

Northern Oklahoma College
Mathematics and Physical Science Degree Program Review
Options: Astronomy, Chem/Physics, Mathematics, & Pre-Engineering
Program Assessment
Completed May 2017

Based on the thorough internal or external program review addressing all criteria in policy, a comprehensive report should be possible within ten or fewer pages. This program review template is provided to assist institutions in compiling the program review information, which is to be presented to the institutional governing board prior to submission to the State Regents. Executive Summaries should be possible within two pages using the provided template (Program Review Executive Summary Template).

Description of the program's connection to the institutional mission and goals:

The mission of Northern Oklahoma College, the State's oldest community college, is a multi-campus, land-grant institution that provides high quality, accessible, and affordable educational opportunities and services which create life-changing experiences and develop students as effective learners and leaders within their communities in a connected, ever-changing world.

Northern Oklahoma College will be recognized as a model institution and leader in academic quality and cultural enrichment, promoting student success, collaborative learning, creative and forward thinking, and community responsiveness.

The core values of Northern Oklahoma College are that through personalized education we believe in providing individualized services leading our students to achieve their academic goals in a welcoming and safe environment, and we will provide support to students in and out of the classroom so that they receive a full college experience with diverse opportunities. Another core value is community and civic engagement, so we believe that educated citizens are necessary for a healthy, democratic society, and that free and open expression and an appreciation for diversity are cornerstones of higher education, and we believe in economic and environmental sustainability and the importance of enriching the intellectual, artistic, economic, and social resources of our communities.

We at Northern Oklahoma College also believe in the inherent value of intellectual pursuit for both personal and professional growth, as well as the need to prepare students for the 21st century professions, and that a knowledge-centered institution is vital to a knowledge-based economy, and we measure our success against national models and standards of excellence

3.7.5 Process (Internal/External Review):

Previous Reviews and Actions from those reviews:

Analysis and Assessment (including quantitative and qualitative measures) noting key findings from internal or external reviews and including developments since the last review:

2016-2017**Astronomy**

- Purchased several upgrades for the Mackey Planetarium for better student learning opportunities.

Chem/Physics

- Modified semester offerings of CHEM 1014 Concepts of Chemistry to address the needs of multiple degree program.
- Added summer offerings of CHEM 1314 (Tonkawa).
- Added online offerings of PHSC 1114 General Physical Science to both Spring and Summer schedules.
- Added online sections of ESCI 1114 Earth Science to Summer schedule.

Mathematics

- Began offering a few pilot sections of College Algebra Supplement and Math Applications Supplement on all three campuses.
- Increasing the offerings of Calc I and II to meet the needs of students.

Pre-Engineering

- Switched semester offerings for ENGR 2433 Thermodynamics and ENGR 2113 Statics to better align with mathematics course offerings.
- Incorporated a multidiscipline aspect to ENGR 2111 Engineering Mechanics I.
- Began offering PHYS 2014 Engineering Physics I to Enid campus via ITV.
- Offered a summer section of Phys 2014 (Tonkawa) to support student to degree completion in a timely manner.
- Placed 3 engineering interns during the year.
- Began offering Physics research opportunities to students.

A. Centrality of the Program to the Institution's Mission:

The mission of Northern Oklahoma College, the State's oldest community college, is a multi-campus, land-grant institution that provides high quality, accessible, and affordable educational opportunities and services which create life-changing experiences and develop students as effective learners and leaders within their communities in a connected, ever-changing world. Students in the A.S. degree program meet general education needs and can specialize in 4 different areas aiding in smooth transfer in high demand degree areas for our region.

B. Vitality of the Program:**B.1. Program Objectives and Goals:**

Students after completion of the Mathematics and Physical Science degree will be able to:

Mathematics and Physical Science**Astronomy**

- Use and apply physical data to solve problems
- Use logical reasoning to solve problems

- Explain evolutionary theory and its supporting principles

Chem/Physics

- Use and apply physical data to solve problems
- Use logical reasoning to solve problems
- Communicate scientific ideas through technical writing
- Solve problems related to thermodynamics

Mathematics

- Sketch or identify and interpret graphs.
- Manipulate, simplify and/or solve expressions or equations.
- Solve and interpret real world application problems.

