechanical Engineering – Propulsion Systems Concentration

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Freshman I							
ORI 101 First Year Experience I	R				1	Fall 2017/Spring 2018	38
ENG 101 Composition I [1]	R			3		Fall 2017/Spring 2018	26
MTH 125 Calculus I	R	4				Fall 2017/Spring 2018	30
CHE 101 General Chemistry I	R	3				Fall 2017/Spring 2018	51
CHE 101L General Chemistry I Lab	R	1				Fall 2017/Spring 2018	28
PED/MSC/HED Elective	E				2	Fall 2017/Spring 2018	Unknown
ME 101 Intro. to ME	R		1			Fall 2017/Spring 2018	30
ME 101 Intro. to ME lab	R		1(√)			Fall 2017/Spring 2018	30
Freshman II							
ME 104 Engineering Programming	R	3				Fall 2017/Spring 2018	34
ENG 102 Composition II [1]	R			3		Fall 2017/Spring 2018	27
MTH 126 Calculus II	R	4				Fall 2017/Spring 2018	26
PHY 213 Genera Physics with Cal. I	R	4				Fall 2017/Spring 2018	21
ME 103 Computer Aided Design I	R		2(√)			Fall 2017/Spring 2018	33
ORI 102 First Year Experience II	R				1	Fall 2017/Spring 2018	37
Continued on the next page							

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Sophomore I							
History Sequence I [3]	R			3		Fall 2017/Spring 2018	80
MTH 227 Calculus III	R	4				Fall 2017/Spring 2018	26
PHY 214 Genera Physics with Cal. II	R	4				Fall 2017/Spring 2018	26
ME 205 Statics	R		3			Fall 2017/Spring 2018	30
EE 201 Linear Circuit Analysis I	R		3			Fall 2017/Spring 2018	39
Sophomore II							
History Sequence II [3]	R			3		Fall 2017/Spring 2018	80
MTH 238 Applied Diff. Equations	R	3				Fall 2017/Spring 2018	17
ME 204 Engineering Analysis	R	3				Fall 2017/Spring 2018	26
ME 206 Dynamics	R		3			Fall 2017/Spring 2018	35/45
ME 210 Materials Science	R	1	2			Fall 2017/Spring 2018	35/35
Junior I							
ECO 231 or 232				3		Fall 2017/Spring 2018	30/32
ME 231 Strength of Materials	R		3			Fall 2017/Spring 2018	33
ME 300 Math Methods in M.E.	R	3				Fall 2016/Fall 2017	24
ME 310 Thermodynamics	R		3			Fall 2017/Spring 2018	35
ME 360 Fluid Mechanics I	R		3			Fall 2016/Fall 2017	30
ME 360L Fluid Mechanics I/Lab	R		1			Fall 2016/Fall 2017	30
Continued on the next page							

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
Junior II							
ME 320 Kinematics/Dyncs of Machines	R		3(√)			Spring 2017/Sp'18	27
ME 313L Experimental Mechanics Lab	R		1			Spring 2017/Sp'18	24
ME 301 Ana & Instrmnt of P.Sys	R		2			Spring 2017/Sp'18	27
ME 301L Ana&Instrmnt of P.Sys Lab	R		1			Spring 2017/Sp'18	27
ME 380 Computer Aided Design II	R		3(√)			Spring 2017/Sp'18	21
ME 312 Heat and Mass Transfer	R		3			Spring 2017/Sp'18	27
ME 312L Heat and Mass Transfer/ Lab	R		1			Spring 2017/Sp'18	27
ME 425 Design of Machine Elements	R		3(√)			Spring 2017/Sp'18	24
Senior I							
ENG 203 World Literature I	R			3		Fall 2017/Spring 2018	41
ME 412 Anal./Syn. of Gas Turb./Com	R		3(√)			Fall 2016/Fall 2017	22
ME 412L Anal./Syn. of Gas Turb. Lab	R		1			Fall 2016/Fall 2017	21
ME 451 Auto Control Systems	R		3			Fall 2016/Fall 2017	26
ME 470 Mech. Engineering Des. Project	R		2(√)			Fall 2016/Fall 2017	30
ME 417 Power Sys. Integ & Performance	R		3(√)			Fall 2016/Fall 2017	20
Senior II							
ENG 204 World Literature II	R			3		Fall 2017/Spring 2018	41
ART 101 or 220 or 221 or MUS 101	R			3		Fall 2017/Spring 2018	35
ME 413 Rocket Propulsion	R		3			Spring 2017/Sp'18	20
ME 416 Gas Dynamics	R		3			Spring 2017/Sp'18	21
ME 475 Mech. Engineering Des. Project	R		2(√)			Spring 2017/Sp'18	30
ME 4xx Elective	SE		3			Fall 2017/Spring 2018	
Continued on the next page							

Course (Department, Number, Title)	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[1]	Subject Area (Credit Hours)				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Maximum Section Enrollment for the Last Two Terms the Course was Offered[2]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
ME Senior Elective							
ME 441 Renewable Energy	SE		3			Fall 2016/Fall 2017	10
ME 442 Solar Thermal Engineering	SE		3			Spring 2017/Sp'18	12
ME 481 Qual. Reliability Assurance	SE		3			Fall 2016/Fall 2017	31
ME 472 Economic Eval. of Design Prj.	SE		3(√)			Spring 2017/Sp'18	18
ME 482 Operations Planning & Sched.	SE		3			Spring 2017/Sp'18	18
Add rows as needed to show all courses in the curriculum.							
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		37	62	27	4		
OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM	130						
PERCENT OF TOTAL		28.5%	47.7%	20.8%	3.08%		
Total must satisfy either credit hours or percentage	Minimum Semester Credit Hours	32 Hours	48 Hours				
	Minimum Percentage	25%	37.5 %				

1. **Required** courses are required of all students in the program, **elective** courses (often referred to as open or free electives) are optional for students, and **selected elective** courses are those for which students must take one or more courses from a specified group.
2. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the maximum enrollment in each element. For selected elective courses, indicate the maximum enrollment for each option.

Instructional materials and student work verifying compliance with ABET criteria for the categories indicated above will be required during the campus visit.

Table 5-1 (c) Curriculum

Mechanical Engineering – General

130 Credit Hours

FRESHMAN YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
ORI 101	First Year Experience	1	ORI 101	First Year Experience	1
ENG 101	Composition I[1]	3	ENG 102	Composition II[1]	3
MTH 125	Calculus I	4	ME 103	Computer-Aided Design I	2
CHE 101	General Chemistry I	3	ME 104	Engg Analysis & Computing I	3
CHE 101L	General Chemistry I Lab	1	MTH 126	Calculus II	4
ME 101/L	Introduction to ME & Lab	2	PHY 213	General Physics with Cal. I	4
	PED/MSC/HED Elective[2]	2			
		16			17

SOPHOMORE YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
HIS 101	World History I	3	HIS 102	World History II	3
MTH 227	Calculus III	4	MTH 238	Applied Differential Equations	3
PHY 214	General Physics with Cal. II	4	ME 204	Engineering Analysis	3
ME 205	Statics	3	ME 206	Dynamics	3
EE 201	Linear Circuit Analysis I	3	ME 210	Material Science	3
		17			15

JUNIOR YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
	ECO 231 or 232	3	ME 320	Kinematics /Dynamics of Machines	3
ME 231	Strength of Materials	3	ME 313L	Experimental Mechanics Lab	1
ME 300	Math Methods in Mechanical Engg	3	ME 301	Anal/Instr of Physical Systems	2
ME 310	Thermodynamics	3	ME 301L	Anal/Instr of Physical Systems Lab	1
ME 360	Fluid Mechanics I	3	ME 380	Computer-Aided Design II	3
ME 360L	Fluid Mechanics I Lab	1	ME 312	Heat and Mass Transfer	3
		16	ME 312L	Heat and Mass Transfer Lab	1
			ME 425	Design of Machine Element	3
					17

SENIOR YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
ENG 203	World Literature I	3	ENG 204	World Literature II	3
ME 432/L	Design Mfg Reliability & Lab	4		ART 101 or 220 or 221 or MUS 101	3
ME 451	Auto Control Systems	3	ME 4xx	Elective	3
ME 470	Mechanical Engg Design Project	2	ME 475	ME Design Project Continuation	2
ME 4xx	Elective	3	ME 4xx	Elective	3
		15	ME 4xx	Elective	3
					17

[1]Must earn grade of C or better. ENG 103/104 may be taken by Int'l students.

[2]PED/MSC/HED Electives: PED 1xx, MSC 101, HED 101, FAS 101, NHM 103.

Table 5-1 (d) Curriculum

Mechanical Engineering – Manufacturing Systems

130 Credit Hours

FRESHMAN YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
ORI 101	First Year Experience	1	ORI 101	First Year Experience	1
ENG 101	Composition I[1]	3	ENG 102	Composition II[1]	3
MTH 125	Calculus I	4	ME 103	Computer-Aided Design I	2
CHE 101	General Chemistry I	3	ME 104	Engg Analysis & Computing I	3
CHE 101L	General Chemistry I Lab	1	MTH 126	Calculus II	4
ME 101/L	Introduction to ME & Lab	2	PHY 213	General Physics with Cal. I	4
	PED/MSC/HED Elective[2]	2			
		16			17

SOPHOMORE YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
HIS 101	World History I	3	HIS 102	World History II	3
MTH 227	Calculus III	4	MTH 238	Applied Differential Equations	3
PHY 214	General Physics with Cal. II	4	ME 204	Engineering Analysis	3
ME 205	Statics	3	ME 206	Dynamics	3
EE 201	Linear Circuit Analysis I	3	ME 210	Material Science	3
		17			15

JUNIOR YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
	ECO 231 or 232	3	ME 320	Kinematics /Dynamics of Machines	3
ME 231	Strength of Materials	3	ME 313L	Experimental Mechanics Lab	1
ME 300	Math Methods in Mechanical Engg	3	ME 301	Anal/Instr of Physical Systems	2
ME 310	Thermodynamics	3	ME 301L	Anal/Instr of Physical Systems Lab	1
ME 360	Fluid Mechanics I	3	ME 380	Computer-Aided Design II	3
ME 360L	Fluid Mechanics I Lab	1	ME 312	Heat and Mass Transfer	3
		16	ME 312L	Heat and Mass Transfer Lab	1
			ME 425	Design of Machine Element	3
					17

SENIOR YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
ENG 203	World Literature I	3	ENG 204	World Literature II	3
ME 432/L	Design Mfg Reliability & Lab	4		ART 101 or 220 or 221 or MUS 101	3
ME 451	Auto Control Systems	3	ME 472	Economic Eval of Design Project	3
ME 470	Mechanical Engg Design Project	2	ME 475	ME Design Project Continuation	2
ME 481	Quality & Reliability Assurance	3	ME 4xx	Elective	3
		15	ME 482	Operations Planning & Scheduling	3
					17

[1]Must earn grade of C or better. ENG 103/104 may be taken by Int'l students.

[2]PED/MSC/HED Electives: PED 1xx, MSC 101, HED 101, FAS 101, NHM 103.

Table 5-1 (e) Curriculum

Mechanical Engineering – Propulsion Systems

130 Credit Hours

FRESHMAN YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
ORI 101	First Year Experience	1	ORI 101	First Year Experience	1
ENG 101	Composition I[1]	3	ENG 102	Composition II[1]	3
MTH 125	Calculus I	4	ME 103	Computer-Aided Design I	2
CHE 101	General Chemistry I	3	ME 104	Engg Analysis & Computing I	3
CHE 101L	General Chemistry I Lab	1	MTH 126	Calculus II	4
ME 101/L	Introduction to ME & Lab	2	PHY 213	General Physics with Cal. I	4
	PED/MSC/HED Elective[2]	2			
		16			17

SOPHOMORE YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
HIS 101	World History I	3	HIS 102	World History II	3
MTH 227	Calculus III	4	MTH 238	Applied Differential Equations	3
PHY 214	General Physics with Cal. II	4	ME 204	Engineering Analysis	3
ME 205	Statics	3	ME 206	Dynamics	3
EE 201	Linear Circuit Analysis I	3	ME 210	Material Science	3
		17			15

JUNIOR YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
	ECO 231 or 232	3	ME 320	Kinematics /Dynamics of Machines	3
ME 231	Strength of Materials	3	ME 313L	Experimental Mechanics Lab	1
ME 300	Math Methods in Mechanical Engg	3	ME 301	Anal/Instr of Physical Systems	2
ME 310	Thermodynamics	3	ME 301L	Anal/Instr of Physical Systems Lab	1
ME 360	Fluid Mechanics I	3	ME 380	Computer-Aided Design II	3
ME 360L	Fluid Mechanics I Lab	1	ME 312	Heat and Mass Transfer	3
		16	ME 312L	Heat and Mass Transfer Lab	1
			ME 425	Design of Machine Element	3
					17

SENIOR YEAR

First Semester			Second Semester		
Course No.	Course Title	Hrs	Course No.	Course Title	Hrs
ENG 203	World Literature I	3	ENG 204	World Literature II	3
ME 412/L	Anal/Syn of Gas Turbines/Comp	4		ART 101 or 220 or 221 or MUS 101	3
ME 451	Auto Control Systems	3	ME 475	ME Design Project Continuation	2
ME 470	Mechanical Engg Design Project	2	ME 4xx	Elective	3
ME 417	Power Systems Perf. & Intg.	3	ME 413	Rocket Propulsion	3
		15	ME 416	Gas Dynamics	3
					17

[1]Must earn grade of C or better. ENG 103/104 may be taken by Int'l students.

[2]PED/MSC/HED Electives: PED 1xx, MSC 101, HED 101, FAS 101, NHM 103.

Table 5.2 Curriculum Alignment with Program Educational Objectives

Program Educational Objectives: Produce graduates who, within the first few years of their graduation:	ME Courses																																
	ME1001	ME1011L	ME1013	ME1014	ME2005	ME2006	ME2110	ME2311	ME3000	ME3001	ME3011L	ME3110	ME3112	ME3112L	ME3113L	ME3120	ME3600	ME3600L	ME3800	ME4112	ME4112L	ME4113	ME4116	ME4117	ME4225	ME4332	ME4332L	ME4511	ME4511L	ME4475	ME4772	ME4881	ME4882
1. Are successfully employed in ME related fields or have transitioned into nontraditional career paths.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2. Advance professionally as a result of his/her ability to solve complex technical problems and demonstrate professional engineering competence via promotions and/or positions of increasing responsibility			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3. Continue life-long learning via progress toward, or successful completion of an advanced degree, professional development and/or industrial training course(s), and/or engineering certification.			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4. Demonstrate service and sovereignty through involvement with community and/or professional organizations and/or make contributions towards society's greater good and prosperity.	X	X																	X											X	X	X	X

Table 5.3(a) Student Outcomes – Curriculum Matrix (Non ME Courses)

	ORI 101	ENG 101	MTH 125	CHE 101/ L	ENG 102	MTH 126	PHY 213	HIS 101	MTH 227	PHY 214	EE 201	EE 201L	HIS 102	ECO 231/ 232	ENG 203	ENG 204
(a) an ability to apply knowledge of mathematics, science, and engineering			X	X		X	X		X	X	X			X		
(b) an ability to design and conduct experiments as well as to analyze and interpret data			X	X		X	X		X	X		X				
(c) an ability to design a system, component, or process to meet desired needs																
(d) an ability to function on multi-disciplinary teams	X															
(e) an ability to identify, formulate, and solve engineering problems						X			X							
(f) an understanding of professional and ethical responsibility		X			X			X					X			
(g) an ability to communicate effectively	X	X			X										X	X
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context														X		
(I) a recognition of the need for, and an ability to engage in life-long learning								X					X			
(j) a knowledge of contemporary issues																
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practices																

Table 5.3(b) Student Outcomes – Curriculum Matrix (ME Courses)

	ME 1011	ME 1011L	ME 1013	ME 1014	ME 2044	ME 2045	ME 2046	ME 2110	ME 2311	ME 3000	ME 3011	ME 3011L	ME 3017	ME 3110	ME 3112	ME 3112L	ME 3113L	ME 3120
(a) an ability to apply knowledge of mathematics, science, and engineering	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
(b) an ability to design and conduct experiments as well as to analyze and interpret data					X							X				X	X	
(c) an ability to design a system, component, or process to meet desired needs	X	X	X						X		X			X	X			X
(d) an ability to function on multi-disciplinary teams																		
(e) an ability to identify, formulate, and solve engineering problems	X	X		X	X	X	X	X	X	X	X			X	X	X	X	X
(f) an understanding of professional and ethical responsibility	X	X											X					
(g) an ability to communicate effectively	X	X						X				X				X	X	
(h) understand the impact of engineering solutions in a global and societal context	X	X						X					X					
(I) a recognition of the need for, and an ability to engage in life-long learning			X													X		
(j) a knowledge of contemporary issues								X										
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practices			X	X					X	X		X	X	X	X	X	X	X

Table 5.3(b) Student Outcomes – Curriculum Matrix (ME Courses Continued)

	ME 360	ME 360L	ME 380	ME 412	ME 412L	ME 413	ME 416	ME 417	ME 425	ME 432	ME 432L	ME 441	ME 442	ME 451	ME 460	ME 461	ME 470/5	ME 472	ME 481	ME 482
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
(b) an ability to design and conduct experiments as well as to analyze and interpret data		**X**																		
(c) an ability to design a system, component, or process to meet desired needs			**X**	**X**	**X**			**X**	**X**	**X**	**X**	**X**	**X**	**X**			**X**		**X**	**X**
(d) an ability to function on multi-disciplinary teams																	**X**			
(e) an ability to identify, formulate, and solve engineering problems	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
(f) an understanding of professional and ethical responsibility																	**X**	**X**		
(g) an ability to communicate effectively		**X**			**X**				**X**		**X**						**X**	**X**		
(h) understand the impact of engineering solutions in a global and societal context									**X**								**X**	**X**		
(I) a recognition of the need for, and an ability to engage in life-long learning			**X**				**X**										**X**			
(j) a knowledge of contemporary issues								**X**		**X**	**X**	**X**	**X**				**X**	**X**		
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practices	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**

MECHANICAL ENGINEERING PRE-REQUISITE GUIDE

(MANUFACTURING OPTION)

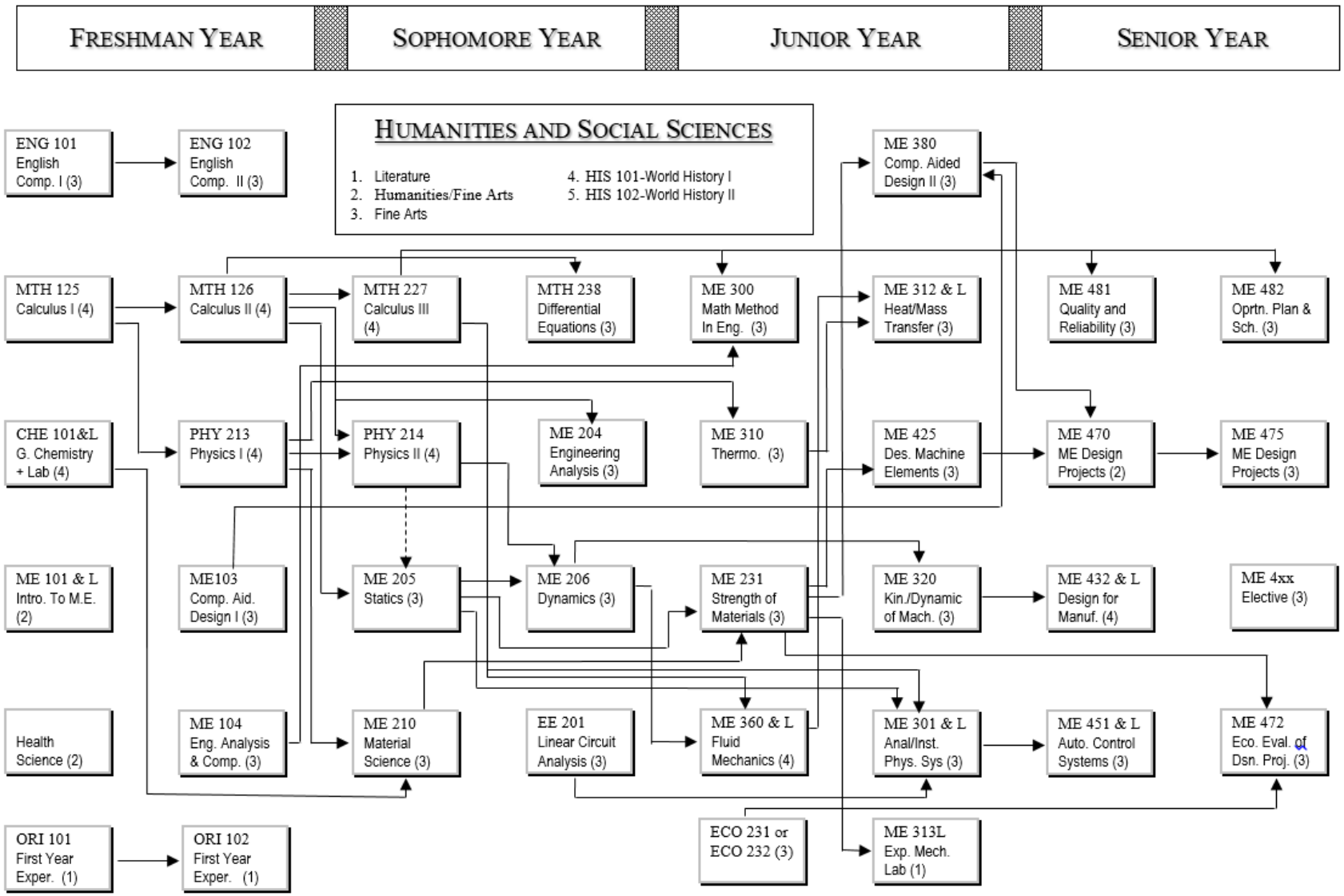


Figure 5.4(a) Prerequisite Guide for Manufacturing Systems Concentration

MECHANICAL ENGINEERING PRE-REQUISITE GUIDE

(PROPULSION OPTION)

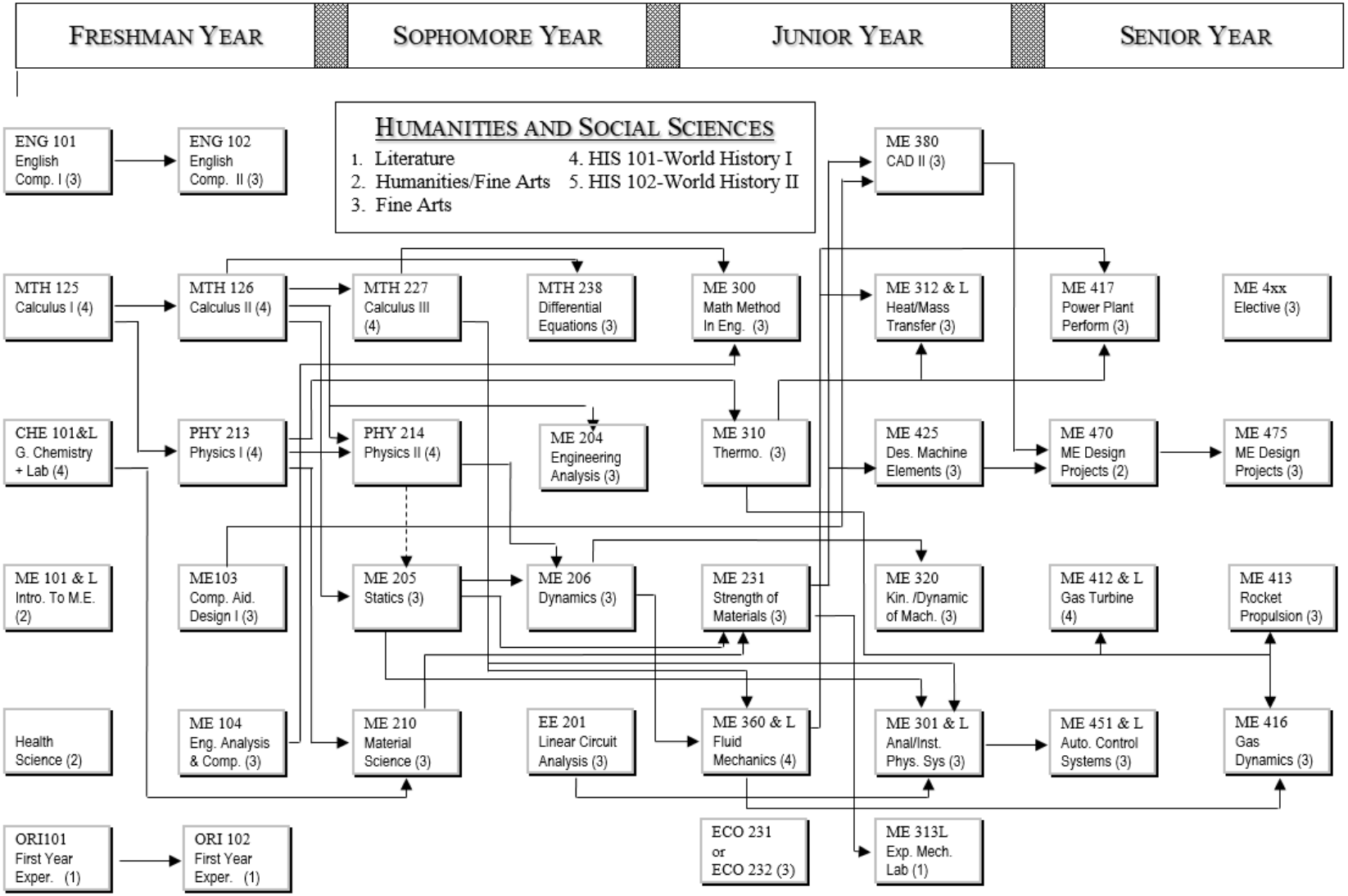


Figure 5.4(b) Prerequisite Guide for Propulsion Systems Concentration

CRITERION 6. FACULTY

A. Faculty Qualifications

Faculty is the key ingredient for providing high quality instruction and student motivation in any program. Faculty members of the Department of Mechanical Engineering at Alabama A&M University have significant academic training and research experiences that provide the skills and expertise to drive the program to grow and mature. The basic criteria used to select faculty members are:

1) Experience in teaching undergraduate students,
2) Capability to maintain research while carrying a teaching load,
3) Excellent writing skills which helps to develop students and proposals, and
4) Academic strength to extend the undergraduate curriculum and assist in the Department's MS Graduate program.

The faculty is the heart of any educational program. As shown in Table 6-1 Faculty Qualifications, the Mechanical Engineering faculty is well qualified. All the faculty members hold doctoral degrees in Mechanical Engineering or related areas. In terms of professional registration, two faculty members are registered professional engineers in the State of Alabama and other states. Faculty members are actively involved in research and/or professional activities. The diversity of the faculty is the strength of our program. Faculty members represent several different countries and nationalities, thus strengthening the global perspective of the program. All Engineering faculty members possess excellent oral and written communication skills. These attributes are considered in the hiring process.

It should be noted that during the academic year 2017-18, the ME program employed adjunct faculty in order to fill the position vacated by Dr. Xiaoqing (Cathy) Qian (currently she is the Interim Executive Director of Sponsored Program at the university). The specific data on each ME faculty member is provided in Appendix B - Faculty Vitae. The following is a summary of the characterization of the ME faculty members:

- Numbers of full-time faculty in Mechanical Engineering department are 8 positions.
- The average semester work load for fulltime faculty is 9 – 12 credit hours (actual contact hours are larger)
- Percent of faculty teach overloads is 33%
- Percentage of the faculty having externally funded research projects is 85.7%
- Faculty are evaluated annually by the chair of the department
- Faculty are evaluated by students using Course Evaluation Form
- Professional development: The faculties are supported to attend professional development conferences like American Society of Engineering Education (ASEE) Annual Conferences, Business Industry Cluster Meetings, ASME, AIAA, and various workshops.

Table 6-1. Faculty Qualifications

Mechanical Engineering

Faculty Name	Highest Degree Earned-Field and Year	Rank [1]	Type of Academic Appointment [2] T, TT, NTT	FT or PT [3]	Years of Experience			Professional Registration/ Certification	Level of Activity [4] H, M, or L		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
Aaron L Adams	Ph.D., 2013 Mechanical Engineering	AST	T	FT	10	8	8		M	M	L
Showkat Chowdhury	Ph.D., 1990 Mechanical Engineering	P	T	FT	2	26	16		L	M	L
Zhengtao Deng	Ph.D., 1991 Aerospace Engineering	P	T	FT	4	22	22		M	M	M
Mebougna Drabo	Ph.D., 2011 Mechanical Engineering	ASC	T	FT	-	6	6		H	M	M
Mohamed Gadalla	Ph.D. , 1998 Mechanical Engineering	AST	NTT	FT	2	16	7		H	M	L
Amir Mobasher	Ph.D., 1994 Mechanical Engineering	P	T	FT	3	20	20	PE	L	M	M
Mohamed Seif	Ph.D., 1988 Mechanical Engineering	P	T	FT	3	29	16	PE HPR L2	L	M	L

Instructions: Complete table for each member of the faculty in the program. Add additional rows or use additional sheets if necessary. Updated information is to be provided at the time of the visit.

1. Code: P = Professor ASC = Associate Professor AST = Assistant Professor I = Instructor A = Adjunct O = Other
2. Code: T = Tenured TT = Tenure Track NTT = Non Tenure Track
3. Code: FT = Full-time PT = Part-time Appointment at the institution.
4. The level of activity (high, medium or low) should reflect an average over the year prior to the visit plus the two previous years.

B. Faculty Workload

The normal teaching load for a tenured or tenure-track faculty member is three typical three-hour courses per semester plus 1hr lab (three-hour contact lab - either in the fall semester or the spring semester).The faculty workload is summarized in Table 6-2. Besides teaching, faculty members are expected to engage in research and scholarly activity producing publication of articles in archival journals or the equivalent (e.g., refereed conference proceedings, book chapters, or other refereed forums) annually. In addition, they are also expected to write and submit proposals for externally funded research and/or development. For service, faculty must participate in the academic life of the university serving various committees and also play an active role in professional organizations at the national level (e.g., reviewing articles and proposals, serving on technical, conference, and editorial committees, and editing archival publications).

C. Faculty Size

The size of the ME faculty is adequate to cover all of the curriculum areas of the educational program, while also allowing the faculty time for research and service activities, professional development, and interactions with industry and practitioners. All of the core courses are offered at least once a year. Some of the ME courses offered both Fall and Spring semesters. In the last six years, increasing undergraduate enrollment in the Mechanical Engineering program, has resulted in an unusually high student: faculty ratio of 40:1 in the department (advising loads of 40 undergraduate advisees per faculty member). Although manageable, a lower number would allow for a more personalized advising experience for ME students. As of Spring 2018, there are six (7.25) full-time tenured or tenure-track faculty members in the Mechanical Engineering program. The vacant tenure-track faculty position is used to hire a full time temporary faculty since Dr. Qian's current position is considered to be a temporarily one (Interim Executive Director of Sponsored Program at the university).

Interactions with Students, Student Advising and Counseling. Our faculty members have direct interaction with all students and active participation in each student's professional development. As described in Criterion I, the student advising system consists of a two-tier system; the advising is done initially collaboratively by the university college advisor and the major departmental co-advisor at the freshman and sophomore levels and then through a major advisor at the junior and senior levels. However, faculty interact closely with students in career decisions and advising, they employ NSF Undergraduate Research, and other undergraduate research students in their laboratories and research. Program faculty members also advise very active ASME, AIAA, SME, and SWE student chapters. All faculty members maintain an open-door policy for student office hours and consultation.

Professional Development. ME faculty members are active in the professional societies of the field, both mainline societies and others that tend to cross boundaries with other disciplines such as computational mechanics and aerospace science/engineering. In addition, several faculty members are active as consultants and in state-of-the-art research oriented capacities within the areas of experimental mechanics, advanced composite structures, computational

fluid dynamics, CAD applications, robotics, advanced manufacturing, alternative energy, propulsion, and materials characterization. Moreover, the faculty is strongly encouraged to bring experiences, from these contexts, into the classroom.

All faculty members are actively involved in proposal writing seeking funded research. Faculty members continue to derive valuable information from their participation in such developmental activities or sponsored research, technical presentations, workshops, and journal publishing. Several faculty members have been successful in implementing their newly acquired knowledge into classroom activities.

Services to the University and Community. In addition, the faculty members are actively involved in providing substantial service to the University. Whether elected or appointed, members of the ME faculty have been routinely called upon to serve on important university search committees at various levels, such as the Faculty Senate, University Promotions and Tenure Committee, Grievance Committee, and for numerous other standing Committees. The ME faculty actively supports various community activities. Several faculty members routinely participate in the local science fair and habitat program and get students involved, as well.

Interaction with Industry. Several local industries provide generous support to our ME Department in various ways. Industrial representatives are frequently invited as guest lecturers in many of the undergraduate classes. The ME Faculty routinely arranges field trips to manufacturing sites through direct interaction with the involved engineers. Several local engineering firms such as Boeing, Northrup Grumman, NASA – MSFC, U S Army RDECOM/AMRDEC, and Pratt & Whitney Rocketdyne provide internships and co-op opportunities to our students. Furthermore, several industries have established scholarship programs for our ME students. All the faculty members are members of ASME, AIAA and/or ASEE. ME Faculty along with the student chapter members regularly attend local ASME and AIAA branch meetings and interact directly with the local engineers. In addition, the faculty has substantial interaction with industry, government, and professional societies through their consulting and research and is thus better able to assist the professional development of their students. The program faculty members, through our industrial advisory board, have been able to maintain the expected interactions with industrial practitioners including employers of the students. The board meets twice a year and all program faculty members participate in these meetings.

D. Professional Development

Faculty members are encouraged to participate in various professional development activities to improve their teaching and research productivity. AAMU offers various on-campus teaching and research related seminars and training workshops. All these on-campus seminars are offered free to all faculty and staff. Funds to support faculty professional development are planned when the budget is prepared. The program coordinator requests enough funds to send each faculty member to at least one professional meeting per year. University Title III grant also provides funds for faculty development.

Mechanical Engineering faculty members participate in various on and off-campus professional development activities. These include participation in the local chapter of the ASME, participating in technology transfer programs, teaching Fundamentals of Engineering and Professional Engineering examination review courses, working with and helping the student chapter of AIAA in national and regional contests, and winning funded projects for research and consultancy. All our faculty have attended and presented papers at technical conferences. Some have served as panel reviewers of federal grant proposals, and as reviewers of technical and scientific journals in their areas of expertise. Several faculty members are also active in professional organizations and/or technical/scientific committees. Details of these activities can be found in the faculty CVs in Appendix B.

Support for obtaining external research is available through the AAMU - Office of Sponsored Programs. The office advises faculty members of current grant opportunities and provides assistance in grant preparation. The office also sponsors outside speakers who discuss current grant opportunities, grant writing techniques, etc.

The city of Huntsville, Alabama is the home of NASA Marshal, U S Army AMRDEC and many manufacturing and aerospace companies such as Boeing, Northrup Grumman, Pratt & Whitney Rocketdyne, Teledyne Brown Engineering, and Lockheed Martin. As such, many opportunities exist for the program faculty to engage in consulting activities and membership in professional engineering societies.

E. Authority and Responsibility of Faculty

The university re-organized in the Fall 2011by merging and re-aligning several departments, schools and programs. This resulted in merging of the Civil and Mechanical Engineering departments and eliminating one Chair position. The combined department is named "Mechanical and Civil Engineering Department." The Chair of the department is primarily responsible for assigning teaching responsibilities, managing the working budget of the department and general operation of the program in addition to teaching and research responsibilities. In collaboration with the program faculty members, the chair has responsibility for and control of the program curriculum and responsibility for program development. He is also responsible for all hiring of faculty members and other personnel in the program. He provides input to the dean on space utilization, program needs, and any additional information needed by the administration to ensure the effective management of institutional resources.

Authority over all aspects of the mechanical engineering degree program rests primarily with the program faculty. With a relatively small faculty of seven, the program faculty acts as a "committee of the whole" to deliberate over and enact changes to curricula, educational objectives, and student outcomes. While the department chair coordinates the collection and basic analysis of assessment data, evaluation and assessment take place at regular faculty meetings with all faculty participating. Similarly, individual faculty prepares "Course Assessment Data" and Action Plan" documents for their courses, which are circulated to all faculty and discussed at faculty meetings. Any faculty member may propose changes to

curriculum, objectives, and outcomes using the “Continuous Improvement” form. Such changes require a majority vote of the faculty.

The Chair plays a leading role in the continuous improvement of the program by: coordinating the collection and analysis of assessment data, setting the agenda of faculty meetings to ensure timely assessment, working with college and university committees who must consider and approve curricular changes, and coordinating the process of course assessment using “Course Assessment Data” and “Action Plan” forms. The chair also conducts constituent surveys, which are essential for the assessment and evaluation of program educational objectives.

Table 6-2. Faculty Workload Summary

Mechanical Engineering

Faculty Member (name)	PT or FT[1]	Classes Taught (Course No./Credit Hrs.) Term and Year[2]	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
Aaron Adams	FT	Fall 2017: ME101-SEC-01 to 03-Introduction to Mechanical Engineering, ME 101L-SEC-01 to 03-Introduction to Mechanical Engineering Laboratory; ME 210-Materials Science. Spring 2018: ME101-SEC-01 to 02-Introduction to Mechanical Engineering, ME 101L-SEC-01 to 02-Introduction to Mechanical Engineering Laboratory; ME 210-Materials Science.	80%	10%	10%	100
Showkat Chowdhury	FT	Fall 2017: ME205-Statics, ME 310-Thermodynamics, ME 441-Renewable Energy. Spring 2018: ME312-heat and Mass Transfer, ME312L-Heat and Mass transfer Lab, ME 425-Design of machine Elements, ME 442-Solar Thermal Engineering.	80%	10%	10%	100
Zhengtao Deng	FT	Fall 2017: ME 300-Mathematical Methods in ME, ME360-Fluid Mechanics, ME360L-Fluid Mechanics Lab. Spring 2018: ME205-Statics, ME413-Rocket Propulsion, ME416-Gas Dynamics.	65%	10%	25%	100
Mebougna Drabo	FT	Fall 2017: ME 204-Engineering Analysis, ME412-Analysis of Gas turbine, ME412L-Analysis of gas turbine Lab, ME 417-Power Sys Integ & Performance.	80%	10%	10%	100

		Spring 2018: ME 204-Engineering Analysis, ME206-Dynamics, ME 310-Thermodynamics, GEN 500-Engineering Systems Analysis.				
Mohamed Gadalla	FT	Fall 2017: ME 104-SEC-01 to 02- Engineering Analysis and Computing, ME 432-Design for manufacture, ME432L-Design for manufacture Lab. Spring 2018: ME 104-Engineering Analysis and Computing, ME380-Computer Aided Design II, ME 482-Operations Plan & Scheduling.	80%	10%	10%	100
Amir Mobasher	FT	Fall 2017: ME 231- Strength of Materials, ME451- Automatic Control Systems, ME 206-Dynamics. Spring 2018: ME 301- Instrumentation of Physical Systems, ME301L-Instrumentaion Lab, ME320-Kinematics and Dynamics of Machines, ME 472- Economic Evaluation of Design projects.	80%	10%	10%	100
Michael Ayokanmbi	PT	Fall 2017: ME 481-Quality and reliability (two sections)	25%			25
Ahmed Elsayed	PT	Spring 2018: ME 104-Engineering Analysis and Computing, ME 231- Strength of Materials, ME103-Computer Aided Design I	50%			50
Mohamed Seif	FT	Fall 2017: ME103-SEC-02-Computer Aided Design I, ME 470 Mechanical Engineering Design Project. Spring 2018: ME103-Computer Aided Design I, ME 313L-Experimental Mechanics Lab, ME 475 Mechanical Engineering Design Project II.	40%	10%	50% Admin.	100

1. FT = Full Time Faculty or PT = Part Time Faculty, at the institution
2. For the academic year for which the self-study is being prepared.
3. Program activity distribution should be in percent of effort in the program and should total 100%.
4. Indicate sabbatical leave, etc., under "Other."
5. Out of the total time employed at the institution.

CRITERION 7. FACILITIES

The Engineering, Technology and Computer Science programs are retained in the new Engineering and Technology building named Arthur J Bond Hall (AJBH) located on the South Campus of Alabama A&M University. Construction of the AJBH was begun in fall 2001 and was completed in fall 2002. The College initiated classes in the AJBH in the spring of 2003. The AJBH comprises a gross useable area of 85,319 sq. ft. The net square footage, which is defined to be the occupiable area, is 57,253 sq. ft or about 67% of the gross area. The net area, by definition, does not include electrical and mechanical equipment rooms, storage areas, corridors, restrooms, stairs, the roof terrace or janitorial spaces. The net occupiable area contains 13 classrooms, 31 dedicated laboratories, 9 research offices/laboratories, 43 faculty offices, 6 department chair offices, and the Dean's area. There are facilities for a technical library, a student study area, student organization offices, a faculty conference room, faculty lounge and a general use auditorium. The net area is adequate for the current faculty and student population.

The AJBH contains 13 classrooms with a total area of 10,006 sq ft and an average area of 770 sq. ft. Four classrooms are convertible into two large classrooms with an area of about 1500 sq. ft. each. Classrooms can accommodate 482 students, or an average of 37 students per classroom. Eight classrooms are department dedicated and five classrooms including the two "high tech" rooms are open for overload use.

