d. Has the mission of the program(s) changed since last review?

students work with faculty on research projects or with the WSU National Institute for Aviation Research (NIAR) in their laboratories.
education.

The AE department meets standards established by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (simply called).

ABET requires accredited undergraduate programs to utilize a comprehensive process of continuous improvement. Programs must establish clear objectives, quantifiably measure progress, achieve minimum outcomes, and effectively identify changes needed to improve the program. Constituent (i.e., students, alumni, industry, graduate programs, etc.) needs are paramount within the effort.

Accreditation reviews involve generation of a comprehensive self-study document and a campus visit by a qualified team of evaluators. At minimum, programs seeking accreditation are reviewed every six years. The WSU AE program completed an ABET review in the fall of 2013. The EAC ABET reported on their review in the summer of 2014. The AE program received full accreditation.

Specific measureable objectives and outcomes directly related to the program are evaluated regularly and externally reviewed during the ABET accreditation cycle. The AE Program Educational Objectives (PEOs) are:

> Within a few years after graduation program alumni are dependable, productive professionals using learned engineering principles to successfully satisfy employer needs in aerospace engineering or related fields in Wichita and the global community.
> Within a few years after graduation program alumni successfully complete advanced degrees in aerospace engineering or related fields.

Interestingly, these objectives are not static. Department faculty utilizes program-related input, from students, employers, and graduates, to regularly review the Program Educational Objectives. Hence, a mechanism to change or update the PEOs exists. The current PEOs were updated in 2011.

The following AE undergraduate program outcomes are central to measuring success in meeting the PEOs. Graduating students are expected to clearly demonstrate:

a. An ability to apply knowledge of science, mathematics, 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 multi-disciplinary 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;

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

The above outcomes are evaluated utilizing a variety of methods related to the following:

Department assessment exam
Co-Op employer survey
Course exams and rubrics

Additional and more detailed information on the assessment methods, results, and program changes will be provided in other sections of this self-study.

Undergraduate Program Goals and Objectives Changes
There have been no changes.

Graduate Programs Description
The Department of Aerospace Engineering offers Master of Science (MS) and Doctor of Philosophy (PhD) degrees in the following areas of specialization:

Aerodynamics and Fluid Mechanics
Structures and Solid Mechanics
Flight Dynamics and Controls
Multi-Disciplinary Design, Analysis, and Optimization

There are three MS degree program options available, with the following requirements:

Thesis Option - A minimum of 24 credit hours of graduate course work plus 6 credit hours of thesis
Directed Project - A minimum of 30 graduate credit hours of course work plus 3 credit hours of directed project
Non-Thesis Option - A minimum of 33 credit hours of graduate course work plus an exit exam over the core courses in the Tf [5 335.3(r)10(d)3(es)-.04 1DT /F1 11.04 Tf299(D)6(o)5(cto)-7(r

Provide a brief assessment of the quality of the faculty/staff using the data in the table above and tables

Course Level	2014	2015	2016
Total	3,479	2,860	2,717
100-299	663	711	638
300-499	1,105	683	711
500-699	860	690	725
700-799	729	582	432
800-899	83	170	158
900-999	39	24	55

should relate to the goals and objectives of the program as listed in 1e.

P1e. Provide an analysis and evaluation of the data by learner outcome with proposed actions based on the results.

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Undergraduate Program Outcomea: An ability to apply knowledge of science, mathematics, and engineering;	- DepartmentAssessmentExam - Co-Op Employer Survey - CourseRubrics/Exams	-		

Interestingly, a separate study of 160 AE 223 students and 250 AE 333 students provides insight into other factors that might be in play. Specifically, the typical AE 223 and AE 333 student is

- Enrolled in 14 credit hours/semester (equivalent to about 5 hours/week of time)
- Working part-time job for 14 hours/week
- Spending 15 hours/week on other activities (e.g., 5.3 hours/week of extracurricular activity, 4.1 hours/week of driving, and 5.5 hours/week on household chores/childcare)

This situation translates to the equivalent of 46 hours/week, assuming the student attends class. For the surveyed average course load (14 credit hours), students should be spending another 28 to 42 hours/week studying.

As a result of these observations, it is probable that the average AE 223 and AE 333 student is simply overloaded with outside of class commitments and is not studying enough.

There have been notable improvements in AE 373 (the course in general one of the

The flight structures course sequence (AE 525/625) weekly recitation sessions and Wingbox competition allow students to practice more real-life course content application.

The capstone design course sequence (AE 528/628) students continue to improve in overall quality, given the sustained use of hands- activities (e.g., Bronze Propeller competition). Interestingly, the of hands-on activities facilitate identification of undergraduate program issues.