Pre-Engineering

- Use and apply physical data to solve problems
- Use logical reasoning to solve problems
- Communicate scientific ideas through technical writing
- Recognize connections between physical concepts and engineering applications

B.2 Quality Indicators (including Higher Learning Commission issues):

Mathematics and Physical Science

No objectives determined yet

Astronomy

Date	5/11/2017
Competency # and Description	1. Use and apply physical data to solve problems
Course	ASTR 2513 – Observatory Methods MATH 2145 – Calculus I MATH 2155 – Calculus II
Activity	ASTR 2513 - Quiz MATH 2145 – Word problems involving derivations MATH 2155 – Word problems involving vectors.
Measurement (attached copy of instrument with point distribution)	ASTR 2513 - Quiz MATH 2145 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz
Evaluation Criteria	ASTR 2513 - 70% pass rate on exam MATH 2145 - Students will earn 70% or better on the quiz MATH 2155 - Students will earn 70% or better on the quiz
Last Semesters results	ASTR 2513 Not offered MATH 2145 not collected MATH 2155 not collected

Results	<p>ASTR 2513 Not offered</p> <p>MATH 2145 – 7/7 (100%) of students met competency MATH 2155 – 31/35 (88.57%) of students met competency</p> <p>MATH 2145 – 26/35 (74.28%) of students met competency MATH 2155 – 4/7 (57.14%) of students met competency</p>
Summary of previous changes	NA
Recommendation for changes	<p>ASTR 2513 – NA</p> <p>MATH - Conversation still in progress to be completed before fall course start.</p>
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Date	5/11/2017
Competency # and Description	2. Use logical reasoning to solve problems
Course	<p>ASTR 2513 – Observatory Methods</p> <p>MATH 2145 – Calculus I</p> <p>MATH 2155 – Calculus II</p>
Activity	<p>ASTR 2513 - Quiz</p> <p>MATH 2145 – Word problems involving derivations</p> <p>MATH 2155 – Word problems involving vectors.</p>
Measurement (attached copy of instrument with point distribution)	<p>ASTR 2513 - Quiz</p> <p>MATH 2145 - Common questions assessed on a quiz</p> <p>MATH 2155 - Common questions assessed on a quiz</p>
Evaluation Criteria	70% pass rate on activity
Last Semesters results	<p>ASTR 2513 Not offered</p> <p>MATH 2145 103 out of 134 – 77%</p> <p>MATH 2155 36 out of 39 – 92%</p>
Results	<p>NA – ASTR 2513 not offered</p> <p>MATH 2145 – 7/7 (100%) of students met competency MATH 2155 – 31/35 (88.57%) of students met competency</p> <p>MATH 2145 – 26/35 (74.28%) of students met competency MATH 2155 – 4/7 (57.14%) of students met competency</p>
Summary of previous changes	NA
Recommendation for changes	<p>ASTR - NA</p> <p>MATH - Conversation still in progress to be completed before fall course start.</p>
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.

Chem/Physics	
Date	5/11/2017
Competency # and Description	3. Explain evolutionary theory and its supporting principles.
Course	ASTR 1523 – Planetary Science
Activity	ASTR 1523 - Exam
Measurement (attached copy of instrument with point distribution)	ASTR 1523 - Exam
Evaluation Criteria	Pass rate of 70% on each activity
Last Semesters results	ASTR 1523 15 out of 15 – 100%
Results	ASTR 1523 17 out of 17 – 100%
Summary of previous changes	Added moon, Mars and Io
Recommendation for changes	Next year will include Mercury
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Chem/Physics	
Date	5/11/2017
Competency # and Description	4. Use and apply physical data to solve problems
Course	CHEM 1414 – General Chemistry II PHYS 2014 – Engineering Physics I MATH 2145 – Calculus I MATH 2155 – Calculus II
Activity	CHEM 1414 – Quizzes, exams PHYS 2014 - Quizzes, exams MATH 2145 – Word problems involving derivations MATH 2155 – Word problems involving vectors.
Measurement (attached copy of instrument with point distribution)	CHEM 1414 – Quizzes, exams PHYS 2014 – Quizzes, exams MATH 2145 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz
Evaluation Criteria	70% pass rate on exam