There are 31 dedicated laboratories in the AJBH: 9 computer laboratories (including 1 open computer lab), 5 Civil Engineering core curriculum laboratories, 10 Electrical Engineering core curriculum laboratories, and 7 Mechanical Engineering core curriculum laboratories. Mechanical Engineering facilities also include a machine shop located within the AJBH and an Engineering Annex located on West Campus. Computer laboratories are, with exception of the "open" computer laboratory, located on the second floor of the AJBH. CE, EE and ME all have dedicated computer laboratories. Core curriculum laboratories are located on both the first and second floor of the AJBH. Civil and Mechanical Engineering laboratories are generally located on the first floor of the AJBH. These are "high bay" rooms with un-encumbered height of 18 ft. All "high bay" laboratories are equipped with single phase and three phase power (to 480V) and natural gas. All are individually cooled and ventilated. The Mechanical Engineering Senior Design Laboratory is located on the second floor. Electrical Engineering laboratories are, with the exception of the Clean Room/Micro-Fabrication Laboratory, located on the second floor of the AJBH. These laboratories have standard 10" ceiling height. EE laboratories are equipped with 120/208V, three-phase power and are individually cooled and ventilated. There are six research offices on the first floor and three on the second floor.

The Dean's area (including a dedicated conference room) is located on the second floor. There are six Department Chair Areas (office plus support area and work area). There are forty-three Faculty offices with an average area of 130 sq. ft. per office. These are generally located on the third floor. The Faculty conference room is located on the second floor and Faculty lounge is on the first floor. The student study area and the four student organization offices are located on the first floor of the AJBH. The general use auditorium, located on the second floor of the AJBH, has a capacity of over 200 persons.

A. Offices, Classrooms and Laboratories

1. Offices.

The administrative office of the Mechanical Engineering Program is located in a suite on the third floor of Arthur J Bond Hall (313 AJBH). The office is equipped with a high-capacity photocopy machine, color laser printer, and a fax machine. Three portable projectors facilitate audio/visual presentation in classrooms. The office is run by a secretary, and up to two student assistants. The office also contains the program files, reference books and office supplies cabinet. The space is adequate for a program of 8 faculty members. All program faculty and staff have their own office computers and telephones. All desktop computers are connected to the campus-wide network, allowing access to the Banner system and the internet.

Every faculty member has a well-appointed private office with an average area of 130 sq. ft. per office. This allows each faculty member to comfortably meet with and advise students. The office equipment includes standard desk, chair, bookcases, small table and two chairs for meeting with students. Each faculty member has a telephone, desktop computer/workstation, laptop and multi-function printer/copier. All faculty offices are clustered around the ME office on the third floor of Arthur J Bond Hall. There is also an office space (150 AJBH) for graduate students or adjunct faculty, if any. It has two desks, file cabinets, bookshelves, tables, a networked computer, and printer.

2. Classrooms

The Mechanical Engineering program has a reserved two 30-seat classroom in AJBH , where the program is located. These classrooms (104 and 118 AJBH) have an overhead projector and two large whiteboards. Additional classrooms can be assigned to the program. In addition, the program has two teaching computer facility. Each one consists of 30 personal computers equipped with audio-video equipment, a screen, and one large whiteboard and are located in rooms 235 and 271 AJBH. The facilities are adequate for instructional purposes. The capstone design class usually meets in the room 118 AJBH.

3. Laboratory facilities

There are 7 operating Mechanical Engineering core curriculum laboratories and 1 research dedicated laboratory that occupy an area of 8814 sq. ft of the ETB. There is also a Computer laboratory designated for the ME program, which is located on the second floor of the AJBH room 235. Mechanical Engineering laboratories include:

1. Instrumentation and Control laboratory
2. Experimental Mechanics laboratory
3. Fluid Mechanics Laboratory
4. Heat and Mass Transfer laboratory
5. Manufacturing Systems laboratory
6. High Performance Computing research laboratory

7. Thermal Engines laboratory
8. Senior Design Classroom laboratory
9. CAD Laboratory
10. Supersonic wind tunnel laboratory

These laboratories are relatively conventional mechanical engineering laboratories but additional work is being done to supplement the fluids laboratory with a supersonic wind tunnel with test section of 6"x6" with variable mach number from 0 to 4. In addition the tunnel and the laboratories will be provided with pressurized air from an air-tank-farm located outside the building. The Thermal Engines laboratory is being prepared to handle testing of small rocket motors as well as small gas turbines of 250 hp or less like the Allison 260. The major pieces of equipment used by the program in support of instruction are listed in Appendix C.

The Mechanical engineering students are required to take one electrical engineering course for which they have the opportunity to use the Linear Circuits laboratory. This lower division laboratory is dedicated to basic Electrical circuits and electronics. The laboratory is equipped with the basic equipment required to demonstrate and do experiments in fundamental Mechanical/Electrical concepts. Laboratory equipment includes oscilloscopes, multi-meters, power supplies, signal generators, circuit mock-up hardware and other teaching tools.

B. Computing Resources

The teaching computer facility consists of two CAD laboratories. Each lab has 30 personal computers. The computers available to undergraduate courses are two years old. These computers have several special purpose design software – SolidWorks, SolidEdge, Ansys, Matlab and MiniTab – installed in them. All computers are connected to the Internet. The Mechanical Engineering Computer Laboratories are used to teach ME101, ME104, ME 103, ME 300 and ME380. A full time computer technician from the College of Engineering, Technology, and Physical Sciences is available to maintain the computers.

<u>Opportunities to learn the use of modern engineering tools:</u>
Students are afforded the opportunity to use Internet services and state-of-the-art software. Additionally, common PC based programs, MATLAB and C+ compilers are available. Each student is assigned an e-mail account. There is an open Computer lab located on the first floor of AJBH that is open to all majors. The STEM Knowledge Center in AJBH also has several computers open to all majors. All computers in AJBH are installed with the same set of software. Several student dormitories have their own computer facilities with Internet connections. The addition of the new high capacity load frame provides student and faculty the opportunity to use modern data acquisition systems and testing devices.

Alabama A&M University operates and maintains a campus-wide wireless network through which students can access the internet. This network is accessible 24 hours a day in all academic, residential, and administrative buildings. In addition, The Alabama Super Computer provides free access for interested students and faculty. The computing facilities and resources

in the college are adequate to meet the educational, scholarly, and administrative needs of the students, staff and faculty in the program.

C. Guidance

All undergraduate laboratory exercises are supervised by faculty knowledgeable about the use of the relevant equipment or computing resources. As much as possible, students are encouraged to operate laboratory equipment for themselves. Most laboratory exercises begin with demonstration/training in the use of the experimental apparatus(es) by faculty. During the exercises, faculty monitors students as they use the laboratory equipment. Preparatory resources are available prior to the laboratory sessions, such as; the course text book which outlines fundamental principles of instrument operation; commonly accepted manuals of practice, course notes provided in class or in handout material. Training in the use of computer software occurs as part of laboratory exercises in several classes. This training is supervised by faculty who teach those courses.

Safety is a primary concern in all of the ME laboratories. Safety policies are posted in various laboratories which will be made available to the ABET team during their visit. One of the primary goals of the program is to get students to work in a team environment and apply the engineering experiences they have developed in previous courses so after appropriate training, student teams can work on their projects independently and interact with the instructor for help when needed. Training and safety protocols for the shop equipment are provided by the program's laboratory technician for those students wishing to learn to use the shop equipment.

D. Maintenance and Upgrading of Facilities

The university's Department of Physical Facilities is responsible for the basic maintenance of the infrastructure serving laboratory and computing facilities – water, power, custodial care, lighting, etc. Maintenance of laboratory equipment is carried out by staff and faculty. The college has one full-time technician/ machinist, an electronics technician, and one computer technician who service and repair equipment in the labs. They also fabricate materials and devices for instructional purposes. Maintenance costs are borne by departments as part of their normal budgets. The purchase and/or upgrading of equipment is the responsibility of each program/department. Until 2011, the ME program budget included an annual allocation for purchasing new equipment, computers and software and for repair costs for existing equipment. Recently the university has implemented a new policy by allocating equipment funds for each college while the college procures new equipment and software based on a prioritized list requested by each program/department. Recently requested prioritized list of equipment can be found in Appendix C, page C5.

Campus networking facilities and equipment are maintained by the Information Technology Services (ITS) of the university. The budget for ITS comes from the Provost's Office. ITS also services computers in faculty and staff offices. The cost of licenses for software programs that are used across the university (e.g., Microsoft Office, etc.) is borne by ITS while the specialized software is borne by the college or the department.

E. Library Services

Library resources are provided centrally by the University. The main library is the J. F. Drake Memorial Learning Resources Center (LRC) located in the north side of the AAMU campus, a short walk from AJBH and most departments. The catalog of library resources is online and accessible from the university computing network to university employees and students. In addition to several electronic repositories of publications, there also are search engines that identify resources that are available from a variety of sources. The library is a member of state and regional consortia for sharing resources. Print material that is not available locally normally can be obtained through inter-library loan within one or two days.

Staff

J. F. Drake Memorial Learning Resources Center (LRC)

Librarians – 6 Full-Time – Master's Degrees in Library Science
Support Staff – 10 Full-Time

The J. F. Drake Memorial Learning Resources Center is the central library that provides comprehensive resources and services in support of the research, teaching, and learning needs of Alabama A&M University. The LRC is a three story building containing 60,000 square feet of floor space designed to seat 1000 patrons and accommodate over 200,000 titles.

Services

Interlibrary Loan:

Interlibrary Loan (ILL) is a service provided by the Library that attempts to borrow materials from other libraries for Alabama A&M University faculty, staff and students that are not available in the University Libraries.

Research Services:

The Research Services concentrates on academic support and instruction for graduate students, faculty, and advanced undergraduates. Librarians in their capacity as subject liaisons to academic departments, programs, and centers provide instruction tailored to specific courses and assignments, as well as develop the Library's collection in support of teaching and research.

Technical Collection

The Engineering subject collection contains books, journals, audio-visuals and conference proceedings in: bioengineering, civil engineering, computer science, electrical engineering, environmental engineering, industrial engineering, materials science and engineering, mechanical engineering, nuclear engineering, operations research, and technology.

The book collection consists of titles that support the mechanical engineering subject areas on solid mechanics and design, computational fluid dynamics, CAD/CAM/CAE, materials, health monitoring, experimental mechanics, and robotics.

J. F. Drake Memorial Learning Resources Center

The current holding statistics for the LRC as of 5/1/2018 is the following:
Book Collection – 254,156
Bound Journals – 27,193
Government Publications – 202,053
Microform Collection – 143,872
AV Materials – 8,018

Acquisition Process

Books:

Selection of library materials is a collaborative effort involving the University faculty and the Library staff. The faculty is largely responsible for recommending the acquisition of publications within their areas of expertise. The Library is responsible for monitoring and coordinating the development of the collection as a whole, for providing the faculty with bibliographic assistance and purchase suggestions and for ordering reference and interdisciplinary materials.

The partnership between the University faculty and Library in acquiring books requires that information between departments and the Library flow easily. Each department designates a faculty member to represent their department to the Library; the Library, in turn, assigns a member of the Library faculty to each department as that department's liaison with the Library.

The Librarian over the CETPS Library is the liaison for the College of Engineering, Technology and Physical Sciences. A faculty member may request books via the Liaison Process. He or she may also send the request directly the Acquisitions Librarian.

Periodicals:

The Library will acquire only those serial publications, which directly relate to the courses offered. New titles that are available electronically will not be purchased in print.

Electronic Access

Electronic resources are made available by the University Libraries to students, staff, faculty, and other authorized users. The electronic resources may be accessed from the public computers located anywhere on the campus. Users are provided with the following resources:

Subscribed Electronic Resources: The library has licensed over 20 electronic resources that allow faculty, students and staff to locate and access databases, indexes, and other products that are provided for research purposes.

Online Public Access Catalog: The Online Public Access Catalog is the computerized **database** of the Library's holdings. The OPAC may be searched in the libraries or campus wide from any computer with internet access.

E-Book Collections: Alabama A&M University students, staff, and faculty have access to a variety of currently published books in electronic format. The library subscribes to netLibrary, a comprehensive collection of electronic books (eBooks) in a wide range of research, reference, and reading materials online. netLibrary can be accessed directly through its web site and in addition each book is listed in the Online Public Access Catalog with a link to its location on the World Wide Web.

Electronic Journals: The library subscribes to EBSCO*host* Electronic Journals Service (EJS) which is a gateway to e-journals subscribed to by the library containing millions of articles from hundreds of different publishers, all at one web site.

Alabama Virtual Library: The Alabama Virtual Library provides all students, teachers, and citizens of the State of Alabama with online access to essential library and information resources. It is primarily a group of online databases that have magazine, journal, and newspaper articles for research. Through the AVL, an equitable core of information sources is available to every student and citizen in Alabama, raising the level of excellence in schools and communities across the state.

Memberships

Network of Alabama Academic Libraries (NAAL) - The purpose of the Network of Alabama Academic Libraries (NAAL) is to coordinate academic library resource sharing to enhance education and research. NAAL is an unincorporated consortium of the Alabama Commission on Higher Education and Alabama's eligible public and private four-year colleges and universities.

OCLC - OCLC's purpose is to establish, maintain and operate a computerized library network and to promote the evolution of library use, of libraries themselves and of librarianship, and to provide processes and products for the benefit of library users and libraries, including such objectives as increasing availability of library resources to individual library patrons and reducing the rate-of-rise of library per-unit costs, all for the fundamental public purpose of furthering ease of access to and use of the ever-expanding body of worldwide scientific, literary and educational knowledge and information.

LYRASIS - LYRASIS partners with member libraries to create, access and manage information, while building and sustaining collaboration, enhancing library and technology operations, and increasing buying power. LYRASIS helps libraries operate more effectively by providing expanded access to valuable resources and professional expertise in content creation and management.

F. Overall Comments on Facilities

To ensure that our students have a safe environment to work in, all students are required to follow appropriate safety protocols whenever they are in a lab performing lab experiments or using lab equipment for a class or for research. Safety procedures appropriate to each exercise

are discussed at the beginning of the lab period. Students who are unfamiliar with the operation of any piece of lab equipment or the use of any chemicals are carefully supervised by experienced lab instructors and/or graduate assistants. First aid kits, safety eye wash fountains, showers, and telephones are located in the labs in case of emergency.

In addition, hazardous materials are inventoried periodically and they are always placed in safe storage. All of the research and teaching labs at the university are routinely visited by safety professionals in the Environmental Health and Safety department at AAMU. These visits are conducted with appropriate program faculty and the Department Head. The Mechanical Engineering program has not experienced any student injuries.

CRITERION 8. INSTITUTIONAL SUPPORT

A. Leadership

As described earlier, the program is part of the College of Engineering, Technology and Physical Sciences. The day-to-day administration of the program is the responsibility of the Department Chair and the Program Coordinator. The Department administers three programs –Civil Engineering, Mechanical Engineering and Construction Management. The Department Chair also serves as the Program Coordinator of Mechanical Engineering program. Currently, Professor Mohamed Seif serves as Department Chair and Program Coordinator of the Mechanical Engineering Program. Professor Mohamed A. Ashour serves as the Program Coordinator of the Civil Engineering Program, and Prof. Tamara Chowdhury serves as the coordinator of the Construction Management Program. Because of the relatively small size of the faculty – 8 at present – the Program has no standing committees. Most of the administrative work of the faculty can be done in regular departmental/program faculty meetings. *Ad hoc* committees for undergraduate affairs and graduate affairs are formed as needed. Committees for tenure and promotion are formed in years when there is work for such a committee. All recommendations for changing program educational objectives, student outcomes, or courses are considered by and voted upon by all full-time faculty members. The approved curriculum changes are forwarded to the College Curriculum Committee for review and approval before going to the Dean's office and then to the University Academic Standards and Curriculum Committee. Historically, all academic and curricular proposals from Engineering have been approved by the Provost. The leadership structure has been adequate to ensure the continuity and quality of the program, as evidenced by the increasing enrollments and the success of our graduates in recent years.

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B. Program Budget and Financial Support

1. The University derives financial support from student fees and from the State of Alabama. The amount of student support depends primarily on enrollment. The amount of State support for all of education depends primarily on anticipated tax revenue. The budget begins at the program level with chairs and coordinators first taking care of salaries. Next, the chairs and coordinators attempt to anticipate upcoming needs and then, wants. This budget is submitted to the chair who has the authority to modify it. The chairs submit their budgets to the dean who also has the authority to modify the budget. Once the dean has checked the budgets, they go to academic affairs. The deans are then invited to defend their budgets before a committee made up of the Provost, President, Legal Counsel, and the Vice President for Business and Finance. Chairs and program coordinators are invited to assist the dean in the presentation. The committee looks for waste and redundancy, and attempts to put priorities in place. In most instances, the academic unit is authorized to receive whatever comes out of this committee. When the entire budget is compiled, an academic unit may have further cuts if there are insufficient funds to support the composite budget. The committee will decide what to cut for each unit.

2. Graders, teaching assistants and student workers are placed in the proposed budget which is developed by the program coordinators and/or the chairs. They may acquire this

support until allocated funds run out. The University is also supported with the federal Title 3 funds. These funds are used to enhance teaching and the quality of education. Each college will be allocated funds to support this effort. The dean of the College of Engineering, Technology and Physical Sciences further allocates funds in proportion to the number of faculty members within an academic unit.

3. Funds to support the infrastructure have to be placed in the budget by the program coordinators and chairs. Additionally, Title 3 funds are used for this function. Each dean is allocated a certain amount of Title 3 funds each year. They will further allocate funds to sub-units depending on accreditation needs and the need for general laboratory upgrades.

4. Student needs are paramount to decisions being made by the University. Those needs are discussed in meetings between the chairs, program coordinators and the dean. It is left up to the program coordinators and chairs to bring the needs to the attention of the dean and the Provost and Vice President for Academic Affairs. This is done in the Deans Council meeting and the budget hearing meetings.

C. Staffing

The administrative, instructional and technical staff, and the institutional services provided to the Mechanical Engineering Program are adequate to enable the students in the Mechanical engineering program to attain the student outcomes. The Mechanical Engineering Program currently employs a full-time secretary, a technician, and one biweekly student assistant to assist the operation of daily business. The Program shares technicians to maintain the laboratory equipment with other departments in the College of Engineering, Technology and Physical Sciences. On some occasions, the Program issues service contracts for services and support needed beyond the availability or exceeds the capability of the technicians. The Information Technology Services supports faculty computing activities.

The university's Human Resources department offers a broad range of training programs on general skills and for specialized tools and programs staff uses. In addition, Alabama A&M University has tuition benefits, which allow full-time staff members to take courses at discounted tuition rate, either towards a degree or in a non-matriculated fashion. Annual staff performance reviews are performed to collaboratively set annual goals, and assess their progress towards their goals. A component of the University College, the Center for Effective Teaching and Learning (CETL), is responsible for improving the quality of faculty and staff at the University. There are training courses almost every week.

D. Faculty Hiring and Retention

1. Prior to hiring new faculty members, an academic unit must acquire permission from Academic Affairs. Permission is usually granted in the cases where there is a vacancy due to retirement or if a faculty member vacates a position due to taking another job or death.

Permission is generally granted if there is an increase in enrollment producing a large number of student credit hours. Program coordinators and chairs seek permission to hire with a letter submitted to the dean who forwards that request to the Provost. Once permission is granted by the Provost, a selection committee determines the qualifications and submits them to the Human Resources Office. That office develops an announcement and ads are placed. The selection committee's next job is to evaluate candidates. Applicants submit their documents to the Human Resource Office electronically. Only members of the selection committee have access to those documents. Once they make a decision, the data is submitted to the dean who submits it to the Provost. Next, the top candidates may be invited to the campus or a "skype" interview will be held. The committee, the dean and the Provost must agree on a candidate. An official offer is made by the Human Resources Office.

2. The most important factor is retaining faculty members is to provide competitive salaries. The Vice President for Academic Affairs either ask the dean to research these issue or he will research them himself. If the University fall behind on compensation, that information is communicated all the way to the Board of Trustee who will recommend an increase in student fees to provide sufficient compensation to retain faculty members.

E. Support of Faculty Professional Development

Generally, the program coordinator and/or chair places funds in their proposed budget for each faculty members to attend at least one conference/workshop per year. Additional funds may be requested if there are mandatory conferences and workshops that faculty members must participate in. Program coordinators and chairs are encouraged to put the request in their proposed budget and justify it during budget hearings. Faculty members are encouraged to utilize funds in sponsored research projects to assist as conferences and workshops usually support both education and research. In addition, travel funds are provided to the dean through the Title 3 project. The dean allocates funds in proportion to the size of the academic unit's faculty.

A faculty member may be granted a sabbatical from the Provost. In order to get the sabbatical, the faculty member must submit a request through their program coordinator, chair, and dean to the Office of Academic Affairs. The Provost makes the decision based upon budget, longevity with the University and the need of the academic unit. Funds to support the sabbatical come from the general fund.

PROGRAM CRITERIA

Applicable program criteria for mechanical engineering are:

1. Curriculum
   The curriculum must require students to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes; and prepare students to work professionally in both thermal and mechanical systems areas.
2. Faculty
   The program must demonstrate that faculty members responsible for the upper-level professional program are maintaining currency in their specialty area.

Students must apply principles of engineering in all of the mechanical engineering courses (ME prefixes). In these courses students must also apply basic science and mathematics (including multivariate calculus and differential equations). For example, in the laboratory courses ME 301L, ME 360L, ME 312L, ME 412L and ME 432L students must calculate the uncertainty in their measurements. This involves the calculation of partial derivatives of a function containing several variables. As another example, students in the ME206 Dynamics course must apply basic science (Newton's 2nd and 3rd laws) to solve for the motion of bodies under loads. In the ME 312 Heat Transfer course, students must solve differential equations governing heat conduction, and similarly, in ME 451 Automatic Control Systems course, students must solve differential equations governing motion and stability of systems. Syllabi with course learning outcomes are given for all the engineering, science, and mathematics courses in the curriculum in Appendix A.

Students are required to model, analyze, design, and realize physical systems in many required courses in the curriculum. As examples:

1. Students in the ME380 Computer Aided Design II course worked in small groups designed and analyzed a model of a proposed device using the SolidEdge/SolidWorks simulation software and then did the analysis using ANSYS software.
2. In the ME 231 Strength of Materials course, students model structural members using the assumptions of Euler beam theory. They then analyze the members for stress and deflection. Finally, they design the member to accommodate the loads.
3. In the ME360 Fluid Mechanics course, students model a piping network, analyzing it for pressure losses due to friction. They then design a system that can deliver a specified flow rate.
4. In the 2017-2018 Senior Design course, students model, design, analyze, test, and modify their design projects to meet their design goals. The following is a list of their projects:

   - Dual Solar/Wind Turbine
   - Supersonic Wind Tunnel Model Positioning System
   - Design of a Reusable Rocket "Revolution" with Scientific Payloads (NASA – Rocket Competition – USLI)
   - Moon Buggy Team (NASA – Moon Buggy Competition)
   - Solar Collector Design and Analysis
   - Design of Nozzle Configuration Maps for Supersonic Wind Tunnel

- Solar Panel Design and Performance Analysis
- Variable Speed and Pitch Plastic Shredder

Students are prepared to work professionally in both thermal and mechanical systems areas by a curriculum with several courses covering the two areas. Required thermo-fluids courses are: ME 360 Fluid Mechanics, ME 360L Fluid Mechanics Lab, ME 310 Thermodynamics, ME312 Heat and Mass Transfer, and ME312L Heat and Mass Transfer Lab. Required mechanical systems courses are: ME 210 Materials Science, ME 205 Engineering Mechanics: Statics, ME 206 Engineering Mechanics: Dynamics, ME 231 Strength of Materials, and ME 425 Design of Machine Elements. In addition, the course ME 380 Computer-Aided Design II includes a design project that requires work in both thermal and mechanical systems.

Program criteria also require that the faculty members responsible for the upper-level professional program maintain currency in their specialty area. As detailed in paragraph D of Criterion 6 and in the individual faculty vitae of Appendix B, all faculty members are engaged in professional development activities that maintain currency in their specialty area.

Signature Attesting to Compliance

By signing below, I attest to the following:

That Mechanical Engineering Program (*Name of the program(s)*) has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET's *Criteria for Accrediting Engineering Programs* to include the General Criteria and any applicable Program Criteria, and the ABET *Accreditation Policy and Procedure Manual.*

Dr. Chance M. Glenn
Dean's Name (As indicated on the RFE)

_____ _____
Signature **Date**

Appendix A – Course Syllabi

ME 101 - INTRODUCTION TO MECHANICAL ENGINEERING
2017 SPRING / FALL SEMESTER

Catalog Data:

Introduction to Mechanical Engineering – 1 credit hour (1 clock hour lecture period per week). Brief review of mechanical engineering as a practice is reviewed briefly. Students are required to develop a basic engineering project to include: Market outlook, basic production techniques, economic assessment, planning and design, manufacturing, testing, and product evaluation. A final technical report is required. The report includes an oral presentation and documentation in writing. Emphasis is placed on team development, consistent use of engineering units, and computer usage. Project selection is under the approval of the instructor.

Co-requisite: ME 101 L.

Textbooks:

- Studying Engineering: A roadmap to a rewarding career 4th edition by Raymond B. Landis, 2014, ISBN-13: 978-0979348747
- Bundle: An Introduction to Mechanical Engineering, 4th + LMS Integrated for MindTap® Engineering, 1 term (6 months) Printed Access Card by Jonathan Wickert / Kemper Lewis, 2015, **ISBN-13:** 978-1337193757

Instructor: Dr. Aaron Adams (aaron.adams@aamu.edu)

Class Schedule:
Section 0: EBT Room# 110 1:00pm– 1:50pm M, CRN 70404
Section 1: EBT Room# 110 1:00pm – 1:50pm W, CRN 70999
Section 2: EBT Room# 110 5:00pm – 5:50pm M, CRN 71652

Objective: This course is designed to provide the student with information regarding the engineering competencies and attributes demanded in today's engineering environment from engineering graduates. The student should be able to develop a personal pre-professional plan to develop such competencies. The student is expected to take a pro-active role in defining and assessing metrics that demonstrate the outcomes of their pre-professional plan. The student will start his/her design portfolio with a class project.

Prerequisites by topic:

1. Solution of algebraic equations
2. Fundamentals of physics
3. Basics of English composition
4. Basic engineering drawing.

Topics:
To develop the skills required for successful engineering, we will be covering a variety of topics. These include the following:

- The Mechanical Engineering Profession
- Mechanical Design
- Technical Problem-Solving Approach and Communication Skills
- Forces in Structures and Machines

- Materials and Stresses
- Fluid Engineering
- Thermal and Energy Systems
- Motor and Power Transmission
- Professional and ethical responsibility

Course Learning Outcomes: Upon the completion of the course, students will be able to

Course Learning Outcome	**Program Outcome**	**Assessment Tool**
1. Understand the role of Mechanical Engineers in industry and society	h	Homework, quiz, exams
2. Know how to select and apply factors of safety to design	e, c	Homework, quiz, exams
3. Effectively estimate and evaluate analytical results	a, e	Homework, quiz, exams
4. Effectively communicate your findings across business discipline	g	Homework, quiz, exams
5. Understand professional and ethical responsibility	f	Homework, exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	**X**
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	**X**
(g) an ability to communicate effectively	**X**
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	**X**
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	

ME 101 Lab - INTRODUCTION TO MECHANICAL ENGINEERING LAB
2017 SPRING / FALL SEMESTER

Catalog Data:

ME101L Introduction to Mechanical Engineering Lab - 1cr. hr. (Lab.3 hrs.)
This laboratory is required to develop the projects associated with ME 101 Class.
Co-requisite ME 101.

TextBook: 1) Mechanical Engineering Lab Manual 1st edition by Aaron Adams & Alan Terrill, 2016, ISBN-13978-160797-685-1
2) 8x5 X 11 Green Engineering Grid to Edge Paper

Instructor: Dr. Aaron L. Adams
Office: 256-372-4218 Email: aaron.adams@aamu.edu

Class Schedule: **Section 01:** 2:00 – 4:50 M, EBT Room# 142
Section 02: 2:00 – 4:50 W, EBT Room# 118
Section 2: 6:00-8:50 W, EBT Room# 104

Objective:

This course is designed to provide the student with basic lab practice and project related to fundamental engineering practice. It supports ME 101 Introduction to Mechanical Engineering lecture. The student will be able to apply knowledge learned in class to conduct discussion, design, team work and project.

Prerequisites: MTH 113 or consent of instructor. Co-requisite: None

Topics:

- Enhance your success as an engineering student
- Understand the role of Mechanical engineers in industry and society
- Create rudimentary models for engineering system
- Effectively estimate and evaluate analytical results
- Make and justify engineering decisions
- Understand professional and ethical responsibility
- Effectively communicate your findings across business disciplines

Course Learning Outcomes: Upon the completion of the course, students will be able to

Course Learning Outcome	**Program Outcome**	**Assessment Tool**
1. Understand the role of Mechanical Engineers in industry and society	h	Homework, quiz, exams
2. Know how to select and apply factors of safety to design	e, c	Homework, quiz, exams
3. Effectively estimate and evaluate analytical results	a, e	Homework, quiz, exams
4. Effectively communicate your findings across business discipline	g	Homework, quiz, exams

5. Understand professional and ethical responsibility	f	Homework, exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	**X**
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	**X**
(g) an ability to communicate effectively	**X**
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	**X**
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	

Alabama A&M University
MECHANICAL ENGINEERING DEPARTMENT
Spring, 2018

ME 103 Computer Aided Design I (2 credit hrs.)

Catalog Data: ME 103 Computer Aided Design I (2 credit hrs, Lect 1 hr; Lab 1 cr. Hrs.) Introduction to computer graphics user interface (gui) for Computer Aided Design (CAD), Graphics visualization and interpretation; creating engineering drawings in two and three dimensions, solid modeling utilities, assembly for manufacturing fundamentals, manufacturing process definition and implementation. Basics on solid modeling, sweeps and blends, Interaction with automated manufacturing devices and basics of Computer Aided Manufacturing (CAM). Prerequisites: none, Co-requisite: none.

References:
- Instructor Notes
- Solid Edge ST9 for Designers, Sham Tickoo, CADCIM Technologies, 14th Edition, 2016, ISBN 978-1-942689-77-5

Instructor: Dr. M. A. Seif, P.E., Phone: #5011, Email: mohamed.seif@aamu.edu
Office: ETB 307
Class Times:
2:00 - 4:50 M, Room 235 ETB

Prerequisites: None

Educational Outcomes: At the end of the course the student will be able to understand the basics of mechanical design, communicating the design through the representation of objects in two dimensional (2-D) and 3-D projections (isometrics blueprints). The student will develop basic skills to utilize modern computer aided design software for building up mechanical models utilized in Mechanical and Thermal systems design.

Objective 1: To teach students the basic principles underlying the mechanical design and computer utilization with CAD software
Objective 2: To train students to use computer software for basic mechanical design rendering.

Topics:
1. Mechanical Design and Computer Applications
2. Computer Applications to Design Processes
3. Typical user interface, view controls and modeling structures
4. Hands on for Computer object generation
4. Visualization, revolved protrusion, mirror copies, rounds, and chamfers
5. Other modeling utilities
6. Datum points and sketch drawing tools
7. Patterning and data base reproduction/distribution
8. Formal engineering drawings
9. Assembly fundamentals
10. Assembly operations
11. Dimensioning and tolerancing in manufacturing
12. Parametric issues and modeling

13. Sweeps and blends, (fine detailing)
14. Wire frame modeling
15. Surface definition/effects/concerns
16. More on surface models
17. Three Dimension Aspects of Solid Modeling
18. The Mechanical Design Process Revisited
19. Implementation of CAD into the CAM
20. The finite element method
21. Mesh generation for the finite element method, Basics
22. CAD implementation in the product realization process

Computer Usage:

Students will be required to use commercial CAD, CAM and CAE software to perform their weekly assignments.

ABET category content as estimated by coordinator:

Engineering Science: 1.5 credits
Engineering Design: 1.5 credits

Instructional Methods:

1. The instructor will present the materials through the use of lectures, visual aids, illustrations, and computer demonstrations. The overall responsibility for learning rests upon each student.
2. Attendance - Each student will be responsible for all class sessions. Absences from tests and other academic work may not be made up unless previous arrangements have been made with the instructor. Make-ups, if any, will be based on proven valid reasons.
3. All assignments must be completed by the assigned deadline date. The assignments and deadline dates will be provided by the instructor.

Course Learning Outcomes:

Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
To teach students the basic principles underlying the mechanical design and computer utilization with CAD software	a, c, i, k	Lab, Exam
To train students to use computer software for basic mechanical design rendering.	a, c, i, k	Lab, Exam

Alabama A&M University, Mechanical Engineering Department

ME 104 Engineering Analysis and Computing

Spring 2018

Catalog Data: ME 104 Engineering Analysis and Computing; Lecture 3 hrs; Credit 3 hrs.
Introduction to problem solving techniques in engineering using digital computers and Fortran programming. Topics include flow charting and emphasis on analysis and solutions of science problems in fluid dynamics, materials, structures and energy systems. Fundamentals of linear algebra are discussed.

Prerequisite: None.

Class Schedule: Tuesday, Thursday, 9:30AM-10:50AM; Location – ETB 235.

Textbook: **Introduction to C++ Excel Matlab & Basic Engineering Numerical Method V1.1**
H. G. Stenger, Smith, C.R., Pearson, Inc., 2010.

"Introduction to Engineering Analysis" by Kirk D. Hagen 4th Edition. Pearson, Inc., 2013, ISBN-13: 978-0133485080

References:

(1) Lecture and Class notes

Instructor: **Dr. Mohamed Gadalla**, Mechanical Engineering Department
Office: ETB 307, Tel: (256)-372-5891, Email: mohmaed.gadalla@aamu.edu

Objectives:

Objectives 1: This course is designed to provide freshman in engineering the ability to develop and understand the basic elements of engineering analysis and to develop computer programming skills.

Objective 2: Students develop modules necessary to analysis, predicate, and evaluate performance of mechanical, thermal, electric, and fluid systems.

Topics to be covered:

1. Introduction to Engineering Analysis, and Engineering Design.
2. Introduction to Excel and MatLab programming.
3. Discussion of typical problem formulation, mathematical modeling and programming.
4. Dimensions and Units: SI Units, English Units, and Unit Conversions.
5. Mechanics Analysis: vector and matrix operations, free body diagram, solution of set of linear equations
6. Introduction to engineering structures and materials "stress and strain".
7. Basic thermodynamics and engineering fluids nomenclature and equations: Bernoulli's equation, mass and energy conservation equations.
8. Data analysis, graphing, and visualization

Relationship to Program Objective:

This course will provide the students with the basic set of knowledge and skills to enable them to use computers and computing platforms to solve engineering problems.

Course Learning Outcomes:

Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand engineering analysis	a	Quiz
2. Understand basic Excel, MatLab and Fortran programming syntax, techniques, and procedures	k	Home work and exams
3. Know dimensional units	e	Home work and exams
4. Understand and program mechanical engineering applications	a, e, k	Home work and exams
5. Understand how to perform vector and matrix operations and find solution of set of linear equations	a, e, k	Home work and exams
6. Apply basic conservation principles, thermodynamics (energy balance, heat engines, etc.)	a, e	Home work and exams
7. Designing, building and programming graphs	k	Home work and exams

Relation of course to Program Outcomes:

Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes (as per Criterion 3)	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

ME 204 Engineering Analysis
Spring 2018

Course: ME 204 – Engineering Analysis

Catalog Data: Lecture 3 hrs; Lab 0 Hrs; Credit 3 hrs.
The goal of the course is to impart the concepts and techniques of modern linear algebra including, but not limited to, systems of linear equations and matrices, Gaussian elimination, Gauss-Jordan elimination, homogenous systems, matrix algebra, elementary matrices, inverses, determinants. Introduction to statistics and data analysis, probability and sampling distributions, error analysis, estimation and statistical intervals, the analysis of variance, experimental data, and linear regression.

Schedule: 9:00-9:50 MWF, Room: ETB 104

Prerequisites: MTH126

Instructor: Dr. Mebougna Drabo.
Room: ETB 308, Phone: (256)372-4136
Email:mebougna.drabo@aamu.edu

Textbook:
1) Linear Algebra: A Modern Introduction.4th Edition, David Poole, 2014.
2) Miller and Freund's Probability and Statistics for Engineers, Richard A. Johnson,, 9th Edition, Pearson, 2017.

Reference: Probability and Statistics with R for Engineers and Scientists, Michael Arkitas, Pearson, 1st Edition, 2016.

Objectives: Students will:
1. Students will know the various concepts of vectors and linear equations. Students will know the various methods for solving linear equations and matrices. They will be able to perform mathematical operations of matrices and understand the concepts of linear independence and linear combinations. They will be familiar with different applications of matrices such as the concepts of determinants, eigenvalues and eigenvectors, as well as similarity and diagonalization.
2. Students will be able to apply mathematical logic to higher-order problem solving, apply mathematical theory to the subject of Linear Algebra, apply the concepts of mathematics know the ideas supporting mathematical methods as they relate to Linear Algebra.
3. Apply various statistical methods to analyze engineering data
4. Apply engineering judgment on the obtained data by interpreting results of statistical analysis.

Topics:
1.1The Geometry and Algebra of Vectors
1.2Length and Angle: The Dot Product
1.3 Lines and Planes
1.4 Applications
2.1Introductions to Systems of Linear Equations
2.2 Direct Methods for Solving Linear Systems
2.2 Direct Methods for Solving Linear Systems
2.3 Spanning Sets and Linear Independence
2.4 Applications
2.5 Iterative Methods for Solving Linear Systems
3.1 Matrix Operations
3.2 Matrix Algebra
3.3 The Inverse of a Matrix
3.3 The Inverse of a Matrix

3.4 The LU Factorization
3.5 Subspaces, Basis, Dimension, and Rank
3.6 Introduction to Linear Transformations
4.1 Introduction to Eigenvalues and Eigenvectors
4.2 Determinants
4.3 Eigenvalues and Eigenvectors of nxn Matrices
4.4 Similarity and Diagonalization
5.1Introduction to statistics
5.2 Organization and Description of Data, Error analysis
5.3 Sampling Distribution
6 Regression Analysis

- The method of Least Squares
- Inferences based on the Least Squares
- Curvilinear Regression

7 Multiple Regression
8. Analysis of Variance

- Single Factor Analysis of Variance
- Single Factor ANOVA
- One Way Analysis of Variance
- One Way ANOVA

Course Learning Outcomes: Upon the completion of the course, students will be able to:

Course Learning Outcome	Program Outcome	Assessment Tool
1. Students will know the various concepts of vectors and linear equations. Students will know the various methods for solving linear equations and matrices. They will be able to perform mathematical operations of matrices and understand the concepts of linear independence and linear combinations. They will be familiar with different applications of matrices such as the concepts of determinants, eigenvalues and eigenvectors, as well as similarity and diagonalization.	a, e	Homework, quiz, exams
2. Students will be able to apply mathematical logic to higher-order problem solving, apply mathematical theory to the subject of Linear Algebra, apply the concepts of mathematics know the ideas supporting mathematical methods as they relate to Linear Algebra.	a	
3 Apply various statistical methods to analyze engineering data	a, b,e	Homework, quiz, exams
4 Apply engineering judgment on the obtained data by interpreting results of statistical analysis	a, b, e	Homework, quiz, exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**

ME 205 Statics
Fall 2017

Course: ME 205 – Statics

Catalog Data: Lecture 3 hrs; Lab 0 Hrs; Credit 3 hrs.
Principles of equilibrium, governing equations, free-body diagrams. Topics include statics and the design problem, vectorial representation of forces, analysis of mechanical systems in equilibrium, properties of forces, equivalent systems, moments, couples, and resultants. Applied problems in friction, centroids and area moments of inertia and an introduction to computer simulation techniques

Schedule: 11:00-11:50 MWF, Room: ETB 118

Prerequisites: MTH126 **Co-requisite:** PHY214

Instructor: Dr. Showkat Chowdhury.
Room: ETB 311, Phone: (256)372-8401
Email:showkat.chowdhury@aamu.edu

Office Hours: Posted on the Blackboard. Other times by appointment

Textbook: Vector Mechanics for Engineers - Statics, Ferdinand P. Beer, David F. Mazurek, and Elliot R. Eisenberg, 11th ed, McGraw Hill, 2016. ISBN:9780077687304

Prerequisites by topic:

1. Algebra of polynomial, rational, exponential, and logarithmic functions
2. Algebraic equations - linear and quadratic equations, simultaneous equations
3. Trigonometric functions, identities and equations
4. Differentiation of algebraic, trigonometric, exponential and logarithmic functions
5. Applications of the derivative – maxima and minima problems
6. Integration of algebraic, trigonometric, exponential and logarithmic functions
7. The definite integral ant its application to area and volume
8. Ability to visualize objects in three dimensions

Other Policies:

1. Students are expected to attend all classes and are responsible for all the materials covered in class.
2. Homework should be turned in on its due date. It will be graded and returned to students promptly. Homework assignments are designed to enhance students' comprehension of the course material and prepare them for examination. Copying of others' work is strictly prohibited and will only lead to inadequate performance on examinations.
3. Examinations will be close or open book. There will be no makeup examinations except under very exceptional circumstances pre-excused by the instructor. Any missed examination automatically receives a grade of ZERO. Collaboration on examination (including exchange of books, calculators, etc.) is strictly prohibited. Cheating on examinations could lead to an "F" grade in the course.
4. Any cellular telephone, PDA, or notebook computer use (calls or other functions, e.g. calculator) is not allowed during examinations.