Weaknesses recognized in assessments center mostly around the high-level application of science/math/engineering principles (Outcome a) and an ability to identify/formulate/solve engineering problems (Outcome e).

ical to note that these outcome

In response to high student interest, the department hired an astronautics focused faculty member who is expanding course, hands-on, and research opportunities for students
Also in response to student and industry interest (specifically from GE Aviation), the department is considering expanding course, hands-on, and research opportunities for students in the applied propulsion area
Some minor changes were made in course prerequisites to minimize bottlenecks to degree completion
The department has devised a plan to offer a critical structures course twice a year, versus the current fall only offering this could noticeably assist students with graduating sooner
The department chair continues to meet with more than seventy Campus Visitors a year in an ongoing effort to sustain and improve recruiting (visitor surveys indicate the visits are extremely effective)
The WSU NASA Jump Start Fellowship Program continues to create opportunities for new freshmen or transfer students to get valuable experience working with faculty or in campus labs (e.g., 7x10 ft wind tunnel)

Graduate Program
The overall quality of the graduate (MS & PhD) program is high. Specifically:

100% of the students passed the core courses in their areas of specialty
100% of the students showed competency in at least one graduate level class per degree in mathematics/statistics
100% of the graduates showed the ability to perform independent research by preparing, theses, dissertations, or final project reports.
All graduates, who could be tracked, were employed by the local and national industry or continued with their studies for a higher graduate degree.
A new direct to PhD
that this opportunity will increase the number of graduate students pursuing a PhD.

4. Analyze the student need and employer demand for the program/certificate. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section)

Provide a brief assessment of student need and demand using the data from tables 11-15 from the Office of Planning and Analysis and from the table above. Include the most common types of positions, in terms of employment graduates can expect to find.

Provide assessment here:

Undergraduate Program

AE undergraduate enrollments and the industry demand for quality graduates appears steady. The US labor data suggests a negative 2% rate of employment growth .

Most AE students take traditional engineering positions, especially in structures and testing areas. Interestingly, students are often hired at higher levels because of WSU Cooperative Education program, on-campus research activities, and hands-on learning focus. Their prior work and project experience proves very valuable.

Graduate Program

The need for engineering students with graduate degrees is strong. Industry interest in employee development is a major driver. Additionally, many of our graduate students are working to better position themselves, through graduate education, to work in a competitive environment.

Most of the MS and PhD students take on more advanced engineering positions or advance in grade, especially in structures and testing areas. Employment data for Program Graduate Degree Recipients from 2015 through 2017 are summarized below.

5. Analyze the service the Program/certificate provides to the discipline, other programs at the University, and beyond. Complete for each program if appropriate. (refer to instructions in the WSU Program Review document for more information on completing this section)

a. Provide a brief assessment of the service the Program provides. Comment on percentage of SCH taken by majors and non-majors, nature of Program in terms of the service it provides to other University programs, faculty service to the institution, and beyond.

Provide assessment here:

The following table outlines data on Student Credit Hour (SCH) production. Total and program graduate values have slowly decreased for the past three years. Undergraduate levels have been essentially level. Non-program majors account for most of the decrease. Data from 2017 was not available at this writing.

Major & Student Level SCH	2014	2015	2016
Total	3,479	2,860	2,717

Incoming undergraduate student GPA and ACT scores are as good or better than the university average
Program SCH production is steady
The undergraduate and graduate programs enjoy good reputations
Students, alumni, and employers rate the programs and students highly
The addition of six new labs in the Experiential Engineering Building (EEB) has had a dramatic impact on the program, the increased space for hands-on activities and resources are most appreciated
Undergraduate engineering core course changes and the expansion of experiential learning opportunities continue to favorably impact the undergraduate and graduate programs
Our ability to connect with, properly prepare, and advise incoming freshmen students has been dramatically diminished (this could have retention effects)
Attempts to engage new freshmen have been disappointing, they won't attend well-advertised social or advising related events hosted by the department
We are considering the addition of a zero-credit hour freshmen colloquium course, with the intent to increase contact and to assure students are starting the program properly
Unfortunately, staffing and supporting a new zero-credit hour colloquium course will be extremely difficult
Sophomore and higher-level class sizes have improved notably (down from about 75, to 50). The impact on student participation is notable
Undergraduate and graduate student satisfaction is high, above both the college and university averages
The average undergraduate student, enrolled in AE 223 and AE 332, is busily overloaded with outside of class commitments that limit study (and sleep) time
The department has worked towards increasing program visibility and pride (e.g., adding a Facebook page with notable news, student/alumni successes, and job opportunities)
Salaries for aerospace engineers is up significantly from three years ago
The graduate program is the primary provider of advanced degrees in aerospace engineering in the state of Kansas
The graduate program offers local engineers the opportunity to further their technical skills while employed
Employers from outside of Kansas dramatically increased their efforts to recruit students in 2017 (e.g., Boom, Scaled Composites, Lockheed Martin, Boeing, and Gulfstream)
Significant undergraduate enrollment growth will likely be hampered by a lower than

Research and external funding is reasonable, but is now focused with a small number of faculty

The department has made some progress engaging Spirit AeroSystems in funded research (two $100K/year grants each, over the last three years)

The department is now applying essentially the same approach, used with Spirit, to seek support from other companies