Last Semesters results	CHEM 1414 31 out of 44 – 70.5% PHYS 2014 14 out of 20 – 70.0% MATH 2145 not collected MATH 2155 not collected
Results	CHEM 1414 39 out of 51 – 76.5% PHYS 2014 25 out of 25 – 100% MATH 2145 – 7/7 (100%) of students met competency MATH 2155 – 31/35 (88.57%) of students met competency MATH 2145 – 26/35 (74.28%) of students met competency MATH 2155 – 4/7 (57.14%) of students met competency
Summary of previous changes	Math faculty have added this assessment to their overall program assessment and courses will be assessed for the following spring. Science - No changes made in previous year.
Recommendation for changes	Science - Use the same set of questions along with a rubric for scoring. Math - Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Date	5/11/2017
Competency # and Description	5. Use logical reasoning to solve problems
Course	CHEM 1414 – General Chemistry II PHYS 2014 – Engineering Physics I MATH 2145 – Calculus I MATH 2155 – Calculus II
Activity	CHEM 1414 – Quizzes, exams PHYS 2014 - Quizzes, exams MATH 2145 – Word problems involving derivations MATH 2155 – Word problems involving vectors.
Measurement (attached copy of instrument with point distribution)	CHEM 1414 – Quizzes, exams PHYS 2014 - Quizzes, exams MATH 2145 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz
Evaluation Criteria	70% pass rate on exam
Last Semesters results	CHEM 1414 28 out of 45 – 62.2% PHYS 2014 14 out of 20 – 70.0% MATH 2145 103 out of 134 – 77% MATH 2155 36 out of 39 – 92%
Results	CHEM 1414 38 out of 55 – 69.1% PHYS 2014 25 out of 25 – 100%

	MATH 2145 – 7/7 (100%) of students met competency MATH 2155 – 31/35 (88.57%) of students met competency MATH 2145 – 26/35 (74.28%) of students met competency MATH 2155 – 4/7 (57.14%) of students met competency
Summary of previous changes	No changes to previous year.
Recommendation for changes	Science - Use same set of questions and use a rubric to score. Math - Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Date	5/11/2017
Competency # and Description	6. Communicate scientific ideas through technical writing
Course	CHEM 1414 – General Chemistry II PHYS 2014 – Engineering Physics I
Activity	CHEM 1414 - Labs PHYS 2014 - Labs
Measurement (attached copy of instrument with point distribution)	CHEM 1414 - Labs PHYS 2014 - Labs
Evaluation Criteria	Pass rate of 70% on each activity
Last Semesters results	CHEM 1414 39 out of 40 – 97.5% PHYS 2014 17 out of 20 – 85.0%
Results	CHEM 1414 44 out of 53 – 83.0% PHYS 2014 26 out of 28 – 92.8%
Summary of previous changes	No changes for previous year.
Recommendation for changes	Have students take lab notes and turn these in with the lab report.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Date	5/11/2017
Competency # and Description	7. Solve problems related to thermodynamics
Course	CHEM 1414 – General Chemistry II

Activity	CHEM 1414 – Quiz, exam
Measurement (attached copy of instrument with point distribution)	CHEM 1414 – Quiz, exam
Evaluation Criteria	Pass rate of 70% on each activity
Last Semesters results	CHEM 1414 34 out of 45 – 76%
Results	CHEM 1414 46 out of 53 - 86.8%
Summary of previous changes	No changes to previous year.
Recommendation for changes	Use a specific quiz for thermo assessment using a rubric for scoring.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.

Mathematics

Date	5/23/2017
Competency # and Description	1. Sketch or identify and interpret graphs
Course	MATH 1613 - Trigonometry MATH 2145 – Calculus I MATH 2155 – Calculus II
Activity	MATH 1613 – Identify amplitude, period and sketch graph of the 6 trig functions MATH 2145 – Discuss the continuity of a given function at a point and on an interval MATH 2155 – Find the second derivative, slope of the tangent line and the y direction of a point of a function
Measurement (attached copy of instrument with point distribution)	MATH 1613 - Common question assessed on quiz MATH 2145 - Common question assessed on quiz MATH 2155 - Common question assessed on quiz
Evaluation Criteria	MATH 1613 - Students will earn 70% or better on quiz MATH 2145 - Students will earn 70% or better on quiz MATH 2155 - Students will earn 70% or better on quiz
Last Semesters results	MATH 1613 – 75/94 (79.79%) of students met competency MATH 2145 – 17/22 (77.27%) of student met competency MATH 2155 – 12/18 (66.67%) of students met competency MATH 1613 – 70/94 (74.47%) of students met competency MATH 2145 – 39/46 (84.78%) of students met competency MATH 2155 – 14/20 (70.00%) of students met competency