Objectives: Students will:

1. Understand the basic principles underlying the statics of particles and rigid bodies
2. Know how to draw a free body diagram and apply equilibrium equations to particles and rigid bodies
3. Comprehend the principles of equivalent systems of force and equilibrium of rigid bodies
4. Grasp the laws of various types of dry friction

5. Acquire the skill to calculate centroids, centers of gravity, and moments of inertia of common geometric shapes

Topics:

1– Introduction
2 – Statics of Particles
3 – Rigid Bodies: Equivalent Systems of Forces
4 – Equilibrium of Rigid Bodies
5 – Distributed Forces: Centroids and Centers of Gravity
6 – Analysis of Structures
7 – Friction
8 – Distributed Forces: Moments of Inertia

Course Learning Outcomes: Upon the completion of the course, students will be able to:

Course Learning Outcome	Program Outcome	Assessment Tool
1. Know how to analyze forces acting on particles and rigid bodies	a, e	Homework, quiz, exams
2. Draw free body diagrams	a	
3. Understand the concept of equilibrium of rigid bodies	a, e	Homework, quiz, exams
4. Calculate centroids and centers of gravity of common geometric shapes	a, e	Homework, quiz, exams
5. Calculate friction forces	a, e	Homework, quiz, exams
6. Determine moments of inertia	a, e	Homework, quiz, exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**

ME 206 Dynamics
Spring 2018

Catalog Data: ME 206 Dynamics - Lec 3 Hrs; Credit - 3 hrs.
Principles of systems in motion, fundamental governing equations for particles and rigid bodies, dynamics and the design problem, vectorial representation of velocity and acceleration, relative motion, work, energy, impulse, and momentum, along with an introduction to computer simulation techniques.
Prerequisites: ME 205, MTH 126 (or concurrently), PHY 214.

Text: Vector Mechanics for Engineers – Statics/Dynamics, Beer, Johnston, Mazurek, Cornwell and Self, 12th Ed, McGraw Hill, 2019.

Coordinator: Dr. Mebougna Drabo, Assistant Professor of ME.
Office: AJB 308 **Tel**: (256) 372-4136
email: mebougna.drabo@aamu.edu

Class Times: 11:00 am – 12:20 TR, Room: ETB 118

Prerequisites by topic:

1. Trigonometric functions, identities and equations
2. Differentiation of algebraic, trigonometric, exponential and logarithmic functions
3. Applications of the derivative – maxima and minima problems
4. Integration of algebraic, trigonometric, exponential and logarithmic functions
5. Vectors – basic vector algebra, basic vector calculus and vector products
6. General Physics – application of Newton's Laws to simple problems in mechanics
7. Statics – Forces, moments and couples, free body diagrams, friction, equilibrium of rigid bodies and structures, centroids, and moment of inertia
8. Ability to visualize objects in three dimensions
9. Computer programming – Fortran, Labview or other scientific language

Objectives:

Objective 1: To teach students the basic principles underlying the dynamics of particles and rigid bodies

Objective 2: To train students to identify, formulate and solve engineering problems in particle and rigid body dynamics

Objective 3: At the end of the course students are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Brief Topics:
1. Kinematics of particles – rectilinear and curvilinear motion
2. Kinetics of particles - Newton's second law
3. Kinetics of particles – energy and momentum methods

4. Systems of particles
5. Kinematics of rigid bodies -Translation, rotation, general plane motion, absolute and relative motion
6. Kinetics of rigid bodies - Plane motion: forces and accelerations
7. Kinetics of rigid bodies - Plane motion: energy and momentum methods
8. Introduction to computer simulation techniques to analyze dynamics problems

Course Learning Outcomes:

Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcomes	Assessment Tools
Understand rectilinear and curvilinear motion, Determine position, velocity and acceleration. Integration.	a,e	Homework, Quiz, Exam
Memorize and Apply Newton's second law	a,e	Homework, Quiz, Exams
Understand energy and momentum methods, analyze particle motions using these methods.	a,e	Homework, Quiz, Exams
Understand energy and momentum methods for system of particles.	a,e	Homework, Quiz, Exams
Understand rigid body motions. Determine, compute, analyze translation, rotation.	a,e	Homework, Quiz, Exams
Analyze plane body motion,acceleration forces.	a,e	Homework, Quiz, Exams
Apply momentum and energy methods to analyze rigid body motion.	a,e	Homework, Quiz, Exams
Apply knowledge learned, design, evaluate, and analyze rigid body system	a,e	Project, Exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**

Alabama A&M University, Mechanical Engineering Department

ME 210 – Material Science

Spring 2018

Catalog Data: ME 210 Material Science; Lecture 3 hrs; Credit 3 hrs.
Structure of matter. Physical and mechanical properties of materials including metals, polymers, ceramics, composites, and electronic materials. Equilibrium diagrams and heat treatments, material selection for manufacturing and corrosion problems are also included.

Prerequisite: CHE 101, PHY 213.

Class Schedule: Section 0: TR 8:00 – 9:20, ETB, Room 119

Textbook: Fundamentals of Materials Science and Engineering: An integrated approach 5th edition by William D. Callister & David G. Rethwisch , Wiley, 2015. ISBN-13: 978-1119175483.

References: (1) Lectures and Class notes.

Instructor: **Dr. Aaron L. Adams**
Office: ETB 316, Tel: (256)-372-4128, Email: aaron.adams@aamu.edu

Objectives:

- Understand the basic classes of materials and their relevant structures, properties and applications.
- Understand how engineering structure, from multiple length scales, influences properties.
- Understand how a materials' structure can be engineered and exploited.
- Effectively communicate your findings across other discipline

Topics to be covered:

1. Atomic bonding
2. Crystal structures and descriptions via Miller Indices
3. Crystalline defects
4. Diffusion
5. Phase equilibrium, phase transformations and microstructure development
6. Mechanical properties
7. Electrical properties
8. Optical properties
9. Thermal properties
10. Magnetic properties
11. Corrosion
12. Classes of metals, ceramics, polymers and composites and their applications

Course Learning Outcomes: Upon the completion of the course, students will be able to

Course Learning Outcome	**Program Outcome**	**Assessment Tool**
1. Understand the basic classes of materials and their relevant structures, properties and applications.	h	Homework, quiz, exams
2. Understand how engineering structure, from multiple length scales, influences properties.	e	Homework, quiz, exams
3. Understand how a materials' structure can be engineered and exploited.	a, e	Homework, quiz, exams
4. Effectively communicate your findings across other discipline	g	Homework, quiz, exams
5. Contemporary Issues	j	Homework, quiz, exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(g) an ability to communicate effectively	**X**
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	**X**
(j) a knowledge of contemporary issues	**X**

ME 231 - Strength of Materials
Fall 2017

Catalog Data: ME 231 Strength of Materials; Lecture 3 hrs; Credit 3 hrs.
A study of the mechanics of deformable materials, durability, chalk propagation, performance, and life-cycle analysis; theory of stress and strain; deformations under simplified loads (axial, torsional, bending); analysis of columns, buckling loads; review of data acquisition and instrumentation for testing; material selection for design.

Prerequisite: ME 205, and ME 210.

Class Schedule: Section 01: MWF 9:00 – 9:50, ETB, Room 118

Text: Mechanics of Materials, Beer, Johnston, DeWolf, and Mazurek, 7th Edition, McGraw Hill, 2014, ISBN-13:978-0073398235.

References: (1) Lectures and Class notes.

Instructor: Dr. Amir A. Mobasher, PhD, PE
Office: ETB 309, Tel: (256)372-4151 Email: amir.mobasher@aamu.edu

Objectives: **At** the completion of this course the students will be/have:

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand the concepts of normal, shear and bending stress	a	Homework, quiz, exams
2. Know how to select and apply factors of safety to design	e, c, k	Homework, quiz, exams
3. Be familiar with Hooks law and modulus of elasticity	a, e	Homework, quiz, exams
4. Be able to calculate deformation under axial loading	a, e	Homework, quiz, exams
5. Analyze torsion and stress concentration in circular shafts	a, c, e	Homework, quiz, exams
6. Determine bending moment and stresses	a, e	Homework, quiz, exams
7. Draw shear and bending moment diagrams	a, e	Homework, quiz, exams
8. Use Mohr circle to identify the principal stresses and strains	a, e, k	Homework, quiz, exams

Lecture No.	Topic	Homework	Due
1	Introduction to Mechanics of Materials		
2-3	Introduction-Concept of stress, Normal stress, Shear stress and Bearing stress		
4	Application, analysis and design of a simple structure		
5-7	Design considerations: Ultimate strength, allowable load, factor of safety and selection of appropriate factor of safety	H1	TBD
8-11	Stress and strain in axial loading, concept of yield point, Hooke's law and modulus of elasticity,		
12-13	Deformation under axial loading, Poisson's ratio	H2	TBD
14-15	Review and problem solving session-1		
16	Test 1		
17-21	Torsion, angle of twist, power transmission, stress concentration in circular shafts	H3	TBD
22	Review and problem solving session-2		
23	Test 2		
24-27	Bending Moment and pure bending moment, stresses in pure bending	H4	TBD
28-32	Analysis and design of beams for bending- Drawing shear and bending moment diagrams.	H5	TBD
33	Review and problem solving session-3		
34	Test 3		
35-40	Transformation of stresses and strain-Mohr circle, Principal stresses and strains.	H6	TBD
41	Review and problem solving session-4		

ME 300 Mathematical Methods in Mechanical Engineering
Fall Semester 2017

Catalog Data: ME 300 Mathematical Methods in Mechanical Engineering Credit: 3
Prerequisites: MTH 227 and ME 104.
A study of solution methods for nonlinear algebraic equations, sets of linear algebraic equations, eigenvalue problems, interpolation and curve fitting, numerical integration, numerical differentiation, and or commonly, and polynomial equations. Applications in fluid mechanics, heat transfer and mass transfer, thermodynamics, kinematics, and design are covered..

Textbook: Numerical Methods for Engineers, Steven Chapra, 7th edition, 2014.

References: Curtis F. Gerald and Patrick O. Wheatly, Applied Numerical Analysis, Addison Wesley, Sixth edition.
Chapra, Applied Numerical Methodswith MATLAB for engineers and Scientists, McGrawHill, 2005.

Coordinator: Zhengtao Deng, Professor of ME

Class Schedule: Tuesday and Thursday, 11:00AM-12:20PM, 80 minutes in each session.

Prerequisites by Topic:
1. Solution of ordinary differential equations.
2. Mathematical methods for solution of physical problems
3. Fundamentals of thermodynamics and fluid mechanics.
4. Knowledge of computer programming using FORTRAN, C, Excel or MATLAB.

Objectives:
Objective 1: This course is designed to provide the student a working knowledge of approximation methods applied to the solution of typical engineering problems. To cover the analysis necessary for engineering design purposes and to develop empirical formulas for experimental data. The student will be able to utilize and develop computer programs and supporting software to identify the parameters that characterize the operation of engineering systems / subsystems or components.
Objective 2: At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics:
1. Modeling, Program software, Computers and error Analysis.
2. Solutions for non-linear equation in one-variable – Graphical method, bracking algorithm, fixed-point iteration, the Newton-Raphson method, roots of polynomials. Error analysis for iterative methods. Applications in mechanical engineering.
3. Solutions for set of linear algebraic equations. Gauss elimination, LU decomposition.
4. Optimization, Curve fitting. Least-square regression.
5. Numerical differentiation and Integration.
6. Numerical solutions to differential equations. Runge-Kutta methods.
7. Introduction to numerical solutions of partial differential equations. Application to thermodynamics, heat transfer and fluid mechanics analysis.
8. Introduction to high performance computing.

Course Learning Outcomes:

Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcomes	Assessment Tools
Solve nonlinear equation. Create computer program using Newton Iteration. Apply it to engineering	a,e	Homework, Quiz, Exam
Solve a set of linear equations. Analyze engineering problems.	a,e	Homework, Quiz, Exams
Apply linear regression methods to curve fitting and engineering data	a,e,k	Homework, Quiz, Exams, project
Understand, analyze, apply integration methods to engineering	a,e	Homework, Quiz, Exams
Solve differential equations using numerical methods. Apply it to thermodynamics, fluid mechanics.	a,e	Homework, Quiz, Exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Computer Usage:

Computer program in FORTRAN or in C, MATLAB will be developed and used to support design projects and analysis.

ALABAMA A & M UNIVERSITY
MECHANICAL ENGINEERING DEPARTMENT
ME 301 – Analysis and Instrumentation of Physical Systems
Spring/2018

Catalog Data:

A two hour lecture class. A unified introduction to dynamic engineering systems, including those with electrical, mechanical, and fluid elements. Mathematical modeling techniques subdivided in topics and used to gain insight in engineering systems and analytical as well as experimental techniques of general importance in engineering problems are presented. Basic concepts and the use of modern instrumentation, including digital systems, are covered in the lab.

Credits: Credit 2 hrs, Lecture 2 hrs;.

Prerequisites: EE 201, ME 205 and MTH 227.
Co-requisites: ME 301L.
Class Schedule: Section 01: MW 10:00 – 10:50 PM, ETB, Room 118

Text: Experimental Methods for Engineers, J. P. Holman, 8th ed., McGraw Hill, 2011. Laboratory manual, LabView resources, handouts

Instructor: Dr. Amir A. Mobasher, PhD, PE
Office: ETB 309, Email: amir.mobasher@aamu.edu

Specific Goals for the course: Students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand the concept of dynamic measurements	a, e	Homework, quiz, exams
2. Perform statistical and uncertainty analyses of data	a, e	Homework, quiz, exams
3. Learn about numerous experimental techniques and instruments used for basic mechanical engineering measurements	a, c, e	Homework, quiz, exams

Topics to be covered

No.	Topic	Homework	Due
1	Chapter 1– Introduction		
2	Chapter 2 – Basic Concepts		
3-7	Chapter 3 – Analysis of Experimental Data	H1	TBD
8-10	Chapter 4 – Basic Electrical Measurements and Sensing Devices	H2	TBD

11	Review and problem solving session-1		
12	Test 1*		
13-14	Chapter 6 – Pressure Measurement	H3	TBD
15-16	Chapter 7 – Flow Measurement	H4	TBD
17-20	Chapter 8 – The Measurement of Temperature	H5	TBD
21	Review and problem solving session-2		
22	Test 2*		
23-25	Chapter 10 – Force, Torque, and Strain Measurements	H6	TBD
26	Review and problem solving session-3		
27	Project Due		
28	Review and problem solving session-4		

***Test dates are tentative.**

Course Learning Outcomes: Upon the completion of the course, students will be able to:

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand the concept of dynamic measurements	a, e	Homework, quiz, exams
2. Perform statistical and uncertainty analyses of data	a, e	Homework, quiz, exams
3. Learn about the experimental techniques and instruments used for basic mechanical engineering measurements	a, c, e	Homework, quiz, exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(c) an ability to design a system, component, or process to meet desired needs	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**

ALABAMA A & M UNIVERSITY
COLLEGE OF ENGINEERING & TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT

Spring/2018

Course: ME 301L – Analysis and Instrumentation of Physical Systems Lab
Credits: Lecture 0 hrs; Lab 3 hrs; Credit 1 hrs.
Catalog Data:. Laboratory supporting the required practices for ME 301
Co-requisites: ME 301.
Class Schedule: Section 01: M 2:00 – 4:50 PM, ETB, Room 118
Text: Experimental Methods for Engineers, J. P. Holman, 8th ed., McGraw Hill, 2011.
Laboratory manual, LabView resources, handouts
Instructor: Dr. Amir A. Mobasher, PhD, PE
Office: ETB 309, Email: amir.mobasher@aamu.edu

Specific objectives of the course:

	The students will be able to:	**Evidence**
1	apply theoretical knowledge to analyze experimental observations (a,b)	Laboratory exercises and reports
2	Perform basic mechanical engineering measurements (k)	Laboratory exercises and reports
3	learn how to estimate the error and reliability of experimental data (b)	Laboratory exercises and reports.
4	Know how to use data acquisition systems and Lab View software (k)	Laboratory exercises and reports.
5	document the results of experiments in a technical report (g)	Laboratory exercises and reports

COURSE OUTLINE

(Subject to Minor Changes)

Week	Topics
1	Introduction
2	Design of Experiments
3	Exercise #1. Determination of Time constant for a first order system
4	Workshop: Technical report writing- Experiment 1
5	Exercise #2: Calibration of potentiometer
6	Exercise #3: Measurement of Height using potentiometer
7	Exercise #4: Introduction to data acquisition with Lab View

8	Exercise #5: Measurement of Temperature – Thermocouples
9	Exercise #6: Measurement of Temperature – Thermistors
10	Exercise #7: Measurement of Force - Load Cells

Relationship to Program Outcomes:

Outcomes a - k	**Explanation**	**Evidence**
a. An ability to apply knowledge of mathematics, science and engineering	Students are required to apply knowledge of Mathematics, Physics, Statistics, and Electric Circuits to set-up and perform experiments.	Laboratory exercises and reports
b. An ability to design and conduct experiments as well as to analyze and interpret data	The main focus of the course is on the ability to design and conduct experiments and to analyze and interpret experimental and numerical data.	Laboratory exercises and reports
d. An ability to function on multidisciplinary teams	Students learn to work in teams to perform experiments	reports are prepared to identify the collaborative efforts
e. An ability to identify, formulate and solve engineering problems	The students learn to identify, formulate and solve engineering problems and then test and verify their engineering analysis of experimental data.	Laboratory exercises and reports
f. An understanding of professional and ethical responsibility	Students are exposed to ethical and professional responsibility issue through team work and by meeting requirement demands under given time constraints	Laboratory exercises and reports
g. An ability to communicate effectively	The student are required to write technical reports and communicate orally with the instructor	Laboratory exercises and reports, Classroom discussions,
k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	Students use numerical tools such as Lab View and MATLAB	Laboratory exercises and reports

Course number and name: ME 307 Fundamentals of Nuclear Engineering

Credits and contact hours: 3, 3

Instructor: Dr. Stephen Egarievwe

Text Book: **J. R. Lamarsh and A. J. Baratta,** *Introduction to Nuclear Engineering*; 3rd or Latest Edition, Prentice Hall (2001) **ISBN-13: 978-0201824988**; **ISBN-10: 0201824981**

References: (1) **I. Kaplan;** *Nuclear Physics*, **Any Edition or Latest** Edition, Addison Wesley Publishing or successor Publisher

(2) Any Nuclear Physics Book by any Author(s)

Course description: This course covers basic atomic and nuclear physics, fundamentals of radiation, knowledge of radioactive decay, binding energy, types of interactions, shielding, and radioisotopes, fission cross section, fission in a reactor, controlling fission chains, nuclear reactor, components of nuclear reactors, nuclear fuel cycles, radioactive waste storage and disposal, reactor accidents, safety, nonproliferation and national security, radiation effects, radiation detectors, etc.

Prerequisites: CHE 101, CHE 101L, PHY 214, Approval of the Advisor
Junior Standing in Electrical Engineering or Junior Standing in Mechanical Engineering;

Required course for Nuclear Power Concentration

Course Learning Outcomes: Upon completion of the course, students will be able to:

Course Learning Outcome	Program Outcome	Assessment Tool
1. Students will be able to apply knowledge of atomic structure, atomic weight, number densities, mass and energy, mass defect, and binding energy.	a, f, h, k	Homework, Exams
2. Students will be able to apply knowledge of excited states, radioactive decay, radioactivity calculations, nuclear reaction, and nuclear reactions	a, f, h, k	Homework, Exams
3. Students will be able to apply knowledge of charge Particle interactions and neutron interactions	a, f, h, k	Homework, Exams
4. Students will be able to apply knowledge of fundamentals of fission, fission chain reaction, neutron flux, and Fick's law of diffusion.	a, f, h, k	Homework, Exams
5. Students will be able to use the concept of biological and environmental effects of nuclear radiation.	a, f, h, k	Homework, Exams
6. Students will be able to apply knowledge of basic principles of nuclear radiation detection, nuclear waste management, and non-proliferation.	a, f, h, k	Homework, Exams

Relation of course to Student Outcomes:

Student Outcomes	
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	
(f) an understanding of professional and ethical responsibility	**X**
(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	**X**
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	**X**

Topics Covered:

1. Overview of Nuclear Engineering: atomic structure, atomic weight, number densities, mass and energy, mass defect, and binding energy
2. Exicited states, radioactive decay, radioactivity, and nuclear reactions
3. Fundamentals of charge particle interactions, neutron interactions, fission, and fission chain reaction
3. Neutron diffusion, neutron flux, and Fick's law
4. Basics of nuclear reactor theory
5. Basics of biological and environmental effects of nuclear radiation.
6. Radiation protection and radiation shielding
7. Reactor safety issues

Alabama A&M University, Mechanical Engineering Department

ME 310 Thermodynamics

Spring 2018

Catalog Data: ME 310 Thermodynamics; Lecture 3 hrs; Credit 3 hrs.
A study of basic thermodynamics properties; pressure, temperature, work, specific volume, and energy. The first and second law of thermodynamics, closed and open systems, enthalpy and entropy; properties of gas mixtures and air-vapor mixtures; as well as basic applications are covered.
Prerequisite: PHY 213.

Textbook: **Thermodynamics: An Engineering Approach.**
Yunus A. Cengel , Michael A. Boles, and Mehmet Kanoglu McGraw Hill, 9th Edition, 2019

References: Thermodynamics: An Engineering Approach.
Yunus A. Cengel and Michael A. Boles, McGraw Hill, 8th Edition, 2015.

Coordinator: **Dr. Mebougna Drabo**, Mechanical Engineering Department
Office: ETB 308 Tel: (256)-372-4136 Email: mebougna.drabo@aamu.edu

Class Schedule: Monday, Wednesday, Friday, 11:00 – 11:50AM; Room – ETB 103

Objectives:

Objective 1: This course is designed to provide the student a basic working knowledge of engineering thermodynamics with the inclusion of open ended problems in the design of thermal systems and consideration to the thermodynamics of thermal systems. The student will be able to identify the parameters that characterize the operation of vapor power systems and gas power systems.

Objective 2: At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics to be Covered:

Thermodynamic systems, and fundamental concepts (Property, state, process and equilibrium). System of units. Methodology to solve thermodynamic problems.

Energy systems and first law of thermodynamics. Concepts of energy, methods for energy transfer, energy of a system, energy balance, analysis of energy of simple thermodynamic systems.

Properties of pure and simple compressible substances. The state postulate, P-V-T relations, property data of thermodynamic systems, comparison with the ideal gas model.

Control volume approach to energy system analysis. Continuity, momentum and energy equations. Steady state and transient analysis, review of first law of thermodynamics for open system. Enthalpy.

Energy systems and second law of thermodynamics. Entropy and the quality of energy available. Irreversible and reversible processes. Second law and thermodynamic cycles. Absolute zero, absolute entropy, the third law of thermodynamics. Maximum performance measures for power, refrigeration and heat pump cycles operating between two reservoirs.

Entropy and design of power system components. The isentropic process. Thermodynamic efficiency of turbines, nozzles, compressors and pumps. Heat transfer and work in steady state flow process.

Available energy analysis and thermodynamics of vapor power systems, Rankine cycles, regenerative vapor power cycle, cogeneration, case study, analysis of a vapor power plant.

Energy analysis of gas power systems. Air standard Otto cycle, diesel cycle, Bryton cycle. Gas turbines for aircraft propulsion. One dimensional steady flow in nozzles and diffusers.

Basics of refrigeration and heat pump systems.

Relationship to Program Objective:

This course will provide students the basic working knowledge of engineering thermodynamics with the inclusion of open ended problems in the design of thermal systems, and help pursue professional carrier in Mechanical Engineering.

Course Learning Outcomes:

Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
Understand the concept of thermodynamic systems, property, state, process and equilibrium.	a	Homework, Exam
Understand energy systems and first law of thermodynamics. Analyze energy of simple thermodynamic systems.	a, c, e	Homework, Exam
Evaluate properties of pure and simple compressible substances.	a, e	Homework, Exam
Use control volume approach to energy system analysis. The general conservation equation for a control volume, continuity, momentum and energy. Steady state and transient analysis, review of first law of thermodynamics for an open system. Enthalpy.	a, e, k	Homework, Exam
Understand energy systems and second law of thermodynamics. Entropy and the quality of energy available. Irreversible and reversible processes. Second law and thermodynamic cycles. Absolute zero, absolute entropy, the third law of thermodynamics. Maximum performance measures for power, refrigeration and heat pump cycles operating between two reservoirs.	a, e, k	Homework, Exam
Learn entropy and design of power system components. The entropy balance for closed and open systems. The isentropic process. Thermodynamic efficiency of turbines, nozzles, compressors and pumps. Heat transfer and work in internally reversible steady state flow process.	a, c, e	Homework, Exam
Learn available energy analysis and thermodynamics of vapor power systems, Rankine cycles, regenerative vapor power cycle.	a, c, e	Homework, Exam
Learn energy analysis of gas power systems. Air standard Otto cycle, Diesel cycle, Bryton cycle. Gas turbines for aircraft propulsion. One dimensional steady flow in nozzles and diffusers.	a, c, e	Homework, Exam
Learn basics of refrigeration and heat pump systems.	a, e	Homework, Exam

Relation of course to Program Outcomes:

Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes (as per Criterion 3)	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(c) an ability to design a system, component, or process to meet desired needs	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Alabama A&M University, Mechanical Engineering Department

ME 312 Heat and Mass Transfer

Spring Semester 2018

Catalog Data: ME 312 Heat and Mass Transfer; Lecture 3 hrs; Credit 3 hrs.
Fundamentals of heat transfer by conduction, convection, and radiation; mass transfer by convection. Basic system applications in engineering and component performance.
Prerequisite: ME 310, ME 360. Co-requisite: ME 312L.

Class Schedule: Mon, Wed, Friday, 11:00-11:50AM; Location – ETB 104.

Textbook: **Fundamentals of Heat and Mass Transfer, Enhanced eText**
Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera and David P. DeWitt, John Wiley & Sons Inc., 8th Edition, 2017.
ISBN-13: 978-1-119-32042-5

References: (1). Lecture notes
(2). Heat and Mass Transfer: Fundamentals and Application.
Yunus A. Cengel and Afshin J. Ghajar, McGraw Hill, 5th Edition, 2014.

Instructor: **Dr. Showkat Chowdhury**, Mechanical Engineering Department
Office: ETB 311, Tel: (256)-372-8401, Email: showkat.chowdhury@aamu.edu

Objectives:

Objective 1: This course is designed to provide the student a basic working knowledge of heat and mass transfer processes with the inclusion of open ended problems in the design of thermal systems and consideration to the economics of system performance. Theoretical, empirical and practical relations for heat and mass transfer will be utilized in selected open-ended problems in the basic design of thermal systems. The student will be able to utilize computer based methods and software to identify the parameters that characterize the operation of heat exchangers and other system components.
Objective 2: At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics to be Covered:

Introduction to Basic Modes of Heat Transfer – Conduction, Convection, Radiation.
One-Dimensional Steady-State Conduction.
Conduction with Thermal Energy Generation.
Heat Transfer from Extended Surfaces.
Steady-State Conduction in Multi-Dimension, Numerical Analysis Methods.
Transient Conduction, Lumped Capacitance Method, Spatial Effects.
Introduction to Convection, Velocity Boundary Layer, Thermal Boundary Layer, Concentration Boundary Layer, Laminar and Turbulent Flow.
Empirical and Practical Relations for Forced-Convection Heat Transfer, External Flow.
Internal Flow, Hydrodynamic Considerations, Thermal Considerations, Energy Balance, Laminar Flow in Circular Tubes, Turbulent Flow in Circular Tubes, Convection Correlations for Noncircular Tubes.
Free Convection, Boiling and Condensation.
Heat Exchangers.

Intro to Radiation Heat Transfer, Mass Transfer: Diffusion, Convection and Combustion Process.

Relationship to Program Objective:

This course will provide students the basic working knowledge of heat and mass transfer processes in the design of thermal systems and system performance, and help pursue professional carrier in Mechanical Engineering.

Course Learning Outcomes:

Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome (as per Criterion 3)	Assessment Tool
Differentiate Basic Modes of Heat Transfer — Conduction, Convection, Radiation.	a	HW, Exam
Analyze 1-D Steady-State Conduction problems	a, c, e	HW, Exam
Solve conduction problems with Thermal Energy Generation	a, e	HW, Exam
Evaluate Heat Transfer from Extended Surfaces.	a, c, e	HW, Exam
Compute Steady-State Conduction In Multi-Dimension, using Numerical Analysis Methods.	a, e, k	HW, Exam
Solve Transient Conduction problems using Lumped Capacitance Method, and consider Spatial Effects.	a, e, k	HW, Exam
Distinguish basic Convection, Velocity Boundary Layer, Thermal Boundary Layer, Concentration Boundary Layer, Laminar and Turbulent Flow.	a, e	HW, Exam
Solve problems using Empirical and Practical Relations for Forced-Convection Heat Transfer, for External Flow.	a, e	HW, Exam
Analyze Internal Flow problems – Hydrodynamic Considerations, Thermal Considerations, Energy Balance, Laminar Flow in Circular Tubes, Turbulent Flow in Circular Tubes, Convection correlations for Noncircular Tubes.	a, e	HW, Exam
Understand Free Convection, Boiling And Condensation.	a, e	HW, Exam
Analyze Heat Exchanger performance.	a, e, k	HW, Exam
Solve simple Radiation Heat Transfer problems.	a, e	HW, Exam
Understand Mass Transfer: Diffusion, Convection and Combustion Process.	a, e	HW, Exam
Solve Design Projects	a, e	Project

Relation of course to Program Outcomes:

Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes (as per Criterion 3)	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(c) an ability to design a system, component, or process to meet desired needs	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Alabama A&M University, Mechanical Engineering Department

ME 312L Heat and Mass Transfer Lab

Spring Semester 2018

Catalog Data: ME 312L Heat and Mass Transfer Lab; Lab 3 hrs; Credit: 1 hr.

Fundamentals of heat transfer by conduction, convection, and radiation; mass transfer by convection. Basic system applications in engineering and component performance.

Prerequisite: ME 310, ME 360. Co-requisite: ME 312.

Class Schedule: Monday 2:00-4:50P T; Location – ETB 143

Textbook: **Fundamentals of Heat and Mass Transfer, Enhanced eText**
Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera and David P. DeWitt, John Wiley & Sons Inc., 8th Edition, 2017.
ISBN-13: 978-1-119-32042-5

References: (1). Lecture notes
(2). Heat and Mass Transfer: Fundamentals and Application.
Yunus A. Cengel and Afshin J. Ghajar, McGraw Hill, 5th Edition, 2014.

Instructor: **Dr. Showkat Chowdhury**, Mechanical Engineering Department
Office: ETB 311, Tel: (256)-372-8401, Email: showkat.chowdhury@aamu.edu

Course Objectives:

1. Familiarize the student with laboratory testing equipment used in heat transfer analysis.
2. Use laboratory equipment to demonstrate various modes of heat transfer.
3. Emphasize reinforcement of materials presented in class.
4. Analyze the performance of heat exchangers.
5. Develop computer-based models to analyze the heat transfer during different processes.
6. Analyze experimental data and correlate experimental results to theoretical models.
7. Enhance technical report writing and data presentation skills.

Relationship to Program Objective:

This course will provide students the knowledge to analyze heat and mass transfer processes in the design of thermal systems and evaluate system performance. Report writing and data presentation skills are developed by the preparation of technical reports. These knowledge/skills will help the students to successfully practice the profession of mechanical engineering.

Relation of course to Program Outcomes (as per Criterion 3):

Outcomes a - k	Explanation	Evidence
a. An ability to apply knowledge of mathematics, science and engineering	Students are required to apply knowledge of Mathematics, Heat Transfer, Thermodynamics, and Fluid Mechanics to set-up and perform experiments.	Laboratory reports, exams
b. An ability to design and conduct experiments as well as to analyze and interpret data	The main focus of the course is on the ability to design and conduct experiments and to analyze and interpret experimental and numerical data. Students design experiments	Laboratory reports, exams

	to test different heat transfer processes, and simulate various mechanical components to analyze heat transfer.	
e. An ability to identify, formulate and solve engineering problems	The students learn to identify, formulate and solve engineering problems in Heat Transfer, and then test and verify their design through hands-on experiments and computational tool.	Laboratory reports, exams
g. An ability to communicate effectively	Presentation of the student reports and through communication between the team members and the instructors.	Classroom discussions, Team meetings
i. A recognition of the need for and an ability to engage in lifelong learning	The need for lifelong learning of improvements and development of numerical and experimental tools in engineering are emphasized.	Classroom discussions
k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	Students use numerical tools such as Interactive Heat Transfer (IHT) software, EXCEL and modern experimental devices such as thermocouples, data acquisition boards and mechanical components in setting-up and conducting experiments.	Laboratory reports

Lab Schedule:

Week No.	Topic
1-2	Introduction Addressing various modes of Heat Transfer
3	Expt #1: Heat Transfer Analysis through a Composite Oven Wall
4	Expt #2: Heat Transfer with Thermal Energy Generation
5	Expt #3: Determination of Thermal Conductivity of a Specimen
6	Expt #4: Calculation of Heat Transfer from an Extended Surface
7	Expt #5: Heat Transfer Analysis for a Curing Process
8	Expt #6: Heat Transfer from a Flat Plate with Segmented Heaters
9	Expt #7: Combined Convection and Radiation Heat Transfer Analysis
10	Discussion about various types of Heat Exchangers
11	Expt #8: Analysis of a Double Pipe Heat Exchanger
12	Expt #9: Heat Transfer Analysis in a Shell-and-Tube Heat Exchanger
13	Exam

Alabama A&M University
MECHANICAL ENGINEERING DEPARTMENT
Spring, 2018

COURSE: ME 313L **Experimental Mechanics Lab** 1 Credit
Schedule: 2:00-4:50 W, Room: ETB 118

INSTRUCTOR: Mohamed A. Seif, Ph.D., P.E.
Room: ETB 314
Phone: #5011, Email: mohamed.seif@aamu.edu

TEXTBOOK: Lab Manual and Instructor Handouts.

REFERENCES:
- Figliola RS, Beasley DE, Theory and Design for Mechanical Measurements. John Wiley & Sons, Inc., New York, 2014.
- Gere JM, Goodno BJ, Mechanics of Materials, ninth edition. Cengage Learning, 2018.

COURSE DESCRIPTION: Lect. 0, Lab 3, 1 credit. Introduction to experimental stress analysis; measurement of tensile, compressive, bending and shear stresses; impact and hardness tests; vibration measurements, modal analysis; structural dynamics; Strain Gages. Prerequisite: ME 210 Materials Science, Corequisite: ME 231 Strength of Materials.

COURSE OBJECTIVES
1. Familiarize the student with laboratory testing equipment used in experimental mechanics
2. Use laboratory equipment to demonstrate the mechanical behavior of common engineering materials
3. Develop computer-based models to describe the behavior of different Materials
4. Analyze experimental data and correlate experimental results to theoretical models
5. Enhance technical report writing and data presentation skills

Relationship to Program Objectives
This course primarily serves students in the department. Report writing and data presentation skills are developed by the preparation of technical reports. These skills combined with hands-on experimental mechanics skills and experience with numerical techniques, contribute towards the knowledge base needed to successfully practice the profession of mechanical engineering.

Relationship to Program Outcomes:

Outcomes a - k	Explanation	Evidence
a. An ability to apply knowledge of mathematics, science and engineering	Students are required to apply knowledge of Mathematics, Statics, Dynamics, and Mechanics of Materials to set-up and perform experiments.	Laboratory reports, exams
b. An ability to design and	The main focus of the course is on the ability	Laboratory

conduct experiments as well as to analyze and interpret data	to design and conduct experiments and to analyze and interpret experimental and numerical data.	reports, exams
e. An ability to identify, formulate and solve engineering problems	The students learn to identify, formulate and solve engineering problems in mechanics and then test and verify their design through hands-on experiments.	Laboratory reports, exams
g. An ability to communicate effectively	Oral presentation of the student reports and through communication between the team members and the instructors.	Classroom discussions, Oral presentations, Team meetings
k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	Students use numerical tools such as MATLAB, EXCEL and Minitab and modern experimental devices such as sensors, data acquisition boards and mechanical and dynamic components in setting-up and conducting experiments	Laboratory reports

COURSE OUTLINE

Week	**TOPICS** (Subject to Minor Changes)
1-2	- Introduction - Addressing uncertainty, Stress, Strain, and Deflection
3	- Statistical analysis of data
4	**Experiment #1**: Uni-axial stress-strain relationships
5	**Experiment #2:** Torsion of solid and thin-wall bars and determination of the modulus of rigidity
6	**Test #1** **Experiment #3:** Fatigue Testing of Metals
7	**Experiment #4:** Hardness Testing of Metals
8	**Experiment #5:** Modulus of Elasticity using Strain Gage – Flexure
9	**Experiment #6:** Poisson's Ratio using Strain Gage – Flexure
10	**Experiment #7:** Principal Strains and Stresses – Flexure
11	**Test #2** **Experiment #8:** Ultrasonic Testing.
12	**Experiment #9:** Natural Frequencies of Structures
13	**Experiment #10:** Measurement of the Dynamic Response of a Structure
14	**Experiment #11:** Materials behavior under High and Low Temperatures
15	**Final Exam**

ALABAMA A & M UNIVERSITY
COLLEGE OF ENGINEERING & TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT

Spring/2018

Course: ME320-Kinematics and Dynamics of Machinary

Catalog Data: Kinematics and Dynamics of Machines – 3 credit hours. Kinematics and dynamics of machine elements, vector loop approach, numerical methods and graphical techniques, kinematics coefficients, newton formulation, power equation, gears and cams, static and dynamic balancing, critical speeds of shafts.

Schedule: 8:45-10:00,MW, Room: ETB 118

Prerequisites: ME104 Engineering Analysis and Computing,
ME 206 Dynamics

Instructor: Amir A. Mobasher, Ph.D.,P.E.

Contact: amir.mobasher@email.aamu.edu
(256)372-4151

Textbook: Uicker, Pennock and Shigley *Theory of Machines and Mechanisms*, Oxford University Press, 5th edition, 2016, ISBN:978-0-19-026448-2

Objectives:
It is expected that at the completion of this course the students will:

1. Have a working knowledge of analysis and design of linkage systems including position, velocity and acceleration analysis
2. Will be familiar with the concept of Cams, Gears, Gear trains
3. Learn the concept of synthesis linkages using inverse methods
4. Become familiar with power train and power train components
5. Be able to evaluate dynamic performance of mechanical systems using numerical or virtual prototyping methods.

Topics to be covered

Lecture	Topic	Assignment	Due
1	Introduction to Kinematic Systems		
2-3	Review of Vectors and vector properties	HWK 1	TBD
4-5	Introduction to Chace's Method/position analysis		
6	Cardboard Mechanism Practice (Slider-Crank Mechanism)	HWK 2	TBD
7-8	Position analysis (continued)	HWK 3	TBD
9	Velocity analysis (Chace's Method)		
10	Acceleration Analysis	HWK 4	TBD
11	Exam No. 1		
12	Review of exam 1./Introduction to synthesis		
13	Synthesis of linkage systems		

14-15	Chebyshev averaging/Freudestein theorem	HWK 5	TBD
16-17	Case study and examples of synthesis		
18	Exam No .2		
19	Review of Exam 2.		
20	Introduction to Cams and terminology of Cams		
21-24	Design of high speed cams	HWK 6-7	TBD
25	Exam no. 3		
26	Review of Exam 3		
27-28	Integration of concepts (Introduction to gear trains)		
29	Review		

Course Learning Outcomes
Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand the concept of Linkages and Linkage systems	a,c,e	Homework, Quiz, Hands on exercises
2. Perform position, velocity and acceleration analysis on Linkage systems. Design Cams, Gears and gear train systems.	a,c	Homework, quiz, exams
3. Develop prototypes of linkage systems	k	Hands on exercises

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(c) an ability to design a system, component, or process to meet desired needs	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

ME 360 Fluid Mechanics

Fall 2017

Catalog Data: ME 360 Fluid Mechanics
Credit: 3
ME 360 Fluid Mechanics, Lecture 3hrs, Credit 3.
Fundamentals of fluid mechanics are covered. Newtonian fluids, system of units, fluid statics and kinematics, incompressible fluid flow, Bernoulli's equation, conservational principles of mass, momentum and energy, flow in pipes, internal and external flows, compressible fluid flow, flow through turbomachinery. Relevance to engineering applications.

ME 360L Fluid Mechanics Lab, 3 hours lab, credit 1. Supports projects / practices of ME 360.
Co-requisite ME 360.

Prerequisite: MTH 227(Offered-consult advisor). Co-requisite ME 360L.

Textbook: Fluid Mechanics Fundamentals and Applications, Yunus A. Cengel, John M. Cimbala, Fourth Edition, ISBN 978-1-259-69653-4, 2018.
Essentials of Fluid Mechanics-Fundamentals and Applications
Customized Book, 2014, Zhengtao Deng, based on Essentials of Fluid Mechanics-Fundamentals and Applications**,** John M. Cimbala and Yunus A. Cengel, McGrawHill.

References: (1). Lecture notes
(2). An Album of Fluid Motion, Milton Van Dyke**.** The Parabolic Press, 1982.

Coordinator: Z.T. Deng, Professor of ME

Class Schedule: T,Th, 8:00-9:20AM. Monday 2:00-4:50PM Lab.

Prerequisites by Topic:

1. Fundamentals of thermodynamics with applications in open system, one-dimensional isentropic flows.
2. Fundamentalf of fluid dynamics and applications to propulsion system.
3. Knowledge of computer programming using FORTRAN, C, MATLAB, or LabView.

Objectives:

This course is designed to provide the student a basic working knowledge of engineering fluid mechanics with the inclusion of open ended problems in the design of fluid systems and consideration to the economics of fluid systems performance. The student will be able to identify the parameters that characterize the operation of fluid flow in incompressible and compressible flow problems and its application on turbomachinery systems. At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics:

1	Introduction to fluid mechanics: Incompressible, compressible, subsonic, transonic, supersonic and hypersonic flows. continuum and rarefied fluid. Intro. to Hydraulics and Fluids, Dimensions, Units, No-Slip Condition, Fluid Flow Classification, System and Control Volume
2	Properties. System units. extensive and intensive properties, viscosity and elasticity, surface tension, Pressure Gradients & Viscosity
3	Fluid Statics, Hydrostatic Pressure, Manometers, Barometers, Forces on plane surfaces. Forces on plane surfaces, Forces on curved surfaces.
4	The fundamental principles governing fluid motion. Fluid Kinematics, control volume and control mass approaches. Reynolds Transport Theorem, conservation of mass (Continuity equation), viscous stress, pressure measurements, momentum equations, and energy equation to one-dimensional application problems. Bernoulli's equation to incompressible and compressible fluid and its application. Equation of state.
5	Dimensional Analysis.
6	The fundamental principles to pipe and channel flows for incompressible fluid. Flow in pipes. Minor losses. Drag and lift. Laminar flow, turbulent flow. Moody Chart - turbulent

7	Compressible fluid flow. Mach number, static and stagnation properties. relationships between total and stagnation properties. subsonic, transonic, supersonic, and hypersonic flow. External flows.
8	Introduction to computational fluid mechanics. Differential analysis of fluid flows, Introduction to Turbomachinery.

Course Learning Outcomes:

Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcomes	Assessment Tools
DEFINE, REPEAT, REMEMBER, DESCRIBE, EXPLAIN, AND DISCUSS the concepts of Incompressible, compressible, subsonic, transonic, supersonic and hypersonic flows. **EXPLAIN** continuum and rarefied fluid. Intro. to Hydraulics and Fluids, Dimensions, Units, No-Slip Condition, Fluid Flow Classification, System and Control Volume	a,e	Homework, Quiz, Exam
DEFINE, RELATE, EXPLAIN, and DISCUSS Fluid properties. **REMEMBER** System units. **ILLUSTRATE and DISCUSS** extensive and intensive properties, viscosity and elasticity, surface tension, Pressure Gradients & Viscosity Fluid Statics, Hydrostatic Pressure, Manometers, Barometers, Forces on plane surfaces. Forces on plane surfaces, Forces on curved surfaces.	a,e	Homework, Quiz, Exams
EXPLAIN, DEFINE, REMEMBER, ILLUSTRATE, INTERPRET, ANALYZE, DERIVE and APPLY **the fundamental principles governing fluid motion.** DEFINE and COMPARE **control volume and control mass approaches.** Reynolds Transport Theorem, DERIVE and APPLY **conservation of mass (Continuity equation), viscous stress, pressure measurements, momentum equations, and energy equation to** SOLVE **one-dimensional application problems.** APPLY and DISCUSS **Bernoulli's equation to incompressible and compressible fluid and its application.** DEFINE and REMEMBER **equation of state.**	a,e	Homework, Quiz, Exams
APPLY the fundamental principles to pipe and channel flows for incompressible fluid: **CALCULAT**E pressure drop in Pipe flow. **ANALYZE** flow pattern, APPLY to channel flow. **DEFINE and CALCULATE** drag and lift. **ANALYZE and COMPARE** laminar 7flow, turbulent flow. **SOLVE** pressure drop for laminar and turbulent flows. Moody Chart - turbulent	a,e	Homework, Quiz, Exams
DISCUSS Compressible fluid flow. **DEFINE** Mach number, static and stagnation properties. **DERIVE** relationships between total and stagnation properties. APPLY to turbomachinery. **IDENTIFY** subsonic, transonic, supersonic, and hypersonic flow. **INTERPRET** its flow characteristics. Computational Fluid Dynamics	a,e,k	Homework, Quiz, Exams, project

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Computer Usage:

Computer program in FORTRAN or in C, MATLAB, LabView, excel will be developed and used to support design and Lab projects and analysis.

ME 360L Fluid Mechanics Lab

Fall 2017

Catalog Data: *ME 360L Fluid Mechanics Lab,* 3 hours lab, credit 1. Supports projects / practices of ME 360. Co-requisite ME 360.
Prerequisite: MTH 202(Offered-consult advisor).

Textbook: Lecture Notes and Lab Manual.

References: (1). Fluid Mechanica, Fundamentals and Applications, Yunus Cengel and John Cimbala, 4th Edition, 2018.
(2). Essentials of Fluid Mechanics Fundamentals and Applications, John Cimbala, McGraw Hill, 2008.
(2). An Album of Fluid Motion, Milton Van Dyke. The Parabolic Press, 1982.

Coordinator: Zhengtao Deng, Professor of ME **Class Schedule:** Monday 2:00-4:50PM.

Prerequisites by Topic:

1. Fundamentals of thermodynamics with applications in open system, one-dimensional isentropic flows.
2. Knowledge of computer programming using FORTRAN, C, MATLAB, or LabView.

Objectives[1]:

Objective 1: This course is designed to provide the student a basic Lab experience and project related to engineering fluid mechanics. It supports ME 360 Fluid Mechanics lecture. The student will be able to do hands on lab to verify conservation principles on mass, momentum and energy. The student will also be able to apply related computer software to do analysis for project.

Topics:

1. Lab #1: Introduction to fluid mechanics Lab: Laboratory report, safety, measuring tools, computer software overview.

2. Lab #2: Fundamental principles governing fluid motion: Control volume and control mass approach: Measuring of mass flow rate using pitot-tube. Operation of low-speed wind tunnel and velocity measurements. Application of Bernoulli equation. (Lab Report #1)

3. Lab #3: Review of engineering computation. Introduce computer lab, computer software, FORTRAN programming overview, C programming comparison with FORTRAN. MatLab introduction, Introducing Excel and TECPLOT data post-processing scientific data visualization.

4. Lab #4: Verification of Bernoulli equation and verification of conservation of mass (Continuity equation). Manometer measurements on pressure, unit conversion, Bernoulli principle for incompressible flow, low-speed table-top nozzle flow measurement, data repetition, data presentation. (Lab Report #2)

5. Lab #5: Introduction to low-speed wind-tunnel. Tunnel operation fundamentals, flow paths, conservation of mass, momentum and energy. Equation of state, low-speed constant density assumption. Similarity rule. Reynolds number. Wind Tunnel Mass Flow Rate measurements.

6. Lab #6: Error analysis. Random error, bias error, elimination of error, average, standard deviation, deviation ratio, and error analysis. Calibration procedure. Data processing error. Analyze error and data conditioning for Previous labs data. (Lab Report #3)

7. Lab #7: Lift and drag coefficient measurements. Momentum principle. Flow separation.

Laminar and turbulent flows. Generation of lift and drag. Angle of attack. Steady flow. Boundary later concepts. Linear regression, coefficient of correlation. (Lab Report #4)

8. Lab #8: Vorticity Shedding visualization in water tunnel. (Lab report #5)
9. Lab #9: Project.

Course Learning Outcomes:

Upon the completion of the course, students will be able to

Course Learning Outcome	Program	Assessment Tools
Apply pitot-tube and velocity meters to Measure mass flow rate, velocity in wind tunnel, velocity meters. Evaluate continuity concept, analyze boundary layer effects.	a,b,e,g	Lab Report.
Understand and Verify Bernoulli equation and conservation of mass (Continuity equation). Apply Manometer measurements on pressure, unit conversion. Explain Bernoulli principle for incompressible flow, low-speed table-	a,b,e,g	Lab Report.
Error analysis. Analyze Random error, bias error, elimination of error. Calculate average, standard deviation, deviation ratio, and error analysis.	a,b,e,g	Lab Report.
Measure Lift and drag. Calculate Lift and drag coefficients. Apply Momentum principle. Analyze Flow separation. Laminar and turbulent flows. Evaluate effect of Angle of attack on Lift	a,b,e,g,k	Lab Report, Class project.

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(g) an ability to communicate effectively	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Computer Usage:

Computer program in FORTRAN or in C, MATLAB, LabView will be developed and used to support design and Lab projects and analysis.

Alabama A&M University, Mechanical Engineering Department

ME 380 Computer Aided Design II

Spring 2018

Catalog Data: ME 380 Material Science; Lecture 3 hrs; Credit 3 hrs.
Introduction to Geometric dimensioning and tolerancing and fundamentals of structural finite element modeling. Geometry creation, element types, material specification, problem solution and results post-processing. A focus is placed on modeling techniques and guidelines using commercially available software (ANSYS). Applications to problems including structural mechanics, Fluid Mechanics, Dynamics, stress concentrations, and fatigue life . Projects in creative mechanical design and optimization

Prerequisite: ME 231 Strength of Materials

Class Schedule: Tuesday, Thursday, 11:00-12:20AM; Location – ETB 235.

Textbook: **Finite Element Simulations with ANSYS Workbench 16**, September 2015
Huei-Huang Lee, SDC publications, ISBN 978-1-58503-983-8

References: (1) Lectures and Class notes.
(2) J.N. Reddy, An Introduction to the Finite Element Method, 4E Edition, McGraw Hill, 2018, ISBN-13: 978-1259861901

Instructor: **Dr. Mohamed Gadalla**, Mechanical Engineering Department
Office: ETB 307, Tel: (256)-372-5891, Email: mohmaed.gadalla@aamu.edu

Objectives:

Objective 1: To introduce students to fundamental concepts of the finite element method and geometric dimensioning and tolerancing.
Objective 2: To develop a thorough understanding of the proper usage of existing finite element modeling techniques and guidelines.
Objective 3: To provide the student experience with modeling structural components using a commercial finite element software package.

Topics to be covered:

1. Understand the basics of finite element method.
2. Define a node and an element.
3. Use the basic concepts of the finite element method to construct element matrices for simple 1-dimensional.
4. Construct a global stiffness matrix.
5. Solve linear matrix equation for nodal displacements.
6. Use nodal displacements to calculate strains and stresses in the elements.
7. Use a commercially available finite element software package (ANSYS).
8. Make proper modeling decisions based on an understanding of available element types and guidelines.
9. Apply loads, displacements and other boundary conditions to the finite element model.

10. Submit a model for solution.
11. Create displacement and stress contour plots.
12. Assess the of appropriateness of the results.
13. Understand the principle and application of geometric dimensioning and toleranceing.

Relationship to Program Objective:

The course builds on the students' previous fundamentals in mathematics, science and engineering to develop their mechanical design methodology. Their successful completion of this course provides them with the necessary tools to prepare them for the capstone design courses in the Mechanical Engineering curriculum as well as pursue their professional life upon graduation.

Course Learning Outcomes:

Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand the basics of the finite element method	a, e	Homework, exams
2. Use the basic concepts of the finite element method to construct element matrices for simple 1-dimensional and solve for nodal displacements	a, e	Homework, exams
3. Use ANSYS to find stress and strain in different mechanical applications	k	Homework, exams
4. Perform design optimization	e, k	A final project (a research report)
5. Understand the principle and application of geometric dimensioning and toleranceing	c, e, i, k	Homework, exams

Relation of course to Program Outcomes:

Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes (as per Criterion 3)	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	X
(c) an ability to design a system, component, or process to meet desired needs	X
(e) an ability to identify, formulate, and solve engineering problems	X
(i) a recognition of the need for, and an ability to engage in life-long learning	X
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

ME 412 Analysis and Synthesis of Gas Turbines and Components

Fall 2017

ME 412 Analysis and Synthesis of Gas Turbines and Components. Lecture 3hrs.

Catalog Data: Credit 3.
A review of aerothermodynamics of propulsion systems, characterization of power plant utilization, and operation cycle analysis. On-Off design performance, component characterization, component design, component matching, optimization, and introduction to power plant integration systems in a fixed or moving architecture are also covered.

Perquisite: ME 310

Co-requisite: ME 412L or Instructor Approved.

Text Book: **Elements of Propulsion Gas Turbine and Rockets** Mattingly and Boyer. Second Edition, AIAA, 2016. ISBN 978-1-62410-371-1

References: 1) Aircraft Propulsion.
Saeed Farokhi, 2nd Edition, John Wiley & Sons Inc., 2014.
ISBN 978-1-118-80677-7.
2) Aerospace Propulsion.
T-W. Lee, 2014, John Wiley & Sons, Ltd. ISBN: 978-1-118-30798-4.
3) Gas Turbine Theory
6th edition, HIH Saravanamuttoo, GFC Rogers and H Cohen, Prentice Hall 2008.

Instructor: Dr. Mebougna Drabo, Associate Professor, Mechanical Engineering Department, AAMU.

Class Schedule: Tuesday and Thursday, 3:30-4:50PM, Wednesday 2:00- 4:50PM Lab.

Prerequisites by Topic:

1. Fundamentals of engineering thermodynamics and one-dimensional compressible flows
2. Propulsion system integration
3. Mathematical solution of physical problems
4. FORTRAN programming or equivalent.

Objectives:

This course is designed to provide the student a basic working knowledge of aerothermodynamics of the gas turbine engine propulsion with the focus on component performance characterization and compressor and turbine design. The student will be able to analyze the on-off design performance and to characterize the operation of gas turbine engine propulsion systems and components. At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics:

1. Thermodynamics of fluid flow
2. Mechanics of Propulsion
3. Ideal and Real cycle analysis for aircraft propulsion system
4. Gas turbine engine component analysis
5. Axial flow compressor design and analysis
6. Centrifugal compressor design
7. Turbine design and analysis
8. Component matching, on-off design analysis

Course Learning Outcomes: Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool

Understand the first and second law of thermodynamics	A	Homework, exams
Analyze propulsion system performance	A,C,E	Homework, Labs, exams
Analyze gas turbine engine performance	A,E,K	Homework, Labs, exams
Calculate component performance	A,C,E	Homework, Labs,exams
Design first stage compressor blade	A,E,K	Homework, exams, project report
Understand centrifugal compressor design procedure	A,E	Notes
Understand turbine design criteria	A,E,K	Notes
Analyze off-design performance	A,E,K	Homework, Labs, exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	**X**
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Computer Usage:

Computer programs in FORTRAN will be developed and used to support design projects and performance analysis. Use of ANSYS and CAD (Solid Edge, AutoCad) is required.

Laboratory Usage:

Laboratory experiments emphasize reinforcement of material presented in class within the context of the projects selected by the instructor. The lab serves to instruct students in typical practices in compressor and turbine design.

ME 412L Analysis and Synthesis of Gas Turbines and Components Lab
Fall 2017

Catalog Data: *ME 412 L Analysis and Synthesis of Gas Turbines and Components Lab*. Lab 3 hours, credit 1.
Supports projects/practices of ME 412. Co-requisite ME 412.

Text Book: Lecture Notes and Lab Manual.

Reference: Elements of Propulsion Gas Turbine and Rockets Mattingly and Boyer. Second Edition, AIAA, 2016. ISBN 978-1-62410-371-1

Aircraft Propulsion.
Saeed Farokhi, 2nd Edition, John Wiley & Sons Inc., 2014.
ISBN 978-1-118-80677-7.

Aerospace Propulsion.
T-W. Lee, 2014, John Wiley & Sons, Ltd. ISBN: 978-1-118-30798-4.

Gas Turbine Theory 6th edition, HIH Saravanamuttoo, GFC Rogers and Cohen, Prentice Hall 2008.

Instructor: Dr. Mebougna Drabo, Associate Prof. of Mechanical Engineering.

Class Schedule: Wednesday 2:00-5:00P W Lab.

Prerequisites by Topic:

1. Fundamentals of engineering thermodynamics and one-dimensional compressible flows
2. Propulsion system integration
3. Mathematical solution of physical problems
4. FORTRAN programming or equivalent.

Objectives:
This course is designed to support ME 412 and to provide the student a basic working / design knowledge of aerothermodynamics of the gas turbine engine propulsion with the focus on component performance characterization and compressor and turbine design. The student will be able to analyze the on-off design performance and to characterize the operation of gas turbine engine propulsion systems and components.

Topics:

1. Introduction to ME 412 Lab. Laboratory report, safety, measuring tools, computer software overview.
2. Engineering Programming and data visualization overview. FORTRAN, MatLab, C, Gas Turbine compressor and turbine design software, performance analysis, combustor performance (equilibrium, CHEMKIN) software.
3. Solid-Edge and ANSYS overview. Hands-on Examples.
4. Performance Analysis of Turbojet Engine. Design point selection of performance parameters using Performance calculation software,

verification of design performance using NASA Glenn Propulsion engine simulation software *(Lab Report #1).*

5. Revise and repeat Design performance analysis based on new design parameters. *(Lab Report #2).* Practice CAD modeling and Simulation using Solid Edge, Solid Work and ANSYS.
6. Compressor Design and Analysis. Single spool multi-stage axial compressor design. Sizing, stage selection, Free vortex and first power distribution on blade profile *(Lab Report #3).*
7. Axial Compressor Design: First Stage Design. Constant axial velocity. Uniform specific work. Constant product of swirl and rotor radius *(Class Project Report)*. Computer programming.
8. Turbine design practice (No report required). Axial flow turbine.
9. Off-design performance prediction. Turbo-jet engine given diffusor, compressor, combustor, turbine and nozzle characteristics maps. Steady engine speed. Equilibrium running point.

Course Learning Outcomes: Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
Understand the lab report format, software usage	A	Lab practice
Use solid edge, SolidWork and ANSYS software packages for problem solving	A,E	Lab practice
Analyze gas turbine engine performance	A,C,E,G	Lab Report
Design first stage compressor blade	A,C,E,G,K	Lab Report
Design first stage 3D blade, programming	A,C,E	Lab Report
Understand turbine design criteria	A,C,E	Lab Practice
Analyze off-design performance	A,C,E	Lab Practice

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	**X**
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	**X**
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

ME 413 Rocket Propulsion

Spring 2018

Catalog Data: ME 413 Rocket Propulsion, Credit: 3
Prerequisites: ME 411 Power System Integration and ME 360 Fluid Mechanics

A study of propulsion system requirements for terrestrial and interplanetary flight. Basic principles and performance of solid and liquid chemical rocket propulsion systems, elements of nuclear rockets, nuclear-electric power systems, and electrical propulsion systems are addressed.

Textbook: George P. Sutton, Oscar Biblarz, Rocket Propulsion Elements, 9th Edition, Wiley, 2016, ISBN: 978-1-118-75365-1.

References: Philip Hill and Carl Peterson, Mechanics and Thermodynamics of Propulsion, Second edition, Addison Wesley, 1992.

Coordinator: Zhengtao Deng, Professor of ME, Tuesday and Thursday, 9:30-10:50AM, ETB Room 249.

Prerequisites by Topic:

1. Fundamentals of power system integration especially with chemical rocket and combustion.
2. Fundamental of fluid dynamics and applications to rocket propulsion system.
3. Knowledge of computer programming using FORTRAN, C, MATLAB, or LabView.

Objectives[1]:

Objective 1: Upon satisfactory completion of the course, the student will have a working knowledge of the fundamentals of rocket propulsion. The student will be able to identify the influence of performance parameters in rocket engine design and will be able to do preliminary calculations for mission requirements and rocket engine component sizing.
Objective 2: At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics:

1. Introduction, review of fundamentals, rocket basic elements, the thrust equation, specific impulse, mass ratio.
2. Energy breakdown, efficiencies.
3. Ideal rocket, nozzle flow review, perfect gas law, isentropic process, maximum exit velocity, nozzle geometry and performance, real effects, multi-phase flow.
4. Rocket propelled flight, basic equations of motion, forces and accelerations acting on the vehicle.
5. Space mission, escape from the earth, mission to mars, preliminary analysis.
6. Rocket propellants, equilibrium composition.
7. Combustor thermo-chemical equilibrium.
8. Propellant properties / Performance.
9. Liquid propellant properties / performance.
10. Liquid propellant rocket engine thrust chambers, pressure feed systems, injector, combustion instability.
11. Special topic presentation.

Computer Usage:

Computer program in FORTRAN or in C, MATLAB, LabView will be developed and used to support design projects and analysis.

Instructional Methods:

1. The instructor will present the materials through the use of visual aids, lectures, illustrations, and demonstrations, but the overall responsibility for learning falls upon each students.
2. The instructor will offer free study session during his office hours. This study session is not mandatory for student to come. It will solve problems and review class teaching materials. No new class teaching materials will be presented in this special session.

Course Learning Outcomes:

Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcomes	Assessment Tools
Understand rocket basic elements, the thrust equation, specific impulse, mass ratio, energy breakdown, efficiencies.	a,e	Homework, Quiz, Exam
Understand ideal rocket, nozzle flow, perfect gas law, isentropic process, maximum exit velocity, nozzle geometry and performance, real effects, multi-phase flow.	a,e	Homework, Quiz, Exams
Understand rocket propelled flight, basic equations of motion, forces and accelerations acting on the vehicle. Apply to space mission, escape from the earth, mission to mars. Conduct preliminary analysis.	a,e	Homework, Quiz, Exams
Understand rocket propellants, equilibrium composition. combustor thermochemial equilibrium, propellant properties / Performance. And liquid propellant properties / performance.	a,e,k	Homework, Quiz, Exams, Project
Understand liquid propellant rocket engine thrust chambers, pressure feed systems, injector, combustion instability.	a,e	Homework, Quiz, Exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	X
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	X
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	X

ME 416 Gas Dynamics
Spring 2018

Catalog Data: ME 416 Gas Dynamics
Credit: 3
Prerequisites: ME 310 Thermodynamics and ME 360 Fluid Mechanics
A study of the fundamental theory of one-dimensional gas dynamics: Isentropic flow, flow in converging-diverging nozzle, shock propagation, normal and oblique shock theory, Prandtl-Meyer expansions, Fanno Line Flow, and measurement methods.

Textbook: V. Babu, "Fundamentals of Gas Dynamics, 2nd Edition, 2015, ISBN: 978-11-1897-339-4.

References: Robert D. Zucker, Fundamentals of Gas Dynamics, John Wiley, 2nd Edition, ISBN 0-471-05967-6.
James John, Theo Keith, Gas Dynamics, 3rd Edition, Prentice Hall, 2006.
Michel A. Saad, Compressible Fluid Flow, Second edition, Prentice Hall, 1993.
B.K. Hodge and Keith Koenig, Compressible Fluid Dynamics with Personal Computer Applications, Prentice Hall, 1995.
Maurice J. Zucrow and Joe D. Hoffman, Gas Dynamics, John Wiley & Sons, 1975.

Coordinator: Zhengtao Deng, Professor of ME

Class Schedule: Tuesday and Thursday, 8:00AM-9:20PM. 80 minutes each session.

Prerequisites by Topic:

1. Fundamentals of thermodynamics with applications in open system, one-dimensional isentropic flows.
2. Fundamentalf of fluid dynamics and applications to propulsion system.
3. Knowledge of computer programming using FORTRAN, C, MATLAB, or LabView.

Objectives:

Objective 1: At the end of the course the student will have a working knowledge of compressible gas dynamics in one and two-dimensions as applied to calculations of lift and drag forces on simple supersonic airfoils. Nozzle flow, flow with friction, heat transfer and mass addition. Flow in micro-thrusters.
Objective 2: At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics:

1. Review of fundamentals of continuum, conservation equations, first and second law of thermodynamics.
2. One-Dimensional flow equations. Introduction to compressible flow, speed of sound, nozzle flow.
3. More isentropic flow relationships, isentropic flow tables, converging-diverging nozzles, the reference states, mass flow rate and its changes for changes in back pressure. Jet engine components.
4. Steady isothermal flow, the Fanno line, steady one-dimensional isothermal flow with friction.
5. Flow with heat transfer, the Rayleigh line, isothermal frictionless flow in a variable area passage.
6. Shock waves, normal, oblique, reflected shocks.
7. Oblique shocks, equations of motion. Solution of the oblique shock flow, supersonic wind tunnels.
8. Expansion waves, Prandtl-Meyer flow, simple waves, supersonic flow over a concave surface.
9. More application to shockwave electromagnetic modification.

Course Learning Outcomes:

Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcomes	Assessment Tools
DEFINE, REPEAT, REMEMBER, DESCRIBE, EXPLAIN, AND DISCUSS fundamentals of continuum, conservation equations, first and second law of thermodynamics. One-Dimensional flow equations. Introduction to compressible flow, speed of sound, nozzle flow.	a,e	Homework, Quiz, Exam

EXPLAIN, DEFINE, REMEMBER, ILLUSTRATE, INTERPRET, ANALYZE, DERIVE and APPLY isentropic flow relationships, isentropic flow tables, converging-diverging nozzles, the reference states, mass flow rate and its changes for changes in back pressure. Jet engine components.	a,e	Homework, Quiz, Exams
APPLY the fundamental principles to pipe and channel flows. Analyze Steady isothermal flow, the Fanno line, steady one-dimensional isothermal flow with friction. Analyze Flow with heat transfer, the Rayleigh line, isothermal frictionless flow in a variable area passage.	a,e	Homework, Quiz, Exams
Understand Shock waves, normal, oblique, reflected shocks. Oblique shocks, equations of motion. Calculate properties of the oblique shock flow, Expansion waves, Prandtl-Meyer flow, simple waves, supersonic flow over a concave surface. Apply knowledge for Wind tunnel application. Evaluate application to shockwave electromagnetic modification.	a,e,i,k	Homework, Quiz, Exams, project

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	**X**
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Computer Usage:

Computer program in FORTRAN or in C, MATLAB, LabView will be developed and used to support design projects and analysis.

Alabama A&M University, Mechanical Engineering Department

ME 417 Power Systems Integration & Performance

Fall 2017

Catalog Data: ME 417 Power Systems Integration & Performance; Lecture 3 hrs; Credit: 3 hrs.

A study of the fundamentals of aerothermodynamics of propulsion systems. Analysis of the elements and the processes of power systems and their integration. Ideal Brayton air cycle, and real turbojet and turbofan performance. Topics include: energy utilization, combustion, energy cycles, steam power plants, heat exchangers, compressors, economy parameters, performance simulation, and prediction. Introduction to power plant/ airframe integration will be discussed.

Prerequisites: ME 310 and ME 360.

Textbook: - Aircraft Propulsion, Saeed Farokhi, 2nd Edition, John Wiley & Sons Inc., 2014. ISBN 978-1-118-80677-7.

- Elements of Propulsion Gas Turbine and Rockets Mattingly and Boyer. Second Edition, AIAA, 2016. ISBN 978-1-62410-371-1
- Gas Tables, Joseph H. Keenan, Jing Chao and Joseph Kaye, (2nd-3rd Edition) John Wiley and Sons Inc.

References: Mechanics of Flight, Warren F. Phillips, John Wiley & Sons, 2nd Edition, 2009.

Instructor: **Dr.** Mebougna Drabo, Mechanical Engineering Department
Office: ETB 308, Tel: (256)-372-4136, Email: mebougna.drabo@aamu.edu

Objectives:

Objective 1 – Student will have a basic working knowledge of the Aerothermodynamics of propulsion systems, and an understanding of: Different metrics of performance related to power plant applications, the manufacturer perspective, the airplane operator perspective, community perspective. The student will be able to identify parameters that affect power plant performance. Identify effect of component efficiency, basic systems integration tradeoffs. Power plant and vehicle/mission. Special attention given to, turbojets and turbofan engines performance.

Objective 2 – At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics to be covered:

- Concept of Performance. The designer, the manufacturer, the installer, the operator, the maintainability. Life cycle and Disposal of Power plants.
- Power Generation by Turbomachinery – Aeroderivatives.
- Aerothermodynamic review. The Continuity, Momentum, and Energy equation, the Thrust equation, Jets and Nozzles, steady 1-D flow, Supersonic Inlets and Nozzles, Turbojet cycle.
- Combustors, components, and Combustion process.
- Turbojet cycle computations and waste heat.
- Turbofan calculations – By pass air – Bleed air and cooling. Performance, benchmarking, time to overhaul.
- Thrust enhancements, engine performance and reversers.
- Single-stage axial compressor vs. multistage compressor.
- Aerodynamics of subsonic inlets and axial compressors.

- Compressor start-up – Auxiliary Power Units. Combustors/Burners. Basic sizing examples. Instabilities. Engine performance during atmospheric ascent and descent.
- Instrumentation to estimate/ verify engine performance.
- Failure and risk analysis. Quality control. Reliability Assurance. Operation costs.

Relationship to Program Objective:

This course will provide students an understanding of different metrics of performance related to power plant applications, identify parameters that affect power plant performance, component efficiency, learn basic systems integration, and study turbojet and turbofan engine performance. These will help them to pursue professional carrier in Mechanical Engineering, and develop professional skills for life-long learning.

Course Learning Outcomes:

Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
Understand the concept of Performance.	a	HW, Exam
Understand Life cycle and Disposal of Power plants.	a, c	HW, Exam
Understand aerothermodynamics. The Continuity, Momentum, and Energy equation, the Thrust equation, Jets and Nozzles, steady 1-D flow, Supersonic Inlets and Nozzles, Turbojet cycle.	a, e	HW, Exam
Perform computations for Turbojet cycle and waste heat. Calculate thrust developed, efficiency, TSFC, and other performance parameters.	a, c, e	HW, Exam
Analyze the effect of an Afterburner, Combustion process.	a, c, e	HW, Exam
Perform Turbofan calculations – By pass air – Bleed air and cooling.	a, c, e	HW, Exam
Compare the performance of aircrafts having turbojet, turbofan, and turboprop engines.	a, c, j, k	HW, Exam
Analyze ramjet engines.	a, c, e	HW, Exam
Understand single-stage axial compressor vs. multistage compressor.	a, c	HW, Exam
Analyze engine performance at various altitudes.	a, e, k	HW, Exam
Understand engine – aircraft matching, analyze aeroplane and engine characteristics.	a, e, j	HW, Exam

Relation of course to Program Outcomes:

Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes (as per Criterion 3)	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	X
(c) an ability to design a system, component, or process to meet desired needs	X
(e) an ability to identify, formulate, and solve engineering problems	X
(j) a knowledge of contemporary issues	X
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	X

ME 425 Design of Machine Elements

Spring 2018

Catalog Data: ME 425 Design of Machine Elements; Lecture 3 hrs; Credit 3 hrs.
Application of engineering mechanics and strength of materials to the analysis, synthesis, and design of machine elements (design of screws, fasteners, and connections; design of welded, brazed, and bonded joints; mechanical springs; bearings; gears; shafts; design of clutches, brakes, and couplings); theories of failure, stress concentrations, fatigue life, and thermal stresses; consideration of economics and safety; projects in creative mechanical design; design case studies

Prerequisite: ME 231 Strength of Materials.

Class Schedule: 9:30AM-10:50AM Tuesday and Thursday Location: ETB 118

Textbook: **Shigley's Mechanical Engineering Design**, Richard G. Budynas and J. Keith Nisbett, 10th Edition, McGraw Hill, 2015.
ISBN: 978-0-07-339820-4

References: Instructor Lecture Notes.
Robert C. Juvinall and Kurt M. Marshek; Fundamentals of Machine Component Design, 6th Ed., John Wiley, 2017.
ISBN: 978-1-118-98768-1

Instructor: **Dr. S. Chowdhury**, Mechanical Engineering Department
Office: ETB 311 Tel: (256)-372-8401
Email: showkat.chowdhury@aamu.edu

Course Objectives:

- To synergize forces, moments, torques, stress and strength information to develop ability to analyze, design and/or select machine elements - with attention to safety, reliability, and societal and fiscal aspects.
- To introduce students to the design and theory of common machine elements and to give students experience in solving design problems involving machine elements.
- To require the student to prepare professional quality solutions and presentations to effectively communicate the results of analysis and design.

Course Outline

Week	**Topics** (Subject to Minor Changes)	**Text Chapter**
1-2	Introduction	1-4
	Addressing uncertainty, Stress, Strain, and Deflection	
3-4	Materials and Processes	5
	Failure Theories and Safety Factors	6
5	Shafts, Axles, and Spindles	7
	Test #1	
6-7	Gears	13,14&15
8-10	Threaded Fasteners and Power Screws	8
	Welded, Brazed and Bonded Joints	9
	Test #2	
11	Mechanical Springs	10

12	Bearings	11&12
13	Clutches, Brakes, Couplings and Flywheels	16
14	Flexible Mechanical Elements	17
15-16	Miscellaneous Topics	
	Test #3	

Relationship of course to undergraduate degree program objectives and outcomes:
This course primarily serves students in the ME department. The course builds on the students' previous fundamentals in mathematics, science and engineering to help develop mechanical design methodology. ME 425 provides an extremely important preparation for the capstone design courses in the Mechanical Engineering curriculum.

Course Learning Outcomes: Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
Synergize forces, moments, torques, stress and strength information to develop ability to analyze, design and/or select machine elements - with attention to safety, reliability, and societal and fiscal aspects	a, c, e, j, k	Homework, quiz, exams
Introduce to the design and theory of common machine elements and to experience in solving design problems involving machine elements	a, c, e, j, k	Homework, quiz, exams
Prepare professional quality solutions and presentations to effectively communicate the results of analysis and design	g, h	Homework, quiz, exams

Relation of course to Program Outcomes:
Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(c) an ability to design a system, component, or process to meet desired needs	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(g) an ability to communicate effectively	**X**
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	**X**
(j) a knowledge of contemporary issues	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Alabama A&M University, Mechanical Engineering Department

ME432 – Design For Manufacture and Assembly
Fall 2017

Catalog Data: ME 432 Design for Manufacture and Assembly; Lecture 3 hrs; Credit 3 hrs
A study of the design synthesis and methods; strength design of mechanical structures and components; optimization and reliability principles; and computer-aided design techniques. Emphasis is on modeling synergistic processes for manufacture.

Prerequisite: ME 320 Kinematics/Dynamic of Mach. Co-requisite: ME 432L.

Class Schedule: Tuesday, and Thursday, 3:30 AM-4:50 P-M; Location – ETB 142.

Textbook: Manufacturing Processes for Engineering Materials, Kalpakjian, S., Shmid, S., 6th edition, Pearson, 2016, ISBN 13: 978-0134290553

References: (1) Lectures and Class notes.

Instructor: **Dr. Mohamed Gadalla**, Mechanical Engineering Department
Office: ETB 307, Tel: (256)-372-5891, Email: mohmaed.gadalla@aamu.edu

Objectives:

Objective 1: Perform and evaluate costing requirements for different manufacturing processes.
Objective 2: Become familiar with computer aided manufacturing and automated manufacturing systems.
Objective 3: Understand the concept of design for manufacturing (DFM).

Topics to be covered:

1. Review of Basic Concepts in Costing and Engineering Economic
2. Introduction to Machining
3. Introduction to Numerical Control
4. Plastic injection molding (die cost)
5. Metal Casting Processes
6. Sheet Metal Forming
7. Design for Stamping
8. Rapid Prototyping
9. Composite material processes

Relationship to Program Objective:

The course builds on the students' fundamentals in mathematics, and engineering to develop their manufacturing knowledge. Building the manufacturing knowledge closes the loop in their curriculum by identifying the factors the affect the implementation and operation of any engineering system that they may be involved at.

Course Learning Outcomes:

Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand the fundamentals of the machining process and the importance of process planning.	a, e, k	Homework, exams
2. Understand the basics of Numerical programming and develop the skills and knowledge necessary to operate numerical controlled machines.	a, k	Homework, exams
3. Understand the basic parameters of mold and die design in different manufacturing processes.	c	Homework, exams
4. Perform evaluation and/or cost analysis for product manufacturing strategy.	e, j, k	A course project (a design research report)
5. Understand the principle and application of automated manufacturing system.	c, e, k	Homework, exams, attendance of field trips

Relation of course to Program Outcomes:

Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes (as per Criterion 3)	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	X
(c) an ability to design a system, component, or process to meet desired needs	X
(e) an ability to identify, formulate, and solve engineering problems	X
(j) a knowledge of contemporary issues	X
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	X

Alabama A&M University, Mechanical Engineering Department

ME432L – Design For Manufacture and Assembly Lab.
Fall 2017

Catalog Data: ME 432L Design for Manufacture and Assembly Lab.; Lab 3 hrs; Credit 1hrs
Introduction to the Design for Manufacture and Assembly Principals. Topics include: Machining, Stamping, Metal cutting, Casting, Reverse Engineering, Utilization of modern as well as traditional manufacturing will be used.

Prerequisite: Co-requisite: ME 432.

Class Schedule: Wednesday 2:00 PM-4:50PM; Location – ETB 152.

Textbook: Manufacturing Processes for Engineering Materials, Kalpakjian, S., Shmid, S., 6th edition, Pearson, 2016, ISBN 13: 978-0134290553

References: (1) Lectures and Lab. notes.

Instructor: **Dr. Mohamed Gadalla**, Mechanical Engineering Department
Office: ETB 307, Tel: (256)-372-5891, Email: mohmaed.gadalla@aamu.edu

Objectives:

Objective 1: Perform and evaluate costing requirements for different manufacturing processes.
Objective 2: Become familiar with computer aided manufacturing and automated manufacturing systems.
Objective 3: Understand the concept of design for manufacturing (DFM).

Topics to be covered:

1. Introduction and Lab Safety
2. Lathe and Milling lab.
3. Injection Molding exercise
4. CNC milling Lab.
5. Reverse Engineering Lab.
6. Composite material processes Lab.
7. Rapid Prototyping Lab.
8. Field trip1
9. Field trib2

Relationship to Program Objective:

The lab completes the course work of the design for manufacturer and assembly. It enables the students to apply the science and knowledge they learn in the class. In addition, it introduces the students to the importance of safety in engineering professions and also practice lab. data recording and reporting.

Lab. Learning Outcomes:

Upon completion of the course, students will be able to

Lab. Learning Outcome	Program Outcome	Assessment Tool
1. Understand the fundamentals of the machining process and the importance of process planning.	a, e, k, g	Lab. reports
2. Understand the basics of Numerical programming and develop the skills and knowledge necessary to operate numerical controlled machines.	a, k,g	Lab. reports
3. Understand the basic parameters of mold and die design in different manufacturing processes.	c, g	Lab. reports
4. Understand the principle and application of automated manufacturing system.	c, e, k, g	Lab. reports

Relation of course to Program Outcomes:

Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes (as per Criterion 3)	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	X
(c) an ability to design a system, component, or process to meet desired needs	X
(e) an ability to identify, formulate, and solve engineering problems	X
(g) an ability to communicate effectively	X
(j) a knowledge of contemporary issues	X
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	X

ME 441 Renewable Energy

Fall 2017

Catalog Data: ME 441 Renewable Energy. Credit: 3 hrs.
A study of the fundamentals of renewable energy technologies and their applications. Emphasis will be placed on energy sources such as active and passive solar energy, photovoltaic systems, hydropower, wind energy, biomass, geothermal energy, and ocean energy. Technological readiness, efficiency and sustainability of renewable energy alternatives will be discussed. Prerequisites: ME 310 Thermodynamics or consent of instructor.

Textbook: **Renewable Energy Systems**, **by** David Buchla, T. Kissell and T. Floyd, Pearson, 2015,
ISBN: 13-9780132622516

References: Instructor class notes.
Alternative Energy Systems and Applications, by B. K. Hodge, John Wiley & Sons Inc, 2010, ISBN: 978-0-470-14250-9

Coordinator: **Dr. Showkat J. Chowdhury,** Mechanical Engineering Department
Office: ETB-311, Tel: (256)-372-8401, Email: showkat.chowdhury@aamu.edu

Prerequisites by Topic:
Students are expected to have:
1. Working knowledge of elementary solid mechanics
2. Calculus
3. System of units
4. Mathematical solution of physical problems
5. Fundamental concepts of pressure, work, energy, heat and sound
6. Computer programming techniques.

Objectives:
Objective 1 – Students will have a basic knowledge of renewable energy technologies and their applications. They should understand the principles involved in harvesting energy from solar, wind, hydro, biomass and other renewable energy resources, discuss quantitative aspects, limitations, sustainability, and economic aspects.
Objective 2 – At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics and Lecture Schedule:
Lesson topics are in support of program objectives and program outcomes.

Lec No.	Topic	Assignment	Due
1-2	Fundamentals of energy usage. Energy usage in US and worldwide.		
3-5	Basics of Turbomachinery. Turbomachine classification and analysis.		
6-8	Analysis of Hydropower – Hydroelectric Dam. Energy Transfer in turbines.	HW-1	TBD
9-12	Wind energy resources, operation of wind turbines.	HW-2	TBD
13-14	Fundamentals of Solar Energy, solar energy database.		
15-17	Active solar energy, Solar Collectors, Flat-Plate collector analysis.	HW-3	TBD
18-19	Passive solar energy, quantifying passive solar		

	features.		
20-21	Photovoltaic systems – fundamentals, components.	HW-4	TBD
22-24	Fundamentals and availability of Biomass. Biomass based fuels and products.	HW-5	TBD
25-26	Geothermal energy systems.		
27-28	Ocean Energy – thermal energy, tidal energy and wave energy.		