Results	MATH 1613 – 39/49 (79.59%) of students met competency MATH 2145 – 9/9 (100%) of students met competency MATH 2155 – 27/35 (77.14%) of students met competency MATH 1613 – MATH 2145 – 27/35 (77.14%) of students met competency MATH 2155 – 6/7 (85.71%) of students met competency
Summary of previous changes	Trig - stay as is – critical for content mastery needed for calculus Calculus I – graph remains, but students write info regarding graphs with no hints given Calculus II – some rewording – polar coordinates, answers moved to rubric design
Recommendation for changes	Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Date	5/23/2017
Competency # and Description	2. Manipulate, simplify and/or solve expressions or equations
Course	MATH 1613 - Trigonometry MATH 2145 – Calculus I MATH 2155 – Calculus II MATH 2613 – Differential Equations
Activity	MATH 1613 – Verify each identity justifying each step MATH 2145 – Fundamental rules of integration. MATH 2155 – Evaluate and apply double and triple integrals in rectangular and polar coordinates MATH 2613 – Solve various type of equations including Laplace transforms and determining if an equation is exact.
Measurement (attached copy of instrument with point distribution)	MATH 1613 - Common questions assessed on a quiz MATH 2145 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz MATH 2613 - Common questions assessed on a quiz
Evaluation Criteria	MATH 1613 - Students will earn 70% or better on the quiz MATH 2145 - Students will earn 70% or better on the quiz MATH 2155 - Students will earn 70% or better on the quiz MATH 2613 - Students will earn 70% or better on the quiz
Last Semesters results	MATH 1613 – 68/92 (73.91%) of students met competency MATH 2145 – 18/22 (81.82%) of students met competency 15/22 (68.18%) of students met competency MATH 2155 – 17/19 (89.47%) of students met competency MATH 2613 – 12/12 (100%) of students met competency MATH 1613 – 67/91 (73.63%) of students met competency MATH 2145 – 37/47 (78.72%) 33/43 (76.74%) of students met competency MATH 2155 – 19/20 (95%) of students met competency MATH 2613 – 13/19 (68.2%) and 11/19 (57.89%)

Results	<p>MATH 1613 – 20/30 (66.67%) of students met competency MATH 2145 – 7/9 (77.78%) of students met competency MATH 2155 – 30/35 (85/71%) of students met competency MATH 2613 – N/A</p> <p>MATH 1613 – N/A MATH 2145 – 6/7 (85.71%) of students met competency MATH 2155 – 24/35 (68.75%) of students met competency MATH 2613 – 21/28 (75%) of students met competency</p>
Summary of previous changes	A rubric will be created for trig and possible addition of short answer. Possible rewording of instructions. A rubric will be added to differential equations. No changes for the calculus courses.
Recommendation for changes	Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Date	5/23/2017
Competency # and Description	3. Solve and interpret real world application problems
Course	MATH 1613 - Trigonometry MATH 2155 – Calculus II
Activity	MATH 1613 – Word problems involving trig functions MATH 2155 – Word problems involving vectors.
Measurement (attached copy of instrument with point distribution)	MATH 1613 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz
Evaluation Criteria	MATH 1613 - Students will earn 70% or better on the quiz MATH 2155 - Students will earn 70% or better on the quiz
Last Semesters results	<p>MATH 1613 – 72/87 (82.73%) MATH 2155 – 17/19 (89.47%)</p> <p>MATH 1613 – 74/89 (83.15%) MATH 2155 – 16/20 (80.00%)</p>
Results	<p>MATH 1613 – 39/48 (81.25%) of students met competency MATH 2145 – 7/7 (100%) of students met competency MATH 2155 – 31/35 (88.57%) of students met competency</p> <p>MATH 1613 – N/A MATH 2145 – 26/35 (74.29%) of students met competency MATH 2155 – 4/7 (57.14%) of students met competency</p>
Summary of previous changes	Trig assessment will be redone to apply Law of Sines and Law of Cosines. This will be implemented Spring 2017. Calculus rubric added and no class hint for students. Real world questions will be added for addition to other Physical Science degree options.