Course Learning Outcomes:
Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
Understand the fundamentals of energy usage, energy usage in US and worldwide.	a	Homework, Exam
Understand basics of Turbomachinery, turbomachine classification and analysis.	a, c	Homework, Exam
Perform analysis of Hydropower and Hydroelectric Dam. Calculate energy transfer in turbines.	a, c, j, k	Homework, Exam
Analyze wind energy resources, study operation of wind turbines.	a, c, e	Homework, Exam
Study fundamentals of Solar Energy and solar energy database.	a, c, e	Homework, Exam
Analyze active solar energy collectors, perform calculations for Flat-Plate collectors.	a, c, e, j, k	Homework, Exam
Study Passive solar energy and quantify passive solar features.	a, c, e	Homework, Exam
Analyze Photovoltaic systems – fundamentals, components.	a, c, e, j	Homework, Exam
Understand fundamentals and availability of Biomass. Compare biomass based fuels and products.	a, c, j	Homework, Exam
Analyze Geothermal energy systems.	a, c, e	Homework, Exam
Understand Ocean Energy – thermal energy, tidal energy and wave energy.	a, c, e	Homework, Exam
Make project presentation.	a, e	Project

Relation of course to Program Outcomes:
Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	X
(c) an ability to design a system, component, or process to meet desired needs	X
(e) an ability to identify, formulate, and solve engineering problems	X
(j) a knowledge of contemporary issues	X
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	X

ME 442 Solar Thermal Engineering

Spring 2018

Catalog Data: ME 442 Solar Thermal Engineering. Credit: 3 hrs.
Availability of solar radiation; measurement and estimation of solar radiation. Fundamentals of radiation heat transfer; selective radiative surfaces. Components for solar-energy systems (Flat plate and concentrating collectors, heat exchangers, thermal storage); applications for water heating (active and passive), building heating and cooling, process heating, and industrial processes. Prerequisites: ME 310 Thermodynamics or consent of instructor.

Textbook: **Solar Engineering of Thermal Processes**, by John A. Duffie and William A. Beckman, John Wiley & Sons Inc, 4th Edition, 2013, ISBN: 978-0-470-87366-3

References: Instructor class notes.

Coordinator: **Dr. Showkat J. Chowdhury,** Mechanical Engineering Department
Office: ETB-311, Tel: (256)-372-8401, Email: showkat.chowdhury@aamu.edu

Prerequisites by Topic:
Students are expected to have:
1. Working knowledge of elementary solid mechanics
2. Calculus
3. Understanding of thermodynamics and heat transfer
4. Mathematical solution of physical problems.

Course Objectives:
Objective 1 – Students will have a basic knowledge of solar energy availability; fundamentals of radiation heat transfer; absorptance, emittance and reflectance; and radiative transport in participating media.
Objective 2 – They should understand the fundamentals of solar thermal energy collection in flat plate and concentrating collectors; solar thermal energy utilization through water heating, building heating, cooling and other applications.
Objective 3 – At the end of the course the student are expected to learn at a level of analysis and synthesis, i.e. beyond repetition.

Topics and Lecture Schedule:
Lesson topics are in support of program objectives and program outcomes.

Lec No.	Topic	Assignment	Due
1-3	Course Introduction. Solar Radiation. Extraterrestrial Radiation and Beam Radiation.		
4-6	Available Solar Radiation. Measurement and Estimation; Clear and Cloudy Days; Beam and Diffuse Radiation; Hourly, Daily, Monthly Radiation; Effects of Surface Orientation.	HW-1	TBD
7-9	Fundamentals of Radiation Heat Transfer. Natural and Wind Convection Coefficients.		
10-11	Selective Radiative Surfaces. Absorptance, Emittance and Reflectance.	HW-2	TBD
12-15	Flat Plate Collectors. Energy Balance; Overall Heat Transfer Coefficient; Heat Capacity.	HW-3	TBD
16-18	Concentrating Collectors. Thermal and Optical		

	Performance.		
19-20	Solar Energy Storage.	HW-4	TBD
21-22	Solar Process Loads.		
23-25	Solar Water Heating – Active and Passive.	HW-5	TBD
26-27	Building Heating.		
28	Solar Cooling.		

Course Learning Outcomes:
Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
Understand the fundamentals of Solar Radiation; extraterrestrial radiation and beam radiation.	a	Homework, Exam
Understand basics of solar radiation availability, measurement and estimation; clear and cloudy days; beam and diffuse radiation; hourly, daily, monthly radiation; effects of surface orientation.	a	Homework, Exam
Understand fundamentals of radiation heat transfer; natural and wind convection coefficients.	a, e	Homework, Exam
Study selective radiative surfaces; absorptance, emittance and reflectance.	a, c, e	Homework, Exam
Analyze Flat Plate collectors; perform energy balance; overall heat transfer coefficient; and heat capacity.	a, c, e, j, k	Homework, Exam
Study concentrating collectors; thermal and optical Performance.	a, c, e, j, k	Homework, Exam
Study fundamentals of solar energy storage, and solar process loads.	a, c, j, k	Homework, Exam
Analyze solar water heating – active and passive; building heating, and solar cooling.	a, c, e, k	Homework, Exam
Make project presentation.	a, e	Project

Relation of course to Program Outcomes:
Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	X
(c) an ability to design a system, component, or process to meet desired needs	X
(e) an ability to identify, formulate, and solve engineering problems	X
(j) a knowledge of contemporary issues	X
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	X

ALABAMA A & M UNIVERSITY
COLLEGE OF ENGINEERING & TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT

Fall 2017

Course: ME 451 – Automatic Control Systems

Credit: Lecture 3 hrs; Lab 0 Hrs; Credit 3 hrs.

Catalog Data:

Amplification of knowledge of linear system properties gained from previous courses to accomplish modeling, identification, and feedback control of dynamic systems. Both classical and state feedback control concepts are developed in this course. Digital control theory and analysis are also applied to systems composed of linear elements. Laboratory experiments are hardware applications that verify these concepts using both analog and digital computers as appropriate

Prerequisites: MTH 238
Class Schedule: Section 01: MWF 11:00 – 11:50 PM, ETB, Room 103

Textbook: Modern Control Engineering; 5th ed. 2015; Katsuhiko Ogata, Pearson Educational

Instructor: Dr. Amir A. Mobasher, PhD, PE
Office: ETB 309, Email: amir.mobasher@aamu.edu

Course Learning Outcomes: Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand the process of modeling engineering systems	a, e	Homework, quiz, exams
2. Apply basic methods of analyzing automatic control systems	a, e	Homework, quiz, exams
3. Know how to devise and simplify block diagrams to represent engineering systems	c, e, k	Homework, quiz, exams
4. Analyze an automatic control system performance using frequency response method	a, e, k	Homework, quiz, exams
5. Draw Bode diagrams, polar plots, and Nyquist plots	e, k	Homework, quiz, exams
6. Determine the automatic control system stability	e, k	Homework, quiz, exams

Topics to be covered

Lecture No.	Topic	Homework	Due
1-2	Introduction		
3-8	Process for development of mathematical models for a physical system, Laplace transformation and it's application for the solution of differential equations of physical systems- Inverse Laplace transform	H1	TBD

9-19	Transfer functions, block diagram representation of physical systems and block diagram simplification, state space formulation	H2	TBD
20	Review and Problem Solving session - 1		
21	Test 1		
22-30	Frequency response analysis, Bode diagrams	H3	TBD
31	Review and problem solving session - 2		
32	Test 2		
33-45	Polar plots , drawing Nyquist plots, stability analysis	H4	TBD
46	Review and problem solving session - 3		
47	Test 3		

Course Learning Outcomes: Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand the process of modeling engineering systems	a, e	Homework, quiz, exams
2. Apply basic methods of analyzing automatic control systems	a, e	Homework, quiz, exams
3. Know how to devise and simplify block diagrams to represent engineering systems	c, e, k	Homework, quiz, exams
4. Analyze an automatic control system performance using frequency response method	a, e, k	Homework, quiz, exams
5. Draw Bode diagrams, polar plots, and Nyquist plots	e, k	Homework, quiz, exams
6. Determine the automatic control system stability	e, k	Homework, quiz, exams

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	**X**
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Course number and name: ME 460 Nuclear Reactor Engineering I

Credits and contact hours: 3, 3

Instructor: Dr. Stephen Egarievwe

Textbooks:
Nuclear Heat Transport by M. M. El-Wakil (Hardcover, Revised), American Nuclear Society, 1981.
Nuclear Reactor Analysis by J. J. Duderstadt and L. J. Hamilton, John Willey & Sons, 1976.

Course description: This course introduces students to nuclear power generation concepts and systems. Topics will include heat generation and removal from reactors, steady and unsteady-state conduction mechanisms in the reactor elements, single and two-phases, and liquid metal cooling core thermal design.

Prequisites: ME 307

Required course

Course Learning Outcomes: Upon completion of the course, students will be able to

Course Learning Outcome	Student Outcome	Assessment Tool
Understand the various nuclear rector designs and the nuclear fuel cycle	a, e	Homework, Exams
Understand nuclear processes	a, e	Homework, Exams
Understand the thermodynamics of nuclear power plant and heat generation	a, e	Homework, Exams
Solve the steady neutron-transport/heat-conduction problems using the differential equation	a, e, k	Project, Exams
Work with the numerical methods	a, e, k	Project
Understand system characteristics of PWRs and BWRs	a, e, k	Project, Exams

Relation of course to Student Outcomes:

Student Outcomes	
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	

(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Topics: History, types of nuclear reactors, and fuel cycle; Review of Radioactive decay, nuclear interactions, and microscopic and macroscopic cross sections; Thermodynamics of nuclear power plant; Reactor heat generation and temperature distribution in fuel elements; Introduction to neutron transport; Numerical methods; System characteristics of PWRs and BWRs; One-dimensional steady and transient heat transfer; Introduction to conduction mechanisms in the reactor elements, single and two-phases, and liquid metal cooling core thermal design.

Course number and name: EE 461 Nuclear Reactor Engineering II

Credits and contact hours: 3, 3

Instructor: Dr. Stephen Egarievwe

Textbooks:
Nuclear Heat Transport by M. M. El-Wakil (Hardcover, Revised), American Nuclear Society, 1981.
Nuclear Reactor Analysis by J. J. Duderstadt and L. J. Hamilton, John Willey & Sons, 1976.

Course description: This course is the continuation of EE 460 (Nuclear Reactor Engineering I). It provides the BSEE students in the NP concentration with more advanced knowledge in reactor engineering and prepares them for careers in the nuclear power industry. Topics include heat generation and removal studies from reactors, reactor-specific issues, heat transfer calculations, heat flux calculations and core thermal design, major safety issues.

Prequisite: ME 460

Required course

Course Learning Outcomes: Upon completion of the course, students will be able to

Course Learning Outcome	Student Outcome	Assessment Tool
Estimate the stress induced in structural components from temperature gradients due to the heat conduction	a, e	Homework, Exams
Calculate the dimensionless quantities appropriate to heat transfer calculations in nuclear reactors	a, e	Homework, Exams
Calculate heat transfer coefficients using an appropriately selected correlation at forced or natural convection conditions	a, e	Homework, Exams
Perform mass, momentum and energy balances on different reactor components	a, e, k	Homework, Exams
Understand critical heat flux (CHF) and core thermal design	a, e, k	Homework, Exams
Understand major safety issues related to the light water reactors addition to the principal differences between "next generation" and current generation light water reactors.	e, k	Project, Exams

Relation of course to Student Outcomes:

Student Outcomes	
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	
(d) an ability to function on multi-disciplinary teams	

(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Topics: Critical flow phenomenon; Heat transfer with change in phase; Critical heat flux; Two-phase flow fundamentals; Two-phase flow models; Calculation of two phase pressure drop; Critical heat flux and core thermal design; Pressure drop and buoyancy driven flow in BWRs; Next generations (Gen III) ofPWRs and BWRs.

Alabama A&M University, Mechanical Engineering Department

ME 470 Mechanical Engineering Design Project

Fall 2017

Catalog Data: ME 470 Mechanical Engineering Design Project
Credit 2 hrs. (Lecture 1 hr., Lab 1 hr.)
Design or comprehensive analysis and development of an engineering product or process. The student is required to give an oral presentation of his/her work and submit an approved typewritten technical report.
Prerequisite: Senior Standing and ME 425.

Textbook: Instructor Handouts and Lecture Notes.

References: Engineering Text Books, Library, Internet, Engineering Faculty, Professional Engineers.

Instructor: Mohamed A. Seif, Ph.D., P.E.
Office: ETB 314 Tel: (256)-372-5011 Email: mohamed.seif@aamu.edu

Class Schedule: Tuesday, Thursday, 2:00 – 3:20 PM, Room ETB 118

Course Objectives:

1. This course is designed to provide the student a basic working knowledge to solve open ended engineering problems in the design of thermal and mechanical systems.
2. The students have to utilize the knowledge they have learnt in various engineering courses like Heat Transfer, Thermodynamics, Machine Design, Strength of Materials, Fluid Mechanics, etc.
3. They should be able to identify the design parameters that characterize the system, and analyze them.
4. They will have to do project planning and demonstrate project-engineering skills.
5. Students are expected to develop the senior design project with a systems perspective.
6. Other issues to be addressed as appropriate are: safety, economic impact, reliability, the impact of the engineering solution to society at large, and the manufacturability of the proposed solutions (three or more).
7. They will have to work in a team, and experience the knowledge of team-building.
8. The student is required to make an oral presentation of his/her team work and submit an approved typewritten technical report.
9. This will enhance their technical report writing and data presentation skills.

Relationship to Program Objective:

This capstone design course will provide students the knowledge to analyze various processes in the design of thermal and mechanical systems and evaluate system performance. Report writing and data presentation skills are developed by the preparation of project report and presentations. These knowledge/skills will help the students to successfully practice the profession of mechanical engineering.

Weekly Schedule:

Week No.	Topic
1	Introduction Addressing various issues of Capstone Design
2-3	Selection of Design Project
4	Developing Timeline for various activities
4	Make monthly power-point presentation
5-8	Developing Draft design of the project
8	Make monthly power-point presentation
9-12	Developing design of the project. Consider three alternatives.
12	Make monthly power-point presentation
13-14	Complete the design with three alternative choices.
14	Make Final presentation in front of the faculties and peers.
15	Submit Final Project Report.

Relation of course to Program Outcomes:

Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes (as per Criterion 3)	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	**X**
(d) an ability to function on multi-disciplinary teams	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	**X**
(g) an ability to communicate effectively	**X**
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	**X**
(i) a recognition of the need for, and an ability to engage in life-long learning	**X**
(j) a knowledge of contemporary issues	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

ALABAMA A & M UNIVERSITY
COLLEGE OF ENGINEERING & TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT
Spring/2018

Course: ME 472 – Economic Evaluation of Design Projects
Credits: Lecture 3 hrs/Contact 3 hours

Catalog Data:
The concepts of life-cycle costs and optimization of alternatives are investigated. The formal study of decision-making and economic theory are applied to engineering projects. Case studies are used.

Prerequisites: ECO 231 or 232, ME 231
Class Schedule: Section 01: TR 11:00 – 12:20 PM, ETB
Textbook: Canada, J.R., Sullivan W.G., White, J.A., *Capital Investment Analysis for Engineering and Management*, Third Edition, Pearson Hall, 2005.
Instructor: Dr. Amir A. Mobasher, PhD, PE
Office: ETB 309, Email: amir.mobasher@aamu.edu

Objectives:
It is expected that at the completion of this course the students will:

1. Have a working knowledge of various methods for the economic evaluation of engineering alternatives, break even cost analysis, depreciation analysis.
2. To be familiar with the concepts of Decision Criteria and Methods for Risk and Uncertainty.
3. Familiar with Decision Tree analysis, Statistical Decision Techniques and Mathematical Programming for Capital budgeting.
4. Become familiar with the process to respond to Broad Agency Announcements and evaluation of operation costs.

Topics to be covered:

No	Topics	Hw	Due
1-3	Introduction and cost concepts- systems analysis, cost concepts, role of engineers in economic decision making.	Hw, Project	TBA
4-6	Interest calculations- equivalence, compound interest formulas, nominal and effective rates	Hw	TBA
7-9	Measures of economic effectiveness, defining investment alternative, systematic procedure for comparing alternatives, present worth, annual worth and future worth methods.	Hw	TBA
10	**Exam 1**		
11-13	Rate of return methods for comparing alternatives, internal and external rate of return.	Hw	TBA
14-16	Estimating for economic analysis, difficulty and perspective of estimating. Estimation accuracy, sources of data.	Hw	TBA
17-19	Depreciation, Introduction to depreciation, various methods for determination of depreciation	Hw	TBA
20-22	Replacement analyses- Introduction, importance of replacement studies, causes of retirement, replacement consideration, market value of old asset, cash flow approach, calculation of remaining economic life	Hw	TBA
23	**Exam 2**		

24-25	Capital planning and budgeting, sources of funds, identification and evaluation of alternatives, project selection, budget periods, leasing decisions, capital expenditure practices in United States.	Hw	TBA
26-27	Introduction to risk and uncertainty- difference between risk and uncertainty, cause of R&U, ways to change or influence degrees of uncertainty, return, risk and choice, general model of R&U problems	Hw	TBA
28-29	Sensitivity analysis- Introduction, One at a time procedure, Multi-parameter procedures.	Hw	TBA
30-31	Decision criteria and methods for risk and uncertainty- introduction, general model for risk problems.	Hw	TBA
32-34	Decision tree analysis- introduction, deterministic decision tree, consideration of random outcomes,	Hw	TBA
35-36	classical decision tree problem, construction of decision tree, examples of decision tree applications, examples of decision tree applications	Hw	TBA
37-38	Review of final and introduction to some FE style problems	Hw	TBA

Course Learning Outcome

Course Learning Outcome	Program Outcome	Assessment Tool
Have a working knowledge of various methods for the economic evaluation of engineering alternatives, break even cost analysis, depreciation analysis.	A,e,h	Homework, Quiz, Hands on exercises
To be familiar with the concepts of Decision Criteria and Methods for Risk and Uncertainty.	A,e	Homework, quiz, exams
Familiar with Decision Tree analysis, Statistical Decision Techniques and Mathematical Programming for Capital budgeting.	a	Hands on exercises
Become familiar with the process to respond to Broad Agency Announcements and evaluation of operation costs.	F,h,j,g	Projects and Presentations

Relation of course to Program Outcomes

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	**X**
(g) an ability to communicate effectively	**X**
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	

ME 475 Mechanical Engineering Design Project

Spring 2018

Catalog Data: ME 475 Mechanical Engineering Design Project

Credit 2 hrs. (Lecture 1 hr., Lab 1 hr.)

A continuation of ME 470. Design or comprehensive analysis and development of an engineering product or process. The student is required to give an oral presentation of his/her work and submit an approved typewritten technical report.

Prerequisite: ME 470.

Class Schedule: Tuesday, Thursday 2:00-4:50PM. **Class Location:** ETB 118

Textbook: Instructor Handouts and Lecture Notes.

References: Engineering Text Books, Library, Internet, Engineering Faculty, Professional Engineers.

Instructor: **Dr. Mohamed Seif**, Mechanical Engineering Department

Office: ETB 314 Tel: (256)-372-5011 Email: mohamed.seif@aamu.edu

Course Objectives:

1. This course is designed to provide the student a basic working knowledge to solve open ended engineering problems in the design of thermal and mechanical systems.
2. The students have to utilize the knowledge they have learnt in various engineering courses like Heat Transfer, Thermodynamics, Machine Design, Strength of Materials, Fluid Mechanics, etc.
3. They should be able to identify the design parameters and constraints that characterize the system, and analyze them.
4. They will have to do project planning and demonstrate project-engineering skills.
5. Students are expected to develop the senior design project with a systems perspective.
6. Other issues to be addressed as appropriate are: safety, reliability, economic impact, ethics, the impact of the engineering solution to society at large, and the manufacturability of the proposed solutions (three or more).
7. They will have to work in a team, and experience the knowledge of team-building.
8. The student is required to make an oral presentation of his/her team work and submit an approved typewritten technical report.
9. This will enhance their technical report writing and data presentation skills.

Relationship to Program Objective:

This capstone design course will provide students the knowledge to analyze various processes in the design of thermal and mechanical systems and evaluate system performance. Report writing and data presentation skills are developed by the preparation of project report and presentations. These knowledge/skills will help the students to successfully practice the profession of mechanical engineering.

Weekly Schedule:

Week No.	Project Activity
1	Reviewing progress and addressing issues from previous semester for the Capstone Design Project
2	Developing Timeline for various activities in this semester
3-4	Work on the design project
4	Make monthly power-point presentation
5	Submit Design Constraint Focused Report showing use of design requirements/ constraints to develop a design solution by evaluating alternative designs
5-8	Perform Mechanical and Thermal Analysis

8	Make monthly power-point presentation
9-12	Perform calculations and/or simulations for the design project.
12	Make monthly power-point presentation
13-14	Complete the design and report writing.
14	Make Final presentation in front of the faculties, Industrial Advisory Board Members, and peers.
15	Submit Final Project Report.

Course Learning Outcomes:
Upon completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
Develop a problem statement and design requirements/constraints for a design problem of interest to a client	a, c, e, g	Presentation, Project Report
Use design requirements/constraints to develop a design solution by evaluating a number of alternative designs	a, c, e, k	Presentation, Focused Project Report
Build a prototype, model or related proof of concept of their design	c, k	Presentation, Project Report
Identify and describe the potential social impact and ethical concerns associated with the product of their design efforts	f, h, j	Presentation, Project Report
Complete a final report and poster presentation which includes, where applicable, analysis of critical processes, components or assemblies, CAD drawings, costs of production, material selection and rationale, manufacturing considerations, etc.	c, g, k	Presentation, Poster, Project Report

Relation of course to Program Outcomes:
Upon completion of the course, students will fulfill the following program outcomes

Program Outcomes	Accomplish
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	**X**
(d) an ability to function on multi-disciplinary teams	**X**
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	**X**
(g) an ability to communicate effectively	**X**
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	**X**
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	**X**
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

ME 481 - Quality and Reliability Assurance
Fall Semester, 2017

Catalog Data: ME 481 Lecture 3 hrs; Lab 0 hrs; Credit 3 hrs.
An introduction to probability and statistics. Quantative techniques for establishing product specifications and process controls for quality assurance, ISO 9000; the role of reliability in manufacturing operations; and so forth, are covered.
Prerequisite: ME 300

Class Schedule: ETB 271, 11:00am – 12:20pm Tuesday and Thursday
ETB 104, 9:30am – 10:50pm Tuesday and Thursday

Text Book: "*Miller & Freund's* Probability and Statistics for Engineers", R. A. Johnson, 9th Ed., Pearson, 2017

References:
"Statistical Quality Control", 7th Ed., D. C. Montgomery, Wiley
"Statistical Methods for Quality Improvement", Thomas P. Ryan, 3rd Edition, Wiley.
"Introduction to Quality and Reliability Engineering", 2015 Edition. R. Jiang, Springer, 2015
Quality Control", D. H. Besterfield, 6th Edition, Prentice Hall.
"Reliability: Modeling, Prediction and Optimization", W. Blischke D. Murthy, Wiley.
"Reliability & Maintainability Engineering", C. E. Ebeling, McGraw Hill.

Instructor: Dr. Michael Ayokanmbi
Office: ETB 319 **Tel**:(256) 372-4312 **Email**:michael.ayokanmbi@aamu.edu

Pre-requisites by Topics:
1. System of units.
2. Solution of ordinary differential equations.
3. Mathematical Solution of open-ended engineering problems.
4. Fundamental concepts of design and process realization

Topics:
1. Introduction to probability and statistics as applied to quality and reliability analysis
2. Quality Analysis and improvement. Data treatment – Visually Inspecting data to improve product quality; Description of Data – detecting grinding operation problem with frequency distribution; Quartiles and percentiles – comment on the relationship between quality at different plants.
3. Design for reliability and quality in product/process realization. Fundamentals concepts: Sample space and event, tree diagram; permutation and combination - determining the size of an experiment and selection of machines for an experiment; probability calculation - the probability of requiring repairs under warranty.
4. Reliability and mathematical methods. Fundamental concepts of applied probability. Introduction to conditional probability, special production rule of probability - the probability of falsely signaling a pollution problem, using the probability to compare the accuracy of two schemes, Bayes' theorems - applications for system reliability evaluation.
5. Introduction to fundamental concepts in statistical methods for reliability applications and quality control. Various statistical distributions, mean and variance, Chebyshev's theorem, Poisson processes – calculating the probabilities of imperfections, normal and exponential distribution, six-sigma.
6. Quality assurance. ISO 9000, the Malcolm Baldridge Award, certification procedures. Performance measures.

7. The statistical content of quality-improvement program. Experimental designs for quality, the Taguchi method. Quality control, control charts for measurements, control charts for attributes, tolerance limits.
8. Application to reliability and life testing. Failure-time distribution, the exponential model in life testing – obtaining a confidence interval for mean life, Weibull reliability function and Weibull failure-rate function.

Course Learning Outcomes: Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
1. Quality Analysis and improvement. Data treatment, Quartiles and percentiles	A, E	Homework Quiz Exams
2. Design for reliability and quality in product/process realization. Fundamentals concepts: Sample space and event, tree diagram; permutation and combination - determining the size of an experiment and selection of machines for an experiment; probability calculation - the probability of requiring repairs under warranty.	A, C, E	
3. Reliability and mathematical methods. Fundamental concepts of applied probability. Conditional probability, special production rule of probability - the probability of falsely signaling a problem, using the probability to compare the accuracy of two schemes, Bayes' theorems - applications for system reliability evaluation. Various statistical distributions, mean and variance, Chebyshev's theorem, Poisson processes – calculating the probabilities of imperfections, normal and exponential distribution, six-sigma.	A,E	
4. The statistical content of quality-improvement program	A,E, K	
5. Application to reliability and life testing.	A,C, E, K	

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	**X**
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	
(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	X

ME 482 Operations Planning and Scheduling
Spring 2018

Catalog Data:

ME 482 Operations Planning and Scheduling - Lecture 3 hrs, Credit 3 hrs
Analysis and design of production and control systems for both intermittent and continuous manufacturing. Inventory effects on production, production control techniques review of just in time manufacturing. Emphasis is given to extending concurrent engineering techniques and methods for manufacturing and product development. **Prerequisite**: MTH 227

Textbook: 1.) Production and Operations Analysis, Seventh editions, 2018.
By Steven Nahmias. The McGraw-Hill Companies, Inc. ISBN-13:978-1478623069.

2.) Class Notes

Class Schedule: T, R: 3:30 – 4:50 pm
Class Room: ETB # 103

Instructor: **Dr. Mohamed Gadalla**, Mechanical Engineering Department
Office: ETB 307, Tel: (256)-372-5891, Email: mohmaed.gadalla@aamu.edu

Prerequisite: ME 432/L Design Mfg Reliability &Lab, Consult advisor

Objectives:

This course is designed to provide student a comprehensive and up-to-date look at Operation Planning and Scheduling in engineering and manufacturing fields. The course will cover the evolution production systems, problem solving, aggregate planning, material requirements planning, scheduling, project management and integrated production planning and control. The instructor will provide a problem-driven approach to planning, scheduling, controlling and integrating production in conjunction with real-world decision-making operation. The student will be exposed to some examples and mini-case studies to enhance the discussion.

Topics:

1. Introduction to Production Systems, Strategy and Competition
2. Forecasting
3. Aggregate Planning
4. Inventory Control
5. Push and Pull Production Control System: MRP and JIT

6. Operations Scheduling

Course Learning Outcomes: Upon the completion of the course, students will be able to

Course Learning Outcome	Program Outcome	Assessment Tool
1. Understand production system and production management technologies	A	Homework Quiz Exams
2. Understand market driven system	A	
3. Understand forecasting system	A,E,C	
4. Understand Inventory Control	C	
5. Understand MRP and JIT systems	A ,K	
6. Conduct operations scheduling	A,E	

Relation of course to Program Outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	**X**
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Computer Usage: 15%

Other Policies:

1. Students are expected to attend all classes and are responsible for all the materials covered in class.
2. Homework should be turned in on its due date. Homework assignments are designed to enhance students' comprehension of the course material and prepare them for examination. Copying of others' work is strictly prohibited and will only lead to inadequate performance on examinations.
3. Examinations will be close or open book. There will be no makeup examinations except under very exceptional circumstances pre-excused by the instructor. Any missed examination automatically receives a grade of ZERO. Collaboration on examination (including exchange of books, calculators, etc.) is strictly prohibited. Cheating on examinations could lead to an "F" grade in the course.
4. Any cellular telephone, PDA, or notebook computer use (calls or other functions, e.g. calculator) is not allowed during examinations.

Course Number	MTH 125
Course Title	CALCULUS I
Call Number/Section	
Class Times	
Class Location	
Prerequisites	MTH 113, MTH 115, or placement
Textbook	Calculus, Larson and Edwards, 10th edition, 2013.
Instructor	
Office	
Office Hours	
E-mail address	
Telephone number	

COURSE DESCRIPTION

Limits; derivatives of algebraic, trigonometric, exponential, and logarithmic functions; applications of the derivative; differentials; maximum and minimum problems; curve sketching using calculus; and the definite integral and its applications to area. **This is the first of three courses in the basic calculus sequence taken primarily by students in science, engineering and mathematics. Prerequisite: MTH 113, MTH 115, or satisfactory placement test scores.** (Offered Fall, Spring, Summer)

STUDENT LEARNING OUTCOMES

To provide a careful study of calculus. Mastery of the concepts of calculus: functions, limits, continuity, differentiation, and integration.
To help the student acquire technical facility and an understanding of the uses and applications of calculus.
To help the student gain mathematical maturity.

CLASS FORMAT

Students are expected to attend all the lectures, and to complete all homework assigned through webassign following each lecture. All cell phones must be turned off during class time, and cell phones cannot be used for calculation purposes.

COURSE OUTCOMES

Learning Outcomes
Apply mathematical logic to higher-order problem solving

1. Create a proof using the language of mathematics
2. Apply mathematical theory
3. Assess the veracity of mathematical statements
4. Know the ideas supporting mathematical methods
5. Apply the concepts of mathematics
6. Produce and interpret graphs and tables

SERVICES FOR PERSONS WITH DISABILITIES

The University provides environmental and programmatic access for persons with documented disabilities as defined in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disability Act of 1990. Any student who desires information or assistance in arranging needed services for a disabling condition should contact the Director of Special Students Services, Student Center, Room 203, (256) 372-4263.

STUDY FOLDER

Create your own study folder for the course and organize it chronologically. If, for some reason, you miss any lecture, make sure you get the corresponding class notes from your fellow students.

ATTENDANCE POLICY

A student is permitted one (1) unexcused absence for each credit hour generated by the class. For example, two (2) absences are allowed in a two-hour class.

TUTORIAL ASSISTANCE

Tutorial assistance for undergraduate courses can be obtained from the Tutorial Assistance Network (TAN), a subsidiary of the Office of Academic Support Services. TAN is located in Room 100C Buchanan Hall. The telephone number is 256-372-5487.

GRADE DETERMINATION

There will be at least 4 in-class tests, worth 50% of the final course grade, weekly in-class quizzes, homework assignments for each section, and a two hour **common comprehensive final examination**.

Course Requirements	Points Awarded	Percent of Total
Homework assignments, attendance and class performance		10%
Quizzes		15%
Test		50%
Common Comprehensive Final Exam		25%
TOTAL		100%
Grading Scale		
Percent of Points	Number of Points	Grade
90% - 100%		A
80% - 89%		B
70% - 79%		C
60% - 69%		D
0% - 59%		F

COURSE OUTLINE

Dates*	Topics	Assignments
WEEK 1	**P.1 Graphs and Models** **P.2 Linear Models and Rates of Change** **P.3 Functions and Their Graphs**	
WEEK 2	**1.2 Finding Limits Graphically** **1.3 Finding Limits Analytically**	
WEEK 3	**1.4 Continuity and One-Sided Limits** **1.5 Infinite Limits**	
WEEK 4	**3.5 Limits at Infinity** **2.1 The Derivative and the Tangent Line Problem**	
WEEK 5	**2.2 Basic Differentiation Rules and Rates of Change** **2.3 Product and Quotient Rules and Higher-Order Derivatives**	
WEEK 6	**2.4 The Chain Rule** **2.5 Implicit Differentiation**	
WEEK 7	**4.1 Antiderivatives and Indefinite Integration** **4.2 Area**	
WEEK 8	**4.3 Riemann Sums and Definite Integrals** **4.4 The Fundamental Theorem of Calculus**	
WEEK 9	**4.5 Integration by Substitution** **5.1 The Natural Logarithmic Function: Differentiation**	
WEEK 10	**5.2 The Natural Logarithmic Function: Integration** **5.3 Inverse Functions**	
WEEK 11	**5.4 Exponential Functions: Differentiation and Integration** **5.6 Inverse Trigonometric Functions: Differentiation** **5.7 Inverse Trigonometric Functions: Integration**	
WEEK 12	**8.7 Indeterminate Forms and L'Hospital's Rule** **3.1 Extrema on an Interval**	
WEEK 13	**3.3 Increasing and Decreasing Functions and the First Derivative Test** **3.4 Concavity and the Second Derivative Test**	
WEEK 14	**3.6 A Summary of Curve Sketching** **3.9 Differentials**	
Optional	**3.7 Optimization Problems** **2.6 Related Rates**	

CLASSROOM CODE OF CONDUCT

As a means of becoming successful and prepared for the professional world, including internships, graduate or professional school and positions of employment, students are expected and required to abide by the following codes.

Individual breaches of codes of conduct or dress codes will be dealt with by the instructor, on a case-by-case basis, based on the severity of the infraction. Punishment can range from being marked "absent for that day to being dismissed from the class. Severe or repeat infractions may be turned over to judiciary.

GENERAL DECORUM

1. Students must be able to present their ID cards for inspection. It is recommended that the card be visibly displayed, whether clipped to a waistband or breast pocket or worn on a lanyard.

2. Students must attend class regularly, missing no more than the allowed number of absences:
   a. Absent 1 hour of class for a 1 credit hour course
   b. Absent 2 hours of class for a 2 credit hour course
   c. Absent 3 hours of class for a 3 credit hour course
   d. Absent 4 hours of class for a 4 credit hour course

   ***Students whose absences exceed the above scale will receive a reduction in their final course averages** as determined by the faculty member. Exceptions to this policy on point reduction may be granted by the faculty upon presentation of documentation from the Vice President of Academic Affairs that an official excuse has been granted for the student's absence.

   Conditions warranting such an approval include cases involving death in the family, illness of the student or his/her immediate family members or for military duty. It is the student's responsibility to provide legitimate, official documentation of excused absences to the instructor(s) of the courses involved. Other reasons for absences not covered here must be cleared with the appropriate College Dean. - Undergraduate Catalog, p. 57.

3. Students must be on time to class and must remain until dismissed.

4. Students must prepare for each class meeting by reading assignments and completing any required written work. It is thus imperative that students purchase their books in a timely manner (i.e., within the first two weeks of the semester).

5. Students must meet all deadlines, including those established by the instructor and those set by the University.

6. Students must never have electronic devices such as cell phones, PDA's, iPods, or similar items in use during class time.

7. Students are expected to act with courtesy and respect to instructors, guests, staff members, and fellow classmates and **may not disrupt a classroom or a faculty member's conduct of a class.** For example, students should refrain from talking during class while the instructor or another student "has the floor." Failure to behave with proper courtesy and respect could result in disciplinary action. **A student who disrupts a classroom may be removed or ejected from the class or classroom.**

8. Students must not come to class under the influence of drugs or alcohol.

9. Food and drinks are not allowed in the classroom, lecture hall, or lab.

STUDENT DRESS CODE

1. Pajamas, sleep wear and inappropriate exercising clothes (i.e. P.E. uniforms, bicycle shorts, under armor, uncovered spandex) are not allowed in the classroom. Shirts/tops must be worn at all times. Sweat pants are allowed when worn with appropriate undergarments.

2. All students must wear shoes, boots, or other types of footwear made for outside wear: bedroom shoes/slippers, shower shoes, or similar footwear are not allowed in the classroom.

3. Dress and grooming will not disrupt the teaching/learning process or cause undue attention to an individual student; for example, no sunglasses are allowed in the classroom; excessive body piercings, tattoos, and “grillz” are not recommended.

4. Hats, hoods, caps, stocking caps, wave caps, do-rags, and other head coverings are not to be worn in the classroom; no hair curlers whether covered or uncovered are allowed in classrooms. Head coverings designed for religious, cultural, or medical/illness purposes are allowed.

5. Attire must not display language and/or images which are derogatory, profane, or sexually explicit, or abusive, or which “advertise” drugs or alcohol.

6. Dress must be modest and appropriate for a professional or serious setting; no midriff tops, halter tops, sports bras, strapless tops or dresses, camisole tops with spaghetti straps, see-through blouses or shirts, or extremely short or revealing shorts or skirts will be allowed in the classroom.. If a student chooses to wear a midriff top, halter top, sports bra, camisole with spaghetti straps, or a tank top or sundress with straps less than 2 inches wide (male or female), the student must wear a shirt or jacket over it.

7. Clothing which allows undergarments to be visually observed is not permitted: NO SAGGING PANTS will be allowed. No undergarments should be visible at any time.

8. It is assumed that students will practice personal cleanliness. Additionally, clothing should not carry excessive odors, i.e., tobacco, body sprays, or colognes.

Course Number	MTH 126
Course Title	CALCULUS II
Call Number/Section	
Class Times	
Class Location	
Prerequisites	MTH 125 Calculus I
Textbook	Calculus, Larson and Edwards, 10th edition, 2013.
Instructor	
Office	
Office Hours	
E-mail address	
Telephone number	

COURSE DESCRIPTION

Area, volume, and arc length; techniques of integration; sequences and series; parametric and polar curves; three-dimensional coordinates, vectors, lines, and planes. **This is the second of three courses in the basic calculus sequence taken primarily by students in science, engineering and mathematics. Prerequisite: MTH 125 or satisfactory placement test scores.** (Offered Fall, Spring, Summer)

STUDENT LEARNING OUTCOMES

The students should be able to apply calculus to compute measure. They should have familiarity with the techniques of integration and series. They should have knowledge of parametric and polar curves. They should have introductory knowledge of vectors and the three-dimensional coordinate system.

CLASS FORMAT

To be determined by the instructor

COURSE OUTCOMES

The students will be able to think about mathematics both algebraically and geometrically.
The students will develop critical thinking and apply it to problem solving.
The students will gain familiarity with various forms of graphs.

SERVICES FOR PERSONS WITH DISABILITIES

The University provides environmental and programmatic access for persons with documented disabilities as defined in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disability Act of 1990. Any student who desires information or assistance in arranging needed services for a disabling condition should contact the Director of Special Students Services, Student Center, Room 203, (256) 372-4263.

STUDY FOLDER

To be determined by the instructor

ATTENDANCE POLICY

A student is permitted one (1) unexcused absence for each credit hour generated by the class. For example, two (2) absences are allowed in a two-hour class.

TUTORIAL ASSISTANCE

Tutorial assistance for undergraduate courses can be obtained from the Tutorial Assistance Network (TAN), a subsidiary of the Office of Academic Support Services. TAN is located in Room 100C Buchanan Hall. The telephone number is 256-372-5487.

GRADE DETERMINATION

Course Requirements	Points Awarded	Percent of Total
Assignments.		0% - 5%
Quizzes		20% - 25%
Tests		50%
Comprehensive Final Exam		20% - 25%
TOTAL		100%
Grading Scale		
Percent of Points	Number of Points	Grade
90% - 100%		A.
80% - 89%		B
70% - 79%		C
60% - 69%		D
0% - 59%		F

DESCRIPTION OF SPECIFIC ASSIGNMENTS

To be determined by the instructor.

COURSE OUTLINE

Dates*	Topics	Assignments
WEEK 1	**2.2, 2.3, 2.4, 5.1, 5.4 Review of Derivatives** **4.4, 5.2, 5.4 Review of Integrals** **4.5, 5.2, 5.4 Integration by Substitution**	
WEEK 2	**8.2 Integration by Parts** **8.3 Trigonometric Integrals**	
WEEK 3	**8.4 Trigonometric Substitution** **8.5 Partial Fractions** **Summary of Techniques of Integration**	
WEEK 4	**8.8 Improper Integrals** **7.1 Area of a Region between Two Curves**	
WEEK 5	**7.2 Volume: the Disk Method** **7.4 Arc Length**	
WEEK 6	**10.2 Plane Curves and Parametric Equations** **10.3 Parametric Equations and Calculus**	
WEEK 7	**10.4 Polar Coordinates and Polar Graphs** **10.5 Area in Polar Coordinates**	
WEEK 8	**11.1 Vectors in the Plane** **11.2 Space Coordinates and Vectors in Space** **11.3 The Dot Product of Two Vectors**	
WEEK 9	**11.4 The Cross Product of Two Vectors in Space** **11.5 Lines and Planes in Space**	
WEEK 10	**9.1 Sequences** **9.2 Geometric Series and the Divergence Test**	
WEEK 11	**9.3 p-Series** **9.4 The Limit Comparison Test**	
WEEK 12	**9.6 The Ratio Test** **Summary of Convergence Tests**	
WEEK 13	**9.7 Taylor Polynomials** **9.8 Power Series**	
WEEK 14	**9.10 Taylor and Maclaurin Series** **Review**	

COLLEGE OF ENGINEERING, TECHNOLOGY & PHYSICAL SCIENCES
Alabama A&M University
Normal, AL 35762

COURSE SYLLABUS
Fall 2015

Course Number	MTH 227
Course Title	CALCULUS III
Call Number/Section	
Class Times	
Class Location	
Prerequisites	MTH 126
Textbook	Calculus, Larson and Edwards, 10th edition, 2013.
Instructor	
Office	
Office Hours	
E-mail address	
Telephone number	

COURSE DESCRIPTION

Calculus III - 4 hrs. Vector-valued functions; functions of several variables, partial derivatives and their applications; quadric surfaces, multiple integration, and vector calculus, including line and surface integrals; curl and divergence, Green's Theorem, and Stoke's Theorem. **This is the third of three courses in the basic calculus sequence. Prerequisite: MTH 126 or MTH 146**. (Offered Fall, Spring, Summer)

STUDENT LEARNING OUTCOMES

This course is designed to provide students of science, mathematics, and engineering an understanding of multivariate calculus.

1. The use of the methods of vector analysis including differentiation and integration of vector functions, finding tangent and normal vectors for curves, and graphing quadric surfaces.

2. The theory of functions of several variables, including continuity, partial and directional derivatives, the differential. and the finding of extrema.