Recommendation for changes	Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Chem/Phys & Pre-Engineering Option	
Date	5/23/2017
Competency # and Description	4. Use and apply physical data to solve problems
Course	MATH 2145 – Calculus I MATH 2155 – Calculus II
Activity	MATH 1613 – Word problems involving trig functions MATH 2145 – Word problems involving derivations MATH 2155 – Word problems involving vectors.
Measurement (attached copy of instrument with point distribution)	MATH 2145 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz
Evaluation Criteria	MATH 2145 - Students will earn 70% or better on the quiz MATH 2155 - Students will earn 70% or better on the quiz
Last Semesters results	N/A
Results	MATH 2145 – 7/7 (100%) of students met competency MATH 2155 – 31/35 (88.57%) of students met competency MATH 2145 – 26/35 (74.28%) of students met competency MATH 2155 – 4/7 (57.14%) of students met competency
Summary of previous changes	N/A
Recommendation for changes	Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Chem/Phys & Pre-Engineering Option	
Date	5/23/2017
Competency # and Description	5. Use logical reasoning to solve problems
Course	MATH 2145 – Calculus I MATH 2155 – Calculus II
Activity	MATH 2145 – Word problems involving derivations MATH 2155 – Word problems involving vectors.
Measurement (attached copy of instrument with point distribution)	MATH 2145 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz

Evaluation Criteria	MATH 2145 - Students will earn 70% or better on the quiz MATH 2155 - Students will earn 70% or better on the quiz
Last Semesters results	N/A
Results	MATH 2145 – 7/7 (100%) of students met competency MATH 2155 – 31/35 (88.57%) of students met competency MATH 2145 – 26/35 (74.28%) of students met competency MATH 2155 – 4/7 (57.14%) of students met competency
Summary of previous changes	N/A
Recommendation for changes	Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Biological Science Degree – Pre-Pharmacy Option	
Date	5/23/2017
Competency # and Description	6. Demonstrate effective implementation of the scientific method and written and oral expression of scientific concepts and data.
Course	MATH 2103 – Elementary Calculus
Activity	MATH 2145 – Word problems involving derivations MATH 2155 – Word problems involving vectors.
Measurement (attached copy of instrument with point distribution)	MATH 2145 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz
Evaluation Criteria	MATH 2145 - Students will earn 70% or better on the quiz MATH 2155 - Students will earn 70% or better on the quiz
Last Semesters results	N/A
Results	MATH 2103 – 12/15 (80%) of students met competency
Summary of previous changes	N/A
Recommendation for changes	Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
<u>Pre-Engineering</u>	

Date	5/15/2017
Competency # and Description	1. Use and apply physical data to solve problems
Course	PHYS 2014 – Engineering Physics I PHYS 2114 – Engineering Physics II MATH 2145 – Calculus I MATH 2155 – Calculus II
Activity	PHYS 2014 - Quizzes, exams PHYS 2114 – Quizzes, exams MATH 2145 – Word problems involving derivations MATH 2155 – Word problems involving vectors.
Measurement (attached copy of instrument with point distribution)	PHYS 2014 - Quizzes, exams PHYS 2114 – Quizzes, exams MATH 2145 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz
Evaluation Criteria	70% pass rate on exam
Last Semesters results	PHYS 2014 14 out of 20 – 70.0% PHYS 2114 4 out of 5 – 80.0% MATH 2145 not collected MATH 2155 not collected
Results	PHYS 2014 25 out of 25 – 100% PHYS 2114 18 out of 20 – 90% MATH 2145 – 7/7 (100%) of students met competency MATH 2155 – 31/35 (88.57%) of students met competency MATH 2145 – 26/35 (74.28%) of students met competency MATH 2155 – 4/7 (57.14%) of students met competency
Summary of previous changes	Math faculty have added this assessment to their overall program assessment and courses will be assessed for the following spring.
Recommendation for changes	Science - No changes at this time Math - Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Date	5/15/2017
Competency # and Description	2. Use logical reasoning to solve problems
Course	PHYS 2014 – Engineering Physics I PHYS 2114 – Engineering Physics II MATH 2145 – Calculus I MATH 2155 – Calculus II

Activity	PHYS 2014 - Quizzes, exams PHYS 2114 – Quizzes, exams MATH 2145 – Word problems involving derivations MATH 2155 – Word problems involving vectors.
Measurement (attached copy of instrument with point distribution)	PHYS 2014 - Quizzes, exams PHYS 2114 – Quizzes, exams MATH 2145 - Common questions assessed on a quiz MATH 2155 - Common questions assessed on a quiz
Evaluation Criteria	70% pass rate on exam
Last Semesters results	PHYS 2014 14 out of 20 – 70.0% PHYS 2114 4 out of 5 – 80.0% MATH 2145 103 out of 134 – 77% MATH 2155 36 out of 39 – 92%
Results	PHYS 2014 25 out of 25 – 100% PHYS 2114 18 out of 20 – 90% MATH 2145 – 7/7 (100%) of students met competency MATH 2155 – 31/35 (88.57%) of students met competency MATH 2145 – 26/35 (74.28%) of students met competency MATH 2155 – 4/7 (57.14%) of students met competency
Summary of previous changes	None made
Recommendation for changes	Science - No changes at this time. Math - Conversation still in progress to be completed before fall course start.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Date	5/15/2017
Competency # and Description	3. Communicate scientific ideas through technical writing
Course	PHYS 2014 – Engineering Physics I PHYS 2114 – Engineering Physics II
Activity	PHYS 2014 – Lab PHYS 2114 - Lab
Measurement (attached copy of instrument with point distribution)	PHYS 2014 – Lab PHYS 2114 - Lab
Evaluation Criteria	Pass rate of 70% on each activity
Last Semesters results	PHYS 2014 17 out of 20 – 85.0% PHYS 2114 4 out of 5 – 80.0%

Results	PHYS 2014 26 out of 28 – 92.8% PHYS 2114 18 out of 20 – 90%
Summary of previous changes	None made
Recommendation for changes	No changes at this time.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.
Date	5/15/2017
Competency # and Description	4. Recognize connections between physical concepts and engineering applications
Course	PHYS 2014 – Engineering Physics I PHYS 2114 – Engineering Physics II
Activity	PHYS 2014 – Assignments, exam PHYS 2114 – Assignments, exam
Measurement (attached copy of instrument with point distribution)	PHYS 2014 – Assignments, exam PHYS 2114 – Assignments, exam
Evaluation Criteria	Pass rate of 70% on each activity
Last Semesters results	PHYS 2014 not collected PHYS 2114 4 out of 5 – 80.0%
Results	PHYS 2014 not collected PHYS 2114 18 out of 20 – 90%
Summary of previous changes	None made.
Recommendation for changes	No changes at this time.
Timeline for Review	Fall/spring data will be collected and reviews in the spring by instructors from all campuses will determine needed adjustments.

B.3. Minimum Productivity Indicators:

Time Frame (e.g.: 5 year span)	Head Count/Graduates				
	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Mathematics and Physical Sci	0/0	0/0	0/1	3/0	7/0
Astronomy	0/1	0/0	2/0	2/0	0/0
Chem/Physics	10/3	7/5	6/6	9/0	13/0
Mathematics	24/8	47/7	61/14	69/7	58/18

Pre-Engineering	107/5	90/18	102/18	184/3	232/19
Total	141/16	144/30	171/38	267/10	310/37

B.4. Other Quantitative Measures:

a. Number of courses taught exclusively for the major program for each of the last five years and the size of classes:

Course Number	Course Name	Sections/Average Size of Class				
		2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
ASTR 1523	Planetary Science	1/22	1/20	1/17	1/22	1/31
ASTR 2513	Observatory Methods	0	0	1/10	1/2	0
MATH 2145	Calculus I	3/16	2/25	2/21.5	2/24	3/15.7
MATH 2155	Calculus II	2/10	2/18	2/10.5	2/12	3/15.7
MATH 2613	Differential Equations	1/9	1/21	2/8	2/9.5	2/15
PHYS 2014	Engineering Physics I	1/26	1/23	1/18	1/24	1/33
PHYS 2114	Engineering Physics II	1/12	1/20	1/15	1/7	1/23

b. Student credit hours by level generated in all major courses that make up the degree program for five years:

Course Number	Course Name	Hours Generated				
		2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
ASTR 1523	Planetary Science	66	60	51	66	93
ASTR 2513	Observatory Methods	0	0	30	6	0
MATH 2145	Calculus I	240	250	215	240	235
MATH 2155	Calculus II	100	180	105	120	235
MATH 2613	Differential Equations	27	63	48	57	90
PHYS 2014	Engineering Physics I	104	92	72	96	132
PHYS 2114	Engineering Physics II	48	80	60	28	92
Total		585	725	581	613	877

c. Direct instructional costs for the program for the review period:

The program cost for the degree and options with salary and fringe benefits was \$4812 average per 3-credit hour class taught.

\$4812 X 15 sections of 3 credit hour courses = \$72,180

\$6416 X 10 sections of 4-credit hour courses = \$64,160

\$8020 X 23 sections of 5-credit hour courses = \$184,460

Total Instructional Cost for Offering Program Courses: \$320,800

d. The number of credits and credit hours generated in the program that support the general education component and other major programs including certificates:

Course Number	Course Name	Hours Generated				
		2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
CHEM 1414	General Chemistry II	240	312	256	288	140
PHYS 1114	General Physics I	184	188	228	212	204
Total		424	500	484	500	344

e. A roster of faculty members, faculty credentials and faculty credential institution(s). Also include the number of full time equivalent faculty in the specialized courses within the curriculum:

Faculty	Credential	Institution that granted degree
Full-time teaching program courses: Dee Cooper (Calc)	Master of Education plus hours in math	Southwestern Oklahoma State
Jack Cnossen (Chem)	PhD in Chemical Engineering	Worcester Polytechnic Institute
Mary Ann Harris (Chem)	PhD in Animal Sciences	University of Arizona
Christi Hook (Calc/Diffi)	MS in Mathematics	Chadron State College
Lisa McGaw (Chem)	MS in Chemistry	Texas A & M
Charmaine Munro (Chem/Phys)	PhD in Chemistry	Oklahoma State University
Darrel Negelein (Chem)	MS in Chemistry	University of Oklahoma
Kristi Orr (Calc)	MEd in Mathematics	University of North Dakota
Fritz Osell (Astr)	MEd in Ed Tech and graduate work in Geology/Oceanography	University of Hawaii
Frankie Wood-Black (Chem/Physics)	PhD in Physics	Oklahoma State University
*12 additional fte faculty teach general education math courses.		

B.5.b. Detail demand for students produced by the program, taking into account employer demands, demands for skills of graduates, and job placement data:

This degree enables students to declare that they have an associate's degree when applying for various employment, which according to recent College Study Board data increases earning potential by 13%.

While the associate degree is intended as a transfer degree, students who continue on to receive a bachelor's or master's degree may pursue careers such as actuaries, statisticians, education, engineer, or architect.

According to US Bureau of Labor statistics:

With an Associate's Degree, the median pay in 2012 for civil, electrical, and mechanical engineering technicians ranged from \$47,500-\$57,900. There is little to no growth in the job outlook for engineering technicians.

With a Bachelor's Degree, the median pay in 2012 for civil, mechanical, electrical or chemical engineers ranged from \$80,000-\$95,000. While petroleum engineers earned a median pay of \$130,000. The job outlook for civil, mechanical, electrical or chemical engineers is about 5%, while petroleum engineers is about 26% growth.

With a Bachelor's degree the median pay in 2012 for a high school teacher is \$55,000 and post-secondary is \$68,900. Job outlook is expected to grow by 6% for high school teachers (higher in certain areas) and 19% for post-secondary.

With a Master's Degree, the median pay in 2012 for a mathematician was \$101,300 and a statistician was \$75,500. Job outlook is expected to grow by 23-27% for mathematicians and statisticians.