3. The theory and use of multiple integrals, with applications to problems' of area, volume, surface area, mass and moments.

4. The definitions, theory and application of line and surface integrals.

CLASS FORMAT

Issues such as expectations of students classroom rules, policy on cell phones and make-up exams, policy on cheating, encouraging office visits, etc.

COURSE OUTCOMES

Learning Outcomes
Apply mathematical logic to higher-order problem solving 1. Create a proof using the language of mathematics 2. Apply mathematical theory 3. Assess the veracity of mathematical statements 4. Know the ideas supporting mathematical methods 5. Apply the concepts of mathematics 6. Produce and interpret graphs and tables

SERVICES FOR PERSONS WITH DISABILITIES

The University provides environmental and programmatic access for persons with documented disabilities as defined in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disability Act of 1990. Any student who desires information or assistance in arranging needed services for a disabling condition should contact the Director of Special Students Services, Student Center, Room 203, (256) 372-4263.

STUDY FOLDER

This section is optional

ATTENDANCE POLICY

A student is permitted one (1) unexcused absence for each credit hour generated by the class. For example, two (2) absences are allowed in a two-hour class.

TUTORIAL ASSISTANCE

Tutorial assistance for undergraduate courses can be obtained from the Tutorial Assistance Network (TAN), a subsidiary of the Office of Academic Support Services. TAN is located in Room 100C Buchanan Hall. The telephone number is 256-372-5487.

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GRADE DETERMINATION

Course Requirements	Points Awarded	Percent of Total
Assignments		
Quizzes		
Tests		
Comprehensive Final Exam		
TOTAL		

Grading Scale

Percent of Points	Number of Points	Grade
90% - 100%		A
80% - 89%		B
70% - 79%		C
60% - 69%		D
0% - 59%		F

DESCRIPTION OF SPECIFIC ASSIGNMENTS

COURSE OUTLINE

Dates*	Topics	Assignments
WEEK 1	**11.1 Vectors in the Plane** **11.2 Space Coordinates and Vectors in Space** **11.3 The Dot Product of Two Vectors**	
WEEK 2	**11.4 The Cross Product of Two Vectors in Space** **11.5 Lines and Planes in Space** **11.6 Surfaces in Space**	
WEEK 3	**11.7 Cylindrical and Spherical Coordinates** **12.1 Vector-Valued Functions**	
WEEK 4	**12.2 Differentiation and Integration of Vector-Valued Functions** **12.4 Tangent Vectors**	
WEEK 5	**12.5 Arc Length**	

	13.1 Introduction to Functions of Several Variables
WEEK 6	**13.3 Partial Derivatives**
	13.5 Chain Rules for Functions of Several Variables
WEEK 7	**13.6 Directional Derivatives and Gradients**
	13.7 Tangent Planes and Normal Lines
WEEK 8	**13.8 Extrema of Functions of Two Variables**
	14.1 Iterated Integrals and Area in the Plane
WEEK 9	**14.2 Double Integrals and Volume**
	14.3 Change of Variables: Polar Coordinates
WEEK 10	**14.5 Surface Area**
	14.6 Triple Integrals
WEEK 11	**14.7 Triple Integrals in Other Coordinates**
	14.8 Change of Variables: Jacobians
WEEK 12	**15.1 Vector Fields**
	15.2 Line Integrals
WEEK 13	**15.4 Green's Theorem**
	15.6 Surface Integrals
WEEK 14	**15.7 Divergence Theorem**

Course Number	MTH 238
Course Title	Applied Differential Equations (Three Semester Hours)
Call Number/Section	
Class Times	
Class Location	
Prerequisites	MTH 126
Textbook	A First Course in Differential Equations with Modeling Applications (10th Edition) by Dennis G. Zill
Instructor	
Office	
Office Hours	
E-mail address	
Telephone number	

COURSE DESCRIPTION

An introduction to numerical methods, qualitative behavior of first order differential equations, techniques for solving separable and linear equations analytically, and applications to various models, including populations, motions and chemical mixtures. Techniques for solving higher order linear differential equations with constant coefficients, including the general theory and the methods of undetermined coefficients, reduction of order, and variation of parameters. Interpretation of the behavior of solutions, and applications to physical models with higher order governing equations. The Laplace transform as a tool for solving initial value problems with discontinuous inhomogeneous terms. **Prerequisite**: **MTH 126 or MTH 146.** (Offered Fall, Spring, Summer)

STUDENT LEARNING OUTCOMES

Ability to solve first and second order Differential Equations, find exact solutions using method of variation, Know initial value problems, know application of differential equations, ability to assess the veracity of mathematical statements, have ideas to support mathematical methods, and apply mathematical logic to higher-order problem solving.

CLASS FORMAT

Policy to be adopted by Instructor

COURSE OUTCOMES

- Apply mathematical logic to higher-order problem solving
- Apply the concepts of mathematics
- Apply mathematical theory
- Know the ideas supporting mathematical methods
- Assess the veracity of mathematical statements

SERVICES FOR PERSONS WITH DISABILITIES

The University provides environmental and programmatic access for persons with documented disabilities as defined in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disability Act of 1990. Any student who desires information or assistance in arranging needed services for a disabling condition should contact the Director of Special Students Services, Student Center, Room 203, (256) 372-4263.

STUDY FOLDER

To be determined by Instructor

ATTENDANCE POLICY

A student is permitted one (1) unexcused absence for each credit hour generated by the class. For example, two (2) absences are allowed in a two-hour class.

TUTORIAL ASSISTANCE

Tutorial assistance for undergraduate courses can be obtained from the Tutorial Assistance Network (TAN), a subsidiary of the Office of Academic Support Services. TAN is located in Room 100C Buchanan Hall. The telephone number is 256-372-5487.

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GRADE DETERMINATION

Course Requirements	Points Awarded	Percent of Total
Quizzes Homework Tests Final Exam		20% 5% 50% 25%.
TOTAL		100%
Grading Scale		
Percent of Points	Number of Points	Grade
90% or above 80% --89% 70% - 79% 60% - 69% Below 60%		A B C D F

DESCRIPTION OF SPECIFIC ASSIGNMENTS

To be determined by Instructor
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COURSE OUTLINE

Dates*	Topics	Assignments
Week 1	**Chapter1: Introduction to Differential Equations; 1.1: Definition and Terminology**	
Week 2	**1.2:Initial Value problems; 1.3: Differential Equations as Mathematical models**	
Week 3	**Chapter2: First Order Differential Equations;** **2.2: Separable Variables; 2.3 Linear Equations**	
Week 4	**2.4: Exact Equations; 2.5: Solutions by Substitution**	

Week 5	**Chapter 3: Modeling with First Order Differential Equations; 3.1:Linear Models**	
Week 6	**3.2 : Nonlinear Models**	
Week 7	**3.3: Modeling with Systems of First-Order DEs**	
Week 8	**Chapter 4: Higher Order Differential Equations;** **4.1:Preliminary Theory-Linear Equations;** **4.1.1: Initial-Value and Boundary-Value Problems; 4.1.2.:Homogeneous Equations;** **4.1.3: Nonhomogeneous Equations.**	
Week 9	**4.2: Reduction of Order**	
Week 10	**4.3 Homogeneous Linear Equations with Constant Coefficients**	
Week 11	**4.4: Undetermined Coefficients-Superposition Approach; 4.5: Undetermined Coefficients-Annihilator Approach**	
Week 12	**4.6: Variation of Parameters**	
Week 13	**Chapter 7: The Laplace Transform;** **7.1 Definition of Laplace Transform;** **7.2: Inverse Transforms and Transforms of Derivatives**	
Week 14	**7.3 Translations Theorem**	
Week 15	**Chapter9: 9.1: Euler Methods and Error Analysis;** **9.2: Runge-Kutta Methods**	
Week 16	**REVIEW FOR FINAL EXAM**	

Alabama A&M University
College of Engineering, Technology, and Physical Sciences
Department of Physics, Chemistry, and Mathematics
COURSE SYLLABUS
FALL 2017

Course Number	PHY 213
Course Title	Physics Lecture and Laboratory I
Call Number/Section	71299, Section 3
Instructor	Mohan Aggarwal
Class Schedule	MW 1:00 to 3:05 PM F 1:00 to 2:00 PM
Class Location	V. Murray Chambers Bldg Room 140
Prerequisites	MTH 125
Textbook	"Fundamentals of Physics", 10th Edition by Halliday, Resnick & Walker, John Wiley & Sons Inc. (2014**).**
Office Location	Room 124 V Murray Chambers Building
Office Hours	Mondays, Wednesdays, Fridays; 8:00-10.00 Tuesdays, Thursdays 8.00-10.00
Telephone number	256-372-8132
E-mail address	mohan.aggarwal@aamu.edu
Course web-site	Blackboard

COURSE DESCRIPTION

Phys. 213 is the first part of a two-semester calculus-based introductory physics course designed to review the fundamental concepts of physics for science and engineering majors. It addresses the subjects covering Newtonian Mechanics, waves, and Thermodynamics. It provides a solid foundation for the more advanced courses to follow**.**

STUDENT LEARNING OUTCOMES

Upon successful completion this course, the student will have acquired the following knowledge and skill to:

1. Demonstrate a comprehension of physical reality by understanding how fundamental physical principles underlie the huge variety of natural phenomena and their interconnectedness.

2. Demonstrate a comprehension of technology by understanding how things work on a fundamental level.

3. Build critical thinking and quantitative skills by gaining insight into the thought processes of physical approximation and physical modeling, by practicing the appropriate application of mathematics to the description of physical reality.

4. Demonstrate basic experimental skills by the practice of setting up and conducting an experiment with due regards to minimizing measurement error and by the thoughtful discussion and interpretation of data.

5. Demonstrate basic communication skills by working in groups on a laboratory experiment.

TEXT URL:
Please visit the textbook's web site at http://www.wiley.com/college/halliday

CLASS FORMAT
Attendance: "Participation" includes attending class regularly, asking relevant questions during class, seeking help during SI sessions and office hours, helping to lead discussions, etc. Attendance is required at all lecture classes. Students are responsible for material covered and announcements made in class.
Cell Phones: Use of cell phones and Bluetooth devices are not allowed. Put them in mute or vibrate mode during lectures. Having a cell phone out during a quiz or an exam (even if it is turned off) will not be allowed.
Calculators: You will often need to use a calculator for lectures and exams. You will need a non-programmable calculator that you should bring to every class. Using a programmed calculator in an exam to store information not available to the entire class, including solutions or equations, is considered cheating. A cell-phone calculator is not allowed during exams.

COURSE OUTCOMES
The primary goal of this course is to acquaint the students with basic conceptual foundation and vocabulary of physics. Upon completing this course the student should be able to:

- Convert the unit of a physical quantity from one system of units to another
- Resolve vectors and to calculate the dot and cross product of two vectors
- Determine the particle kinematics with constant acceleration
- Calculate the trajectory of a projectile
- Define inertia, mass, Newton s laws of motion, inertial and noninertial frames of reference, frictional forces
- Define work, energy, conservative and nonconservative forces, and the Work-energy theorem
- Explain the principle of conservation of energy, linear and angular moments of inertia, and energy quantization
- Calculate the center of mass of rigid bodies
- Explore the collision of two bodies and the definition of elastic and inelastic collisions
- Define the concept of rotational dynamics, rotational inertia, centers of mass and gravity
- Apply the Newton s law of Universal Gravitation, Pascal's and Archimedes' principle.
- State the relationship between the kinetic, potential and total energies for a simple harmonic oscillator
- Understand various waves, wave parameters, energy and power of a wave, and the wave equation
- Understand the zeroth law and first law of thermodynamics, thermal expansion and heat transformation.

SERVICES FOR PERSONS WITH DISABILITIES

The University provides environmental and programmatic access for persons with documented disabilities as defined in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disability Act of 1990. Any student who desires information or assistance in arranging needed services for a disabling condition should contact the Director of Special Students Services, Student Center, Room 203, (256) 372-4263.

TUTORIAL ASSISTANCE

Tutorial assistance for undergraduate courses can be obtained from the Tutorial Assistance Network (TAN), a subsidiary of the Office of Academic Support Services. TAN is located in Room 100C Buchanan Hall. The telephone number is 256-372-5487.

GRADE DETERMINATION

Course Requirements	Points Awarded	Percent of Total
Test 1	100 Points	20%
Test 2	100 Points	20%
Test 3	100 Points	20%
Test 4	100 Points	20%
Homework	50 points	10%
Laboratories	50 Points	10%
TOTAL	**500**	
points	**100%**	

GRADES

90%-100%	A
80%-89.9%	B
70%-79.9%	C
60%-69.9%	D
0 -59.9%	F

DESCRIPTION OF SPECIFIC ASSIGNMENTS

Dates*	Topics	Assignments
Week 1	Introduction to Physics	None
Week 2	Chapter 1: Measurement	Problems: 1,12, 21, 37, 47
Week 3	Chapter 2: Motion Along a Straight Line	Problems: 3, 11, 19, 33, 46, 60, 87, 91
Week 4	Chapter 3: Vectors	Problems: 9, 34, 41, 63

Week 5	Chapter 4: Motion in two and three Dimensions	Problems: 15, 25, 30, 47, 77
	TEST ONE	
Week 6	Chapter 5: Forces and Motion – I	Problems: 13, 43,53, 56, 69, 78
Week 7	Chapter 6: Forces and Motion - II	Problems: 7, 25, 35, 87
Week 8	Chapter 7: Kinetic Energy and Work	Problems: 22, 23, 37, 39, 48, 53
Week 9	Chapter 8: Potential energy and Conservation of Energy	Problems: 8, 19, 24, 34, 56
	TEST TWO	
Week 10	Chapter 9: Center of Mass and Linear Momentum	Problems: 6, 13, 38, 51, 68
Week 11	Chapter 10: Rotation	Problems: 7, 28.33,50,70
Week 12	Chapter 11: Rolling, Torque, and Angular Momentum	Problems: 3,19,27, 36, 51
Week 13	Chapter 13: Gravitation	Problems: 3, 17, 43,60, 72
	TEST THREE	
Week 14	Chapter 15: Oscillations	Problems: 3, 8, 11, 24, 38
Week 15	Chapter 16: Waves - I	Problems: 3, 13, 17, 26, 31
Week 16	Chapter 18: Temperature, Heat, and the 1st Law of Thermodynamics	Problems: 5, 11, 21, 42, 44
Week 17	**FINAL EXAM (Comprehensive)**	

LABORATORY EXPERIMENTS:

Students are also required to perform ten experiments during the semester. A brief report of each experiment should be submitted at the end of each experimental period.

CLASSROOM Code of Conduct

Please follow classroom code of conduct, a copy of which is provided to you along with this course outline and is also on the University website and on Blackboard course information.

Alabama A&M University, Normal, AL 35762
College of Engineering, Technology, and Physical Sciences
Department of Physics
COURSE SYLLABUS, Spring 2018

Course Number	PHY 214 02
Course Title	General Physics with Cal II
CRN	11829
Instructor	Dr. Rajpal Sirohi
Class Location and Hours	VMC Bldg. Room 130, 10:00 am to 11:40 am [Mondays and Fridays]; VMC Bldg. Room 129, 10:00 am to 10:50 am [Wednesdays].
Prerequisites	MTH 125, PHY 213
Textbook	"Fundamental of Physics", 9th or 10th Edition by Halliday, Resnick & Walker, John Wiley & Sons Inc.
Office Location	V. Murray Chambers Bldg. Room 141
Office Hours	Monday and Wednesdays 3 pm to 4 pm, Friday 2 pm to 4 pm Tuesdays 08 am to 12 am, Thursdays 2 pm to 4 pm
Telephone number	256-372-8131
E-mail address	Rajpal.sirohi@aamu.edu

COURSE DESCRIPTION

PHY 214 is the second part of a two-semester calculus-based introductory physics course designed to review the fundamental concepts of physics for science and engineering majors. This is the second part of a calculus - based physics course designed for sciences, engineering and technical majors. The goal is the same as for Physics 1. Topics to be covered will include electricity, magnetism, and light. The students will perform eight to ten experiments. The course provides a solid foundation for the more advanced courses in physics to follow.

STUDENT LEARNING OUTCOMES

The primary goal of this course is to acquaint the students with basic concepts in electricity, magnetism and optics. It is designed to help students develop problem-solving skills. At the end of the course, each student should be able to demonstrate his/her understanding of electric and magnetic forces, fields, electrical potential, electrical energy, RCL circuits, Maxwell's equations, wave optics, mirrors and lenses. Upon completing this course, the students should be able to:

- Define Coulomb's law and explore its properties
- Explain electric field, electric force, electrical potential & electrical energy
- Apply Gauss Law
- Define capacitance and calculate it for capacitors in series and parallel combinations as well as the stored energy.
- Understand the sources and forces due to magnetic fields
- Explain Faraday's law of electromagnetic induction
- Understand the physical meanings of Maxwell's equations and their applications

The following chapters from the textbook will be covered. Four of the assigned problems in each chapter should be worked out and submitted one week from the date we have covered the chapter. Students are encouraged to do all the assignments to enhance their understanding of the concepts. Office conferences are highly welcomed.

CLASS FORMAT

Attendance: A student is permitted one unexcused absence for each credit hour generated by the class. For example, two absences are allowed in a two-hour class.

*Students whose absences exceed the above scale will receive a reduction in their final course averages as determined by the faculty member. Exceptions to this policy on point reduction may be granted by the faculty upon presentation of documentation from the Vice President of Academic Affairs that an official excuse has been granted for the student's absence. Conditions warranting such an approval include cases involving death in the family, illness of the student or his/her immediate family members or for military duty. It is the student's responsibility to provide legitimate, official documentation of excused absences to the instructor(s) of the courses involved. Other reasons for absences not covered here must be cleared with the appropriate College Dean. (- Undergraduate Catalog, p. 57).

Cell Phones: Use of cell phones and Bluetooth devices are not allowed. Put them in mute or vibrate mode during lectures. **Having a cell phone out during a quiz or an exam (even if it is turned off) will not be allowed.**

Calculators: You will often need to use a calculator for lectures and exams. You **MUST** have a non-programmable calculator that you should bring to every class. Using a programmed calculator in an exam to store information not available to the entire class, including solutions or equations, is considered cheating. A cell-phone calculator is not allowed during exams.

COURSE OUTCOME

Understanding the electrical properties of solids is right at the heart of modern society and technology. At the end of this course students will have a good understanding of electrical force, electric field, electric potential, capacitance, electric current and direct-current circuits, magnetic field, magnetic induction, alternating current circuits and Maxwell's equations.

SERVICES FOR PERSONS WITH DISABILITIES

The University provides environmental and programmatic access for persons with documented disabilities as defined in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disability Act of 1990. Any student who desires information or assistance in arranging needed services for a disabling condition should contact the Director of Special Students Services, Student Center, Room 203, (256) 372-4263.

GRADE DETERMINATION

Course Requirements		Percent of Total
Test 1		10%
Test 2 (Mid Term)		20%
Test 3		10%
Test 4 (Final)		20%
Homework / Quizzes		20%
Laboratory Exams		10%
Attendance		10%
TOTAL	**100**	**100%**
Percent of Points	Number of Points	Grade
90-100	90-100	A
80-90	80-90	B
70-80	70-80	C
60-70	60-70	D
<60	<60	F

COURSE OUTLINE

Dates*	Topics	Assignments
Week 1	Coulomb's Law	Chapter 21: 5, 26, 36, 54
Week 2	Electric Fields	Chapter 22: 4, 23, 34, 56
Week 3	Gauss' Law	Chapter 23: 5, 18, 24, 76
Week 4	Electric Potential	Chapter 24: 2, 6, 25, 37
Week 5	Review and Exam 1	
Week 6	Capacitance	Chapter 25: 4, 10, 30, 42
Week 7	Current and Resistance	Chapter 26: 1, 7, 17, 62
Week 8	Circuits	Chapter 27: 2, 22, 23, 43
	Review and Exam 2 (Mid-Term)	
Week 9	Magnetic Fields	Chapter 28: 2, 8, 17, 40
Week 10	Magnetic Fields due to Currents	Chapter 29: 4, 43, 50, 71
Week 11	Induction and Inductance	Chapter 30: 7, 32, 40, 58
Week 12	Review and Exam 3	
Week 13	Electromagnetic oscillators and Alternating Current	Chapter 31: 4, 10, 25, 62.
Week 14	Maxwell's Equations	Chapter 32: 1,14
Week 15	Review and Exam 4 (Finals)	

Name_____

COLLEGE OF ENGINEERING, TECHNOLOGY, AND PHYSICAL SCIENCES
Alabama A&M University
Normal, AL 35762
COURSE SYLLABUS

Spring 2014

Course Number	**CHE 101**
Course Title	General Chemistry Lecture I
Call Number/Section	10065, Section 1
Class Times	11:00-11:50 am MWF
Class Location	CARTER AUDITORIUM
Prerequisites	High School Algebra
Textbook	CHEMISTRY & Chemical Reactivity by John C. Kotz, Paul M. Treichel, & John R. Townsend, (7th Ed.), Thomson-Brooks/Cole (2009)
Instructor	**J. (Ade) Odutola, Ph.D.**
Office	VMC Room 225
Office Hours	MWF 10-11am; MW 3:30-5:30pm; Tu 5:00-6:00pm; F 2:00-4:00pm
E-mail address	Jamiu.odutola @aamu.edu
Telephone number	256-372-4933

COURSE DESCRIPTION

A study of the fundamental laws of matter that govern physical and chemical changes. Atomic and molecular theories, atomic structure, periodic functions, classification of the elements are addressed.

STUDENT LEARNING OUTCOMES

1. Students will develop an understanding of the fundamental concepts of matter (atoms, molecules, and ions).
2. Students will develop an understanding of the stoichiometry of chemical reactions.
3. Students will develop an understanding of the first law of thermodynamics and thermochemistry.
4. Students will develop and understanding of the principles of atomic structure.
5. Students will develop an understanding of the periodic trends of the elements.

Methods of Assessing Outcomes

Assessment will be achieved through homework assignments, semester, standard, and final exams

CLASS FORMAT

1. Instructors are required to record attendance. Attendance will be recorded by circulating an attendance sheet during class meeting. You must sign this sheet during the class meeting with your full signature in order to prove that you attended class. Signing for another person is forgery and will be treated as academic dishonesty.
2. Students are expected to attend all classes for which they are registered. Students who are unable to attend class regularly, regardless of the reason or circumstance, should withdraw from the class before poor attendance interferes with the student's ability to achieve the objectives required in the course. Withdrawal from class can affect eligibility for Federal Financial Aid.
3. The University and the Alabama State Board of Education are committed to providing both employment and educational environments free of harassment or discrimination related to an individual's race, color, gender, religion, national origin, age, or disability. Such harassment is a violation of State Board of Education policy. Any practice or behavior that constitutes harassment or discrimination will not be tolerated.
4. Please become fully aware of Alabama A & M University's Academic Honesty Code. **Cheating will not be tolerated.**

5. **Please become fully aware of the *AAMU code of Student Conduct*. The link is provided below:**
   http://www.aamu.edu/Academics/academicresources/Documents/Code_of_Conduct_2011-12.pdf
6. Do not conduct personal conversations or use communication devices during lectures. Cell phones or pagers going off during lecture time will not be tolerated. Finally, your choice of words when you are not in class is a personal matter, but the use of vulgar language or profanity is not acceptable during lectures. Rude or disruptive behavior is unacceptable.
7. Please make sure you turn in all assignments to the instructor personally. Any assignments handed to the instructor via another student or employee of AAMU will not be accepted. All assignments are due on time. **Late assignments will not be accepted.**
8. You will have at least four exams and a standardized final exam.

Testing and Grading Policies

1. Every student is required to take each exam and also the standardized final exam. Each student is encouraged to complete all homework assignments. The standardized final exam will constitute at least 12.5% of your course grade.

As previously stated, you will have at six exams. The proposed exam dates are listed in the course syllabus. Tests will be announced one week before the test date. While instructors are not required to give make-up tests, instructor may take into consideration emergency situations and may allow each student one make-up test during the course. The make-up test will be given at an assigned date and time (given by instructor) within one week of the initial scheduled exam. Exceptions to this policy will be made only in extreme cases that are supported by documentation.

2. **YOU ARE NOT ALLOWED TO USE ANY DEVICE THAT COMMUNICATES WITH OTHERS OR HOLDS TEXT IN MEMORY DURING IN-CLASS TESTS. THIS INCLUDES, BUT IS NOT LIMITED TO, GRAPHING CALCULATORS, COMPUTERS, IPODS AND CELL PHONES.**
3. A grade of "I" will be given only in special circumstances and if the student has completed at least 75% of the course work.

COURSE OUTLINE

Dates*	Topics	Assignments
01-8 – Wednesday	Introduction	N/A
01-10 – Friday	Basic Concepts of Chemistry (Chapter 1)	Chapter 1 Homework
01-13 – Monday	Basic Concepts of Chemistry (Continued)	Chapter 1 Homework
01-15 – Wednesday	Basic Concepts of Chemistry (Continued)	Chapter 1 Homework
01-17 –Friday	Diagnostic Test	N/A
01-20 – Monday	*Martin Luther King Holiday*	*Holiday! Holiday!! Holiday!!!*
01-22 – Wednesday	Atoms, Molecules, and Ions (Chapter 2)	Chapter 2 Homework
01-24 – Friday	Atoms, Molecules, and Ions (Continued)	Chapter 2 Homework
01-27 –Monday	Atoms, Molecules, and Ions (Continued)	Chapter 2 Homework
01-29 – Wednesday	**EXAMINATION #1 (Chapters 1 and 2)**	**Exam! Exam!! Exam!!!**
01-31 – Friday	Chemical Reactions	Chapter 3 Homework
02-03 – Monday	Chemical Reactions (Continued)	Chapter 3 Homework
02-05 – Wednesday	Chemical Reactions (Continued)	Chapter 3 Homework

02-07 – Friday	Chemical Reactions (Continued)	Chapter 3 Homework
02-10 – Monday	Stoichiometry	Chapter 4 Homework
02-12 – Wednesday	Stoichiometry (Continued)	Chapter 4 Homework
02-14 – Friday	Stoichiometry (Continued)	Chapter 4 Homework
02-17 – Monday	Stoichiometry (Continued)	Chapter 4 Homework
02-19 – Wednesday	Stoichiometry (Continued)	Chapter 4 Homework
02-21 – Friday	Stoichiometry (Continued)	Chapter 4 Homework
02-24 – Monday	**EXAMINATION #2 (Chapters 3 and 4)**	**Exam! Exam!! Exam!!!**
02-26 – Wednesday	Energy and Chemical Reactions	Chapter 5 Homework
02-28 – Friday	Energy and Chemical Reactions (Continued)	Chapter 5 Homework
03-03 – Monday	Energy and Chemical Reactions (Continued)	Chapter 5 Homework
03-05 – Wednesday	Energy and Chemical Reactions (Continued)	Chapter 5 Homework
03-07 – Friday	Energy and Chemical Reactions (Continued)	Chapter 5 Homework
03-10 – Monday	*Spring Recess! Spring Recess!! Spring Recess!!!*	*Recess! Recess!! Recess!!!*
03-13 – Wednesday	*Spring Recess! Spring Recess!! Spring Recess!!!*	*Recess! Recess!! Recess!!!*
03-14 – Friday	*Spring Recess! Spring Recess!! Spring Recess!!!*	*Recess! Recess!! Recess!!!*
03-17 – Monday	The Structure of Atoms	Chapter 6 Homework
03-19 – Wednesday	The Structure of Atoms (Continued)	Chapter 6 Homework
03-21 – Friday	The Structure of Atoms (Continued)	Chapter 6 Homework
03-24 – Monday	**EXAMINATION #3 (Chapters 5 and 6)**	**Exam! Exam!! Exam!!!**
03-26 – Wednesday	The Structure of Atoms and Periodic Trend	Chapter 7 Homework
03-28 – Friday	The Structure of Atoms and Periodic Trend (Continued)	Chapter 7 Homework
03-31 – Monday	The Structure of Atoms and Periodic Trend (Continued)	Chapter 7 Homework
04-02 – Wednesday	Bonding and Molecular Structure	Chapter 8 Homework
04-04– Friday	Bonding and Molecular Structure (Continued)	Chapter 8 Homework
04-07 – Monday	Bonding and Molecular Structure (Continued)	Chapter 8 Homework
04-09 – Wednesday	Orbital Hybridization and Molecular Structure	Chapter 8 Homework
04-11 – Friday	Orbital Hybridization and Molecular Structure (Continued)	Chapter 8 Homework
04-14 – Monday	Orbital Hybridization and Molecular Structure (Continued)	Chapter 9 Homework
04-16 – Wednesday	Orbital Hybridization and Molecular Structure (Continued)	Chapter 9 Homework
04-18 Friday	*Observed Holiday! Observed Holiday!! Observed Holiday!!!*	*Holiday! Holiday!! Holiday!!!*
04-21 – Monday	**EXAMINATION #4 (Chapters 7, 8 and 9)**	**Exam! Exam!! Exam!!!**
04-23 – Wednesday	REVIEW FOR STANDARDIZED EXAM	REVIEW
04-25 – Friday	REVIEW FOR STANDARDIZED EXAM	REVIEW
04-30 – Wednesday	**FINAL EXAM! FINAL EXAM!! FINAL EXAM!!!**	**Final! Final!! Final!!!**

Name_____

COLLEGE OF ENGINEERING,
TECHNOLOGY & PHYSICAL SCS.
Alabama A&M University
Normal, AL 35762
COURSE SYLLABUS
SPRING 2017

Course Number	CHE 101L
Course Title	General Chemistry Lab I
Call Number/Section	10889, Section 5
Class Times	2:00-4:50 Thursdays
Class Location	Room 401, Carter Hall
Prerequisite/Co-requisite	CHE 101
Textbook	General Chemistry Laboratory Manual for Alabama A. & M. University, Kamala Bhat and Paul Okweye, (2nd Ed.), Thomson Learning, Ohio, (2004). This is an "in-house" manual.
Instructor	Jamiu A. Odutola, Ph.D.
Office	VMC Room 225
Office Hours	10-11 am & 4-7pm MW; and Tuesda2:00-5:00 pm MWF 5:00-7:00 pm Tuesdays
E-mail address	Jamiu.odutola @aamu.edu
Telephone number	256-372-4933

COURSE DESCRIPTION

Laboratory to accompany CHE 101. Basic exercises in general chemistry, to include fundamental operations used in making scientific measurements; properties of gases, liquids and solids, chemical elements and compounds. **Prerequisite: None Co-requisite: CHE 101**

STUDENT LEARNING OUTCOMES

1. Students will cultivate the ability to use standard lab equipment properly, effectively and safely (in the laboratory)
2. Students will exhibit the ability to follow instructions, carry out experiments, collect, record, graph, chart, and interpret data from experimentation (including possible sources of error)
3. Students will develop the ability to apply knowledge in lectures (such as chemical and physical properties of substances, solutions properties, stoichiometry, etc.) to the laboratory exercises
4. Students will demonstrate the ability to communicate effectively the results of their lab work via written reports.

Methods of Assessing Outcomes

Assessment will be achieved through Lab reports, home-works, quizzes, midterm and final exams

CLASS FORMAT

1. Instructors are required to record attendance. Attendance will be recorded by circulating an attendance sheet during class meeting. You must sign this sheet during the class meeting with your full signature in order to prove that you attended class. Signing for another person is forgery and will be treated as academic dishonesty.
2. Students are expected to attend all classes for which they are registered. Students who are unable to attend class regularly, regardless of the reason or circumstance, should withdraw from the class before poor attendance interferes with the student's ability to achieve the objectives required in the course. Withdrawal from class can affect eligibility for Federal Financial Aid.
3. The University and the Alabama State Board of Education are committed to providing both employment and educational environments free of harassment or discrimination related to an individual's race, color, gender, religion, national origin, age, or disability. Such harassment is a violation of State Board of Education policy. Any practice or behavior that constitutes harassment or discrimination will not be tolerated.
4. Please become fully aware of Alabama A & M University's Academic Honesty Code. **Cheating will not be tolerated.**
5. **Please become fully aware of the *AAMU code of Student Conduct*. The link is provided below:**
   http://www.aamu.edu/Academics/academicresources/Documents/Code_of_Conduct_2011-12.pdf
6. Do not conduct personal conversations or use communication devices during class session. Cell phones or pagers going off during class time will not be tolerated. Finally, your choice of words when you are not in class is a personal matter, but the use of vulgar language or profanity is not acceptable during class sessions. Rude or disruptive behavior is unacceptable.
7. No provisions will be made for any missed experiment.
8. In order to be able to use your time in the laboratory efficiently **you must come to the lab on time and be prepared.**
9. It is important that you read and write an outline of your laboratory experiment in your lab notebook as part of your preparation. **The blue or yellow sheet copies of your lab notebook containing the data of the *lab- day* must be handed to the instructor before leaving the lab**.
10. All data **must** be entered directly into your lab notebook. **If it is determined that you recopied data from scrap paper, points will be deducted from your experiment.** In this course students must learn to take and preserve original data.
11. No one is allowed to do any experiment in the lab without **goggles** on. Wearing a lab-coat is strongly recommended.
12. Please make sure you turn in all reports by the deadline to the instructor personally. The deadline means the beginning of the lab session on the week following the completion of the experiment. Any reports handed to the instructor via another student or employee of AAMU will not be accepted. All assignments are due on time. **Late reports will not be accepted.**
13. You will write out all lab reports and submit on time, take both midterm and final exam.

Testing and Grading Policies

1. Every student is required to submit lab reports, take quizzes, midterm and final exams
2. The proposed midterm and final exams are listed in the course syllabus. Exam will be announced one week before the test date. While instructors are not required to give make-up tests, instructor may take into consideration emergency situations and may allow each student one make-up test during the course. The make-up test will be given at an assigned date and time (given by instructor) within one week of the initial scheduled exam. Exceptions to this policy will be made only in extreme cases that are supported by documentation.
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4. A grade of "I" will be given only in special circumstances and if the student has completed at least 75% of the course work.

COURSE OUTLINE

Chemistry 101 Laboratory Schedule - Spring 2017

Date Topics covered

Week	Title of Experiment	Type	Page	Home Work #
1	Safety Film, Lab Policy, Introduction to Statistical and data analysis in Chemistry Labs	Safety	Video & 39	Quiz & 51: 3,4
2	Determination of Density	Physical Property	53	63: 2,3,4
3	Identification of unknown Liquid	Physical Property	65	75: 2,3
4	Separation of mixture into components	Physical & Chemical Properties	77	87: 3,4,5
5	Determination of Avogadro's number	Physicochemical constant	101	108: 2,3
6	Determination of the Empirical formula of an oxide	Chemical Analysis	109	119: 3
7	Determination of the percent of water in a hydrate compound	Gravimetric Analysis	133	139: 2,3
8	***Mid-Term Examination – Covers***	***Experiments 1-7***		
9	Classification of Chemical Reactions	Chemical Reactions	141	155: 1,2,3
10	Formation of a Chemical Compound	Chemical Synthesis	169	175: 1,2
11	Acid Base Reactions (Standardization of NaOH and analysis of a vinegar solution)	Volumetric Analysis	189	199: 2,3,4
12	Determination of Specific Heat and Atomic Mass	Thermochemistry	217	223: 1,2,3
13	Determination of Heat of Neutralization	Thermochemistry	201	
14	**Review**			
17	***Final Examination***	***Experiments 1-12***		

Name__Jamiu A. Odutola_____

COLLEGE OF ENG., TECH., AND PHYSICAL SCIENCES
Alabama A&M University
Normal, AL 35762

COURSE SYLLABUS Summer 2015

Course Number	CHE 102
Course Title	General Chemistry Lecture II
Call Number/Section	40064, Section 0
Class Times	1:00-2:20 MTWR
Class Location	Carter Hall Room 321
Prerequisites	CHE 101 & 101L
Textbook	CHEMISTRY and Chemical Reactivity by John C. Kotz, Paul M. Treichel, and John R. Townsend, (9th Ed.), Thomson-Brooks/Cole (2009)
Instructor	Jamiu A. Odutola, Ph.D.
Office	225 VMC
Office Hours	TBA
E-mail address	Jamiu.odutola @aamu.edu
Telephone number	256-372-4933

COURSE DESCRIPTION

A study of the properties and laws of gases, liquids, and solids, the solutions and their behaviors, the fundamentals of chemical kinetics, the collision theory, and the reaction mechanisms, the principles of chemical equilibria and the chemistry of acids and bases, and the fundamentals of thermodynamics and electrochemistry.

STUDENT LEARNING OUTCOMES

1. Students will develop an understanding of atomic structure, bonding and intermolecular forces.
2. Students will develop an understanding of the states of matter, phase transitions and the unit cells
3. Students will develop an understanding of solution properties including equilibria and kinetics
4. Students will develop and understanding of acid base chemistry, electrochemistry and oxidation-reduction reactions.
5. Students will develop an understanding of essential nuclear chemistry (i.e. binding energy and nuclear reactions)

Methods of Assessing Outcomes

Assessment will be achieved through homework assignments, semester, standard, and final exams

CLASS FORMAT

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As previously stated, you will have at six exams. The proposed exam dates are listed in the course syllabus. Tests will be announced one week before the test date. While instructors are not required to give make-up tests, instructor may take into consideration emergency situations and may allow each student one make-up test during the course. The make-up test will be given at an assigned date and time (given by instructor) within one week of the initial scheduled exam. Exceptions to this policy will be made only in extreme cases that are supported by documentation.

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TUTORIAL ASSISTANCE

Tutorial assistance for undergraduate courses can be obtained from the Tutorial Assistance Network (TAN), a subsidiary of the Office of Academic Support Services. TAN is located in Room 100C Buchanan Hall. The telephone number is 256-372-5487.

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COURSE OUTLINE

Dates*	Topics	Assignments
05-26 – Tuesday	**INTRODUCTION TO CLASS**	N/A
05-27 – Wednesday	**Diagnostic Test**	Diagnostic Test
05-28 – Thursday	**CHAPTER 11**	Chapter 11 Reading
06-01 – Monday	**CHAPTER 11**	" "
06-02 – Tuesday	**CHAPTER 11**	" "
06-03 – Wednesday	**CHAPTER 12**	Chapter 12 Reading
06-04 – Thursday	**CHAPTER 12**	" "
06-08 – Monday	**CHAPTER 12**	" "
06-09 – Tuesday	**CHAPTER 13**	Chapter 13 Reading
06-10 – Wednesday	**CHAPTER 13**	" "
06-11 – Thursday	**CHAPTER 13**	" "
06-15 – Monday	**REVIEW**	REVIEW
06-16 – Tuesday	**EXAMINATION #1 (CH. 11, 12 & 13)**	EXAM
06-17 – Wednesday	**CHAPTER 14**	Chapter 14 Reading
06-18 – Thursday	**CHAPTER 14**	" "
06-22 – Monday	**CHAPTER 14**	" "
06-23 –Tuesday	**CHAPTER 15**	Chapter 15 Reading
06-24 – Wednesday	**CHAPTER 15**	" "
06-25 – Thursday	**CHAPTER 15**	" "
06-29 – Monday	**CHAPTER 23**	Chapter 23 Reading
06-30 – Tuesday	**REVIEW**	REVIEW
07-01 – Wednesday	**EXAMINATION #2 (CH. 14, 15 & 23)**	EXAM
07-02 –Thursday	**HOLIDAY**	HOLIDAY
07-06 – Monday	**CHAPTER 16**	Chapter 16 Reading
07-07 -- Tuesday	**CHAPTER 16**	" "
07-08 –Wednesday	**CHAPTER 16**	" "
07-09 – Thursday	**CHAPTER 17**	Chapter 17 Reading
07-13 – Monday	**CHAPTER 17**	" "
07-14 – Tuesday	**CHAPTER 17**	" "
07-15 – Wednesday	**CHAPTER 18**	Chapter 18 Reading
07-16 – Thursday	**CHAPTER 18**	" "
07-20 – Monday	**CHAPTER 18**	" "
07-21 – Tuesday	**REVIEW**	REVIEW
07-22 – Wednesday	**EXAMINATION #3 (CH. 16, 17 & 18)**	EXAM
07-23 – Thursday	**CHAPTER 19**	Chapter 19 Reading
07-27 – Monday	**CHAPTER 19**	" "
07-28– Tuesday	**CHAPTER 20**	Chapter 20 Reading
07-29 – Wednesday	**CHAPTER 20**	" "
07-30- Wednesday	**EXAMINATION #4 (CH. 19 & 20) + STANDARD FINAL EXAM**	EXAM

Name_____

COLLEGE OF ENGINEERING, TECHNOLOGY AND PHYSICAL SCIENCES
Alabama A&M University
Normal, AL 35762

COURSE SYLLABUS
SPRING 2014

Course Number	CHE 102L
Course Title	General Chemistry Lab II
Call Number/Section	10094, Section 1
Class Times	9:30 - 12:20 Tuesdays
Class Location	Room 418, Carter Hall
Prerequisites	CHE 101 & 101L
Textbook	General Chemistry Laboratory Manual for Alabama A. & M. University, Kamala Bhat and Paul Okweye, (2nd Ed.), Thomson Learning, Ohio, (2004). This is an "in-house" manual.
Instructor	Jamiu A. Odutola, Ph.D.
Office	225 VMC
Office Hours	MWF 10-11am; MW 3:30-5:30pm; Tu 5:00-6:00pm; F 2:00-4:00pm
E-mail address	Jamiu.odutola @aamu.edu
Telephone number	256-372-4933

COURSE DESCRIPTION

Laboratory to accompany CHE 102. An introduction to quantitative and qualitative analyses. Acid-base titrations, reaction kinetics, and qualitative analyses of the elements are covered.

STUDENT LEARNING OUTCOMES

1. Students will cultivate the ability to work effectively and safely in a laboratory
2. Students will exhibit the ability to follow instructions, carry out experiments, collect data, and analyze the results including sources of error
3. Students will develop the ability to apply knowledge in lecture materials (such as gases properties, solutions properties, chemical kinetics, and chemical equilibria) to the laboratory exercises
4. Students will develop understanding of chemical qualitative analysis concepts
5. Students will demonstrate the ability to communicate effectively the results of their lab work via written reports.

Methods of Assessing Outcomes

Assessment will be achieved through Lab reports, home-works, quizzes, midterm and final exams

CLASS FORMAT

1. Instructors are required to record attendance. Attendance will be recorded by circulating an attendance sheet during class meeting. You must sign this sheet during the class meeting with your full signature in order to

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7. No provisions will be made for any missed experiment.
8. In order to be able to use your time in the laboratory efficiently **you must come to the lab on time and be prepared.**
9. It is important that you read and write an outline of your laboratory experiment in your lab notebook as part of your preparation. **The blue or yellow sheet copies of your lab notebook containing the data of the *lab- day* must be handed to the instructor before leaving the lab**.
10. All data **must** be entered directly into your lab notebook. **If it is determined that you recopied data from scrap paper, points will be deducted from your experiment.** In this course students must learn to take and preserve original data.
11. No one is allowed to do any experiment in the lab without **goggles** on. Wearing a lab-coat is strongly recommended.
12. Please make sure you turn in all reports by the deadline to the instructor personally. The deadline means the beginning of the lab session on the week following the completion of the experiment. Any reports handed to the instructor via another student or employee of AAMU will not be accepted. All assignments are due on time. **Late reports will not be accepted.**
13. You will write out all lab reports and submit on time, take both midterm and final exam.
14. Please complete and submit accordingly the STUDENT DATA FORM in the address provided below:

https://docs.google.com/forms/d/167bV5b6qcKy4PmsAE0aV9Uft6dmglIEI_pMJ6llL6_4/viewform

Testing and Grading Policies

1. Every student is required to submit lab reports, take quizzes, midterm and final exams
2. The proposed midterm and final exams are listed in the course syllabus. Exam will be announced one week before the test date. While instructors are not required to give make-up tests, instructor may take into consideration emergency situations and may allow each student one make-up test during the course. The make-up test will be given at an assigned date and time (given by instructor) within one week of the initial scheduled exam. Exceptions to this policy will be made only in extreme cases that are supported by documentation.
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4. A grade of "I" will be given only in special circumstances and if the student has completed at least 75% of the course work.

SERVICES FOR PERSONS WITH DISABILITIES

The University provides environmental and programmatic access for persons with documented disabilities as defined in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disability Act of 1990. Any student who desires information or assistance in arranging needed services for a disabling condition should contact the Director of Special Students Services, Student Center, Room 203, (256) 372-4263.

COURSE OUTLINE

General Chemistry II Laboratory - CHE 102L - Schedule - Spring 2014

Wk.	Title Of Experiment	Type	Page	Home Work #
1	Safety Film, Lab Policy, Introduction to Qualitative Analysis in Chemistry			
2	Analysis of Group 1 Cations: Ag^{+}, Pb^{2+}, Hg^{2+}	Qualitative Analysis of Cations	230	235 = 5,6,7
3	Molar Mass By Dumas Method: Application of ideal gas equation (PV=nRT)	Gas properties	237	243 = 1,2,3
4	Analysis of Group IV Cations: Ba^{2+}, Sr^{2+}, Ca^{2+}	Qualitative Analysis of Cations	391	397 = 2,5,6
5	Molar Mass By Freezing Point in Anti-freeze	Solution properties	273	279 = 2,3,4
6	Analysis of Anions Group: (a) ***Silver group***: Cl^{-}, Br^{-}, I^{-}, SCN^{-}; **OR** (b) ***Acid volatile group:*** CO_3^{2-}, SO_3^{2-}, NO_2^{-}, S^{2-}; **OR** (c) ***Barium group:*** SO_4^{2-}, PO_4^{3-}, CrO_4^{2-}, $C_2O_4^{2-}$, BO_2^{-}; **OR** (d) ***Soluble group*** NO_3^{-}, $C_2H_3O_2^{-}$	Qualitative Analysis of Anions	H-out	
7	Iodine Clock Reaction	Chemical Kinetics	H-out	
8	***Mid-Term Examination – will cover***	***Expt. 1 – 6***		
9	Rate of Reaction $KMnO_4$ and Oxalic Acid	Chemical Kinetics	301	311 = 1,2,3
10	Standardization of NaOH using Primary Standard (potassium hydrogen phthalate, KHP); **OR** Standardization of HCl using Primary Standard (sodium carbonate, Na_2CO_3).	Equilibrium: Acid-Base Reaction	H-out	Read 363-368
11	Analysis of commercial household ***vinegar*** **OR** ***wine*** using standard NaOH solution.	Equilibrium: Acid-base reaction	H-out & 189	197 = 1, 2, 3, 4
12	Determination of acid content in ***aspirin*** tablet using standard NaOH solution **OR** Analysis of ***antacid*** using standard HCl.	Acid-Base Equilibria	H-out	347-353
13	Solubility Product of Lead(II) Iodide **OR** Thermodynamics of solubility Equilibrium of potassium nitrate, KNO_3	Equilibrium Solubility	399	403 = 1,2
14	Electrochemical cell Experiments	Electrochemistry	H-out	
15	Review			
16	***Final Examination***	***Expt. 8-14***		

**** H-out means: Hand-out will be provided for the experiment.

Course number and name: EE201 Linear Circuit Analysis I

Credits and contact hours: 3, 3

Instructor: Dr. Satilmis Budak

Text book: Basic Engineering Circuit Analysis, John Wiley, Eleventh (11^{th}) Edition, 2015

Course description: Resistance and Ohm's Law, Kirchhoff's Laws, nodal and loop analysis, superposition, source transformation, Thevenin's and Norton's Theorems, maximum power transfer, capacitance, inductance, transient analysis and introduction to ac sinusoidal analysis and phasors.

Prerequisites: EE 101 , Corequisite: MTH 115

Required course

Course Learning Outcomes: Upon completion of the course, students will be able to

Course Learning Outcome	Student Outcome	Assessment Tool
Resistance and Ohm's Law, Kirchhoff's Laws	a, e	Homework, Quiz, Exams
Nodal and loop analysis	a, e	Homework, Quiz, Exams
Superposition, source transformation, Thevenin's and Norton's Theorems	a, e	Homework, Quiz, Exams
Maximum power transfer	a, e, k	Homework, Quiz, Exams
Capacitance, inductance, transient analysis and introduction to ac sinusoidal analysis and phasors	a, e, k	Homework, Quiz, Exams

Relation of course to Student Outcomes:

Student Outcomes	
(a) an ability to apply knowledge of mathematics, science, and engineering	**X**
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	
(c) an ability to design a system, component, or process to meet desired needs	
(d) an ability to function on multi-disciplinary teams	
(e) an ability to identify, formulate, and solve engineering problems	**X**
(f) an understanding of professional and ethical responsibility	

(g) an ability to communicate effectively	
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	
(i) a recognition of the need for, and an ability to engage in life-long learning	
(j) a knowledge of contemporary issues	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**X**

Topics: Basic Concepts, Introduction, units, voltage, current and power, Resistive Circuits, Ohm's law and Kirchhoff’s laws, Resistances in series, parallel and equivalent resistance, Mesh analysis, formulation and solution of node equations, Circuits containing dependent sources, Network theorems; superposition theorem, Thevenin's and Norton's theorems, maximum power transfer, applications, Capacitance and Inductance, First and Second order Transient Circuits, AC Steady-State Analysis, Introduction to sinusoidal analysis and phasors.

Appendix B – Faculty Vitae

Dr. Aaron L. Adams

1. **Name:** Aaron L. Adams, Assistant Professor, Mechanical Engineering
2. **Education:**
   2013 Ph.D., Mechanical Engineering Department, University of Alabama.
   2012 M. Sc., Mechanical Engineering Department, University of Alabama.
   2009 M. Sc., Marketing Department, University of Alabama.
   1998 M. Sc., Mechanical Engineering Department, Wayne State University.
   1996 B. Sc., Mechanical Engineering Technology Alabama A&M University.

3. **Academic Experience:**
   8/1/13-Present: Assistant Professor, Mechanical & Civil Engineering and Construction Management Department, Alabama A & M University, Huntsville, Alabama 35762.
   10/1/10-8/1/13: Assistant Professor and Coordinator, Mechanical Engineering Technology Department, Alabama A & M University, Huntsville, Alabama 35762.

4. **Non-academic experience:**
   Summer 15,17,19 NASA Faculty Fellowship Program (NFFP), NASA–Marshall Space Flight Center.
   1/14 – 9/14 National Academy of Engineering (NAE), Developed proficiency in the understanding of engineering policy and the process required to change STEM-related policy at the federal and state levels.
   5/13 – 9/13 DOE National Energy and Technology Laboratory, Used a 1-dimemsional SOFC simulation model to demonstrate how an increase in overall system efficiency affects the lifetime assessment of a power-generating facility using the economic metrics of net present value, return on investment, and benefit to cost ratio.
   5/08 – 8/08 DOE Brookhaven National Laboratory, Conducted Brunauer, Emmett & Teller (BET) and temperature program reduction (TPR) measurements on selected oxygen storage materials using microkinetics reactor.
   8/96 - 2/06 Ford Motor Company, Dearborn Michigan 48120. Developed test plans for all prototype integration vehicles for cross-functional areas of performance feel, shift quality, and fuel

5. **Certifications or professional registrations:**
6. **Current membership in professional organizations:**
   - Member, American Society of Mechanical Engineers (ASME).
   - Member, American Society for Engineering Education (ASEE)
   - Member, Society of Automotive Engineering (SAE)
7. **Honors and Awards:**
   - University of Alabama Future Faculty Fellowship, University of Alabama, 2007–2011
   - Graduate School Senator, Student Government Association, University of Alabama, 2009
   - Graduate Teaching Assistantship, University of Alabama, 2007–2009
   - NASA Faculty Award for research,

8. **Service activities:**
   Within the institution:
   - Member: Faculty Search committee , College of Engineering, Technology, and Physical Sciences
   - Alabama Space Grant Consortium Campus Coordinator
   - Advisor: National Society Of Black Engineers

   Outside of the Institution:
   - **Reviewer:** National Science Foundation, NASA

9. **Most Important Publications in Past Five Years:**
   - **Aaron L. Adams,** Ezekiel O. Agbalagba, Julius O. Jow, John G. Mwathi, Alexander A. Egarievwe, Wing Chan, Stephen U. Egarievwe. 2016. "Thermal Annealing of CdMnTe Material Being Developed for Nuclear Radiation Detection Applications." IOSR Journal of Mechanical and Civil Engineering 2016 Vol Pending
   - **Aaron L. Adams**, Marcus D. Ashford, Aschalew Kassu, Mebougna Drabo, Wing Chan, Stephen Egarievwe, Asja Radja, Ge Yang, Ralph B. James. 2012. "Thermal Annealing Improves the Performance of Cadmium Zinc Telluride (CZT) Semiconductor Material Used for Nuclear Radiation Detectors." ASME Early Career Technical Conference 2012. Vol.11 pages 47-51.
   - **A. Adams,** S.U. Egarievwe, R. Martin, U. Roy, E. Agbalagba, R.B. James. "Batch Annealing CdMnTe Wafers for Nuclear Detection Applications." Presented at IEEE Nuclear Science Symposium and Medical Imaging Conference, and Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors Workshop, October 29-November 6, 2016, Strasbourg, France.
   - S.U. Egarievwe, E. Lukosi, M. Drabo, I. Okwechime,O. Okobiah, **A. Adams**, A. Hossain, U. Roy, R. Gul, R.B. James. "Surface Passivation and Contacts in CdZnTe X-Rays and Gamma-Rays Detectors" Presented at IEEE Nuclear Science Symposium and Medical Imaging Conference, and Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors Workshop, October 29-November 6, 2016, Strasbourg, France.

10. **Most Recent Professional Developmental Activities:**
    - IEEE 2012 Nuclear Science Symposium, Medical Imaging Conference and Workshop on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors, Strasburg, France
    - Assessment, Southern Association of Colleges and Schools, Normal, AL, June 2015
    - Joint InSynC-INCREASE Workshop, Brookhaven National Laboratory, Long Island, NY, April 2015

Dr. Showkat J. Chowdhury

1. **Name:** Showkat J. Chowdhury, Professor, Mechanical Engineering
2. **Education:**
   Ph.D., 1990, Department of Mechanical Engineering, Clarkson University, New York.
   M.S., 1985, Department of Mechanical Engineering, Clarkson University, New York.
   B.S., 1981, Department of Mechanical Engineering, Bangladesh University of Engineering & Technology
3. **Professional Experience:**
   Aug 2008 – Present: **Professor**, Department of Mechanical Engineering, Alabama A & M University, Huntsville, Alabama.
   Aug 2002 – Jul 2008: **Associate Professor**, Department of Mechanical Engineering, Alabama A & M University, Huntsville, Alabama.
   Mar 2001 – Aug 2002: **Manufacturing Engineering Specialist**, Corning Incorporated, Wilmington, North Carolina.
   Jul 1996 – Feb 2001: **Professor**, Department of Mechanical Engineering, Bangladesh University of Engineering and Technology.
   Sep 1999 – Aug 2000: **Visiting Professor**, School of Engineering, University of Brighton, U.K.
   Oct 1993 – Jun 1996: **Associate Professor**, Department of Mechanical Engineering, Bangladesh University of Engineering and Technology.
   Mar 1990 – Sep 1993: **Assistant Professor**, Department of Mechanical Engineering, Bangladesh University of Engineering and Technology.
   Sum 1988 and 1989: **Instructor**, Dept. of Mechanical Engineering, Clarkson University, New York.
4. M**embership in Professional Organizations:**
   - Member, American Society of Mechanical Engineers (ASME)
   - Member, American Society for Engineering Education (ASEE)
   - Member, American Institute of Aeronautics and Astronautics (AIAA)
5. **Honors and Awards:**
   - Received Outstanding Teaching Award at Alabama A&M University, 2009 and 2014.
   - Invited as Speaker at the American Association of University Women (AAUW) Meeting to talk about Renewable Energy on May 05, 2015. Published in the AAUW newsletter.
   - Research in Renewable Energy published in "Huntsville Times", Sep 03, 2014.
   - Invited and served as Planning Committee Member for the 2012 NSF S-STEM Projects Meeting held at Crystal Gateway Marriott in Arlington, VA, Oct. 14-16, 2012.
   - Awarded Best Paper Award at the 1985 AIAA Conference in Buffalo, New York.
   - Invited and served as Session Chair for the Huntsville Simulation Conference 2008, Society for Modeling & Simulation Inter. at Marriott Hotel, Huntsville, Oct 21-23, 2008.
   - Invited as Session Chair at the 4th BSME and ASME Intern. Conf., Dec 27-29, 2008.
   - Listed in Strathmore's WHO'S WHO 2002-2003 registry (USA), Honored Membership.
   - Served as Reviewer of a number of Journals.
6. **Research Interest and Experience:**
   - Renewable Energy, Computational Fluid Dynamics (CFD), Combustion, Heat & Mass Transfer, Nanotechnology, and Manufacturing Process Analysis, extensive simulation experience with CFD codes FIDAP, FLUENT, GAMBIT, ANSYS, & VECTIS.

- Conducting experiments and research on solar and wind energy and nanocomposites.
- Performed research to identify the causes of various manufacturing issues and improve the processes, using sophisticated mathematical approaches & computational procedures.
- Conducting experimental and numerical analysis of different fluid flow, heat and mass transfer problems.
- Conducting research on effective pedagogy for enhancement of minority students' learning outcomes, retention and success.
- Coordinating the Heat & Mass Transfer Lab, and Renewable Energy Lab.

7. **Selected Publications:**

- Hyder, **S. Chowdhury**, T. Chowdhury, C. Baker, H. Kilson, I. Williamson, "Solar PV System with Dual Axis Tracking", 2018 *STEM Day Proceed*, AAMU, April 13, 2018.
- **S. J. Chowdhury**, and M. Seif, "Enhancement of Learning Outcome and Retention of Minority Students in Engineering", *Proc. of ASEE 2010 Annual Conf.*, Louisville, *KY*, June 20-23, 2010.
- **S. J. Chowdhury**, and B. Howard, "Thermo-Mechanical Properties of Graphite-Epoxy Composite", *Inter Rev of Mech Engineering Journal*, Vol. 4, No. 6, pp.785-790, 2010.
- M. Khoshbakht, **S. J. Chowdhury**, M. A. Seif, and U. A. Khashaba, "Failure of Woven Composites under Combined Tension-Bending Loading", *J. of Composite Structures,* Vol.90, pp. 279-286, 2009.
- **S. J. Chowdhury**, and T. Kirby, "Analysis of Irradiator Tube Purging for Fiber Drawing", *International Rev. Chem Engineering Journal*, Vol.2, No.4, pp.484-493, 2010.
- **S. J. Chowdhury**, and M. Seif, "Capstone Design Course as a Tool for Assessment and Improvement", *Proc of ASEE 2007 Annual Conference*, Honolulu, June 24-27, 2007.
- **S. J. Chowdhury**, and T. Chowdhury, "Effect of Scholarships and Professional Development Activities on Student Success", (In progress).

8. **Research Grants/Fundings:**

- S. J. Chowdhury (P.I.), C. Glenn, X. Zhao, T. Chowdhury, R.M. Jackson, "Scholarships for Success of Underrepresented Minority Engineering and Computer Science Students", National Science Foundation (NSF), S-STEM, Sept. 2016 – Aug. 2021, $1,000,000.00.
- S. J. Chowdhury (P.I.), W. Chan, T. Chowdhury, "Integration of Renewable – Solar & Wind Energy into the Engineering Curriculum", National Science Foundation (NSF), July 2013 – June 2016, $290,000.00.
- S. J. Chowdhury (P.I.), M.A. Alim, T. Chowdhury, A.R. Scott, F.M. Ayokanmbi, "Scholarships for Underrepresented Minority Engineering, Technology & Computer Science Students", National Science Foundation (NSF), S-STEM, Aug. 2010 – July 2015, $600,000.00.

9. **Institutional and Professional Development Activities:**

- Attended American Society of Engineering Education (ASEE) Conference, Mar 2-5, 2017, Puerto Rico.
- Attended AIAA SciTech Conference & Expo 2016, San Diego, California, Jan 4-8, 2016.
- Attended NSF Meeting & ERN Conference, Washington D.C. Feb 18-21, 2015.
- Working as University Graduate Council Member.
- Working as Member of College Promotion & Tenure Committee.
- Working as Grad & Undergrad Student Advisor of Mechanical Engineering Department.

Dr. Zhengtao Deng

1. **Name:** Zhengtao Deng, Professor, Mechanical Engineering

2. **Education:**
   1991 Ph.D. Aerospace Engineering, University of Tennessee.
   1985 Bachelor of Science, Aerospace and Mechanical Engineering (Jet Propulsion), Beijing University of Aeronautics and Astronautics.
3. **Academic Experiences:**
   2007-Present: Professor, Mechanical Engineering Department, AAMU.
   2003-2007: Associate Professor, Mechanical Engineering Department, AAMU.
   1998-2003: Assistant Professor, Mechanical Engineering Department, AAMU.
   1992-1998: Research Assistant Professor, Computational Fluid Dynamics Group, Department of Civil Engineering, AAMU.
4. **Non-Academic Experiences:**
   2015 – Present Faculty Associate for Research and Scholarships, College of Engineering, Technology and Physical Sciences (CETPS), AAMU.
   06/16 - 08/16 Faculty Fellow, NASA Faculty Fellowship Program, NASA Marshall Space Flight Center.
   06/15 - 08/15 Faculty Fellow, NASA Faculty Fellowship Program, NASA Marshall Space Flight Center.
   06/10 – 08/10 NASA Science and Technology Institute, Research Fellow.
5. **Certifications or Professional Registrations:**
   - Workplace Violence Prevention Training, National Aeronautics and Space Administration, May 2017.
   - SHE 102: MSFC Safety Hazards Environmental (SHE) Program Refresher Training. National Aeronautics and Space Administration, April 2018.
   - Annual Security refresher Training, National Aeronautics and Space Administration, April 2018.
   - FY2018 Cybersecurity and Sensitive Unclassified Information Awareness Training, National Aeronautics and Space Administration, April 2018.
   - Annual Information technology Security and Privacy Awareness Course, National Aeronautics and Space Administration, June 2015.
   - Basics of operation Safety, National Aeronautics and Space Administration, June 2015.
   - SHE 101: MSFC Safety Health and Environmental (SHE) Program, National Aeronautics and Space Administration, June 2015.
   - MSFC Workplace Violence Prevention Training, National Aeronautics and Space Administration, June 2015.
   - FY2016 Cybersecurity and Sensitive Unclassified Information Awareness Training, National Aeronautics and Space Administration, June 2016.
6. **Current Membership in Professional Organizations:**
   - Member of American Institute of Aeronautics and Astronautics (AIAA)
   - Member of American Society of Mechanical Engineer (ASME)
7. **Honors and Awards:**
   - Excellence in Scholarship, Research, Creative Activity, and Other Professional Contributions Award, AAMU, 2018.
   - Excellence in Teaching Award, AAMU, 2013.

- Outstanding Teaching Award, CETPS, AAMU, May 2013.
- Oak Ridge National Laboratory (ORNL) Research Alliance in Math and Science Excellence in Mentoring, 2007
- ORNL 2008 RAMS Summer Internship Mentoring, 2008.
- ORNL Exceptional Mentoring, RAMS Summer Internship Program, 2009.
- ORNL Exceptional Mentoring, RAMS Summer Internship Program, 2010.
- ORNL Exceptional Mentoring, RAMS Summer Internship program, 2011.

8. Service Activities:

- University Promotion and Tenure Committee, AAMU.
- Faculty Senate Senator, AAMU.
- University grievance Committee, AAMU.
- Chair, Scholarship Committee, CETPS, AAMU.
- NASA Space Technology Fellowship Review Panel
- Journal Reviewer, the International Journal of Engineering Research and Innovation.
- American Institute of Aeronautics and Astronautics (AIAA) Student Branch Faculty Advisor.

9. Most Important Publications in Past Five years:

- Deng, Z.T., Glenn, C., and Thompson, F., "Development of Semiconductor Materials and Multi-Materials Printer Prototype for 3D Printing of Electronic Components," Invited Presentation, NASA Printed Electronics Workshop, Huntsville, AL, April 3-4, 2018.
- Deng, Z.T., Rugani, K., Earhart, E., Mobasher A., et al. "Alabama A&M University Bearing Kinematic Test Rig Hazard Analysis & Safety Manual," Jacobs Space Exploration Product ID: JPID-FY18-00433, April 2018.
- Deng, Z.T., Turpin, A., Majumdar, A., Stephens, J., and Tieman, S., "Design Concepts for Bubble Transport Simulation Experiment," NASA-TM-2017-218234, pp. 89-97, 2017.
- Deng, Z.T., Rugani, K., Earhart, E., et al., "AAMU-NASA Bearing Test Rig Critical Design Review (CDR)," Jacobs ESSSA Product ID: ESSSA-FY17-1454, May 2017.
- Deng, Z.T., Martin, H., Turpin, A. and Tieman, S., "Modeling and Characterization of Gas Bubble Dynamics in Propellant Simulant," NASA-TM-2015-218216, pp. 67-79. 2015.
- Deng, Z.T. and Qian, X., "MRI: Acquisition of High Speed Video Imaging System for Electromagnetic Shockwave Control and Shockwave-Boundary Layer Interaction Research at AAMU," NSF Final Report 1337227, 2014.

10. Most Recent Professional Development Activities:

- NASA Solid Rocket Propulsion Workshop, MSFC, 05/30 –06/02, 2017.
- NASA MSFC Professional Development Seminar: Space Technology, 07/2016.
- NASA MSFC ER Learn Workshop, Cryogenic Fluid Management, 07/2017.
- NASA Professional Development Seminar: Space Launch System Technology, 06/2017.
- MSFC Seminar: Space Exploration and Propulsion, 03/2016.
- NASA MSFC Professional Development Seminar: Turbomachinery, 03/2016.
- NASA MSFC Seminar: Introduction to Rotordynamics and Bearings, 03/2016.
- MSFC Seminar, Finite Element Modal Analysis of Rotors, 09/2016.
- Advanced Dynamics Of Rolling Elements (ADORE) Training, 04/2016.
- MSFC-AAMU-RISE Seminar, Overview of Mechanical Design, 11/2016.
- MSFC Seminar: Fastrac Engine: Understanding Technical Implications of Programmatic Decisions on Fastrac and the Legacy to Propulsion Systems, 11/2016.

Dr. Mebougna Drabo

1. **Name:** Mebougna Drabo, Associate Professor
2. **Education:**
   2011 Ph.D., Mechanical Engineering Department, The University of Alabama.
   2010 M. S., Mechanical Engineering Department, The University of Alabama.
   2006 M. S., Aerospace Engineering, University at Buffalo.
   2005 B. S. Aerospace Engineering, University at Buffalo.
   2003 A. S. Engineering, Fulton Montgomery Community College, NY.
3. **Academic Experience:**
   8/15/18-Present: Associate Professor, Mechanical Department, Alabama A & M University, Huntsville, Alabama 35762.
   9/1/12-8/15/18: Assistant Professor, Mechanical Engineering Department, Alabama A & M University, Huntsville, Alabama 35762.
4. **Non-academic experience:**
   Summer '16-'18 Brookhaven National Laboratory NSF Appointment-*Sustainable Energy Technologies Department.*
   Summer '14-'15 Visiting Faculty Program, Brookhaven National Laboratory-*Sustainable Energy Technologies Department.*
   Summer 2013 Visiting Faculty Program, Brookhaven National Laboratory-*Nonproliferation and National Security Department.*
5. **Current membership in professional organizations:**

- Society of Automotive Engineers (SAE) Fuels and Lubricants Council Member-General Interest, September 2014 to present
- SAE Combustion and Fuels Committee, May 17, 2013 to present
- SAE Engine Combustion, May 17, 2013 to present
- American Society of Mechanical Engineers
- Sigma Xi- The Scientific Research Society
- SAME- The Society of American Military Engineers
- Phi Kappa Phi- Honor Society that recognize and promote academic excellence in all field of higher education and to engage the community of scholars in service to others.

6. **Honors and Awards:**
   - Certificate of Recognition of my contributions to the Professional Development of Students at Alabama Agricultural & Mechanical University, August 15, 2017.
   - 2017 Faculty of the Year Excellence in Teaching, College of Engineering, Technology, and Physical Sciences, Alabama A&M University, May 2017.
   - 2016 "Professor of the year" by overall excellence in teaching, research and service Award University wide.
   - 2016 Excellence in Service to the University Community, in the College of Engineering, Technology, and Physical Sciences at Alabama A& M University.
   - 2015 Faculty of the Year Teaching Award, College of Engineering, Technology, and Physical Sciences, Alabama A&M University.

7. **Service activities:**
   Within the institution:

- Assessment Coordinator, Mechanical Engineering Department, 2014-to present
- STEM Day 2016 Poster Judge for "Research Excellence in Experiential Learning"
- Co-Chair for the 10th Annual STEM Day Alabama A&M University, April 14, 2016.
- Committee member on the 9th Annual STEM Day, Alabama A&M University, Apr. 10, 2015

Outside of the Institution:

- **Reviewer:** ASEE – SE 16, book chapters, Elsevier, session's organizer for SAE 2015 World Congress, reviewer ASME, and National Society of Black Engineers (NSBE) Scholarships.
- Reviewer for The 2016 National Conference on Undergraduate Research (NCUR).
- Served as a judge for the SAME Huntsville Post special awards at the 2016 Alabama Science and Engineering Fair, April 1, 2016
- Session Organizer for WCX18 World Congress Experience April 10-12, 2018
- Session Organizer for WCX17 World Congress Experience April 4-6, 2017
- Session Organizer and Chair for the SAE 2016 World Congress April 12-14
- Session Organizer and Chair for the SAE 2015 World Congress April 21-23.
- Judge for the SAME Huntsville Post special awards, 2015 Alabama Science and Engineering Fair, April 3, 2015.
- Chairing a Session "Embedded Systems + HPC + Sensory Devices + Network on Chip" at the 2014 International Conference on Embedded Systems & Applications (ESA's 14).
- Chairing a Session "Evolving Systems + Graph Algorithms + math Words" at the 2014 International Conference on Foundations of Computer Science (FCS's 14).

9. **Most Important Publications in Past Five Years:**

- Drabo, M., Egarievwe, S., Okwechime, I., & Hossain, A. (2017). Analysis of Te and TeO2 on CdZnTe Nuclear Detectors Treated with Hydrogen Bromide and Ammonium-Based Solutions. Journal of Materials Science and Chemical Engineering, 5, 9-18.
- Drabo, M., Tutu, N., Butcher, T., & Trojanowski, R. (2016). A Study of Flash Atomization in a Pressure Swirl Nozzle. Int. J. of Modern Engineering, 16(2), 44-48.
- Drabo, M., & Ashford, M. (2015). Gasoline Vapor Liquid Equilibrium Using Peng Robinson Equation of State and Rachford-Rice Equation. Int. J. of Mod. Eng. 16(1), 49-55.
- Drabo, M., Fonseca, D., & Ashford, M. (2014). Improving the Usability of Liquid Motor Fuels. Int. J. of Modern Engineering, 15(1), 15-22.

10. **Most Recent Professional Developmental Activities:**

- Accreditation Board of Engineering and Technology (ABET) IDEAL, 2013.
- Certificate for successful completion of "Evidence-Based Teaching as an effective pedagogy" workshop (February 26, 2015).
- I have completed two other certificate courses in "Basics Gas Turbine Engine Technology" and earned 10 professional development hours (3/20/2016) and "Introduction to finite element analysis" and earned 2.30 continuity education units (2/6/2016).
- Certificate for successful completion of "How to Adopt Evidence-Based Teaching in your Courses to Improve Active Learning Part 1 &2" (March 15, 2016).
- WCX17 World Congress Experience April 4-6, 2017
- WCX18 World Congress Experience April 10-12, 2018

Dr. Mohamed A. Gadalla

1. **Name:** Mohamed A. Gadalla, Assistant Professor, Mechanical Engineering

2. **Education:**
   1998 Ph.D., Mechanical Engineering Department, University of Western Ontario
   1992 M. Sc., Mechanical Design and Production Department, Cairo University.
   1985 B. Sc., Mechanical Design and Production Department, Cairo University.

3. **Academic Experience:**
   2011-Present Assistant Professor of Advanced Manufacturing at the Mechanical Engineering Department, Alabama A&M University.
   2008-2010 Assistant Professor of Advanced Manufacturing at the Mechanical Engineering Department, Central Connecticut State University
   2007- 2008 Visiting Professor: Texas A&M University-Corpus Christi
   2006-2007 Assistant Professor of Manufacturing Engineering, Department of Engineering and Technology, Texas State University.
   2001-2005 Assistant Professor and program coordinator at Kean University.
   Summer '98- '00 Visiting scholar: University of Michigan- Dearborn, joint appointment with departments of computer and information science and the industrial and manufacturing systems engineering.
   1997-1998 Assistant Professor of Production Engineering, Cairo University

4. **Non-academic experience:**
   Summer 2009 Consultant Engineer at Gates Machining New Braunfels, Texas
   Summers '08-'10 CNC freelance programming and consultant for productivity improvements and improving companies' competitive edge.
   Summer 2007 Industrial consultation in CNC Machining (4 axis machining, and CNC- lathe).
   2004-2005 Manufacturing engineer and CNC programmer at GT specialists and EMCO, duties included 3-D machining for Injection Molds.
   Summer 2005 CNC programmer at Interfab machining: duties included CNC programming, and operating CNC lathe.
   1990-1992 Application engineer at the special industrial collaboration unit at Centre of Tribology and Spare Part: involved studying and implementing several industrial projects such as implementing computerized preventive maintenance programs, studying and improving oil consumption at the Iron and Steel Company, and improving the quality of the foundry pig iron at same company.

5. **Current membership in professional organizations:**
   - Member, American Society of Mechanical Engineers (ASME).
   - Member, Society of Manufacturing Engineer (SME)
6. **Service activities:**
   Within the institution:
   - Participated in the assessment and planning university committee, 2012 and 2013.

Outside of the Institution:

- Established a community reform committee, etc.

7. **Most Important Publications in Past Five Years:**
   - Soliman, A., Gadalla, M. A., 2014, "MEASURING AND TRACKING OF LEAN MANUFACTURING TRANSFORMATION", ASME 2014 International Manufacturing Science and Engineering Conference, MSEC2014 June 9-13, 2014, Detroit, Michigan, USA.
   - Gadalla, M. A., 2013, " Developing and Agility Model for Maximum responses for Customer requirements for SME's", Proceedings of the ASME 2013 International Manufacturing Science and Engineering Conference MSEC 2013 June 10-14, 2013, Madison, Wisconsin, USA
   - Gadalla, M., A., Popielarczyk, M., 2011, " Comparison of Process Capability Index and SPC Control Limits Calculation When Using Different Inspection Tools", ASME 2011 International Manufacturing Science and Engineering Conference , MSEC2011 June 13-17, 2011, Corvallis, Oregon, USA.

8. **Most Recent Professional Developmental Activities:**
   - DEA training course on introduction and basics of measuring using TUTOR on DEA CMM (Summer 1993).
   - DEA Training courses on advanced inspection using Surfer (Fall 1994).
   - Origin training courses on using Origin software for inspection "Checkmate", (1998).
   - SME clinics on:
     - Reveres engineering (Summer 1998).
     - Rapid tooling for castings (1999).
     - CMM and GD&T (2001).
   - ImageWare training courses on Image ware software for reveres engineering (2002).
   - Basic and advanced MasterCam (2002).
   - 4, 5 Axis Training at MasterCam (2003).
   - Basic Pro-Engineer, DEA training course on introduction and basics of measuring
   - Attending a training course on Automatic Identification at Ohio University (2002).
   - Daewoo CNC Turning Center Turning (2003).
   - SolidCast (a Solidification Modeling Package (2006).
   - NX6: fundamental of NX System June 2010.
   - NX6: NX manufacturing module
   - Attended MCL CAD on solid works 2013,2014,2017
   - Attended Material Handling society training at University of Auburn 2013 for three days.
   - Attended Workshop on spectroscopy 2018, from Thermo scientific
   - Presented a paper in ASME/NAMRAC 2011, 2013 at Oregon, and Wisconsin

Dr. Amir A. Mobasher

1. **Name:** Amir A. Mobasher, Professor, Mechancial Engineering
2. **Education:**
   1994 Ph.D., Mechanical Engineering Department, University of Alabama, Huntsville.
   1987 MSME, University of South Alabama, Mobile, AL.
   1984 B.S.M.E. University of South Alabama, Mobile, AL.
   Academic Experience:
   8/15/16-Present: Professor, Mechanical and Civil Engineering Department, Alabama A & M University, Huntsville, Alabama 35762.
   8/15/06-8/14/16: Associate Professor, Mechanical and Civil Engineering Department, Alabama A & M University, Huntsville, Alabama 35762.
   8/15/98-8/14/06: Assistant Professor, Mechanical Engineering Department, Alabama A & M University, Huntsville, Alabama 35762.
   8/15/94-8/15/95: Adjunct Faculty, Department of Mechanical Engineering, University of Alabama- Huntsville, 35758.
4. **Non-academic experience:**
   5/2015-current Worked on development of Bearing Test Rig for NASA
   5/2007-8/2007 NASA Summer Faculty Fellow
   5/2006-8/2006 NASA Summer Faculty Fellow
   5/2004-8/2004 NASA Summer Faculty Fellow
   5/2003-8/2003 NASA Summer Faculty Fellow
   5/2002-8/2002 NASA Summer Faculty Fellow

   Summer 1993 Consulting, Browns Ferry Power Plant
   3/1/95 – 4/1/98 Lead Mechanical Engineer, US Army Aeromedical Research Laboratory, UES, Fort Rucker, AL
5. **Certifications or professional registrations:**
   - P.E. Certification: Professional Engineer Certification for the State of California
   - P.E. Certification: Professional Engineer Certification for the State of Alabama
6. **Current membership in professional organizations:**
   - Member, American Society of Mechanical Engineers (ASME).
7. **Honors and Awards:**
   - NASA Administrator's Faculty Fellow (2008-2010)

8. **Service activities:**
   - Member of Tenure and Promotion committee for the college of Engineering and Technology.

9. **Most Important Publications in Past Five Years:**

- Deng, Z.T., Mobasher, A.A. Chan, W. and Glenn C., "AAMU-NASA Bearing Test Rig CDR (Critical Design Review) document," Presented at NASA Marshall Space Flight Center, April, 19, 2017.
- A. Mobasher, M. Drabo and S. Budak, "A laplace-Adomian Solution for Classical Fluid Dynamics Problems," *International Journal of Modern Engineering*, Volume 14, Number 2, Spring/Summer 2014.

- A. Mobasher, A. P. Biazar and Z.T. Deng, "Piecewise Nth Order Adomian Polynamial Stiff Differential Equation Solver," *International Journal of Modern Engineering*, Volume 13, Number 1, Fall/Winter 2012.
- A. Mobasher, P. Shiue, H. jamshidi, Z. Deng," Modeling and Validation of Autonomous Rendezvous and Docking of Air Bearing Vehicles," *International Journal of Modern Engineering*, Volume II, Number 1, Fall/Winter 2010.

10. **Most Recent Professional Developmental Activities:**
    - ABET Advanced Program Assessment Workshop, Chicago, IL, September 30, 2017
    - Seminar on "Life, Rockets, and You", AAMU, February 2017.
    - Seminar on "Space Exploration and Propulsion", AAMU, March, 2016
    - Seminar on "Turbomachinery" , AAMU, March 2016.
    - Seminar on "Introduction to Rotordynamics and Bearings", AAMU, March 2016.
    - Seminar on "Finite Element Modal Analysis of Rotors" , AAMU, September 2016.
    - Seminar on "Overview of Mechanical Design - Best Practice and Lessons Learned" , AAMU, November 2016.
    - Seminar on "Fastrac Engine: Understanding Technical Implications of Programmatic Decisions on Fastrac and the Legacy to Propulsion Systems, AAMU, November 2016.
    - ADORE Training, April 2016.