2016-2025 OK labor market projections

Actuary - Bachelor's Degree

Median Salary - \$38.90/hr.

Growth - 15%

10 year change in jobs - 19

Architect - Bachelor's Degree

Median Salary - \$33.73/hr.

Growth - %

10 year change in jobs - 4

Math or Science Teacher- Bachelor's Degree

Median Salary - \$23.80/hr

Growth - 5%

10 year change in jobs - 47

Mechanical Engineer - Bachelor's Degree

Median Salary - \$37.95/hr.

Growth - 12%
10 year change in jobs - 301

Institutional Program Recommendations: (describe detailed recommendations for the program as a result of this thorough review and how these recommendations will be implemented, as well as the timeline for key elements)

Recommendations	Implementation Plan	Target Date
<p>2016-2017 <u>Astronomy</u></p> <ul style="list-style-type: none"> Evaluate the number of graduates in the degree program to determine feasibility of retaining the program area. 	Annual review	2018
<p><u>Chem/Physics</u></p> <ul style="list-style-type: none"> Pursue more online and evening offerings of course for non-traditional students. Design program options for different workforce areas. Assess the needs of adding course offerings in the subjects areas of circuits, concepts of physics (online) and a General, Organic, Biochemistry (GOB) course. 	Annual review	2018
<p><u>Mathematics</u></p> <ul style="list-style-type: none"> Increase the offerings of Supplement offerings to more full scale. Begin work on new remedial course to replace concepts and intermediate to prepare for college algebra to implement fall 2018. Continue to watch Calculus numbers to gauge the need for offering both each semester. Start offering Supplement to Math Functions fall 2017. Offer Math Functions on all campuses when degree requirements make changes. 	Annual review	2018

<p>Pre-Engineering</p> <ul style="list-style-type: none"> Assess the needs of offering a Basic Circuits course for Engineering students. Assess the feasibility of offering a CAD course for Engineering students. 	Annual review	2018
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Program-Level Outcomes Timeline

Program Objectives	Course Mapping	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Associate in Science-Mathematics and Physical Science – Astronomy						
Objective 1: Use and apply physical data to solve problems	ASTR 2513 MATH 2145 MATH 2155		X	X	X	X
Objective 2: Use logical reasoning to solve problems	ASTR 2513 MATH 2145 MATH 2155		X	X	X	X
Objective 3: Explain evolutionary theory and its supporting principles	ASTR 1523		X	X	X	X
Associate in Science-Mathematics and Physical Science – Chem/Physics						
Objective 1: Use and apply physical data to solve problems	CHEM 1414 PHYS 2014 MATH 2145 MATH 2155	X	X	X	X	X
Objective 2: Use logical reasoning to solve problems	CHEM 1414 PHYS 2014 MATH 2145 MATH 2155	X	X	X	X	X
Objective 3: Communicate scientific ideas through technical writing	CHEM 1414 PHYS 2014	X	X	X	X	X
Objective 4: Solve problems related to thermodynamics	CHEM 1414	X	X	X	X	X
Associate in Science-Mathematics and Physical Science – Mathematics						

Objective 1: Sketch or identify and interpret graphs	MATH 1513 MATH 1613 MATH 2145 MATH 2155	X	X	X	X	X
Objective 2: Manipulate, simplify and/or solve expressions or equations.	MATH 1513 MATH 1613 MATH 2145 MATH 2155 MATH 2613	X	X	X	X	X
Objective 3 : Solve and interpret real world application problems.	MATH 1613 MATH 2155	X	X	X	X	X
Associate in Science- Mathematics and Physical Science – Pre-Engineering						
Objective 1: Use and apply physical data to solve problems	PHYS 2014 PHYS 2114 MATH 2145 MATH 2155	X	X	X	X	X
Objective 2: Use logical reasoning to solve problems	PHYS 2014 PHYS 2114 MATH 2145 MATH 2155	X	X	X	X	X
Objective 3: Communicate scientific ideas through technical writing	PHYS 2014 PHYS 2114	X	X	X	X	X
Objective 4: Recognize connections between physical concepts and engineering applications	PHYS 2014 PHYS 2114	X	X	X	X	X