Dr. Mohamed A. Seif

1. **Name:** Mohamed A. Seif, Professor and Chair, Mechanical Engineering
2. **Education:**
   1988 Ph.D., Mechanical Engineering Department, University of Central Florida.
   1982 M. Sc., Mechanical Design and Production Department, Cairo University.
   1976 B. Sc. (With honors), Mechanical Design and Production Department, Cairo University.
3. **Academic Experience:**
   8/15/15-Present: Chair, Mechanical & Civil Engineering and Construction Management Department, Alabama A & M University, Huntsville, Alabama 35762.
   8/11/12-Present: Chair, Mechanical and Civil Engineering Department, Alabama A & M University, Huntsville, Alabama 35762.
   10/1/07-Present: Chair, Mechanical Engineering Department, Alabama A & M University, Huntsville, Alabama 35762.
   6/22/06-Present: Professor, Mechanical Engineering Department, Alabama A & M University, Huntsville, Alabama 35762.
   9/1/02-6/22/06: Associate Professor, Mechanical Engineering Department, Alabama A & M University.
   1/1/99 – 1/9/02 Associate Professor: Mechanical Engineering Department, Northern Illinois University, DeKalb, IL 60115.
   8/97 - 12/98 Professor: Mechanical Engineering Department, Tuskegee University, Tuskegee, AL 36088.
   5/93 - 8/97 Associate Professor: Mechanical Engineering Department, Tuskegee University, Tuskegee, AL 36088.
   8/89 5/93 Assistant Professor: Mechanical Engineering Department, Tuskegee University, Tuskegee, AL 36088.
4. **Non-academic experience:**
   Summer 2003 NASA Faculty Fellowship Program (NFFP), NASA–Marshall Space Flight Center.
   2/87 - 8/89 CAD Engineer: International CAD Systems, Inc. 258 E. Altamonte Drive, Altamonte Springs, FL 32701. Application and implementation of computer oriented algorithms for simulation, analysis, design, and optimization.
5. **Certifications or professional registrations:**
   - P.E. Certification: Professional Engineer Certification for the State of Alabama
   - High Power Rocketry Level 2 Certification
6. **Current membership in professional organizations:**
   - Member, American Society of Mechanical Engineers (ASME).
   - Member, American Society for Engineering Education (ASEE)
7. **Honors and Awards:**
   - Outstanding Faculty Performance Award for Teaching, 1997-1998 Academic Year
   - Outstanding Faculty Performance Award for Research, 1992-1993 Academic Year
   - Outstanding Leadership Award, the International Society of Agile Manufacturing,1997
   - NASA Faculty Award for research, 1996

8. **Service activities:**

Within the institution:

- Chair of the Mechanical & Civil Engineering, and Construction Management Department
- Chair: Academic Standard Committee, College of Engineering, Technology, and Physical Sciences

Outside of the Institution:

- **Reviewer:** National Science Foundation, NASA, American Institute of Aeronautics and Astronautics (AIAA) Journal, Journal of Concurrent Engineering, Journal of Computers and Industrial Engineering, and Journal of Composite Structures.
- Chair and Symposium Organizer, Competitive Manufacturing Engineering, ASME 2014 Manufacturing Science and Engineering Conference, June 9-13, 2014, Detroit, Michigan

9. **Most Important Publications in Past Five Years:**

- Seif, Mohamed, "Failure Analysis and Quality Assessment of 3D Printed ABS Parts", Proceedings of the ASME 2018 International Manufacturing Science and Engineering Conference, MSEC 2018, June 18-22, 2018, College Station, Texas, USA
- Edwards, E., Booth, J.C., Roberts, J.K., Brantley, C.L., Crutcher, S. H., Whitley, M., Kranz, M., Seif, M., and Ruffin, P., "Military Comparison of 3D Printed Vs Commercial Components," SPIE, Smart Structures and Nondestructive Evaluation Conference, March 4-8, 2018, Denver, CO.
- **Seif, M.A.**, Booth, J. C., Whitley, M., Kranz, M., and Ruffin, P.B., "A Comparative Study between 3D Printing and Extrusion/Forming Sheet Processes Using In-Plane and Out-of-Plane Shear Strength Testing of ABS, HIPS and PLA Plastics", Advanced Technology Workshop on Additive Manufacturing, Huntsville, AL September 13-14, 2017
- Edwards, E., Booth, J.C., Roberts, J.K., Brantley, C.L., Crutcher, S. H., Whitley, M., Kranz, **M., Seif,** M., and Ruffin, P., "Military Efforts in Nanosensors, 3D Printing, and Imaging Detection", Proc. of SPIE Vol. 10167, 1016714, 2017
- Mohamed Gadalla and **Mohamed Seif**, "Evaluation of the Impact of Process Modeling on Opportunity Losses/Gains in a Manufacturing Environment International Manufacturing Research Conference 2015, MSEC2015-9298, June 8- 12, 2015, Charlotte, NC.
- B. T. Branson, M. A. Seif, J. L. Davidson, and C. M. Lukehart, "Fabrication and Macro/nanoscale Characterization of Aggregated and Highly De-aggregated Nanodiamond/Polyacrylonitrile Composite Thick Films", J. of Materials Chemistry, 2013, 21, 18832-18839

10. **Most Recent Professional Developmental Activities:**

- ABET Advanced Program Assessment Workshop, Chicago, IL, September 30, 2017
- Advanced Technology Workshop on Additive Manufacturing, Huntsville AL, September 13-14, 2017
- ASME - Additive Manufacturing and 3D Printing Conference and Expo (AM3D), August 21-24, 2016, Charlotte NC
- International Manufacturing Research Conference, June 8-12, 2015, NAMRC43 – MSEC 2015, Charlotte, NC
- Symposium Organizer, Competitive Manufacturing Engineering, ASME 2014 Manufacturing Science and Engineering Conference, June 9-13, 2014, Detroit, Michigan

Appendix C – Equipment

List of the Major Pieces of Equipment Used by the ME Program

Name of Laboratory	Room No.	Room Size, ft^2	List of main Equipment
ME101L-Intro to Mechanical Engineering	235	775	• 36 Computers - Computer simulation and design • Design, build and testing balsa wood gliders • Basic wind tunnel testing - Calculation of Lift and Drag.
ME103 Computer Aided Design I	271/ 235	600	• 36 Computers - Computer simulation and design software such as SolidWorks, Solid Edge, Ansys, Matlab, etc
ME 380 Computer Aided Design II	235	775	• 36 Computers - Computer simulation and design software such as SolidWorks, Solid Edge, Ansys, Matlab, etc
ME301L-Instrumentation of Physical Systems	157	874	10 work stations :Each station equipped with LabView and the national Instruments data acquisition units NI cDaq-9172 with modules 9215, 9237, 9263,9219,9234 and 9401. 10 thermocouple sensors, 4 units of Load cells, 10 units of thermistors, ten units of potentiometer, 2 units of tank, one unit of suspending beam
ME313L-Experimental Mechanics	162	874	• MTS 810-Universal testing machine • One unit of torsional testing machine • One unit of fatigue testing • One unit of ultrasonic testing machine • One unit of Brinell Hardness testing machine • One unit of Modal testing package and includes shaker and impact hammer • High temperature furnace. • Four Strain Gages units • Creep testing Machine
ME312L-Heat and Mass transfer	143	1282	• Determination of Heat Conduction unit. • Extended Surface Heat Transfer Analysis unit. • Combined Convection and Radiation Heat Transfer unit. • Heat Transfer Service Unit for collecting experimental data. • 10 computers with Interactive Heat Transfer Software for numerically analyzing various heat transfer problems.

			• Double Pipe Heat Exchanger unit.
ME360L-Fluid Mechanics	143	1282	• Low speed wind tunnel by Aerodyne. • High accuracy stainless steel pitot tube • Table top Monometer (Air velocity measurements) by Dwyer Instruments. • Air velocity measurement unit (total Pressure., static pressure, low speed application) • Table top air nozzle for Bernoulli principle and verification of continuity principle • Lift and drag module for low speed wind tunnel • **Water Table** The unit and the associated accessories allow the performing of the following experiments: 1. Laminar - Turbulent Flow Measurements 2. Lift and Drag Measurement 3. Flow Pattern Visualization 4. Vorticity 5. Delta Wing 6. Fore body and cylinder dynamics 7. Pitot tube and digital readout for pressure measurement 8. Velocity meter (digital) (kit) for velocity measurement
ME412L-Analysis of gas turbine	143	1282	• Solid works software, • ANSYS software, • Gas Turbine Engine Performance Analysis software, • Axial flow compressor design software. • Glenn propulsion engine performance analysis package.
ME432L-Design for manufacture	152	912	• Coordinate Measurement Machine (CMM) • Surface roughness measurement system • One unit of Z-Corporation 3-D printer • 2 Units of 3-D scanners (next Engine) • 2 Units of Roland Model-A milling machines • Two units of CNC machines: super Prolight 1000 milling center, and Prolight

			turning center lathe • One unit 3-D Scanner for reverse Engineering
ME451-Automatic Control Systems	157	874	10 work stations: Each station equipped with the national Instruments data acquisition units NI cDaq-9172 with modules 9215, 9237, 9263,9219,9234 and 9401. 10 thermocouple sensors, 4 units of Load cells, 10 units of thermistors, 2 units of tank, 10 units of stepper motors
ME Machine Shop	163	500	• Sheet metal working Station • Engine Lathe (LeBlond Regal) • Bridgeport Milling Machine with indexing head • 1 storage cabinet for tools • Metrology tools: calipers, micrometers, gages (including a go, no-go gage, thread gage, gage block, V-block, and dial indicators) • Manual machines (bench type buffer/ploshier, bench type and floor drill presses, bench type sheet metal bender, machine shop press). • 3 work tables, Vacume Cleaner(wet dry) •
ME Annex – Machine Shop		2400	• Scroll Saw • Table Saw • 12” Chop Saw • B&D 6” grinder • Craftsman Drill Press • 18” Box Brake • Small Drill Press • 250 amp Craftsman Mig Welder • 250 amp Miller Tig welder • Gas Welder • Hobart Plasma Torch • 5 Stainless top table • 3 light rolling Stainless tables • Craftsman two piece Rolling Tool Cabnet(Full of Basic hand tools) • 2 Lisa Work Stations

			• 5 large storage cabnets • 6X4 Layout table • Welding Cabnet with welding consumables inside • 8’ ladder • Horizontal Band Saw • Upright band saw • 10” disc sander • 5 wood work tables • Welding stand • 5 horse 60 gal. Compressor • Soak Tank

Mechanical Engineering Department
Equipment required for the ME Program

Lab	Equipment Needed/remarks	Vendor/Model	# Reqd	Cost
ME 312L - Heat and Mass Transfer Lab	**Temperature Measurement and Calibration Unit + Software** The unit and the associated accessories should allow the performing of different temperature measurements and calibration	ARMFIELD/ TH1-B	1	$33,092.00
CAD Lab (ME 103, ME 104, ME 300, ME380, ME470, ME475)	36 New **Computers** for the ME CAD lab room 235	HP / Dell	36 @ $1200	$43,200.00
ME 432L Manufacturing Lab & Machine Shop	CNC Machine	HAAS Factory Outlet	1	$66,000.00
ME 313L Experimental Mechanics Lab	**Flexor Fixture Device w/experiments** Perform different strain measurements	Vishay/ P920-000037	7 @ $805	$ 5,635.00
	Charpy and Izod Impact Test Unit Perform the impact test on different materials.	Edibon/ EEICI	1	$10,603.00
Total				**$158,530.00**

Appendix D – Institutional Summary

1. The Institution

a. Name and address:

Alabama A&M University
P. O. Box 1357
4900 Meridian Street
Normal, AL 35762

b. Name and title of the chief executive officer:

Dr. Andrew Hugine, Jr.
President, Alabama A&M University

c. Name and title of the person submitting the self-study report:

Dr. Mohamed Seif, Chair
Mechanical and Civil Engineering Department

d. Alabama Agricultural and Mechanical University, AAMU, is accredited by the Southern Association of Colleges and Schools' Commission (SACS) on Colleges to award baccalaureate, master's, educational specialist, and doctoral degrees. AAMU became fully accredited by the Southern Association of Colleges and Schools in 1963. The last accreditation was during 2014. Contact the commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call (404) 679-4500 for questions about the accreditation of AAMU.

2. Type of Control

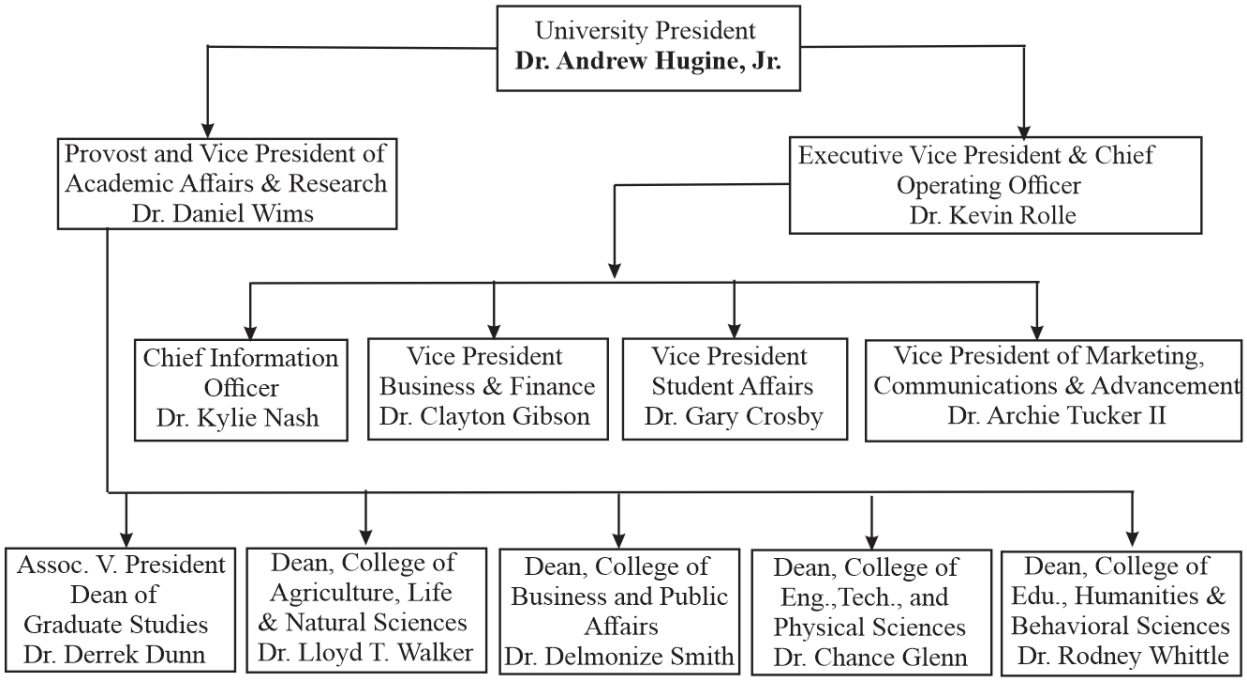
The Alabama Agricultural and Mechanical University is a land-grant university. Its support comes from the state of Alabama and federal funds appropriated to assist in carrying on work stipulated by the Morrill Acts of 1862 and 1890. The University is under the control of a board of trustees appointed by the governor of the State who serves as ex-officio chairman.

3. Educational Unit

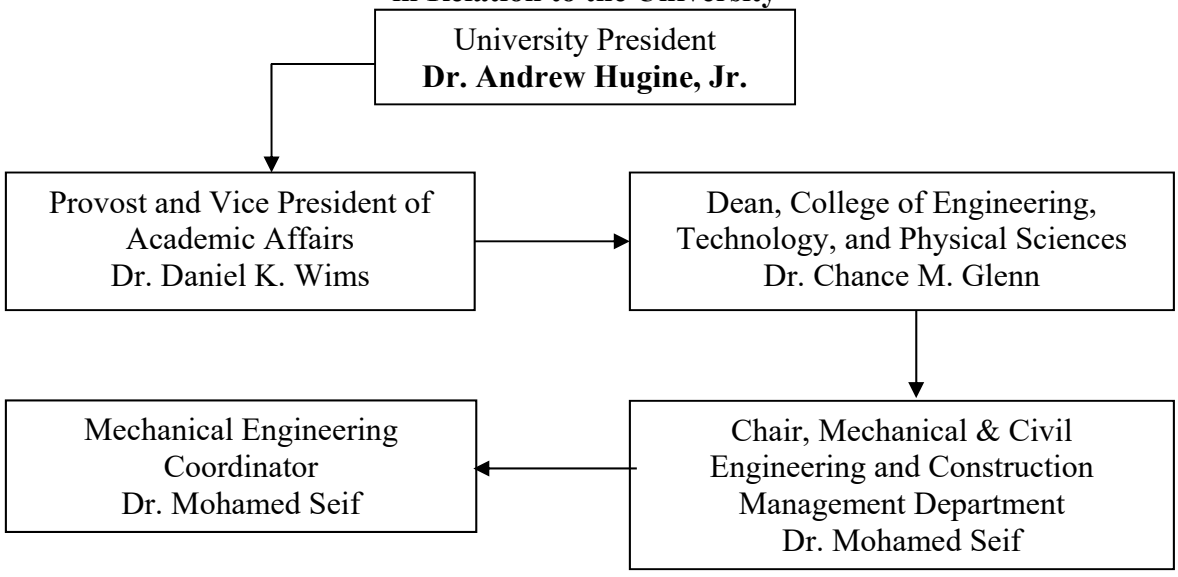
The program is located within the Mechanical & Civil Engineering, and Construction Management Department, a unit of the College of Engineering, Technology, and Physical Sciences. The department currently offers degree programs in Mechanical Engineering, Civil Engineering and Construction Management. The university re-organized in the Fall 2011by merging and re-aligning several departments, schools and programs. This resulted in merging of the Civil and Mechanical Engineering departments and eliminating one Chair position. The combined department is named “Mechanical and Civil Engineering Department.” Recently, The Construction Management Department joined the Mechanical and Civil Engineering Department to form the current department. Currently, Dr. Mohamed Seif is serving as the chair of the department and the program coordinator of the Mechanical Engineering Program, while Dr. Mohamed A. Ashour is serving as the program coordinator of the Civil Engineering Program, and Prof. Tamara Chowdhury is the program coordinator of Construction Management Program.

Day-to-day administration of the program is done by the coordinator of the program whose primary responsibilities are to serve as the ABET program director, to be the interface between the faculty and the chair of the Department, and to do course scheduling. The Mechanical Engineering Program is part of the Mechanical & Civil Engineering and Construction Management Department, overseen by the department chair. The department chair reports to the dean of the College of Engineering, Technology, and Physical Sciences who reports to the Provost and Vice President for Academic Affairs, who reports to the President of the University.

ALABAMA A&M UNIVERSITY – CHIEF ACADEMIC OFFICERS



Organizational Structure of the Mechanical Engineering Program in Relation to the University



4. Academic Support Units

- Required courses in chemistry, mathematics, and physics are the responsibility of Dr. Chance Glenn, Dean of the College of Engineering, Technology, and Physical Sciences.
- General education component are the responsibility of Dr. Rodney Whittle, Intrim Dean of the College of Education, Humanities, and Behavioral Sciences.
- Courses in macroeconomics and microeconomics are acceptable options as a partial fulfillment of the general education component, and these are the responsibility of Dr. Delmonize "Del" Smith, Dean of the College of Business & Public Affairs.

5. Non-academic Support Units

a. Library services: Annie M. Payton, Director, Acting Director and Head of Public and Information Services
b. Information Technology Services: Dr. Kylie Nash, Chief Information Officer
c. Career Development Services: Yvette S. Clayton, Director
d. Office of Retention & Academic Support (ORAS) : Leatha M. Bennett, Ph.D., Director

6. Credit Unit

One semester credit represents one class hour or three laboratory hours per week. Each standard semester is fifteen weeks long followed by one week of final examinations.

7. Tables

Shown below in Table D-1 is program enrollment and degree data. Personnel head count data are presented in Table D-2.

Table D-1. Program Enrollment and Degree Data

Mechanical Engineering – Alabama A&M University

	Academic Year		Enrollment Year					Total Undergrad	Total Grad	Degrees Awarded			
			1st	2nd	3rd	4th	5th			Associates	Bachelors	Masters	Doctorates
Current Year	17-18	FT	128	70	46	52	0	296			34		
		PT											
1	16-17	FT	118	75	49	41	0	283			19		
		PT											
2	15-16	FT	108	63	40	48	0	259			18		
		PT											
3	14-15	FT	114	58	26	52	0	250			23		
		PT											
4	13-14	FT	86	47	23	50	0	206			22		
		PT											

Give official fall term enrollment figures (head count) for the current and preceding four academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

Table D-2. Personnel

Mechanical Engineering – Alabama A&M University

Year[1]: 2011-12

	HEAD COUNT		FTE[2]
	FT	PT	
Administrative[3]	0.75		0.75
Faculty (tenure-track)	1		1
Other Faculty (excluding student Assistants)	6.25		6.25
Student Teaching Assistants		5	2.5
Student Research Assistants			
Technicians/Specialists	1		1
Office/Clerical Employees	1		1
Others[4]			

Report data for the program being evaluated.

[1] Data on this table should be for the fall term immediately preceding the visit. Updated tables for the fall term when the ABET team is visiting are to be prepared and presented to the team when they arrive.

[2] For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester credit-hours (or 24 quarter credit-hours) per term of institutional course work, meaning all courses — science, humanities and social sciences, etc. For faculty members, 1 FTE equals what your institution defines as a full-time load.

[3] Persons holding joint administrative/faculty positions or other combined assignments should be allocated to each category according to the fraction of the appointment assigned to that category.

[4] Specify any other category considered appropriate, or leave blank.

Appendix E

Additional Program Information

Constituent Survey for Mechanical Engineering Program Educational Objectives

The Mechanical Engineering Program is continuously improving its program. As a constituent your input is essential for developing/modifying our program educational objectives. Please e-mail answers to mohamed.seif@aamu.edu or fax to (256) 372-5888. Alternatively you can print this survey and mail it to Dr. Mohamed Seif, Mechanical & Civil Engineering Department, Alabama A&M University, P.O. Box 1163, Normal, AL 35762.

Name and Organization (Voluntary): _____

E-mail (Voluntary): _____

Constituent: __Alumni __Faculty __Advisory Board Member __Employer/Potential Employer

The objectives of the Mechanical Engineering program at Alabama A&M University are to produce graduates who, within the first few years of their graduation:

1. Are successfully employed in ME related fields or have transitioned into nontraditional career paths.
   The program fulfills this objective for its students/ graduates.
   __Strongly Agree __ Agree __Neutral __ Disagree __ Strongly Disagree

   Should this be an objective? __Yes __No
   __Yes with the following changes/ modification(s)

2. Advance professionally as a result of his/her ability to solve complex technical problems and demonstrate professional engineering competence via promotions and/or positions of increasing responsibility.
   The program fulfills this objective for its students/ graduates.
   __Strongly Agree __ Agree __Neutral __ Disagree __ Strongly Disagree

   Should this be an objective? __Yes __No
   __Yes with the following changes/ modification(s)

3. Continue life-long learning via progress toward, or successful completion of an advanced degree, professional development and/or industrial training course(s), and/or engineering certification..
   The program fulfills this objective for its students/ graduates.
   __Strongly Agree __ Agree __Neutral __ Disagree __ Strongly Disagree

   Should this be an objective? __Yes __No
   __Yes with the following changes/ modification(s)

4. Demonstrate service and sovereignty through involvement with community and/or professional organizations and/or make contributions towards society's greater good and prosperity
   The program fulfills this objective for its students/ graduates.
   __Strongly Agree __ Agree __Neutral __ Disagree __ Strongly Disagree

   Should this be an objective? __Yes __No
   __Yes with the following changes/ modification(s)

Additional Comments/Suggestions:

School of Engineering and Technology
Alabama A&M University
Graduating Senior Survey

Name _____
Address _____
Telephone # _____ Email _____

Perceptions and Assessment of Education	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The advice given me by the engineering faculty advisors was accurate and of high quality					
The computing and simulation tools I needed to get my work done were readily available in my department.					
Engineering faculty members encouraged students to study in group environments.					
Lab courses were beneficial in helping to understand concepts taught in the lectures					
Courses taken in my department required that I analyze and interpret data.					
I was taught to design a system, component or process to meet a specific need.					
I was taught to function on multi-disciplinary teams.					
Ethical social and global economic and environmental issues in engineering were discussed in my undergraduate courses.					
My assignments required that I apply math, science and technology principles.					
My engineering assignments required that I solve realistic problems with multiple constraints.					
Oral and written communication skills were required in my courses.					
I made use of library and internet resources in solving problems.					
My instructors encouraged me to further my education beyond the undergraduate level.					
I plan to take the Fundamentals of Engineering examination.					
I plan to enhance my education by attending workshops and enrolling in graduate school.					
Engineering professors, department chairmen and the Dean's office were helpful in obtaining intern and co-op positions and other technical employment.					
Overall, I feel that I have obtained a quality education here at the University.					
I would recommend AAMU to my family and friends.					

Post Graduate Employment	**Yes**	**No**
I have a post graduation job offer.		
The number of job offers I received allowed me to be both job and location selective.		
I am satisfied with the salary offered.		

Alumni Survey Form
School of Engineering and Technology
Alabama A&M University

Part I. Personal Profile:
Name: _____ Year/Semester of Graduation _____
Address: _____ City: _____ State: _____ Zip: _____
Telephone: (H)_____ (W)_____ Email: _____

1) Did you have a job offer before graduation? Yes __No __
2) Did the number of job offers you received allow you to be selective in both jobs and job location Yes__ No__
3) Were you satisfied with your starting salary? Yes __ No __
4) Have you experienced salary growth and promotion in position and/or responsibility? Yes __ No __
5) Are you classified as a professional within your company? Yes __ No __
6) Do you feel that you are competitive with other young professionals hired by your company? Yes__ No__
7) Have you taken/passed the FE/EIT exam? Yes __ No __
8) Have you any further education or training since graduation? Yes __ No __
9) Do you feel that you obtained a quality education at the University? Yes __ No __

10) How well did your education prepare you for professional practice? Well __ Adequately __ Not Well __

Part II. Personal Opinions
1) The following course(s) should be added or strengthened to make graduates more competitive.

2) The following laboratory course(s) should be added or strengthened to make graduates more competitive.

3) The transition from school to work would have been easier if the following were added to the curriculum.

Part III. Your undergraduate experience

Please rate your undergraduate experience	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I have the technical skills required for my job assignments.					
I have the ability to use the techniques and tools necessary for successful professional practice.					
I have the ability to communicate effectively both verbally and in writing.					
I have the ability to function on multi-disciplinary teams.					
I have an understanding of professional and ethical responsibility in professional practice.					
I have a recognition of the need for, and an ability to engage in lifelong learning.					
I am competitive with other young professionals hired by my company.					
I would recommend Alabama A&M University to my family and friends.					

Part IV. The School of Engineering and Technology plans to publish an annual Newsletter. If you would like to share your personal information and opinions with your fellow graduates and provide your input to the undergraduate students of the School of Engineering and Technology please list your accomplishments and other information you consider important below or on a separate sheet.

Signature:_____ Date: _____

Employer Survey Form
For
School of Engineering and Technology
Alabama A&M University (AAMU)

Supervisor Name: _____
Company Name: _____
Address: _____ City: _____ State: ____ Zip: _____
Telephone: _____ Email: _____

Is the AAMU graduate classified as an engineer or professional employee? Yes __ No __
How well did the employee's education prepare him/her for professional practice? _____
_____
_____
_____

Employee Performance

Using the following criteria, please rate your employees.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
AAMU graduates have the technical skills required for their job assignments.					
AAMU graduates have the ability to communicate effectively both verbally and in writing.					
AAMU graduates have the ability to function on multi-disciplinary teams.					
AAMU graduates have an understanding of professional and ethical responsibility in professional practice.					
AAMU graduates have a recognition of the need for, and an ability to engage in life long learning.					
AAMU graduates are competitive with other young professionals hired by my company.					
I would recommend that my company hire more graduates from Alabama A&M University, School of Engineering and Technology.					

Comments: (Please add your perceptions about the employee's career preparation strengths and weaknesses.)

Alabama A&M University
School of Engineering and Technology

Student Satisfaction with ME Department

	Student Name: Semester Year: **Spring 2012**	strongly agree		neutral		strongly disagree
		5	4	3	2	1
	ME DEPARTMENT					
1	I feel comfortable in seeking help from my (major) department office.					
2	My advisor is available and helpful in planning my course of study.					
3	I am encouraged to use the library resources and materials.					
4	I have adequate access to computing facilities.					
5	Laboratories are beneficial in helping to understand theoretical concepts presented in lectures.					
6	Laboratories are well equipped to support experiment objectives.					
7	Senior projects were well designed and supported by faculty					

COMMENTS

INDUSTRY ADVISORY BOARD MEETING/MINUTES-
MECHANICAL ENGINEERING DEPARTMENT

February 21, 2013

Attendants: Dr. Mohamed Seif, Emmett McDonald, Thomas Kmiec, Chris Randall, Gary J. Dillard, Eugene Edwards, Ken Maguire, Tyler Kirby, Dale Hudson, Ahmed Solomon, Dr. Amir Mobasher, Dr. Cathy Qian, Dr. Zhengtao Deng, and Dr. Mohamed Gadalla.

Recorder: LaTisha Jones

Location: 2nd Floor Conference Room

The meeting began at 12:00 pm and was called with the following topics of discussion.

- Welcome and Introduction of attendees
- Review of the meeting agenda (distributed and attached)
- Review of the previous meeting discussion
- The status of the Mechanical Engineering Department

  a) Enrollment
     - Currently, ME Department has 178 students

  b) Curriculum Changes
     - Two courses have been added to the curriculum as per previous meeting
       - ME 204 – Engineering Analysis
       - ME 4xx – ME Elective

- ABET Preparation

  a) Review of ABET report from last visit

  b) Dr. Seif emphasized on the importance of the IAB in assessing:
     - the program outcomes
     - the program educational objectives
     - Alumni Survey
       - IAB suggested that a new survey form be generated to be more detailed
     - Senior Design Project evaluation which will take place here at the conclusion of the meeting in room 110 in the College of Engineering Building.

  c) Laboratory Developments
     - Lab View in Automatic Control Lab
       - Still awaiting response from local "Lab View" group to attempt to schedule to have a meeting. Possible meeting in the Fall 2013 semester
       - Recommend student senior design project using Lab view
     - CAD program option
       - ProE
       - NX
       - Solid Edge
       - Solid Works (better than just using Solid Edge)

     The IAB has recommended teaching ProE (Solid Works at the minimum)

  d) The board members requested the list of ME labs and a detailed list of the capabilities of each lab, as well as, needed equipment list.

- Discussion on Future Directions

a) Department Evaluation (Program Educational Objectives - Continuous Improvement Plan)
   - The modification was presented to the IAB for approval during the Spring 2013 meeting. This initiated a discussion for revisiting the current PEOs and the following recommendations were made:
     - Approve the modification
     - More time needed to carefully revisit the PEOs and look at other institutions for comparisons
     - Use the current Constituent Survey for Mechanical Engineering Program Objectives form to obtain feedback and suggestions from all members.
     - Revisit the alumni and employer surveys to address the lack of response from both constituencies.

b) Dr. Seif requested a critique of department since last meeting from IAB
c) Policy was reiterated that ME- IAB members attend and support Senior Design problems and presentations.
d) It was reiterated that faculty encourage students to begin work on their senior projects during the 2nd semester of their junior year.
e) Attempt to locate funds for students to work and test equipment.

- Review of Action Items
  a) Ways to improve ME labs
     - Find out why department has not been receiving money for equipment
  b) Revise the Program Educational Objectives according to ABET criteria
     - Dr. Seif will send the current objectives to IAB members and ABET's criteria
  c) Assessment of where Alumni work post graduation
  d) Curriculum has been revised to have students take ME 101 during their 1st semester as a freshmen and ME 103 as during the 2nd semester.
  e) IAB will take action to encourage their companies to both utilize Alabama A&M University's Engineering labs and donate company's funds.
  f) IAB will search for surplus equipment to donate to the department

- Ways to improve industry-department relationships
  - Mechanical Engineering Department and IAB will collaborate to host an Engineering Social for new freshmen students

- Review of meeting
  a) IAB will meet again in October.

Discussion followed and the meeting was adjourned at 1:30 p.m.

Senior Design Evaluation Form
ME 470-475
Academic Year 2017- 2018

Project Name:

Group # :

Outcomes Rubrics		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
		5	4	3	2	1
Ability to iterate design cycles						
Ability to implement design and fabricate						
Ability to test, evaluate, and qualify design						
Demonstrate ability to work & plan together						
Demonstrate ability to divide up complex tasks						
Demonstrate ability to integrate individual work						
Demonstrate ability to report team efforts and outputs						
Relate engineering solutions to real life problems						
Integration of engineering science to practical problems of contemporary interest						
Ability to make formal presentation	Student # 1					
	Student # 2					
	Student # 3					
	Student # 4					
Over all performance satisfactory						
Comments:						

AAMU Mechanical Eng Industry Advisory Board Senior Student's Design Project Critique & Suggestions

In April of 2013, representatives from the Alabama A&M University Mechanical Engineering Industry Advisory Board (MEIAB) witness the presentation of design projects by graduating Mechanical Engineering senior students
Perhaps, due to a long MEIAB meeting prior to the presentation, the board members concluded that the presentations appeared to be rushed). The students appeared to be allowed approximately 25 minutes for each team presentation (including setup time). Although the allotted time was perhaps enough for the presentation, suggestions are as follows:

- perhaps the projects should already be in place prior to the meeting
- perhaps a larger auditorium should be consider (as necessary
- have a (no more than 5-10 minute) question period at the end of each presentation
- give students industry equivalent design review templates with presentation guidance
    - what to leave out
    - placement of summary in the presentation's main body
    - placement of details in the presentation's backup charts
    - direct/personal guidance from board members for the template
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Most projects lacked a clear presentation of the objective of the project which in turn would become the requirements for the design. Project objectives/requirements should be explained at the beginning of the presentation, followed by explanations of what Mechanical Engineering principal(s) are being demonstrated, along with what discipline from their course work will be used. For example, if the students are designing a structure, the student is expected to use fundamentals in materials and stress combined with use of Finite Element Analyses tools. In many of the students presentations there seemed to be a misunderstanding of the difference between stress and strength. Numerous ANSYS models were shown outlining stresses (without units); however, not enough understanding was giving to indicate comparisons to strength limits. Most of the ANSYS analyses could have been done with hand calculations; however it would have been preferred if all of the students had done both as was done by student team #2.

Since many of the student teams showed commercial applications for their designs, a more thorough cost analysis and trade study should have been done. Trades in design are integral part of the process and should be part of the work that the students learn and present.

Board members were given a checklist that was more or less irrelevant to the presentations. There should be a clear link between the board's assessment of each project and the students' presentations. The board members saw very little of the checklist's requirement for schedule, division of work, and other checklist items. It is believed that the checklist should be consistent with the ME Department's objectives that were provided to the board as follows:

- Demonstrate the necessary competencies in fundamental technologies (such as thermal and mechanical system design.
  The checklist could provide checks to show such fundamental technologies as mechanical design, thermal analysis, fluid flow, etc
- Demonstrate competencies in experimental testing, error, etc
  The checklist did include an item for testing, which was good, but lacked enough definition to allow the board to score the student's ability to plan and properly execute a test program. The

presentations had very little correlation between test results and expected results (predictions), and no explanation of differences. Such a correlation is the engineering process/competency that the student's should be learning

- Demonstrate computer competency and intelligent use of computers
  The board saw a lot of good FEM and some CFD that should be place on the checklist; however, using the tool is only the beginning of the process, while understanding the results is the evidence that the students have the competency

If the students know that they are required to demonstrate these specific competencies, they would allow their projects to focus more on the competencies and report results that indicate that they have these competencies. It will make it easier for the Board to score their work.

These are some of the MEIAB's specific comments on each students' team project:

Group 1 – **"Dual Solar/Wind Turbine"**
The team used Kevlar properties for a fiberglass part which compared to all the other issues was really just a misunderstanding on their part, but a miss nonetheless of a fundamental on checking on the use of the right material properties. This was a good project, but could have been better if they had tested more variables in order to optimize rather than jump to the need for a gearbox.

Group 2 – **"Supersonic Wind Tunnel Model Positioning System"**
The project was a little confusing. The team showed they could get the force reaction from the sample test article, but it was not clear that they provided a clear way to assess any test article that someone might bring.

Group 3 – **"Design of Reusable Rocket "Revolution" With Scientific Payload"**
The project was well presented; however, the only analysis that that was recalled was the trajectory analysis (which used an analytical tool). Although it showed that the student team could use the tool, there were limited amounts of proof associated with performance of the competencies since it appeared that the tool did the solution for thrust mass and drag. There was an indication that this team also designed the rocket; therefore, perhaps there was some design work including loads and stresses that could have been presented.

Group 4 – **"Design of Nozzle Configuration Maps for Supersonic Wind Tunnel"**
Good thought was put into this project; however, the lack of understanding of identifying the minimum flow (that was normal to the flow surface) showed a real lack of understanding of some basics.

Group 5 – **"Variable Speed and Pitch Plastic Shredder"**
The project appeared to be suffering from a lack of attention and pre-planning; it give indications that last minute scrambles were done to complete some of the work. The team tried to present the animation of the shredder; it is believed that that the results would have only shown that the team could animate two rollers. The model which they did run showed a need for a 5 hp motor; however, this was not flagged as out of line.

Group 6 – **"Solar Panel Design and Performance Analysis"**
The project appeared to have a lot of focus on the panel building and not enough emphasis on the design itself.

Group 7 – **"Moon Buggy Team"**
The project was heavy on the fabrication while being light on design. There was too much time spent on "how" it was built rather on "why." The team did not seem to understand the nuances associated with designing with composites relative to lay and associated material properties.

Group 8 – **"Solar Collector Design and Analysis"**
It was very hard to tell how the experimentation and over work was conducted. In comparison to all of the other projects, this project appears to have the most potential for demonstrating competency associated with heat transfer principals; however, there seen to be a lack of good experimental technique. The team used all of the right equations; this could have been excellent work with more attention to test execution.

Performance Indicators of the Student Outcomes

Outcome a: "an ability to apply knowledge of mathematics, science, and engineering"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. Ability to plot functions and read graphs	All ME courses	Locally produced examinations, scoring rubrics	ME104 ME 312L	Fall and Spring semesters	Dr. Gadalla Dr. Chowdhury	ME faculty
2. Ability to formulate a set of equations and solve them			ME 204 ME 205		Dr. Drabo Dr. Deng	
3. Ability to apply calculus and DE for solving engineering problem			ME 205 ME 312		Dr. Deng Dr. Chowdhury	
4. Ability to apply dimensional analysis and unit conversion			ME 104 ME 101		Dr. Gadalla Dr. Adams	

Outcome b: "an ability to design and conduct experiments, as well as to analyze and interpret data"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. Ability to set up and conduct the experiment	ME 101L, 301L, 312L, 313L, 360L, 412L, 432L, 451L,	Laboratory practice, Laboratory reports	ME360L ME312L	Fall and Spring semesters	Dr. Deng Dr. Chowdhury	ME faculty
2. Ability to collect and present data			ME312L ME360L		Dr. Chowdhury Dr. Deng	
3. Ability to analyze and interpret data			ME360L ME312L		Dr. Deng Dr. Chowdhury	
4. Ability to perform error analysis			ME301L ME360L		Dr. Mobasher Dr. Deng	

Outcome c: "an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. An ability to understand design/process specifications	ME 320, 411, 412, 413, 432, 451, 470,472, 475, 482	Design Assignments	ME470, ME475	Fall and spring semesters	ME-IAB Dr. Seif	ME Faculty
2. Ability to model and prototype	ME103, 320, 380, 451, 470, 475	Simulation assignments	ME470, ME475		ME-IAB Dr. Seif	
3.Ability to implement design and fabricate	ME470/ 475	Senior design projects	ME470, ME475		ME-IAB Dr. Seif	
4. Ability to test, evaluate, and qualify design	ME470/475	Senior design projects	ME470, ME475		ME-IAB Dr. Seif	

Outcome d: "an ability to function on multi-disciplinary teams"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. Demonstrate ability to work & plan together	ME470, ME475	Grades on presentations and semester reports.	ME470, ME475	Fall and spring semesters	ME-IAB Dr. Seif	ME Faculty
2. Demonstrate ability to divide up complex tasks	ME470, ME475	Grades on presentations and project schedule.	ME470, ME475	Fall and spring semesters	ME-IAB Dr. Seif	
3. Demonstrate ability to integrate individual work	ME470, ME475	Grades on presentations and semester reports.	ME470, ME475	Fall and spring semesters	ME-IAB Dr. Seif	
4. Demonstrate ability to report team efforts and outputs	ME470, ME475	Grades on presentations and semester reports.	ME470, ME475	Fall and spring semesters	ME-IAB Dr. Seif	

Outcome e: "an ability to identify, formulate, and solve engineering problems"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. Ability to formulate a set of equations and solve them	All ME Courses	Locally produced examinations, scoring rubrics	ME 204	Fall and Spring semesters	Dr. Drabo	ME faculty
2. Ability to model and solve engineering problems			ME 310 ME 416		Dr. Chowdhury Dr. Deng	
3. Ability to apply differential and integral calculus to engineering problems			ME 451 ME 416		Dr. Mobasher Dr. Deng	
4. Ability to simulate and model engineering problems			ME320 ME451		Dr. Mobasher Dr. Mobasher	

Outcome f: "an understanding of professional and ethical responsibility"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. Demonstrated ability to reason through ethical dilemmas	ME101, ME470, ME 475	Grades on Ethics Case Studies	ME 101	Fall and Spring	Dr. Adams	
2. Demonstrated knowledge of NSPE Code of Ethics	ME101, ME470, ME 475	Grades on Ethics Case Studies	ME 101	Fall and Spring	Dr. Adams	
3. Graduates exhibit professional and ethical behavior in the workplace.	ME101, ME470, ME 475	Graduate and employer survey results	ME 101	Fall and Spring	Dr. Adams	

Outcome g: "an ability to communicate effectively"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. Ability to make formal presentation	ME 101L, 370, 451, 470, 475, 481	Oral presentation	ME470 ME475	Fall and spring semesters	ME-IAB Dr. Seif	
2. Ability to write effectively	ME 312L, 360L, 301L, 412L, 313L, 432L, 451L, 470, 475, 481	Technical reports	ME470 ME475	Fall and spring semesters	Dr. Seif	ME Faculty
3. Participation in classroom discussion	All classes	ME Faculty course survey	ME 313L	Spring Semesters	Dr. Seif	

Outcome h: "the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
2. Understand the impact of engineering solutions in society	ME 470 ME475	Technical reports	ME470 ME475	Fall and spring semesters	ME-IAB Dr. Seif	ME Faculty
3. Relate engineering solutions to real life problems	All ME courses, Assign senior design projects from outside agencies	design or analysis projects,	ME 470 ME 475	Fall and Spring semesters	ME-IAB Dr. Seif	

Outcome i: "a recognition of the need for, and an ability to engage in life-long learning"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. Awareness of modern developments in engineering	Alumni surveys Membership in Professional societies	Percentage of Junior and Senior students participating in at least on Professional society	ASME, NSBE, SWE, AIAA, ME 482	Fall and Spring semesters	Dr. Mobasher Dr. Qian Dr. Deng Dr. Gadalla	ME Advirosy Board, ME Faculty
2. Seeking graduate degree/professional development	Alumni surveys, Senior student surveys	Survey results	Web based survey tools, and exit surveys of graduating seniors	Spring semester	Survey Dr. Seif	

Outcome j: "a knowledge of contemporary issues"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. Demonstrated knowledge of state of the art technology	ME441, ME432, ME481,ME 470, ME 475, ME 490	Reports and locally generated rubrics	ME 441 ME 470, ME 475	Fall and Spring semesters	Dr. Chowdhury ME-IAB	ME Advisory Board, ME Faculty, Outside observers,
2. Integration of engineering science to practical problems of contemporary interest	ME441, ME 442, ME481,ME 470, ME 475, ME 490	Project presentations, reports, and examinations	ME 441 ME 470, ME 475		Dr. Chowdhury ME-IAB	

Outcome k: "an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice"

Performance Criteria	Strategies	Assessment Methods	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
1. Ability to utilize advanced Engineering software design tools	ME 104, 205, 300, 312, 411, 416, 432, 432L, 451, 451L, 470, 472, 475, 482	Locally produced examinations, scoring rubrics	ME 380 ME 432	Fall semester	Dr. Gadalla	ME Department faculty
2. Ability to use advanced computational tools	ME380 ME 470 and ME 475,		ME380		Dr. Gadalla	
3. Ability to design and simulate experiment using advanced Data acquisition tools	ME301L, 312L ME313L, 360L		ME301L ME451		Dr. Mobasher	